Proceedings of the International Seafood Trade Conference

Anchorage, Alaska

September 8-12, 1982

January 1983

Alaska Sea Grant Report No. 83-2
University of Alaska

Alaska Sea Grant College Program
University of Alaska
Fairbanks, Alaska 99701

Proceedings of the

International Seafood Trade Conference

September 8 - 12, 1982
Anchorage, Alaska

Brenda R. Melteff
Conference Coordinator

Alaska Sea Grant Report No. 83-2
January 1983
$12.00

THE WHITE HOUSE

WASHINGTON

August 20, 1982

I am delighted to extend my warm greetings to all those gathered for the International Seafood Trade Conference.

This conference brings added recognition to some of the most critical issues facing people around the globe. With the increasing need for protein from the sea, international trade will play an especially valuable role in filling that need and feeding a hungry world.

This means that we must continue to work to lower the barriers to trade in fish and shellfish and to increase cooperation in the development of our fishing industry.

We must also recognize the need for effective management of the world's living marine resources. They cannot be harvested without limit and our task is not only their more efficient utilization today but also their wise use for future generations.

You have my best wishes for a productive conference and every success in the future.

Ronald Reagan

Table of Contents

PAGE

PAGE

PAGE

Acknowledgments

Thanks go to all of the following for their contributions toward the success of the International Seafood Trade Conference.

Sponsoring Organizations

Pacific Sea Grant College Programs
- University of Alaska
- University of California
- University of Hawaii
- University of Washington
- Oregon State University

Office of Commercial Fisheries Development, Alaska Department of Commerce and Economic Development

National Marine Fisheries Service
- Northwest and Alaska Fisheries Center
- Alaska Region

North Pacific Fishery Management Council

Alaska Fisheries Council

National Bank of Alaska

Frank Orth & Associates, Inc.

West Coast Fisheries Development Foundation

Planning Committee

Clinton E. Atkinson, University of Alaska
Dr. Abby H. Gorham, University of Alaska
Ronald Jensen, National Fisheries Institute
Dr. Richard S. Johnston, Oregon State University
Rebecca Lent, Oregon State University
Brenda R. Melteff, University of Alaska
J. Richard Pace, Universal Seafoods, Ltd.

Kay Poland, Office of Commercial Fisheries Development
Dr. Frederick J. Smith, Oregon State University
Dr. James J. Sullivan, University of California

Conference Chairman

Frederick J. Smith

Session Chairmen

John P. Doyle
Samuel Seligmann
J. Richard Pace
Abby H. Gorham

Workshop Moderator

Clinton E. Atkinson

We would also like to thank Mary Brock and Rebecca Lent of Oregon State University and Eleanor Evans and Amy Richards of the University of Alaska for providing assistance as needed during the conference.

This publication was compiled and produced by the Alaska Sea Grant College Program cooperatively supported by the National Sea Grant College Program, NOAA, U.S. Department of Commerce under grant number NA81AA-D-00009, project A/75-01 and the University of Alaska with funds appropriated by the state. Funds for printing this document were provided by the conference sponsors.

This proceeding is compiled from copy prepared and submitted by the authors in final form. The Alaska Sea Grant College Program is responsible for the reproduction and distribution of these papers, but not for their content.

Executive Summary

Background

During the late 1960s and throughout the 1970s, a large number of econometric studies were produced which focused on the factors affecting the demand for seafood products. The rapid growth in studies of this type was largely due to attempts to correct open access (common property) problems present in existing fisheries and to incorporate economic concepts in the management of developing fisheries. During this period the opportunity to expand management control over fisheries often came from declarations of extended fishing zones by many nations.

In order to move from biological notions such as maximum sustainable yield to bioeconomic notions of maximum economic yield, it became necessary to understand price-quantity and market structure relationships. Both descriptive and analytical studies of demand and supply, as well as market structure studies, flourished. In the United States these studies were largely sponsored by the National Marine Fisheries Service (NMFS) and the newly founded National Sea Grant College Program. In other areas of the world, sponsorship was by both national and international agencies and foundations.

In large part, research focused on the markets for domestically harvested species. For example, in the United States, a net importer of seafoods, emphasis was on United States markets, the impact of imports on United States fishermen, and the potential for expanding markets abroad. Here and elsewhere the relationships between public policy and seafood prices and the potential for developing new markets were emphasized. However, with increases in transportation costs, fluctuating exchange rates and the identification of substitutional relationships among seafood products, there grew an appreciation of the need to understand interdependencies among seafood markets around the world. Shifting trade patterns accompanied extended jurisdiction and comparative advantage questions took on a new importance.

In the summer of 1979, a group of United States fisheries economists met to discuss ways to improve understanding of international--and, hence, domestic--seafood markets. Frustration was expressec at the inaccessibility of relevant market data and lack of understanding by United States researchers of market structures and processes in other countries. Economists at Oregon State University and the University of Alaska then embarked on an experiment: the formation of a network of researchers in a variety of countries to undertake cooperative research of international seafood markets. It was hoped that such an approach would lead to the fruitful exchange of ideas and data. During 1980 and 1981, meetings were held with economists and others from universities, governments and private industries in North America, Europe and Asia. This has recently expanded to other parts of the world. Almost without exception, the reception was highly positive. Each meeting generated new ideas for cooperation. The result of one suggestion is a research report on selected seafood markets, containing contributions from Belgium, Ireland, the United States, The Netherlands and Germany.

Another suggestion led to the present conference. The objectives of the conference were to learn more about the various fisheries around the world and the international trade patterns in those fisheries, to facilitate communication among individuals with interest in seafood trade questions, and to explore the possibilities of cooperative research and data exchange. Participants came from industry, governments and the universities of 21 different countries.

Changing the Structure of International Seafood Trade

With the emergence of new fishery conservation zones, fluctuating exchange rates, increases in fuel costs, changes in trade barriers, and new roles by governments in fisheries development policies, we are witnessing changes, some of them dramatic, in the structure of international seafood trade. Countries which have lost access to fishing grounds have, at least in the short run, increased their import demand and/or reduced their export supply of seafoods.

One country in this situation is Korea and government policy recommendations to deal with it have called for increased efficiency in harvesting and export of seafoods and increased participation in joint venture operations. In Japan, while distant water harvests have declined, seafood demand has increased making cooperation with other seafood trading nations a high priority. The same call for increased cooperation is echoed by Common Market Countries. The EEC is importing more seafood from nonmember than from member countries and exporting to other member countries in greater volume than to nonmembers.

Other countries have become net exporters of seafoods, in part in response to the new ocean regime. This is the case for Brazil, where domestic consumption is low because of distance from supply centers and relatively low meat prices. Australia, on the other hand, despite its large fisheries conservation zone has a low level of fishery production and harvest areas are geographically concentrated. Thus, while some potential for growth exists, it lies primarily in the developed fisheries which already face problems of overinvestment and threats to fish stocks.

Apparently it is not always true that coastal states whose conservation zones are extended will increase exports. This point was demonstrated with data presented and discussed in a theoretical model. In general, while world catch has increased by 2 percent between 1976 and 1979, international trade in seafoods rose by 23 percent during that period. While this is causing temporary dislocations, greater stability in both supply and import demand should lead to more profitable development.

Fisheries Development and Seafood Trade

With respect to fisheries development, the United States' policy is to assist small and medium sized producers in the area of seafood trade, thereby acknowledging the strong link between the growth of the fishing industry and international marketing issues.

For small open economies such as Northern Ireland and Hong Kong, fisheries development is often hampered because it takes place in waters controlled by countries whose objectives may differ from their own.

In Ireland there has been a ten-fold increase in landings and expansion of the fleet since the state sponsored Sea Fisheries Board was charged with the development of Irish fisheries. Ireland's exports have expanded recently because of the demand for mackerel in West Africa, again illustrating the relationship between development and international trade.

Opportunities also exist for new markets for United States seafood, especially in developing countries. The expansion of seafood markets, both domestic and foreign, will require, however, a change from emphasis on production to emphasis on the needs of consumers. When fisheries development is looked at in the developing versus developed country perspective, trade liberalization policies which benefit developing countries are clearly needed if these countries are to realize real growth in their fishing industries.

At the regional level it was argued that new infrastructures will be necessary to ship the product to where it is needed.

Consumer Demand

Another topic of extensive discussion was consumer demand. Japan has increased meat consumption since the 1960s and beef, pork and chicken are now strong substitutes for high, medium and low quality seafoods, respectively. Further, the income elasticity is greater for meat products than for fish products.

In the United Kingdom, low expenditure elasticities of demand have been estimated for imported salmon. Projections are that the United Kingdom salmon imports, primarily of European origin, will rise and that real salmon prices, as well as other seafood prices (except for shellfish) will decline.

The market for Pacific salmon provides an interesting laboratory to test some of the hypotheses of economic theory pertaining to price determination. Many factors are involved, including substitution and demand among species, a variety of product forms, differential growth rates in demand across regions, exchange rates and transportation costs. Seasonal factors may also be important in seafood markets. Since 1974, Canada has become a major supplier of herring roe to Japan. Econometric analysis has demonstrated that the price elasticity of demand is substantially different during the January to September period than it is during the rest of the year. Much of the harvest occurs during the first half of each year, inventories are held for substantial periods and, thus, speculation plays an important role.

Price elasticities of demand for Dutch mussels vary across countries and depend on the availability of substitute mussels. The structure of retail markets also seems to be of major importance in marketing highly perishable products. Frozen fish products appeared between 20 and 30 years ago but since then, no new products with broad appeal have appeared. Quality and price are of utmost concern to the Japanese seafood buyer along with the change from marketing through small shops to selling through supermarkets.

Also noted was the fact that values of salmon, prawns and herring are higher than those for bottomfish and that shoreside processing of the latter is difficult, giving trading companies and fishing companies different perspectives on this issue.

Market Analysis

How does one analyze markets? It was suggested that analysts have been too quick to accept the perfectly competitive model in estimating demand relationships and a better understanding of the market structure at each of the levels in the market channel is necessary in order to determine the appropriate model to use. In the world tuna market, industry structure is important. The tuna industry is quasi-oligopolistic but with more than 200 brands at retail, competition is fierce. Prices may also not always adjust to clear the market and, therefore, more recent econometric techniques designed to look at markets in disequilibrium should be considered.

Public Policy and International Trade

The relationship between public policy and international trade received considerable attention. Outlined were aspects of the United States' "fish and chips" policy, under which foreign access to waters in the United States fisheries conservation zone is related to trade concessions. Also spoken of were efforts to encourage joint ventures and to promote United States seafood sales. The issue of joint ventures was also discussed. Joint venture operations, with lower operating costs and high ex-vessel prices (than would be the case for deliveries to land processors), have resulted in changes in trade patterns, especially in groundfish. From a welfare perspective, gains and losses from joint ventures depend importantly upon the nature of the market structure of the foreign participants.

A closer look at U.S. trade policy in fisheries products was called for and problems of particular concern about trade restrictions were raised.

Additional remarks relating public policy and international trade were that government objectives in the U.S.S.R. with respect to fisheries include the provision of fish for home consumption, agriculture (fish meal), pharmaceuticals, and trade.

Further expansion of the Irish fisheries depends on continued exemption from the "beach to beach" provision of the EEC's common fisheries policy.

The cost of enforcing fisheries law may have an important impact on catch rates and equilibrium stock sizes.

The results of an input-output model to look at the impact of changes in the allocation of fish on income, employment, production, and exports, with particular reference to Denmark, were also explored.

Exchange Rates and International Seafood Trade

Multinationals are actively involved in international seafood trade and the investment decisions of such corporations are strongly affected by exchange rates. They have affected both supplies of seafood, such as cod, and real quayside prices in the United Kingdom. The strengthened United States dollar and competition from Norwegian farmed salmon have affected the United States salmon industry. Despite such problems, however, a return to the situation of the 1930s in which trade in salmon with Germany was done via a cumbersome barter system was not advocated.

Not all importers of seafood purchase for domestic consumption. Substantial volumes of frozen fish imported by Germany are re-exported after further processing. Furthermore, on the export side, some product is shipped abroad through having harvesting vessels offload in foreign ports, a situation described in the case of Taiwan. Future fisheries development in Taiwan will be affected by labor shortages, fuel costs, and reduced access to fishing grounds.

Data Exchange

Much of the conference was devoted to a discussion of aspects of data exchange. Data collection and market study activities of Infofish, GATT, OEDC and NMFS were outlined. A panel chaired a workshop discussion of methods of improving information exchange. Spoken of were the types of data needed for understanding international seafood trade and indicated was the extent to which such information is currently available. Sources of information concerning tariff and non-tariff barriers to trade were also discussed. It was decided that three directories would be developed to improve information exchange capabilities. A working group was appointed to prepare these directories as well as a report on issues involving the establishment of a central data base.

Plans for the Future

1. An international institute was formed and an executive committee will address policy issues and plans for the next conference. The name for the new institute and the acceptability of formal membership are to be determined through a mail ballot distributed to all persons registered for the conference. The executive committee will seek out funding of and a location for the institute's secretariat, to be temporarily located at Oregon State University. The duties of the secretariat are to carry out the day to day activities of the organization: correspondence, facilitating communication among researchers wanting to do

cooperative work, assisting with the data exchange function, and other administrative activities. The executive committee consists of the following individuals:

Clinton E. Atkinson
Fisheries Consultant and Advisor
University of Alaska
8000 Crest Drive, Northwest
Seattle, WA 98115
USA

Frances Cassidy (Conference Coordinator)
Department of Primary Industry
Broughton Street, Barton
Canberra, Australia 2600

Parzival Copes, Director
Institute of Fisheries Analysis
Simon Fraser University
Burnaby, British Columbia
V5A 1S6 Canada

Hans Frost
Institute of Fisheries Economics
Skolegade 33
Esbjerg, Denmark 6700

Abby H. Gorham
Alaska Sea Grant College Program
University of Alaska
3 Bunnell, 303 Tanana
Fairbanks, AK 99701
USA

Ronald Jensen
Sea-Alaska Products, Inc.
150 Nickerson, Suite 300
Seattle, WA 98109
USA

Richard S. Johnston (Chairman)
Department of Agricultural and
Resource Economics
Oregon State University
Corvallis, OR 97331
USA

Wolfgang Krone
Project Manager
INFOFISH
P.O. Box 899
Kuala Lumpur, Malaysia

Frederick J. Smith
Department of Agricultural
and Resource Economics
Oregon State University
Corvallis, OR 97331
USA

2. An information exchange working group was formed and a list of individuals identified for possible membership, including Joe Terry (Northwest and Alaska Fisheries Center, National Marine Fisheries Service, 2725 Montlake Boulevard, East, Seattle, WA 98112, USA) as chairman. This group will coordinate the preparation of three central directories:

   a. an annotated directory of sources of data relevant to studies on seafood trade;

   b. an annotated bibliography of studies on seafood markets and trade; and

   c. a directory of institutes and individuals involved in specific areas of research pertaining to seafood markets and trade. The working group will also prepare a report on issues involving the establishment of a central data base.

3. It was decided to hold the next conference in 1984 and it is hoped that Sydney, Australia, will be its site.

Abby H. Gorham
University of Alaska

Richard S. Johnston
Oregon State University

Overview Papers

Fish Trade in Asia and the Pacific

Wolfgang Krone
INFOFISH
Kuala Lumpur, Malaysia

It is a pleasure for me to join you here in Anchorage. The fishing industry is a global industry and opportunities to make contact with one's colleagues, including some old friends, is always a welcome experience.

One reason that we at INFOFISH have taken a particular interest in this conference is that you have obviously called it to address some of the very concerns which brought our project itself into existence. You are concerned not only about the fishery industry's need for marketing information, but how to process that information as efficiently as possible and how to get it to its intended audience.

In view of this I think you may find it interesting to hear something about our experience in this regard.

I am sure you know that FAO has always seen a major part of its role as the collection and distribution of information. Its Fisheries Department has been very much involved in this activity ever since it came into existence.

One important aspect of these FAO activities has been the preparation of market studies on key commodities. The Organization commissioned a series of these studies in 1975, covering the Asian/Pacific region and focussing on tuna, shrimp, crab, lobster and pelagic fish. They were conducted jointly by FAO, working through its South China Sea Programme, and by the Asian Development Bank.

These were useful studies - to us as well as to our clients. They helped us to learn more about the complex structure of trade in this region. They illuminated certain long-term trends. On this basis it was possible to make certain projections about supply and demand that I know were useful to planners in government and in other institutions.

But information, no matter how accurate and extensive it is, is not a useful commodity in itself. Its usefulness depends on it getting into the right hands at the right time. The trouble about these studies, as we came to see it, was that these conditions were not being completely fulfilled. There was an important audience - the industry itself - that we were not reaching properly - in some cases not in time; in some cases not at all. Data and information is, of course, as perishable as fish and we were particularly concerned about how long it took to get information distributed in this way.

By 1979 the figures from 1975 had certainly perished in terms of usefulness, and whether or not the studies had reached all the people we wanted them to, it was time for us to update them. So we sat down with our friends in the Asian Development Bank and began thinking about this process. And at this point we began to look at ways to supplement and improve these studies with a new kind of delivery system.

It was a good time to make this kind of review. Between 1975 and 1979 there had been an interesting development in this field. FAO had launched a fish marketing and advisory project to serve Latin America and the Carribean. INFOPESCA. Basically what INFOPESCA did was channel market information direct to users. It was, and it still is, a very successful venture in marketing communications on a hemispheric scale. We had learned much from the INFOPESCA experience. It now seemed to us that it was time to build on this experience and to apply it to conditions which were similar but not identical - in the Asian/Pacific region. We took a hard look at the information needs of the fishing industry in this part of the world and without too much difficulty they were seen to fall into certain distinct categories. To state the obvious - the industry needed information as the basis for making decisions.

First - decisions about long-range strategic planning. For instance which products to offer in the future, in what quantity and at what price. Decisions about how to change the organization to fit a future environment, decisions about long-range product development. long range quality goals and so on.

Second, these companies needed information as the basis for tactical decisions about how to achieve those long range goals. In general - decisions about how to acquire the resources, the means, financial and otherwise, to get where they wanted to go.

Last, but very definitely not least, the industry needed information as the basis for day-to-day operational decisions. Decisions about where to sell what was caught and for how much. Information about markets and prices. Information about how to tailor product lines for specific markets, about opportunities for developing new lines, and so forth. As you look over this shopping list of information requirements you see quite clearly that only some can be met in the conventional manner - by the publishing of conventional commodity studies and other reports; and only some of these publications can survive the delay which is inherent in conventional delivery systems without perishing - without losing its usefulness.

With these needs identified we set to work to design a system to meet them. We had, as I have said, the INFOPESCA model in mind, but a direct copy of INFOPESCA was not what we needed. There are significant differences between the situations in these two regions. The most important one is that in Latin America, the industry was operating far from its capacity. The need was to build the volume of sales. In the Asian/Pacific region, increasing volume is important too, but not as important as the need to build value and to diversify into new product lines and new markets.

In any case, it was on the basis of an analysis of the information requirements that we came up with the operational specifications for INFOFISH. INFOFISH is an information processing and distribution machine, tailor-made for the Asian/Pacific region.

The category of information that has occupied our attention most completely in the first year has been short-range operational material. The most visible and certainly the most called upon assistance is our service as a clearing house of buying and selling information. In this department we fill the role, to use a telephone metaphor, of the switchboard operator in the days before automatic exchange systems. We make connections - we plug buyers into sellers and vice versa. Like telephone operators, our task is solely to make these connections. What the parties on the line talk about after that, what agreements they reach are not, strictly speaking, our business. We do not listen in, but we do take a lively interest and we even ask the parties to keep us informed as much as they can about results. And fairly often they do. In our first year of operation we have serviced roughly 750 requests for this kind of buy and sell information. Although we do not know exactly, they may well add-up to 100 million US Dollars of business.

This part of our operation is handled by what we call our Trade Promotion Unit. Our main registry is the INFOFISH data bank and it contains three main categories of information:

- Detailed specifications on 450 products produced in this area.
- A list of producers and exporters of these products. We now have nearly 600 listings in this category.
- A list of some 2 500 importers who have made known to us their interest in buying these products, either on a continuing basis or to fill a current need.

This data base is of course not a static collection of information but a dynamic, constantly-changing assembly of partly confidential information on companies and their products. It is continually being updated and added to in the course of the multitude of mail, telex and telephone contacts that we maintain with traders and producers in the region and importers elsewhere.

At present, this information is being stored and accessed using a word processing system. This obviously is not the ideal way to go for an operation of this scope. It places limits on the speed of our responses that we could not accept as a permanent condition. But the very high degree of utilization of this service in our first year helps us to make a convincing case for the need for computer equipment. We are, at the moment, seeking a donor who would give us the money to acquire one.

Our clients for this service are a varied lot. Our exporters include one- or two- person operations with the capacity to handle a ton or so of fish a day. We also have some multi-million dollar companies which can handle several hundred tons. Most of our clients are medium size organizations. We have exporters in all our 17 member countries. We have them in the big ones like India, Thailand. Korea and Malaysia. We also have listings in the smaller centres. In Fiji, for instance, we list an exporter of mushroom coral, clownfish and other lines. And we list a cooperative in Tarawa, in Kiribati, which sells dried sharkfins in three grades. We do not get many calls for assistance from the really big companies. It is safe to assume they have their own market intelligence systems.

This service is closely supported by a market newsletter, INFOFISH Trade News which we publish twice a month and which carries current price information on about 400 products and markets together with other news. We get this information from a network of correspondents in our member countries and elsewhere. After 20 issues we put this newsletter on a subscription basis. The subscription fee is US$ 245 for member country subscribers - US$ 295 for everyone else. Orders have been coming in briskly since we, so to speak, went commercial. This - and the results of a readership survey we ran earlier this year - suggests that the industry finds this newsletter useful. Newsletters of this type which do exist are entirely geared to clientele in developed countries. We seem to have filled a real vacuum.

As I have mentioned, we want to take as much advantage as possible of data processing technology - at least to the extent consistent with our means and with the need for confidentiality. It would be particularly useful to handle the price and market trend information in the newsletter this way. I hesitate to get too futuristic in my thinking. But data processing costs are falling fairly rapidly and I am optimistic about what can be done later in the decade. It would be nice for instance to think that eventually we could make this information available - very selectively - on line through terminals at our INFOFISH National Liaison Office. And after that - admittedly some time after that - in the offices of fish exporting companies and others in our region. This newsletter information is fresh when we get it - if it is not: we do not publish it - and we get it from reliable and carefully selected sources. Computerization would make it even fresher and to that extent even more useful to our clients.

Charging a subscription fee for the newsletter is the first step toward making INFOFISH self-supporting. We are funded by the Government of Norway for three years. But the ultimate aim has always been for this operation to pay its own way. If our service is commercially useful, it should be able to do so. If it is not commercially useful there is no point in continuing it. Going by our first year, it looks as if we do fill a real need in the region.

This brings me to the category of medium-term information needs and what we do about them. Our main instrument in this area is the Technical Advisory Service which offers advice and information on a very wide range of subjects. We answer questions - or we obtain them from other sources - on such matters as quality control, product development, plant design, processing technology, and import regulations. This service is supported by a very well-equipped technical information centre, which we established using FAO's very extensive information and advisory resources, not only in Rome but also in the field. Here too, our clients come in all sizes and from all parts of the region. We have answered calls, for instance, for advice about how to meet importers' requirements for products packaged in plastic film. We have advised on the feasibility of exporters opening up new product lines. We received a request for information about quality control measures pertaining to shark liver oil. Recently we serviced a request for information about how to equip floating factories. These are the ends of the spectrum. The majority of queries come from medium-scale operations - questions for instance about modern freezing methods, or the canning of tuna and other products. We are limited in what we can do in the way of direct consultancies by our manpower, but we have given some on-site advice, and we do maintain a roster of specialists to whom we can refer other requests.

Also in this category of medium term information we commission and publish studies. We are, for instance, working with AsDB and the FAO South China Sea Programme on the latest update of the commodity series I mentioned earlier. We commissioned the Marine Products Export Development Authority of India to make a study of trade within the Asian/Pacific region. A study on marine transport of frozen fish is now being published.

At this point, I would like to introduce you to a magazine called INFOFISH Marketing Digest. It is a 40- to 50- page publication. It is issued every two months and it plays a key part in our strategy for meeting the medium term information needs of our clients. The Digest covers processing, marketing development, investment, transportation, quality control - in fact all matters related to the post-harvesting stage of fishing industry operation.

We also use the Digest as a delivery system for our studies. Condensed, advanced versions of these reports appear in the magazine before the main publication is issued. In fact, the function of getting this advance notification out is one of the primary reasons for the magazine's existence.

We expect to begin 1983 with another step toward financial self-sufficiency - by selling advertising space in the magazine. The audience is influential and precisely targetted, the rates are good and you can even buy an outside or inside cover in full colour if you hurry. I will be glad to take your orders in the hall.

And for the long-range decision makers and their information needs, our role here is more limited, not by accident but by choice. The industry in the Asian/Pacific region needs long-range information - long-range market research in particular - as much as any other industry and probably more than most. We are not involved in the generation of this kind of material. The reason is simply that there are limits to our resources and if we try to do everything, we wind up doing nothing adequately. This does not mean that we are not involved in long-term information. On the contrary. The area in which we are very much involved is in transmitting the message. We can get long-range studies, including market research studies, to the people that need them most and that can put them to best use - namely the industry. Furthermore, we can do so probably more efficiently and rapidly than any other channel or medium presently available.

If this sounds like an invitation there's an excellent reason. It is.

Speaking directly to this audience and particularly to those people in it who are involved in research, let me invite you to consider INFOFISH as an alternate, supplementary or in some cases even the primary delivery system for your reports. We are prepared, specifically, to reserve a portion of INFOFISH Marketing Digest for this purpose on a planned and systematic basis. Our Asian/Pacific audience is one you want to reach and one that needs to hear from you. The industrialized nations - Japan, the United States, North America - are, in the view of these countries, important markets with great potential. The industry in these developed countries need this communication too. The benefit to it is the building of a better informed, more capable fishing industry in this region - an important source of supply today and, maybe an even more important one tomorrow. The Asian/Pacific region is moreover an increasingly important market for some of the world production.

To sum it up then - and that is what I think I should do about now - it would be good news for the industry as a whole if this meeting in Anchorage could count among its accomplishments the establishment of a working relationship between your organization and INFOFISH. It would, to my mind, be a perfect meshing of capabilities. From the viewpoint of your organization, the benefit might well be a welcome additional measure of insurance against the development of a communication gap between the generators of information and those who need to make use of it - between researchers and those who must apply that research in the industry. There are benefits of course for us at INFOFISH too. We too would get insurance against the dangers of getting so close to the trees that we lose sight of the forest or perhaps I should say so deep into fishery products that we cannot see the fisheries. Certainly we would feel less isolated from the centres of long range investigation where new methods and knowledge are generated - better connected with the sources of information that our clients need, and which it is our job to deliver.

In short, I think we can do useful work together and I look forward to that collaboration.

Thank you.

International Trade in Fishery Products: Issues for Developing Countries

Renzo Franco
General Agreement on Tariffs and Trade
Geneva, Switzerland

Introduction

1. A large number of developing countries record a significant level of fish and fishery products[1] landed and many of these countries have the potential to increase their catch.

2. There are roughly a thousand different species of fish and aquatic animals of which several hundred are of commercial significance. Species are designated differently in different parts of the world and national tariff schedules can involve up to 100 tariff sub-positions for certain CCCN headings.

3. This note attempts to provide a picture of overall developments in world catch and international trade in fishery products, notably from the point of view of developing countries, illustrating tariff and non-tariff measures affecting their exports to developed country markets, and suggesting some points for consideration in the event of a further process of trade liberalization in this sector.

World nominal[2] catch

4. The world nominal catch of fish, crustaceans and other aquatic animals grew from an average of 40 million metric tons[3] in the early 60's to an average of about 65 million metric tons in the early 70's.

[1]The term fish and fishery products in this paper covers fish, crustaceans, molluscs and other aquatic organisms either, fresh, frozen, prepared or preserved.

[2]Nominal catch is the term used to designate landed catch which is recorded.

[3]One thousand kilogrammes "net basis".

5. The remarkable growth in total landings over the decade was mainly attributable to the following factors: (i) the expansion and modernisation of the fishing fleets of a number of countries (notably Japan, the USSR, and several of the Scandinavian countries); (ii) increasingly sophisticated methods of locating schools of fish on the high seas; (iii) use of more efficient fishing equipment and techniques for storing and preserving catches; (iv) a large increase in catches of species (anchoveta) destined for reduction to fishmeal and oils, notably in the South East Pacific area; and (v) the progress made by a number of developing countries, especially countries in the Indo-Pacific region and on the West Coast of Africa, in developing their fishing industry.

6. The world fisheries situation underwent a dramatic change in the mid-1970's. The average annual rate of growth of world nominal catch fell from 6 per cent (1960's-1970's) to about 1 per cent (1975's-80's). As a result nominal catch in 1980 slightly exceeded 72 million metric tons.

7. The explosive development of South-East Pacific anchoveta fishery was dramatically reversed, while overfishing of certain species and in certain fishing areas (notably of cod, herring and capelin in the North-East Atlantic; and of Alaska pollack, herring and makerel in the North-West Pacific) has significantly reduced the stocks-to-catch ratio for certain species, thereby severely limiting in a number of cases the possibility of either increasing the offtake or even maintaining it at the present level. National and international stock management measures, such as agreed catch-quotas, seasonable restrictions on catch, and mesh-size limitations for nets, have been introduced, but results, in general, appear to be limited.

8. Possibilities for any further major increase in world fishery output would therefore be linked to the exploitation of new fishing areas and the fishing of other species in addition to those now most widely in demand by commerce and industry. According to FAO studies, some of the more promising areas for new fishery development are in the South-West Atlantic and the Indian Ocean. Possibilities for increased fishery production have also been identified by FAO in certain parts of the Caribbean. In this context it may be noted that many of the developing countries adjoining these fishing areas are, in fact, planning to expand their fisheries.

9. A large number of the less-known species currently landed in developing countries may offer opportunities for trade development. A prerequisite for such trade diversification and development is, however, a more widespread awareness among buyers and consumers about substitute fish products which developing countries could supply. Such diversification should also contribute to reducing wastage from fish catches, estimated at some 10 million tons in recent years[1] or 15 per cent of total catches.

---

[1] This is, inter alia, a consequence of production, processing and marketing being geared to just a few species, as other species caught are often returned as "waste" to the sea (c.f. FAO, The World Food Problem, E/CONF.65/4).

10. The development of aquafarming of fish, crustaceans and molluscs in fresh and coastal waters could offer additional opportunities for significant increases both in output and in earnings from fishing activities. While aquafarming on a large scale depends on advanced technology and capital investment if it is to be profitable, the hydrological, oceanographic, goegraphic and climatic conditions in many developing countries are considered to be particularly favourable for its development or expansion. Apart from augmenting protein food supplies, such an increase should also permit an expansion of their capacity to export fish and fishery products.

TABLE 1

World Nominal Catch by Economic Regions 1960-1980
(Fish, crustaceans, molluscs, other aquatic animals and plants)

	Thousand metric tons			% Share		
	1960	1970	1980	1960	1970	1980
World Total	40,200.0	65,455.7	72,190.8	100	100	100
Developed countries	16,728.5	24,560.2	27,386.8	41.5	37.5	37.9
Developing countries	13,899.3	29,571.9	29,922.7	34.5	45.2	41.4
(Developing countries without Peru)	(10,172.[illegible])	(17,037,0)	(27,191.3)	(25.3)	(26.0)	(37.7)
Centrally planned countries (including China)	9,572.[illegible]	[illegible]1,323.6	14,881.3	[illegible]	[illegible]	20.6

Source: FAO, Yearbook of Fishery Statistics, various issues.

Processing and marketing of fishery products destined for human consumption

11. Marine products are higly perishable commodities, more rapidly susceptible to microbiological spoilage than most other foodstuffs. This has important consequences for the forms in which they can be stored and marketed. Advances in food processing technology, in methods of preservation and in the speed and variety of means of transport available, have considerably widened the market for most kinds of fish and fishery products, notably resulting in a sharp increase in freezing and canning.

12. Different types of processing are intended to meet the requirements of different segment of the market. Where high quality "fresh" fish, curstaceans and molluscs are available at reasonable prices, consumer preference is normally for the fresh marine product rather than for the corresponding preserved product, as most of the preservation techniques in use alter somewhat the taste and often the texture of the marine products concerned. For certain uses, however, preserved or prepared marine products are preferred - for instance, ready-to-cook convenience foods, canned tuna as an accompaniment to salads, rolled anchovies for party snacks, etc.

13. Fluctuation in prices has also been a significant feature of the market for fish and fishery products. This has resulted from several factors, including movements in prices for competitive or substitutable products and the recessionary trends in most developed countries.

14. The main species offered at present to fish freezing plants and convenience food packers include cod, haddock, hake, sole, halibut and other flat fish. Freezing plants also offer the main outlet for various types of crustaceans and for certain fish aquafarming products, notably trout. On the other hand, tuna, mackerel, pilchards, sardines, salmon and anchovies constitute the major species that are processed by canneries. Crabmeat is generally also canned rather than preserved by other methods. Fish of the herring family are generally cured[1], either in brine, marinated or are smoked, as are some other varieties mentioned earlier, notably salmon and tuna.

15. Trade expansion possibilities for developing countries in frozen fish and fishery products may also be envisaged in respect of retail packed products. Several developing countries have already established a reputation for supplying quality fish products not only of such traditional items as canned sardines, but also in regard to such items as frozen fillets. Many developing countries have export capacities for retail packed deep-frozen crustaceans and molluscs, including marinated molluscs in aritight containers. A number of developing countries have already significant exports of such retail packed fishery products.

---

[1] Curing is the oldest method of preservation taking the form or either: (i) dehydration, for instance by controlled sun-drying; (ii) salting; (iii) curing in brine; (iv) hot-smoking; (v) marination in acetic acid solution; or (vi) after boiling, immersion in oil. All of these preservation methods are still in use. The importance of preservation of fish by means of smoking and marination is, however, declining in relative terms.

TABLE 2

Disposition of World Catch

	1960		1970		1980	
	Million metric tons	% share	Million metric tons	% share	Million metric tons	% share
Total catch	40.2	100	65.5	100	72.2	100
For human consumption	32.0	80	40.8	62	50.5	70
Reduction to fishmeal, oils and miscellaneous purposes	8.2	20	24.7	38	21.7	30

Source: FAO, Yearbook of Fishery Statistics, various issues.

TABLE 3

Disposition of World Catch destined for human consumption by type of marketing and processing

	1960		1970		1980	
	Million metric tons	% share	Million metric tons	% share	Million metric tons	% share
Total catch for human consumption	32.0	100	40.8	100	50.5	100
Intended for marketing fresh or chilled	16.1	50	18.3	45	14.8	29
Freezing	3.7	12	9.1	22	15.7	31
Curing, (in salt or brine, in marinades, by smoking or by drying)	7.7	24	7.6	19	9.9	20
Canning	4.5	14	5.8	14	10,2	20

Source: FAO, Yearbook of Fishery Statistics, various issues.

TABLE 4. INTERNATIONAL TRADE IN FISHERY PRODUCTS

(Q = thousand MT; V = million US$)

		IMPORTS			EXPORTS		
		1978	1979	1980	1978	1979	1980
A. Total fishery products[1/]							
World	Q	8,422.2	9,319.2	9,199.2	8,9[illegible]	10,073.7	10,044.5
	V	12,346.1	15,052.1	15,293.5	11,5[illegible]	[illegible],050.1	14,890.7
of which:							
Developed countries	Q	6,078.0	6,691.6	6,649.5	5,069.4	[illegible],596.1	5,085.5
	V	10,390.5	13,051.0	13,144.6	6,378.6	[illegible],126.2	8,701.6
Developing countries	Q	1,672.3	1,893.0	1,824.7	3,2[illegible]	[illegible],800.0	3,656.7
	V	1,426.6	1,651.4	1,780.2	[illegible]	[illegible],513.0	5,735.9
B. Fish, fresh, chilled or frozen							
World	Q	3,363.0	3,642.4	3,677.1	3,94[illegible]	[illegible],305.4	4,325.3
	V	4,490.9	5,429.3	5,560.8	4,319.5	[illegible],271.7	5,400.0
of which:							
Developed countries	Q	2,516.2	2,687.1	2,680.8	2,[illegible]	[illegible]434.6	2,414.1
	V	3,993.9	4,827.2	4,915.5	2,807.[illegible]	[illegible]441.2	3,577.4
Developing countries	Q	625.0	717.9	697.3	1,1[illegible]	[illegible],165.6	1,169.7
	V	374.6	467.1	480.1	1,026.5	[illegible],293.9	1,265.0
C. Fish, dried, salted or smoked							
World	Q	363.3	394.3	392.5	423.5	468.0	481.0
	V	992.6	1,222.8	1,097.9	896.5	1,097.0	1,216.6
of which:							
Developed countries	Q	223.4	262.7	253.4	343.2	367.0	382.7
	V	759.0	977.2	828.9	755.5	893.4	1,093.3
Developing countries	Q	114.2	115.0	120.9	60.2	72.3	75.8
	V	223.0	232.5	253.5	91.6	122.3	129.2
D. Crustaceans and molluscs, fresh, frozen, dried, salted							
World	Q	1,023.0	1,185.3	1,116.1	998.0	1,143.6	1,075.6
	V	3,343.1	4,657.0	4,400.5	3,145.8	4,113.0	4,016.1
of which:							
Developed countries	Q	913.6	999.3	962.1	420.4	478.6	480.8
	V	3,148.8	4,014.5	4,099.2	1,176.1	1,494.1	1.496.1
Developing countries	Q	101.4	107.1	133.6	552.7	642.6	575.4
	V	170.3	250.3	272.5	1,892.2	2,526.1	2,541.0
E. Fish products and preparations whether or not in airtight containers							
World	Q	791.4	826.9	893.8	815.1	840.6	959.5
	V	1,464.8	1,659.3	1,990.1	1,546.1	1,758.5	2,015.4
of which:							
Developed countries	Q	430.1	460.3	519.5	569.[illegible]	580.0	625.5
	V	1,034.3	1,222.2	1,514.2	1,130.8	1,271.8	1,447.1
Developing countries	Q	323.1	333.4	327.8	183.1	202.8	264.2
	V	379.6	385.5	410.5	299.8	344.1	447.1
F. Crustaceans and molluscs products and preparations, whether or not in airtight containers							
World	Q	159.4	162.8	168.3	106.0	110.3	118.2
	V	619.9	721.5	799.6	428.5	520.8	593.4
of which:							
Developed countries	Q	141.4	133.0	152.3	55.8	56.0	62.0
	V	581.2	681.0	744.5	248.9	300.3	362.4
Developing countries	Q	17.4	19.2	15.6	45.3	50.5	52.7
	V	36.3	38.7	47.7	146.7	180.8	196.8

[1/] Including oils and fats, crude or refined, meals and similar animal feeding stuffs, of aquatic animal origin.

Source: FAO, Yearbook of Fishery Statistics, Vol. 51. Data includes various estimates.

International trade

(a) General

16. International trade in fishery products grew from US$ 11.5 billion in 1978 to almost US$ 15 billion in 1980. More than two-thirds of this trade was accounted for by fresh, chilled and frozen fish; one forth by fresh, chilled and frozen crustaceans and molluscs, while about two tenth were of canned or otherwise preserved fishery products.

(b) Exports from developing countries

17. In 1980, developing countries accounted for 37 per cent by volume and 38 per cent by value of world trade in fish and fishery products. They exported about two-thirds of world crustaceans and molluscs, fresh, chilled or frozen, but only one-third in the preserved form. Exports of canned fish from developing countries increased by more than US$ 100 million in two years, currently representing about one forth of world exports in these products.

18. World trade of dried, salted or smoked fish in 1980 also increased moderately in quantity and more substantially in value. Although more than half of the volume was exchanged among traditional producing and consuming countries in Europe, the demand for cured fish by developing countries expanded in spite of sharp price increases. Cured fish products accounted for the main part in both production and export, in those countries for which data was available.

(c) Structure of trade with developed countries

19. Recorded imports of fish and fishery products into developed countries in 1980 amounted to US$ 13 billion, or 87 per cent of world total. Of this amount, about 40 per cent originated from developing countries. Three markets, the EEC, Japan and the United States, absorbed the bulk of developed countries' total imports from developing countries. Developing countries also held over three-quarters of the Japanese market.

20. Nearly one-half of all such imports by developed countries from developing countries were crustaceans and molluscs, either fresh or preserved. A large number of developing countries were involved in this trade, of which the most important included Brazil, Hong Kong, Malaysia, Mexico, India, Indonesia, Thailand and Venezuela.

Tariff and non-tariff treatments in major markets

21. Developed countries' tariff structures for fishery products vary widely. Japan has a relative simple tariff structure, while others such as those of Norway and the United States, are much more detailed. As a general rule, tariffs are built up on the basis of the species most commonly caught by, or imported into, the country concerned; and past trade negotiations may have created new tariff headings for products of interest to the negotiating parties.

22. Preferential access under GSP schemes (duty-free or reduced rates, unlimited or under country or other limitations) is generally granted on some preserved or processed fishery products. Some shellfish, fresh, chilled, frozen, dried or smoked are also included in certain GSP schemes.

23. Weighted average m.f.n. tariff for fishery products in developed countries were reduced by 14 per cent from 6.3 to 5.4 per cent, following the recently concluded Tokyo Round negotiations. Cuts were by far more significant with respect to unprocessed products (20 per cent) while more limited reductions were granted on processed products (2 per cent).

TABLE 5

Pre-and Post Tokyo Round m.f.n. tariff averages[1] of developed countries[2]

Products	Pre-Tokyo Round	Post-Tokyo Round	% cuts
Fishery products of which:	6.3	5.4	14
Unprocessed	5.0	4.0	20
Processed	14.7	14.5	2

[1]Average of all tariff items (i.e. duty-free as well as dutiable items) weighted by imports of such items from GSP beneficiary countries.

[2]Austria, Canada, EEC, Japan, Finland, Norway, Sweden, Switzerland and the United States.

24. Overall GSP margins were improved by 16 per cent but only by 5 per cent on processed products which bear however an average GSP rate more than 50 per cent less than on a m.f.n. basis.

TABLE 6

Pre-and Post-Tokyo Round m.f.n. and GSP tariff averages[1] of developed countries[2] with respect to items covered by GSP before and after the Tokyo Round

Products	M.f.n. rate average			GSP rate average		
	Pre-Tokyo Round	Post-Tokyo Round	% cuts	Pre-Tokyo Round	Post-Tokyo Round	% cuts
Fishery products	14.1	13.5	4	7.3	5.8	20
of which:						
Unprocessed	12.3	11.6	6	7.0	4.8	31
Processed	16.4	16.1	2	7.7	7.2	7

[1] Average of items covered by GSP weighted by imports of such items from GSP beneficiary countries. GSP rate averages should be read with the understanding that certain products are subject to country or quantitative limitations.

[2] cf. table.

25. Notifications of applied non-tariff measures[1] in this sector are less than those recorded for other agricultural sectors. They affect, however, some substantial trade flows. Apart from quantitative restrictions (global, bilateral, or tariff quotas) they generally include licensing, health standards, product specification standards, labelling and marking regulations, packaging, and custom evaluation procedures.[2]

26. Further details of the Tokyo Round results on fishery products may be found in Annex I[3] which provides data on both pre- and post-Tokyo Round tariff rates in nine developed country markets (as available to date) at the tariff line level together with corresponding trade flow data.

[1] GATT, Inventory of Non-Tariff Measures (AG/DOC series).

[2] For details see: FAO, Registry of Import Regulations for fish and fishery products, GCP/INT/345/NOR, Rome, 1980.

[3] Not reproduced here. Interested persons may obtain a copy by contacting the author.

(a) EEC

27. The EEC imports a wide range of fishery products from developing countries either in fresh, chilled and frozen form or in prepared and preserved form. The tariff structure distinguishes between imports for industrial processing and those for direct human consumption. The former are generally traded liberally . The latter are often subject to significantly higher m.f.n. duty rates.

28. The Common External Tariff on fresh fishery products is subdivided into about one hundred separate lines. Duties on imports of tuna for industrial purposes are temporarily suspended from 22 per cent to zero. Duties on other species range from 5 per cent to 25 per cent, although duty free treatment is granted on some seasonal imports. The tariff structure on preserved products is much simpler, with duties ranging from 5.5 on salmon preparations to 25 per cent on canned sardines.

29. The GSP scheme applies substantial reduction to certain types of shrimps and prawns, fresh, chilled or frozen (Genus Pandalidae sp. and Genus Palamonidae sp., and Penaeus indicus, monodon, esculentes, merguentis). The rate on fresh and chilled lobsters is also reduced from 25 per cent to 7 per cent under the GSP. Preparation of crustaceans and molluscs are also subject to reduced GSP rates.

30. The ACP countries are entitled to duty-free treatment for fish and fishery products under the terms of the Lomé II Convention. Shrimps and squids have also been recently included in the stabex scheme. Certain other Mediterranean countries also benefit from preferential treatment in the EEC market under bilateral arrangements. EFTA members are accorded preferential treatment in the EEC in the form of partial reductions for certain species of fish.

(b) Japan

31. The Japanese tariff structure for fishery products also cover about one hundred tariff or sub-tariff lines of which only few are duty-free. The GSP scheme covers less than one quarter of tariff lines. Protective treatment is mostly applied to species caught locally.

32. Fresh, chilled and frozen fishery products are all subject to m.f.n. rates ranging from 3 to 15 per cent, with the exception of certain fry for fish culture that enjoy duty-free treatment. Five items, (aquarium fish, hard roes salted, etc. shrimps, prawns and lobsters, salted, etc. octopus, fresh, chilled or frozen, and hard clams dried or in shell etc.) are covered by the GSP scheme and benefit from reduced rates.

33. M.f.n. duties on preserved and canned products range from 7.5 per cent ot 15 per cent. However, the GSP scheme is more widely applied and it covers almost all products, except canned salmon, prepared squids and scallops, and preserved shrimps, prawns and lobsters. For these products it would appear that the GSP considerably reduces, or eliminates tariff escalation.

(c) United States

34. In the United States, m.f.n. duty-free access is granted to a number of major tariff lines representing the bulk of the country's imports. These include TSUS 11010 (sea herring, smelts and tuna, fresh, chilled or frozen), TSUS 11047 (fish, skinned and boned, in frozen block, over 10 pounds), and TSUS 11445 (shellfish, n.e.s., fresh, chilled or frozen, prepared or preserved).

35. Although they benefit from duty-free treatment, shellfish are affected by health and sanitary regulations preventing imports of products that have not been covered by the required certificats.[1]

36. Import duties rise, however, markedly with the degree of processing. For instance, fresh or chilled tuna receives m.f.n. duty-free treatment. Canned tuna not in oil bears a 6 per cent duty up to a tariff quota equal to one-fifth of domestic canning output in the preceeding year, and thereafter a 12.5 per cent rate. Canned tuna in oil is dutiable at the peak rate of 35 per cent. The rate levied on canned sardines ranges from 4 per cent to 30 per cent depending on the unit value rate of the goods.

37. The GSP scheme applies to a number of products of interest to developing countries, including canned anchovies in oil, fish pastes and sauces, preserved oysters and oyster juice, crabmeat not canned, canned clams, sturgeon roe, and other fish roes not in oil.

Issues for future trade liberalization in the fishery sector

38. Although the picture that emerges from previous paragraphs would indicate that developing countries' fishery exports to major markets are affected by a number of issues specific to each of these markets, some consideration may nevertheless be given to certain points which could be included in a list of future requests for trade liberalization in this sector.

39. To expand their exports, developing countries must, firstly, expand and diversify their production as well as increase the quality standards of any product.

---

[1] The Maryland State Shellfish and Product Act does not allow imports of shellfish unless they have been certified for inter-State shipment by the US Public Health Department.

40. With respect to exports to developed countries, developing exporting countries should seek to obtain preferential rates in airfreight for those high-valued products that could reach high-income markets in a fresh or chilled state.

41. Developing countries could also consider the possibilites to expand their intra-trade in those products more characteristically preserved or prepared, such as certain cured species of fish.

42. In terms of requests for improved tariff treatment in developed markets, a tariff reclassification may be desirable so as to obtain lower m.f.n. rates on those species typically produced in developing countries and which could only compete at lower prices in major markets. This would also prevent an increase in tariff escalation for those other species must commonly traded in preserved or canned form.

43. For those products, such as tuna, sardines and other preparations, scope may exist for improving the GSP schemes either in terms of their coverage and of the level of tariff reduction or other existing limitations.

44. As regards non-tariff measures, an improved system of notifications as is currently under considerations in most countries participating in multilateral trade agreements, could result into a significant step towards a bette knowledge of existing systems and a possible negotiation on their normative simplification or removal.

The author is Economic Affairs Officer in the Agriculture Division. This paper presents the personal views of the author and cannot in any way construed as representing those of the GATT.

OECD Work on International Trade in Fish and Fish Products

Paul Adam
Organization for Economic
Co-Operation and Development
Paris, France

The study, International Trade in Fish Products: Effects of the 200-Mile Limit, recently finalised by the OECD Committee for Fisheries was centered on the effects of the newly adopted 200 miles fishing zones on international trade. It was not meant to assess the policies pursued or to recommend specific orientations or measures. It was felt useful to only sort out the first facts about the consequences of the new regime of the sea for the trade in fish and fish products. Obviously, since 1977 which has been the year during which the most important decisions were taken in this respect, the situation could not have as yet stabilised. But the first consequences of so general a development were bound to be felt rather quickly and it was essential to survey them immediately, so as to avoid being one day, and one day in the relatively close future, suddenly confronted with unexpected detrimental changes in fish trade.

As it is impossible to summarise 192 pages of a densely printed text, illustrated by many statistical tables, it may be more helpful to highlight some of the findings selected as the most important ones.

1. A redeployment of the fishing activity has been the first and immediate consequence of the new regime. The operations of the Eastern and the European fleets, traditionally or more recently engaged in exploiting the Atlantic and Pacific waters off Canada and the United States, were drastically reduced. Compared to the previous high catches in the area, the remaining shares of those far distant fleets are now close to being negligible. The Eastern fleets were expelled from the North Sea

and the European fleets from the Barents Sea. The fisheries in the Bering Sea were also immediately organised along the new principles, with the result that Japan has to rely upon exchanges with the USSR and quotas granted in the US zone off Alaska, while the USSR had to retreat into the exploitation of its own zone. And the Icelandic waters had already been practically reserved to the nationals. Overall about 12 million tons of mostly food fish were caught by long range fleets in foreign waters up to the mid-1970's, when the total world catch for human consumption was around 44 million tons.

In other words, the losses of supplies for certain countries have been very significant, while other countries have gained new resources, and, in some cases, the first countries have also and already benefited from stocks being in a process of rehabilitation. It is therefore logical to accept the common wording which opposes the "loosers" to the "winners". In the trade of demersal fish this is very important because the loosing countries are not necessarily compensating their missing catches by equivalent imports from the happy winning countries. Improvements in resources availability have not always been accompanied by improvements of market possibilities.

2. The case of tunas, especially the tropical tunas, brings about the problem of the countries which wish to develop the exploitation of formerly neglected resources situated off their coasts. Surely the conditions for the production of tunas are far from being stabilised and are likely to change significantly in years to come. All countries having possible access to tuna resources have made or are making efforts in order to organise their own production. The same kind of national development has already taken place for other species off the coasts of South America and the African countries fronting on the Atlantic coast are now making efforts in the same direction. This can take the form of joint ventures which are rarely contracted without provisions for the training of local crew and the improvement of the shore facilities. All in all, it leads to the conclusion that the share of international trade should be increased for the developing countries, including the possibility of further trade between one another. Currently there is very little trade, only 3% of overall world trade in fish products by value, between countries belonging to neither the OECD or COMECON. It means that, generally speaking, the links between production on one side and processing and marketing on the other side will be weaker. The trade of industrialised countries which were accustomed to closer contact, often times exerting a certain control over the origin of their supplies, will have to adapt to this new situation.

3. The production of fish meal and fish oil is still the source of an important international market, and should remain so for those species which are caught in too great quantities and which do not appeal sufficiently to the

consumers. It should nevertheless be noted that such stocks have often been overfished and do not always recover as rapidly as it could have been hoped. Another more recent development is the growth of the production of canned pelagic fish. It might be that the abundant pelagic species which it was envisaged could be transformed into F.P.C. (fish protein concentrate) would have more success for human consumption in more tasty preparations.

4. Important living resources of the sea have not been actually affected by the new regime of the fishing zones. This mainly concerns the crustaceans which represent a very valuable international market. The link between that market and the other markets mentioned previously is that the same problem of the limits in resource availability has in many cases led to the necessity of protecting the resource and avoiding excessive fishing. Possible scarcity of supply and a sustained demand may have lead to high prices, even to very high prices (cf. caviar!... which is the most costly food offered on the market), hence a delicate balance to be found so as to maximise the global returns without endangering the stocks, and avoiding to overcome the price limit beyond which the consumer would switch to an other kind of luxurious item.

5. The market for fresh fish, which is perhaps the most important is still growing in spite of the mounting costs of fast transportation. It proves that in fish marketing good quality and variety are profitable. But these markets are necessarily regional and can only become international when state boundaries are close enough. They cannot be considered as fully international in the sense of this paper.

Other consequences and many nuances could be added to the above five general remarks. Their sketchy presentation has nevertheless the advantage of leading to broad conclusions which are of interest because they are usually not sufficiently emphasised.

The first conclusion is that the new regime of the sea is at the same time beneficial to countries which did not exploit fully the fish resources off their coasts and detrimental to those countries deploying distant water fleets to meet high domestic demand. In other words, the potential exports are increased as well as the potential imports which should logically lead to an increase in international trade.

Unfortunately the complete story is not so simple:

- Fish trade is a very complex one; many different species, and presentations, varying consumers habits, etc.. As a result the changes in supplies might meet demands which could be somewhat reluctant to adopt the products which would correspond to the new pattern of supply.

- In the overall movement towards the new law of the sea, there has been, in fact, an unorganised but efficient world lobby of fishermen eager to exclude the foreign competitors from their usual fishing grounds. All the business circles... and even the consumers have become aware of the overfishing problems and of the fact that fish resources are not unlimited. A side but essential consequence of that awareness has been a relative increase in fish prices, an increase which could have been effective before any actual scarcity in the supply.

- Finally there are now cases of overall catches below records of former years, but obtaining relatively poor prices, hence difficulties of geeting rid of the inventories, and fishing operations rendered non profitable by significant cost increases not followed by corresponding developments in gross earnings.

After having accumulated many facts and figures the OECD study does not arrive at a very original conclusion but maybe at one which will be easily accepted here as it is a conclusion similar to one of the most important drawn by the organisers of this conference. With a view to the complexity of the situation and its present evolving state, it is very important to keep and to improve the recording and the exchange of data.

Another conclusion of the OECD Committee for Fisheries is more policy orientated and cannot lead to very detailed comments. When the price for frozen blocks of demersal fillets has, in spite of inflation, remained practically stable for five years, when the prices for tunas are on a decreasing trend, to mention only two of the main sectors in difficulty, there are problems for promoting exports or complaints about difficulties before being able to enter into importing countries. This leads to negotiations and, in order to sort out the arguments put forward, to studies in which the OECD Committee is embarking itself following the mandate recently received from the OECD Council. As the precise topic and the outline of the studies are presently under discussion, it might suffice to indicate that the aim will be of examining the consequences for international trade of the current policies in the sector and of the adjustment measures taken in various countries for compensating difficulties with which the fishing industry is confronted.

The author is solely responsible for the ideas and information presented in this paper.

Extended Jurisdiction and Its Effect on World Trade in Seafood

Parzival Copes
Simon Fraser University
Burnaby, British Columbia, Canada

Abstract

With world-wide acceptance of the 200-mile limit, unrestricted international access to the world's marine fish resources has been replaced largely by a system of national fisheries jurisdictions. The former condition of near-anarchy in the exploitation of marine fish stocks is being replaced by more orderly national and multi-national management regimes. This should result, eventually, in greater economic benefits and probably also in larger aggregate fish production than otherwise would obtain.

The new world regime in fisheries is bringing about a gradual shift in fishing activity from distant-water fishing fleets to coastal operations. Generally, states with large coastal resources are increasing their proportion of total fishing activity. In a concomitant shift in trade, the fish-rich coastal states are increasing their relative share of exports and reducing their relative share of imports. These shifts are resulting in an overall increase in the volume of international trade.

In the short run, extended jurisdiction is causing dislocations in established fishing and fish trading patterns. Even fish-rich coastal states are experiencing perversely harmful effects of the 200-mile limit in some instances, as a result of trade diversion. In the international realignment of fishing and fish trading activity, many new arrangements, sometimes in the form of "joint ventures", are being developed.

The outcome of extended jurisdiction in the long run is likely, on balance, to be beneficial to world trade in seafood. Resource management, made possible by national jurisdiction, should result in a more secure and potentially larger supply of fish. Reduction and regularization of distant water fishing activity should also help to stabilize the pattern of demand from fish importing countries. In the more predictable

environment that is emerging, international trade in seafood should find conditions conducive to profitable development.

Introduction

In 1977 the 200-mile fishing limit became an accepted rule of international law. Unrestricted access to most of the world's marine fish stocks was replaced by a system of national fisheries jurisdictions extending to the greater part of these resources (Copes, 1981). This change has momentous consequences for fishing and fish trading around the world, though it will take many years for the full effect to become apparent.

Extended jurisdiction is causing a shift in fishing activity. As may be expected, states with large coastal fish resources are expanding their catches at the expense of countries that have relied heavily on distant-water fishing activities. As a natural outcome, international trade in fish products is being realigned, with fish-rich coastal states generally increasing their relative share of exports and reducing their relative share of imports.

This paper will endeavor to analyse the actual and prospective impacts of extended jurisdiction on the world trade in seafood. To provide an adequate background, the paper will first review the global outlook for fish production, comment on the property rights implications of extended jurisdiction, and assess the consequent shifts in fishing activity that are likely to take place.

Global Prospects for Fish Production

World fish production has increased persistently - year by year, with only minor aberrations - since the Second World War. The world "nominal catch" has risen from a level of 19.5 million metric tons (Mt) in 1948 to 71.3 Mt in 1979.[1]

A distinction needs to be made between the catch in inland waters and that in marine areas. Inland fisheries, by and large, have long been under national jurisdiction and therefore, potentially, subject to management controls. Also, because of easy physical access, inland fisheries have long been subject to relatively high rates of exploitation. These two circumstances favor high and stable production. It is notable that catches in inland waters have stabilized at a plateau of about 7 Mt since the early 1970s.

Marine fisheries have been subject to a different set of development forces. On the one hand, the international open access to marine resources that prevailed until 1977 meant that the commercially more valuable stocks were often seriously overexploited in a competitive fishing contest among aggressive fleets from many nations. On the other hand, the vast extent of the oceans' fish resources meant that there were enormous reserves of unutilized stocks that could be brought under exploitation by means of improved fishing technology, subject to consumer acceptance of the product.

Marine fishing activity was greatly reduced by the circumstances of World War II. It took until 1950 to reestablish pre-war catch levels. The world marine fish catch advanced strongly and consistently until reaching a peak of 59.8 Mt in 1971. By that time some of the more valuable stock complexes were becoming seriously depleted. This was notably the case in the Northwest Atlantic where the catch dropped from 4.6 Mt in 1968 to 2.8 Mt in 1978. Some other areas - such as the Northeast Atlantic, the Mediterranean and Black Sea, and the Northeast Pacific - have also shown signs of overexploitation marked by declining catch levels. Excessive fishing effort in all of these areas may be related to mature, technically advanced local fisheries, to distant-water fishing activities, or to both.

In a different context, the catch in what was then the world's largest single fishery - that for Peruvian anchovy - dropped from 12.5 Mt in 1970 to 2.3 Mt. in 1973. The collapse was largely the result of natural events (Caviedes, 1975), though exacerbated by excessive exploitation levels. After the Peruvian setback, world marine fish catches continued to creep upwards again, reaching 63.8 Mt in 1979. Expansion of the total world catch, despite a reduced yield from several mature fisheries, is an indication that, overall, the world's fish stocks are still not fully utilized.

The ultimate potential of food production from the ocean is a matter of speculation (Carroz, 1973). One FAO study estimates an annual production of living organisms in the oceans in the order of 100,000 Mt. Most of this consists of microscopic plants and much of the rest is zooplankton (FAO, 1970: 282). Only a tiny proportion consists of fish and other animals of a size utilized by humans.

FAO has estimated the potential yield of larger fishes and other animals that have been the subject of major fisheries in recent times at 118 Mt (FAO, 1970: 281). The figure was arrived at by aggregating potential yield estimates for different fisheries areas and species groups. In an alternative approach, Fullenbaum (1970) estimated maximum sustainable yields (MSYs) by species for various world fisheries. These aggregated to an MSY of 120 Mt, which is remarkably close to the FAO estimate. With a 1979 world marine catch of 63.8 Mt, this suggests that a yield from conventional sources of almost double the size could be achieved with concerted effort.

These estimates may be somewhat optimistic. The MSY for many fisheries may not be attainable, e.g. because part of the stock is too remote or scattered to be fished effectively. Also, interspecies relationships may prevent the MSYs for some stocks from being achieved simultaneously: increasing the catch of a prey-species could reduce population levels and catches of predator-species.

There are further economic reasons to doubt the wisdom of trying to exploit conventional fish stocks to their MSY limits. Many stocks that are currently underutilized will remain commercially marginal when they come under increased exploitation. As fishing effort on these stocks rises, catches per unit of effort will fall, making it economically infeasible to pursue catches to the MSY level. In any case, MSY is considered by economists generally to be an undesirable goal, because marginal costs for any fishery as a whole tend to exceed marginal revenue at the MSY level.

For the reasons stated a full MSY exploitation of conventional fish stocks is not likely to be achieved. However, there are many non-conventional stocks that are currently not utilized - or only barely so - which are likely to become commercially exploitable in the future.

Most stocks of cephalopods (squids, etc.) and other molluscs have not yet come under exploitation (Gulland, 1971). Even greater opportunities are potentially offered by krill. The Antarctic stocks could yield 50 Mt or more annually (FAO, 1970). Other unconventional stocks that offer a large harvesting potential include red crabs, lantern fishes, deep-sea smelts and sandlances (Carroz, 1973).

Most of the output of these unconventional species would likely go into such products as fish meal, oil, flour and paste. In turn, this could assist the transfer of other catches from animal feed to human consumption. We have seen many herring stocks withdrawn from meal production to be reserved for human consumption. Substitute species for meal production, such as capelin, may also increasingly be switched to human consumption, which will leave room for hitherto unexploited species to be utilized for fish meal.

One may speculate that harvests of marine species eventually will reach 150-200 Mt annually; that is up to three times the current level. The per unit value of most additional output undoubtedly will be far below that of conventional species. However, the real value of conventional fish supplies has been rising as a result of increasing demand in the face of an absolutely limited natural production capacity. This should leave increasing room for the exploitation of unconventional stocks. The pace at which harvesting of these stocks develops in the future will depend on many factors related to technology, market conditions and production costs (Kasahara, 1972).

The New Property Rights

A growing concern of coastal states that the fish stocks off their shores were being rapidly depleted by foreign fleets of distant-water vessels manifested itself in the early 1970s. It was a major element in the agitation for changes in the international law of the sea, which led to the convening of the Third United Nations Conference on the Law of the Sea (UNCLOS III) in 1973. At the Conference countries with typical coastal state concerns greatly outnumbered those with distant-water fishing interests. As a result the 200-mile fishing zone quickly became a standard of expectation and basis of negotiation.

A number of contentious non-fisheries issues held up progress at the Conference, which carried on until 1982, when a new master convention was finally adopted against the negative votes of the United States and three other countries. Impatient with the slow progress made at the Conference, many coastal states decided to make unilateral declarations of 200-mile fishing zones, to enable them to take quick action against the increasingly evident overexploitation of coastal fish stocks (Copes, 1981). Most of the declarations came in rapid succession during the year 1977. By the end of that year a large majority of countries with sea coasts - including all of the major maritime powers - had claimed 200-mile fishing limits. The near-universal adoption of the 200-mile limit in 1977 gave it the force of "customary" international law.

Early during the Conference a "negotiating text" for a new convention was developed to guide debate. The fisheries provisions of this document, after minor amendments, gathered overwhelming support and were included in the Draft Convention (United Nations, 1980) that was adopted in 1982. In declaring their 200-mile limits, most countries, explicitly or implicitly, accepted the fisheries provisions of the negotiating text, which thereby became *de facto* international law.

Article 56 of the Draft Convention assigns to coastal states "sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources" in an "Extended Economic Zone" reaching beyond a territorial sea of 12 nautical miles to a distance of 200 nautical miles from a coastal baseline. These rights of coastal states are qualified insofar as the Draft Convention enjoins them to assure proper conservation (Article 61) and to promote optimum utilization (Article 62).

The latter article, importantly, also stipulates that where a coastal state "does not have the capacity to harvest the entire allowable catch, it shall ... give other states access to the surplus of the allowable catch." However, the coastal state is also given the right unilaterally to determine the allowable catch and to set conditions of access to its zone. By manipulating the allowable catch and access conditions, the coastal state, in effect, can ban foreign fishing. The requirements placed on the coastal state are essentially in the nature of a moral obligation not to waste fish; allowing other countries access on realistic terms to stocks that the coastal state does not intend itself to utilize.

The 200-mile limit has given coastal states property rights over a wide extent of fish stocks. The change has been monumentous. Before the 200-mile limit the bulk of the world's marine fish stocks were beyond the jurisdiction of coastal states, in the "high seas" to which all countries had free and equal access. The 200-mile limit shrank the high seas for fisheries purposes to an area yielding but a minor share of the marine fish harvest. Katz (1975) quotes sources estimating fish harvests outside 200 miles in the early 1970s at between 6% and 15% of the world total. Gulland (1979) in the late 1980s put the estimate as low as 1%.

Coastal state claims to extended jurisdiction no doubt were motivated in large part by an acquisitive desire to gain possession of valuable coastal resources, to which they felt they should have priority rights. However, in justifying their claims, much emphasis was placed on the need for an undisputed management authority that would ensure conservation and promote fishing practices that were economcially more rational than the destructive free-for-all that had characterized unrestrained fishing in international waters.

The establishment of extended zones of fisheries jurisdiction has already shown some beneficial effects. In a number of areas, coastal states, exercising their new authority, have forced cut-backs in fishing effort that have promoted recovery of depleted stocks, allowing for a subsequent rise in catch levels. The rehabilitation of groundfish resources off the Atlantic Coast of Canada is an example. No doubt, extended jurisdiction is making it possible to improve long run returns from the fisheries through purposeful management.

It may be noted, however, that significant stocks of unexploited or underexploited "unconventional" species occur in the remaining high seas. There still is, therefore, a potential for the expansion of undisciplined fisheries in international waters, with the attendant dangers of overexploitation. Also there are many stocks that migrate across the boundaries of 200-mile zones, impairing the ability of coastal states to subject them to effective resource management.

While the 200-mile limit *enables* coastal states to subject the fish resources within their new jurisdiction to national management regimes, it does not *force* them to do so. A review of current experience suggests that *neither* the will nor the ability of coastal states to manage marine fish stocks effectively has been fully developed. Many developing countries simply do not have the necessary scientific and administrative resources, while their schedule of priorities often does not justify an attempt to acquire the resources needed for effective fisheries management. In developed countries more often the problems are those of institutional rigidity and public ignorance, which hinder the development and application of sensible management measures.

Realignment of Fishing Activity

The political authority and concomitant resource management powers, that coastal states now hold in respect of the fish stocks in their 200-mile zones, are being used to force a realignment of fishing activity. Not unexpectedly, coastal states are reserving a larger share of the stocks in their zones for the fishing fleets of their own nationals. By the same token, distant water fishing activity is being curtailed.

Evidence of this shift is readily obtained from FAO statistics, by comparing catches in 1976, the year before extended jurisdiction, with catches in 1979, the most recent year for which world-wide figures are available. The important, mature distant-water fishing nations invariably registered declines in their total catch over this period (shown in metric tons - mt):[2]

Country	1976 catch	1979 catch	Decrease
USSR	10,132,210	9,113,999	1,018,211
Japan	9,994,420	9,996,394	23,026
Spain	1,468,888	1,205,120	263,768
Poland	750,072	601,153	148,919
West Germany	454,440	356,198	98,242
Portugal	346,128	241,920	104,208
East Germany	279,302	224,402	54,900

The world catch of fish, on the other hand, increased over this period by 1,417,300 mt, rising to a level of 71,286,900 mt in 1979. Among countries registering considerable increases in their fish catches, were developed and semi-developed states whose fishing operations were primarily concentrated in home waters and which had large fish resources off their coasts that had been the target of foreign fleets prior to extended jurisdiction. These countries were in a position to displace foreign fishing effort as soon as they acquired the legal authority of extended jurisdiction. Prime examples are the following (catches in mt):[3]

Country	1976 catch	1979 catch	Increase
USA	3,050,478	3,510,854	460,376
Canada	1,101,870	1,331,898	230,028
Iceland	986,137	1,644,815	658,678
Mexico	526,331	874,886	348,555
Argentina	265,777	565,881	300,104
New Zealand	76,417	110,306	33,889

Developing countries with a coastline have generally displayed typical coastal-state concerns with respect to extended jurisdiction, as very few of them have had any distant-water fishing capacity at all. Indeed, many have developed hardly any marine fishing capacity so far. Before extended jurisdiction they were often concerned that their coastal stocks would be seriously depleted by foreign fleets before they would have a chance to share in the utilization of these stocks on a substantial basis.

It is now evident that exclusive jurisdiction has brought immediate benefits to developing countries. Apart from now being able to charge foreign countries for the privilege of fishing in their coastal zones, they are able to expand their own fishing industries without interference. The result has been that the developing countries as a group increased their fish catch from 30.5 Mt to 33.0 Mt over the period 1976-1979. Developed countries which, as a group, had expanded their catch steadily until reaching a peak of 38.5 Mt in 1976, have seen a decline in every year since, dropping to 37.2 Mt in 1979.

It is obvious that extended jurisdiction is leading to a greater geographical compartmentalization of fisheries. Increasingly, fishing is carried out by domestic fleets in domestic waters. The logic of this development is not as strong as many might suppose. The fact that prior to extended jurisdiction so many countries found it worth their while to engage in distant-water operations, suggests that they may have had a significant comparative economic advantage vis-à-vis coastal states. Countries with an inadequate supply of fish in domestic waters, which possess advanced fishing technology but do not have very high wage rates, may have good economic reasons to engage in distant-water fisheries (Copes, 1972).

Under extended jurisdiction the advantage of ownership of coastal fish resources goes to the coastal state. But to exercise that advantage coastal states do not necessarily have to exploit all their fishery resources themselves (Stokes, 1982). They may consider leasing some fish stocks to foreign fleets, charging them whatever the traffic will bear. The fees collected then represent "rent" yielded by the fishery resources in question. "Efficient" distant-water fleets may well be able to pay substantial access fees in cases where domestic fishing operations sustain a loss or barely meet their costs, even when they are allowed access to the stocks at no charge. Under such circumstances both sides could gain from a leasing of the stocks by the coastal state to foreign fishing interests.

Despite the economic logic of leasing fish stocks to the most efficient operators, i.e. those who can afford to pay most, there is an observable tendency for coastal states to insist on exploiting fish stocks under their jurisdiction through domestic operations. As one US economist remarked, "countries which have acquired marine territory [are] tempted to treat their new seafood accessions as infant industries requiring production subsidies and market protection" (O'Rourke, 1977). This phenomenon is like a variation on Parkinson's law, which might be formulated as follows: "Nations tend to expand their fisheries to bring all available stocks under domestic exploitation."

This tendency has been in evidence in the United States, with many representatives of the domestic industry calling for government assistance to promote expansion. The urge to overexpand into economically marginal and sub-marginal fisheries is perhaps facilitated by the regional management councils, which provide an effective platform for expansionist spokesmen. This has prompted Crutchfield (1979) to remark on the "tendency to supplant redundant foreign fishing capacity with redundant American vessels.' It is true, however, that the current US government is not very subsidy-prone, and particularly not so under the present circumstances of financial stringency.

Despite the foregoing counter-suggestion, there are some good reasons why coastal states should use the opportunities afforded by extended jurisdiction to expand their domestic fishing operations. The authority secured by coastal states to impose conservation and management measures should allow them to create conditions that will make fishing operations much more profitable. This should provide a better opportunity to test the comparative advantage of coastal and distant-water fishing fleets. Comparisons so far have always been blurred by the fact that most countries - coastal as well as distant-water - have subsidized their fishing industries to a greater or lesser extent (Copes, 1981; OECD, 1980).

Coastal states have a basic advantage in that shore-based processing in most instances is economically much superior to ship-borne processing. It is very expensive to mount a whole processing plant on a fishing vessel, together with all the facilities needed for the processing labour force and storage capacity for a long voyage. And the high cost of fuel in recent times has added substantially to the expense of operating a distant-water fleet. Except in cases where perishability requires immediate processing, coastal states can use vessels that are specialized to the fishing function to make short trips to the fishing grounds, while leaving the processing function to plants that are optimally located on land.

Transaction costs have further prejudiced the position of distant-water fleets since the imposition of extended jurisdiction. Coastal states naturally will pass on to foreign operators the high costs of surveillance and inspection of distant-water fleets fishing in their zone. This will raise the operating costs of distant-water fleets relative to domestic fleets.

Extended jurisdiction has forced the suspension of many distant-water fishing operations and in other instances has made the terms of distant-water fishing economically less attractive. In addition, distant-water operators face the uncertainty of whether they will be allowed continuing access to waters now controlled by coastal states.

The existing distant-water fleets represent sunk costs in specialized capital equipment. Until the vessels wear out, their owners will likely seek opportunities to continue to fish as long as they can cover operating costs. However, given the unfavorable circumstances they now face, many will decide not to replace their vessels. The long-run prospect is therefore one of a continuing decline in distant-water fishing, unless and until it becomes practical to exploit the large "unconventional" stocks in the remaining high seas.

While distant-water fleets do face much reduced circumstances, there will be reasonable opportunities for them to continue with some of their conventional operations for several years to come. Many developing countries are a long way from establishing a capacity to exploit their coastal stocks fully and will find it profitable to rent out their stocks in the meantime.

In several instances high-cost developed countries will find it unprofitable to exploit low-value species, particularly if they do not have established access to markets for such species. Thus Canada, on its Atlantic Coast, allows foreign fleets - against a fee - to take all of the roundnose grenadier catch. In Alaska, despite initial optimism, domestic exploitation of the enormous low-value stock of pollock is still a long way from economic feasibility (Scott, 1980; Stokes and Offord, 1981; Stokes, 1982). But lower-cost foreign fleets allowed access to these stocks have helped to make the Alaska pollock fishery the world's largest single species fishery in terms of volume.

The Impact on Trade Flows

Most distant-water fishing has been undertaken by countries with coastal resources that were insufficient to meet domestic market demands for fish. The curtailment of distant-water fishing activity following extended jurisdiction has tended to reduce fish supplies directly available to distant-water fishing nations. This implies an incipient increase in demand for fish products by these nations and an enhanced opportunity for coastal states to utilize increased catches for export. All of this suggests that extended jurisdiction has created opportunities for a significant expansion of international trade in seafood, which indeed has taken place. The world volume of fish exports amounted to 7,892,000 mt in 1976 and to 9,673,000 mt in 1979, signifying a healthy increase of 22.6%! This compares with a 2% increase in the world catch.

The shift in fishing opportunities resulting from extended jurisdiction is reflected indirectly in the changed pattern of production of preserved and processed fishery commodities among nations. The main losers, of course, have been the important distant-water fishing countries. Over the period 1976-1979 world output of these fishery commodities rose by 6.4% from a level of 23.6 Mt to 25.2 Mt of product weight. The main distant-water countries for which figures are available experienced a decline in output, with the exception of Japan which had an increase, but at less than the world rate. Their production record in thousands of metric tons of product weight follows:

Country	1976 output	1979 output	Increase (+) or decrease (-)
Japan	6,320	6,548	+ 228
USSR	6,020	5,382	- 638
Poland	385	353	- 30
West Germany	369	330	- 39
Portugal	102	73	- 29

The developed and semi-developed coastal states which benefited from catch increases, also advanced their production of preserved and processed fishery commodities. Figures available for the more important countries in this group (in thousands of metric tons) show the following:

Country	1976 output	1979 output	Increase
USA	1,516	1,659	143
Canada	418	527	109
Iceland	310	527	217
Mexico	164	202	38

Some distant-water fishing countries have had an important export trade for fish products. Inevitably they have had to cut back on exports when extended jurisdiction led to a reduction in their catches. The figures below show the percentage of world exports of fish products accounted for by these countries in 1976 and 1979:4

Country	Share (%) 1976 exports	Share (%) 1979 exports	Decrease (%)
Japan	8.327	5.282	3.045
Spain	3.143	3.008	.135
USSR	2.540	2.201	.339
West Germany	2.322	1.988	.334

To make up for lost catches, distant-water fishing countries, on the average, also increased their share of the world import trade in fish products, though there were several exceptions:

Country	Share (%) 1976 imports	Share (%) 1979 imports	Increase (%) (+) or decrease (%) (-)
Japan	20.701	27.048	+ 6.347
West Germany	6.220	5.958	- .262
Spain	1.775	2.760	+ .985
Portugal	1.276	.498	- .778
East Germany	.882	.269	- .613
Poland	.487	.693	+ .206
USSR	.325	.343	+ .018

One may expect that the coastal states which increased their catches subsequent to extended jurisdiction would be in a position to increase fish exports and lower fish imports. This is borne out by FAO figures. The changed shares of world exports for the relevant countries are as follows:

Country	Share (%) 1976 exports	Share (%) 1979 exports	Increase (%)
Canada	7.685	8.151	.466
USA	4.773	7.857	3.084
Iceland	4.067	4.365	.298
Mexico	2.630	3.323	.693
Argentina	.526	1.115	.589

Of these countries only the USA and Canada had significant import of fish products. Both cut back their shares of such imports:

Country	Share (%) 1976 imports	Share (%) 1979 imports	Decrease (%)
USA	21.942	18.001	3.941
Canada	2.135	1.791	.344

The trade flow changes that have resulted from extended jurisdiction have had some "perverse" side effects (Copes, 1980). Some coastal states that have benefited from particularly large additions to their catch potential, are finding that some of their most important export markets are shrinking. Canada and Iceland have been important suppliers of the large groundfish markets of the United States. However, extended jurisdiction has given the latter country control over very large groundfish resources. The United States is expanding its groundfish industry and thereby weakening the market for Canadian and Icelandic groundfish exports. It may be noted from the above figures that Canada and Iceland had a more modest expansion of their fish export trade than some other exporting coastal states that were less affected by perverse trade diversions.

Shifts in Product Form

The relative share of fish markets accounted for by different product forms changes over time. How much of the change that has taken place since 1976 can be attributed to extended jurisdiction is a matter of speculation. Disposition of the world fish catch by main product groups over the period 1976-1979 shows the following relative change:

Product	Percentage distribution 1976	1979
Marketing fresh	27.9	20.4
Freezing	17.4	21.2
Curing	11.2	13.9
Canning	13.0	14.0
For human consumption	69.5	69.5
Reduction	29.1	29.1
Miscellaneous purposes	1.4	1.4
For other purposes	30.5	30.5
World catch	100.0	100.0

As may be seen, the relative change is confined to a reduction in fresh fish marketing and an increase in preserved products for human consumption. It may well be that the increase in international trade flows following extended jurisdiction is a major cause of this change. The time and distance factors in international trade tend to favor preserved products over fresh fish.

Cooperative Arrangements

An important aspect of extended jurisdiction in 1977 was the actual or threatened reduction of harvesting opportunities for distant-water nations on their accumstoned fishing grounds (Copes, 1982). This portended a possibly serious decrease in the supply of fish for the domestic markets of these countries. To safeguard continuity of supplies they were impelled to seek assurances of access to foreign fish stocks for their fleets, or else assurances of fish supplies from exports by coastal states. In either case this called for new arrangements and understandings between fish-deficient countries and states that had acquired control over extensive coastal stocks.

The distant-water nations, basically, were having to deal with two groups of countries. One consisted of developing coastal states, most of which had an inadequate capacity to exploit the marine resources of their zones fully. The other group comprised developed coastal states with no lack of technical fishing capability, but possessing fish resources surplus to their immediate harvesting requirements. The United States and Canada are important examples in this group.

A variety of "cooperative arrangements" between coastal and distant-water states have been implemented or considered (Tomlinson and Vertinsky, 1975; Tomlinson and Brown, 1979; Kaczynski and LeVieil, 1980). One straightforward approach is an agreement by which distant-water vessels fish in a coastal state's 200-mile zone, against payment of a fee. The latter should be sufficient, at the very least, to cover the coastal state's relevant costs with respect to resource management and surveillance. Generally, coastal states will want the fee also to provide a net return representing a rent accruing to the coastal state as owner of the resource. This may be particularly important for developing countries in need of foreign exchange earnings. Developing countries may also bargain for technical assistance and aid in developing their domestic fisheries.

Developed coastal states usually want to provide as many fishing opportunities as possible for their domestic fleets. They recognize, however, that the distant-water nations control access to large markets for fish and that the latter want to keep down their foreign exchange costs for fish supplies by using their own fishing and processing facilities as much as possible. A not uncommon compromise arrangement - in which both Canada and the United States have engaged - is one whereby distant-water factory vessels purchase fish "over-the-side" from catcher vessels of a coastal state. Conversely, a coastal state may allow foreign trawlers to fish in its zone on condition that the catch is landed for processing in the coastal state and then exported to the foreign country concerned.

Some arrangements between distant-water and coastal states have taken the form of a corporate structure in the nature of a "joint venture". The two sides contribute to the financial, technological, equipment and personnel requirements of the joint venture according to their respective needs and capabilities.

In the long run, opportunities for distant-water fleets to operate in the coastal zones of other countries undoubtedly will be further reduced. Developing coastal countries will improve their capacity to fish the stocks of their own zones. Developed coastal states are likely to learn to use their comparative advantage of a shore-based fishery more effectively and to develop markets for coastal stocks they previously were unable to exploit commercially.

Many distant-water countries have already made adjustments to meet the changed circumstances. Some western European countries reacted to falling productivity of their distant-water fleets during the period of heavy fishing pressure in the early 1970s by phasing out much of their operations.

Japan also has reduced distant-water operations and is leading the way in exploring alternative arrangements for a secure flow of fish imports from other countries. To this end Japanese companies have invested in local fishing concerns in countries with a surplus of fish supplies that meet the needs of the Japanese market. They have engaged in a variety of arrangements, ranging from outright purchase of foreign fishing enterprises to the extension of commercial loans to foreign fishing companies on easy terms, in return for privileged access to their output of fish products.

Conclusion

As a result of extended jurisdiction most of the world's fish resources can now be brought under purposeful management by national governments. In the long run this should lead to a more economical use of fish resources, in which stock depletion through overfishing is avoided and higher returns are obtained per unit of fishing effort. This better management should allow both a more steady supply and a wider utilization of available stocks, leading to further growth in the world output of fish.

Extended jurisdiction also is causing fishing activity to be concentrated increasingly in the hands of fish-rich coastal states. This, in turn, is leading to an increase in international trade in fish products. Fish-deficient consuming countries, faced with a decline in distant-water fishing opportunities, are having to obtain an increasing volume of their domestic market requirements through imports.

Overall, the changes brought about by extended jurisdiction should have a favorable impact on international trade in seafood. With a more predictable environment, an increase in available supplies and a greater volume of demand, there should be excellent opportunities for profitable development.

Notes

* This paper draws on materials developed for a research project supported by the Social Sciences and Humanities Research Council of Canada.

1 Unless otherwise indicated, statistics given in this paper are drawn from FAO Yearbooks of Fishery Statistics. The discussion in this section is drawn substantially from Copes (1982).

2 South Korea, a semi-developed country engaged in vigorous expansion of its fisheries, succeeded in sustaining catch increases after 1976, despite heavy dependence on distant-water fishing. Thailand, a developing country in a similar position, continued to increase catches until 1977, but has seen a decline since then.

3 Iceland claimed, and tried to enforce, extended jurisdiction prior to 1976, but with only partial success.

4 FAO trade figures are given in US dollars. Because of inflation, absolute figures for different years are not comparable. For that reason the comparisons made here are in terms of percentage shares of world trade.

References

Carroz, J.E. (1973). "The Richness of the Sea: Fisheries," in L.J. Bouchez and L. Kaijen (eds.), The Future of the Law of the Sea, 77-94, The Hague, Martinus Nijhoff.

Caviedes, César N. (1975). "El Niño 1972: Its Climatic, Ecological, Human and Economic Implications," Geographical Review, 65(4): 493-509.

Copes, Parzival (1972). International Fishery Resource Management: A Position for Canada, rev., Ottawa, Canada Department of the Environment.

Copes, Parzival (1980). "British Columbia Fisheries and the 200-Mile Limit: Perverse Effects for the Coastal State," Marine Policy, 4(3), 205-214.

Copes, Parzival (1981). "The Impact of UNCLOS III on Management of the World's Fisheries," Marine Policy, 5(3): 217-228.

Copes, Parzival (1982). "Optimizing the Use of Ocean Fish Resources in the Context of Extended National Jurisdictions," in H.E. English and Anthony Scott (eds.), Renewable Resources in the Pacific, 33-48, Ottawa, International Development Research Centre.

Crutchfield, James A. (1979). "Marine Resources: The Economics of U.S. Ocean Policy," American Economic Review, 69(2): 266-271.

Food and Agriculture Organization of the United Nations (1970). "The Prospects for World Fishery Development by 1975 and 1985," in FAO, Provisional Indicative World Plan for Agricultural Development, Vol. 1, Chapter 6, 273-302, Rome.

Fullenbaum, Richard F. (1970). "A Survey of Maximum Sustainable Yield Estimates on a World Basis for Selected Fisheries," Working Paper No. 43, Washington, U.S. Department of the Interior, Bureau of Commercial Fisheries, Division of Economic Research.

Gulland, J.A. (ed.) (1971). The Fish Resources of the Ocean, FAO, West Byfleet, Fishing News (Books) Ltd.

Gulland, J.A. (1979). "Developing Countries and the New Law of the Sea," Oceanus, 22(1): 36-42.

Kaczynski, V. and D. LeVieil (1980). International Joint Ventures in World Fisheries, Technical Report, Seattle, University of Washington, Division of Marine Resources.

Kasahara, H. (1972). "Japanese Distant-Water Fisheries: A Review," Fishery Bulletin, 70(2): 227-282.

Katz, Stephen R. (1975). "Consequences of the Economic Zone for Catch Opportunities of Fishing Nations," Maritime Studies and Management, 2(1): 144-153.

Organisation for Economic Co-operation and Development (1980). Financial Support to the Fishing Industry, Paris.

O'Rourke, A. Desmond (1977). "Marketing and Distribution Problems with Extended Jurisdiction," in Lee G. Anderson (ed.), Economic Impacts of Extended Jurisdiction, 237-246, Ann Arbor, Mich., Ann Arbor Science Publishers.

Scott, Michael J. (1980). "Prospects for a Bottomfish Industry in Alaska," Alaska Review of Social and Economic Conditions, 17(1), 1-31.

Stokes, R.L. (1982). "The Economic Future of Alaska Groundfish under Extended Jurisdiction," in H.E. English and Anthony Scott (eds.), Renewable Resources in the Pacific, 137-142, Ottawa, International Development Research Centre.

Stokes, Robert L. and Brian H. Offord (1981). "Alaska Groundfish: A Financial Feasibility Analysis," Ocean Development and International Law Journal, 9(1-2): 61-76.

Tomlinson, J.W.C. and P.S. Brown (1979). "Joint Ventures with Foreigners as a Method of Exploiting Canadian Fishery Resources under Extended Fisheries Jurisdiction," Ocean Management, 5: 251-261.

Tomlinson, J.W.C. and I. Vertinsky (1975). "International Joint Ventures in Fishing and 200-mile Economic Zones," Journal of the Fisheries Research Board of Canada, 32(12): 2569-2579.

United Nations (1980). Draft Convention on the Law of the Sea (Informal Text), Third Conference on the Law of the Sea, A/CONF. 62/WP.10/Rev.3, New York, 22 September.

Seafood Markets in the Western Pacific

Market for Fish and Seafood Products in Japan

Norimasa Aoyagi
Marubeni America Corporation
Seattle, Washington

The seafood trade relationship between the United States and Japan has become more important to both countries since the 200 mile limit was implemented in 1977. The U.S. share in Japanese seafood import used to be insignificant because the U.S. did not have export items such as shrimp, tuna, octopus and cuttlefish, which have been major import items in Japan. In 1981, however, the U.S. share in Japan has become first in value (16.14% of total import value) and second in quantity (11.45% of total import quantity), due to the dramatic increase in U.S. frozen salmon production and export (Tables 1 and 2, and Figure 1).

Salmon is considered one of the most important and popular fish in Japan, which has great influence over market prices of other seafoods in Japan. Generally, the Japanese salmon consumption market was limited to northern and central Japan, including the Tokyo area. Japanese inshore salmon fishing had been conducted in the northern part of Japan, mainly Hokkaido. Chum salmon was the predominant species because Japanese inshore salmon fishing was limited to chum and pink, although red sockeye salmon was caught for canning and export to England by high sea fishing. In the late 1960s high sea salmon operators introduced Japanese consumers to frozen red sockeye salmon. It was initially accepted by the southern market, mainly the Osaka area, and then gradually spread to the central area, including a huge Tokyo market.

Japan changed from a net exporter of seafood to an importer in the 1960s due to improved economic standards and increased consumption within Japan. International pressure on Japanese highseas fishing activities also helped to facilitate this change (Table 3).

It was during this period that Japanese companies began investigating the seafood products of this coast of the Pacific Ocean, because latitudes and currents are similar to those of Japan. In mid-1965,

Table 1. Japanese Imports of Fish and Seafood Products.

\- 1981 -

Quantity		Value	
Country	Metric Tons	Country	Million Yen
South Korea	172,751	United States	142,075
United States	129,355	South Korea	112,918
Spain	69,705	Taiwan	65,917
Taiwan	68,248	India	54,376
Canada	61,062	Indonesia	46,249
India	40,910	Canada	40,377
China	39,420	China	40,186
Thailand	38,911	Australia	36,260
Indonesia	26,174	Thailand	35,193
Soviet Union	25,473	Spain	31,739
Others	45,030	Others	276,596
Total	1,129,068	Total	879,881

Table 2. Japanese Imports of Fish and Seafood Products

from the United States

- 1981 -

Fish or Seafood Product	Quantity (mt)	Ref. No.
Frozen Salmon	60,212	1
Frozen Herring	22,343	2
Frozen Crab	21,726	1
Salted Salmon Roe	9,509	1
Frozen Miscellaneous Fish	6,458	
Frozen Cod	2,724	
Salted Herring Roe	1,768	2
Sea Urchin	637	
Fresh Bluefin Tuna	256	
Herring Roe on Kelp	212	
Abalone	138	
Frozen Bluefin Tuna	108	
Fresh Salmon	38	
Yellowfin Tuna	31	
Salmon Caviar	10	

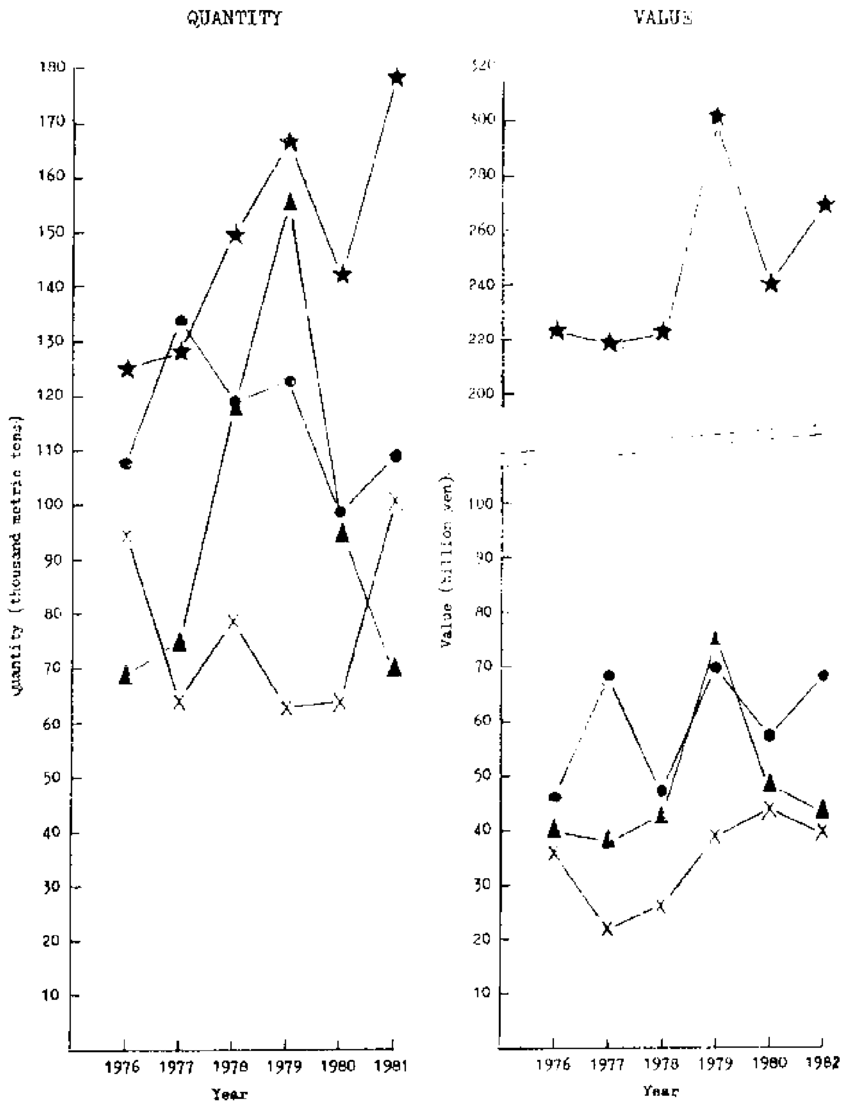


Figure 1. Quantity and Value of Japan's Imports of Fish and Seafood Products.

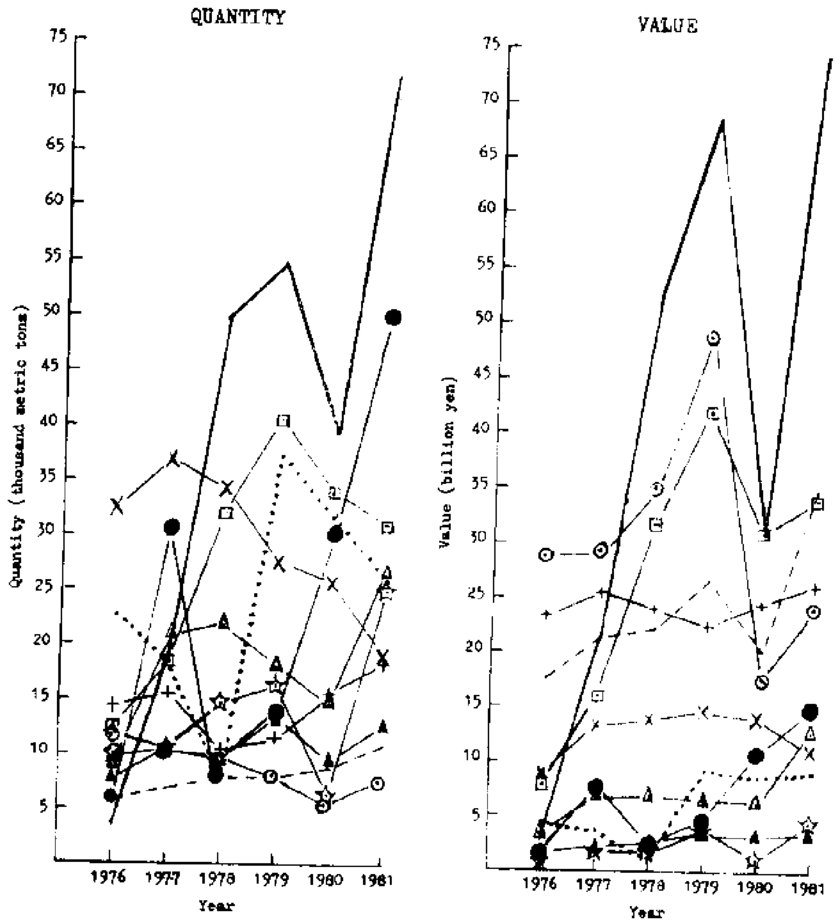
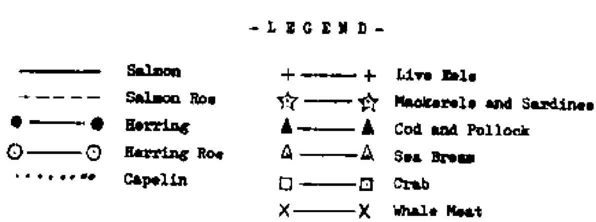


Figure 1 (cont.). Quantity and Value of Japan's Imports of Fish and Seafood Products.



Japanese companies sent processing teams to U.S. salmon canneries to develop a trade in the fish roes - first salmon, then herring - that were considered delicacies in Japan and waste products here.

In the late 1960s, the trade in roes had become significant, and the Japanese companies started to develop salmon exports to Japan because domestic landing there was declining. In the 1970s, Japanese companies began to make investments in Alaskan canneries to provide them with the capital necessary to develop frozen salmon exports to Japan.

U.S. implementation of the 200 mile limit in 1977 created panic in Japan and caused over-reaction, over-buying and the emergence of a false set of economic conditions in Japan. Everyone in the seafood industry in the U.S. and Japan took advantage of the 200 mile limit for short-term profit, leaving the Japanese consumer behind. Even as consumers began to rebel at high prices, the industry refused to take them seriously. The collapse of the herring roe and salmon markets finally convinced industry people that the Japanese consumers really were on the verge of switching to pork, poultry, even beef, and the

Table 3. Japanese Fish and Seafoods Trade

Unit : Quantity - Metric Ton

Amount - Million Yen

YEAR	EXPORT		IMPORT	
	QUANTITY	AMOUNT	QUANTITY	AMOUNT
1969	---	124,881	362,628	93,844
1970	---	140,717	374,569	114,628
1971	---	146,661	398,072	153,347
1972	---	162,178	480,649	190,338
1973	687,726	173,494	685,424	300,074
1974	718,726	201,965	604,641	323,240
1975	503,334	168,696	710,415	385,529
1976	650,350	220,833	814,517	563,649
1977	593,102	198,114	1,045,610	657,714
1978	754,437	171,250	1,017,999	676,455
1979	728,143	186,363	1,151,367	930,760
1980	727,172	265,314	1,037,634	764,319
1981	694,597	253,086	1,127,666	878,148

seafood prices had to be lowered. Since then, many companies have learned a "severe lesson" in the form of selling their speculative frozen inventories at a huge loss, but more realistic pricing has begun to rekindle the interest of Japanese consumers in buying more seafood.

Now seafood industry people on both sides of the Pacific Ocean have a better understanding of what the 200 mile limit really means to Japan, and the growing trend of seafood import by Japan from the U.S. has been restored. The Japanese consuming public is a sensitive entity and is the force that ultimately determines the fate of everything imported into Japan, including U.S. seafood.

Another point of consideration for the U.S. seafood industry is the Japanese ability to produce its own product, or to work with nations other than the United States. The success of hatchery-reared chum salmon runs on Hokkaido Island is a good example, and the Japanese are making an effort to expand the program beyond that island, although the sockeye salmon market that has been cultivated in southern Japan will continue to absorb fish imported from Alaska at a decent price level. Salmon is a non-quota (free) item and the tariff on frozen salmon is 5.0% in Japan (Tables 4 and 5).

Surimi (minced fish meat) is another example. Surimi used to be produced from rockfish caught by Japanese inshore trawl fishing. In the 1960s, Japan developed high quality surimi from Alaska pollock, an underutilized species, which was considered to be abundant and to be economically harvested by large stern trawlers in the North Pacific (Figures 2 and 3). Japan has an ability to produce surimi from sardines caught off the Japanese coast and will commercialize it if pollock surimi becomes too expensive.

Internationally, the Soviet Union is a competitor with the United States in terms of supplying seafood products to the Japanese market. Japan has been maintaining a stable relationship with the Soviet Union in seafood trade, as well as 750,000 mt of fishing allocated in the Soviet 200 mile limit, despite Japan's normalization of relations with China and protestation of the Afghanistan invasion. The United States may not be Japan's only outlet if the U.S. does not consider Japanese needs.

The Alaskan bottomfishing and trawl fishing business will be developed with further investments in both fishing and processing facilities. As the Japanese market will be one of the key elements of the United States bottomfishing and trawl fishing industry, mutual efforts and understanding between the United States and Japan are essential for development. The U.S.-Japanese pollock joint venture is believed to be one of the most realistic and effective steps for both sides.

Since the United States has great potential in every respect of seafood resources and Japan has a great market, both nations will be able to expand and enjoy more seafood trade in the future with mutual respect and understanding.

Table 4. Japanese Import Duties on Fish and Seafood Products.

Species	Duty (percent of value)			
	Frozen	Salted	Others	
Salmon	5.0	15.0	Canned	12.0
			Smoked	15.0
Salmon Roe	4.0	5.9 1/		
Salmon Caviar		8.0		
Crab	7.5 1/		Canned	12.0
Herring	7.5 1/		Seasoned	12.0
Herring Roe	9.6	12.0	Dried	12.0
Herring Roe on Kelp		15.0		
Cod and Pollock	7.5 1/			
Cod and Pollock Roe	7.5 1/	10.5		
Surimi	5.0			
Black Cod	5.0			
Capelin	4.4 1/			
Flounder	3.8 1/			
Tuna	5.0		Canned	12.0
Squid and Cuttlefish	7.9 1/			
Octopus	10.0		Special	5.0
Shrimp	3.4 1/			

1/ Effective April 1, 1982.

Table 5. Fish and Seafood Products under Japanese Import Quota.

Fish and Seafood Import Quota Items
Live, Fresh, Chilled (Iced), Frozen, Salted, Brined or Dried:
Herring
Cod and Pollock
Yellowtail
Mackerel
Sardine
Horse Mackerel
Saury
Scallop
Squid (except Cuttlefish)
Cod or Pollock Roe
Seaweed (including Kelp)

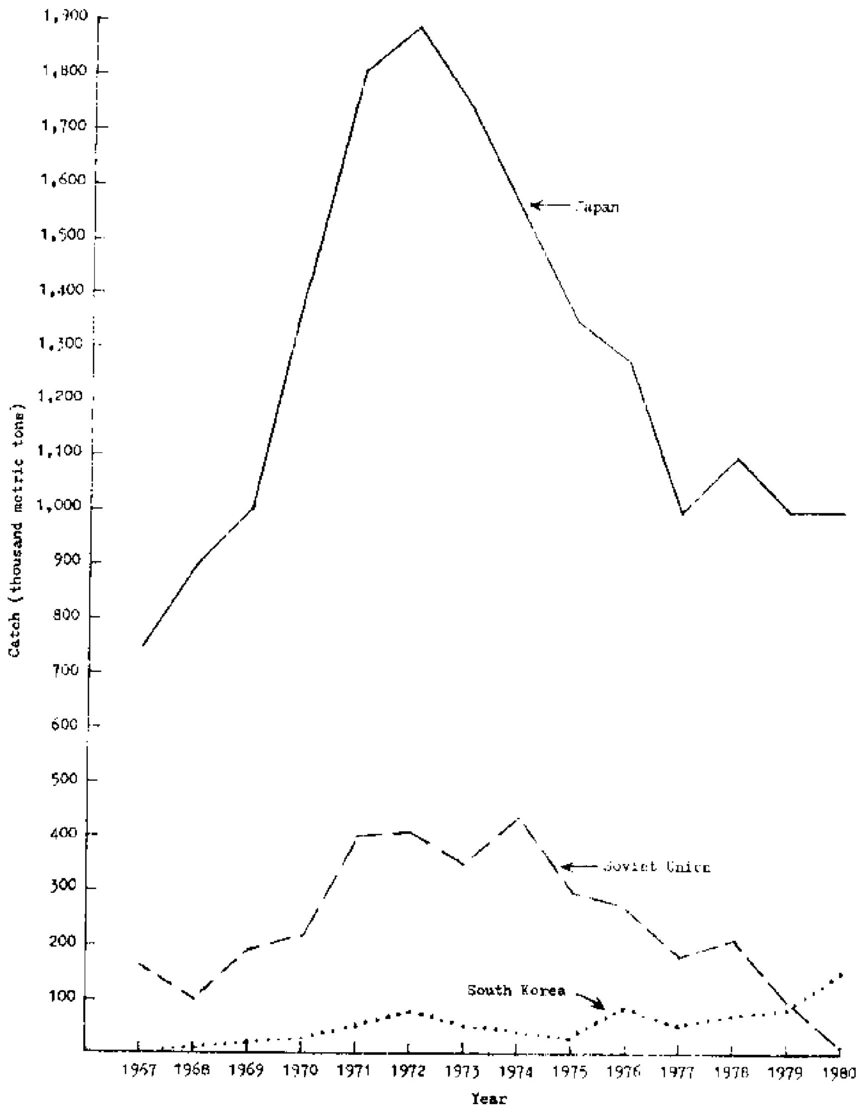


Figure 2. The Annual Catches of Alaska Pollock by Japanese, Soviet and South Korean Trawlers Operating in the Eastern Bering Sea and Aleutian Areas.

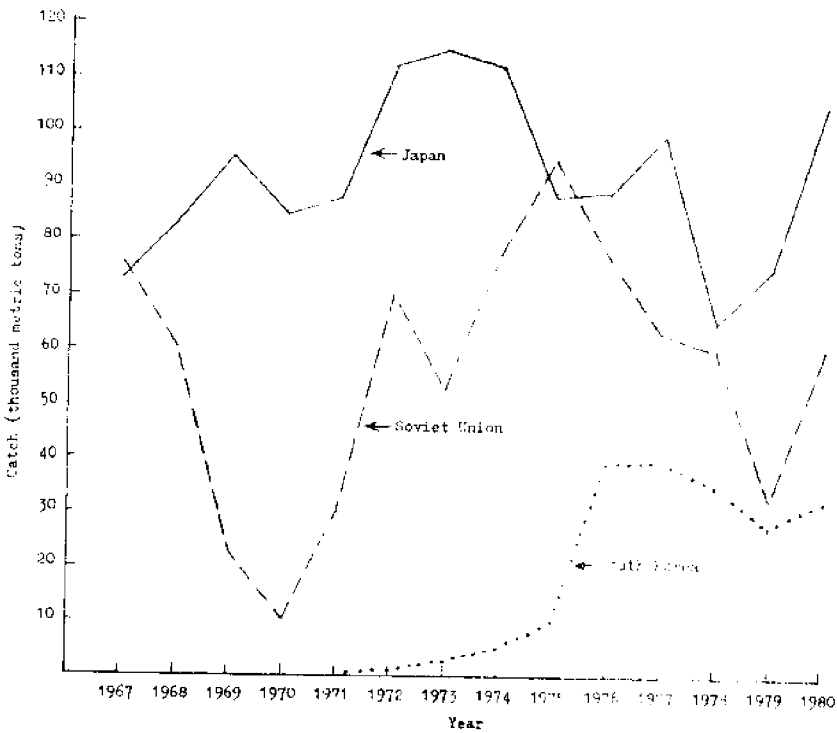


Figure 3. The Annual Catches of Alaska pollock by Japanese, Soviet and South Korean Trawlers Operating in the Gulf of Alaska.

An Overview of Australia's Fishing Zone, Fish Stocks and Seafood Trade

Frances Cassidy
Commonwealth Department of Primary Industry
Canberra, Australia

The pattern of Australia's seafood trade shows marked differences between the nature of the export and import sectors. The export sector is dominated by supplies of products of a high unit value, notably lobsters and prawns, to luxury seafood markets. With the exception of some exports of tuna, the domestic catch of finfish is sold for domestic consumption. Imports supply approximately 55 per cent of Australia's domestic fish consumption and in recent years the growth in Australia's domestic consumption of fish has been met essentially from imports of fresh and frozen fish and canned and processed products.

Australia's resource base is limited. Development of fisheries resources since the extension of Australia's fisheries jurisdiction has concentrated on expanding traditional fisheries. With the exception of some early short term development of the squid fishery, there has been little expansion of fisheries development into new fisheries. Even foreign fishing activities have generally been confined to those fisheries previously exploited by distant water fishing fleets.

Developed fisheries are, however, creating increasingly more complex management problems for fisheries managers. In some, a substantial increase in fishing effort has resulted in fish stocks being seriously threatened and in many fisheries, there is a continuing cost/price squeeze and problems of over-investment.

The outlook for the future will be determined by the ease with which the industry can adjust to biological, economic and market constraints. A significant factor will be the ability of the industry to maintain relative international efficiency to compete with imports on its domestic market and to maintain competitiveness with other exporters of high quality products.

1. An Overview of the Australian Fishing Industry

1.1 Australian fishing industry

There are about 9,000 commercial fishing vessels in Australia with a capital investment of close to $A500 million. Most of these vessels are relatively small; 70 per cent are less than 9 metres and only 2 per cent are more than 21 metres.

In the processing sector there are 160 registered land-based processing plants. Again, most are small - 80 per cent have an annual throughput of less than 1000 tonnes and they employ predominantly casual labour. About 70 per cent are located in rural areas.

Australian fisheries production in the year to June 1981 reached an estimated 149,000 tonnes, compared with 118,000 tonnes ten years' ago. The value of the catch in 1980-81 was about $A350 million ($93 million in 1970-71) but ranking well behind the major rural industries such as wheat, beef, wool and dairying, although ahead of most of the other cropping and livestock activities and accounting for about 3 per cent of the gross value of rural output.

Such figures, however, tend to underestimate the important role played by the industry in the economy, especially as a source of employment in coastal areas. It is estimated that the industry gives employment to some 18,000 fishermen and a further 4,000-5,000 in the processing and wholesaling sector. The fishing industry is the main source of economic activity for many towns along the coast.

Although the gross value of fisheries production is overshadowed by the major rural products, a feature of the industry over the past decade has been its consistently high rate of growth. For example, in the ten years to 1981-82 the gross value of Australian rural output grew by just over 9 per cent annually, compared with a 13.4 per cent growth by the fishing industry. Although this growth has been largely spurred on by higher prices, the volume of catch has also risen by some 2 per cent annually.

From a trade viewpoint, the Australian industry is very much involved in world seafood markets. About two-thirds of the Australian catch, in value terms, is exported, while about half domestic consumption of seafood is supplied by imports.

High value crustaceans and molluscs form the major components of the export trade with the total value of fish and fish product exports amounting to $325 million in 1981-82. These are sold largely in Japan and the United States in competition with other international and domestic supplies to these markets.

Nearly all the finfish caught by Australian fishermen is consumed domestically in fresh or canned form. However, there is a considerable gap between the Australian catch and domestic requirements and imports were valued at $220 million in 1981-82. Import barriers are low or non-existent for seafood products.

1.2 Australian fishing zone (AFZ)

Australia enacted legislation in 1968 to extend its exclusive fisheries jurisdiction to 12 miles following general international acceptance of the rights of coastal States to exercise controls over the exploitation and management of fisheries resources adjacent to their coasts. As a general principle, only Australian vessels were permitted to exploit the resources of the 12 mile declared fishing zone and this exclusivity, combined with the Government's policy of exclusion of foreign fishing vessels from its ports, has allowed the local fishing industry to develop the inshore fisheries without major concern with foreign competition for resources. The only foreign vessels then operating in inshore Australian waters and calling at our ports, were a series of joint ventures in the distant northern prawn fishery and tuna longline vessels operating under a bilateral agreement between Australia and Japan.

On 1 November 1979, Australia extended its fisheries jurisdiction to 200 miles in accordance with developing international law and since then access of foreign fishing vessels to the 200 mile Australian fishing zone has been strictly controlled with a view to protecting the interests of the Australian fishing industry while meeting our international obligations to allow foreign vessels access to surplus resources.

2. Resource Assessment

2.1 Productivity of Australian waters

Australia has one of the longest coastlines of any country in the world (37,000 kilometres) and consequently a large fishing zone (of almost 9 million square kilometres - including areas surrounding offshore island territories). This is greater in extent than the Australian land mass, and is one of the largest fisheries (or Exclusive Economic Zones) in the world. It is roughly the same size as America's fishing zone. Yet we have one of the relatively smallest fishery production. Our current annual output of 149,000 tonnes represents a small fraction, less than .002% of the total world production. America rates fourth in terms of world fishery production and has a recorded catch which is approximately 25 times greater (by weight) than Australia. Reasons for this low output relate, however, almost as much to the history of European settlement in Australia and its concentration on terrestrial agricultural primary production as to the biological limitations on productivity.

Australia is a very old, weathered and arid continent and the soils are deficient in phosphorus and nitrogen. There is thus very low terrestrial discharge of these nutrients into the coastal waters. Upwellings, which in other parts of the world contribute nutrients to support large single species fisheries and large scale fishery production, are limited in Australian coastal waters to sporadic, localised coastal occurrences in some southern locations and a biological enrichment process in north western waters which is little understood.

This low nutrient status exacerbates the other major biological limitation affecting fishery production in Australia, namely its location predominantly in tropical and sub-tropical seas which are characterised by a marine fauna of high species diversity, but limited individual numbers.

Thus, while there are some 3,000 known species of fish and at least an equal number of crustacean and mollusc species inhabiting Australian waters, less than 100 of these are commercially exploited. A resource fact sheet appears at Appendix 1.

2.2 Major fishing areas

As a result of these biological conditions as well as cultural and socio-economic influences the Australian fishing industry has historically been characterised as a small scale, nearshore occupation localised generally near centres of population density. Urban settlement in Australia is concentrated in the south eastern quadrant of the continent and hence much of the fishing is located in the waters of the south east, particularly in relation to trawl fisheries which are the principal supplies of fresh fish to the domestic finfish market.

There are notable exceptions to this situation, however, and fishing production statistics appearing at Appendix 1 show that high unit value species such as prawns and rock lobster which contribute over half the value of the total catch (60 per cent) are taken predominantly in northern and western waters respectively. However, with the exception of these two sectors of the fishing industry, it is true to say that historically we concentrate on, and know more about, the resources of south eastern Australia than in the more remote regions. Foreign fishing activity has dominated the demersal trawl and pelagic fisheries off northern Australia as in the deeper southern waters of the continent. Maps showing our major fisheries appear at Appendices 2-5.

The growth in Australia's fisheries production since the proclamation of the AFZ has taken place in traditional fisheries. There are biological and economic limitations to the further expansion of these fisheries and to a large extent there are also economic and/or marketing constraints to expansion of Australian operations into those fisheries currently being exploited by foreigners, or unexploited. The situation in Australia's major fisheries is summarised in the following sections.

2.3 Limitations to expansion of traditional fisheries

(a) Northern prawns Production from prawn fisheries in Australia in 1981 comprised 27,000 tonnes of the total Australian fisheries production of 149,000 tonnes. In value terms this represents 36 per cent of the total Australian fish catch and 39% of the value of our export trade.

The prawn fishery in northern Australia accounts for approximately 50% of total prawn production. It is based on three major species groups, namely banana prawns (*P. merguinensis*), tiger prawns (*P. esculentus*) and endeavour prawns (*Metapennaeus endeavouri* and *M. ensis*). Other species are also taken.

The banana prawn fishery is considered to be fully exploited (3,000 - 5,000 tonnes annually). The main banana fishery in the south east Gulf of Carpentaria is characterised by very heavy exploitation rates and a progressively shortening season as larger and more powerful fishing vessels enter the fishery and take the majority of the catch in a very short period. Scientists have sounded a note of caution about the possibility of effects of recruitment by over-fishing in the future.

The tiger/endeavour fishery has also been subject to increasing levels of fishing effort in recent years and is now the dominant fishery in terms of quantity taken (8,000 tonnes 1981-82). The catch has not been rising in proportion to the effort and it is not known if further increases in effort will result in a greater catch.

(b) Western rock lobster fishery The western rock lobster fishery (Panulirus longipipes cygnus) is Australia's second most valuable single fishery. It accounts for 8 per cent of Australia's 1981 fisheries production (10,000 tonnes) and $57,000,000(i.e., 16 per cent in value) and 25 per cent of the value of our exports. It is being subjected to increasing fishing pressure and a range of limitations exist to control effort on the resource. Scientists are concerned that technological changes have allowed better directed fishing, so that although the number of pots in the fishery is unchanged, efficiency has increased. To compensate, some reduction in pot numbers will probably be required.

(c) Shark The south eastern shark fishery is based primarily on the exploitation of school shark (Galeorhinus australis) and gummy shark (Mustelus antarcticus) and the catch is exclusively sold on the domestic market. Some 7,500 tonnes were caught in 1981-82 representing in value terms 4 per cent of total Australian production.

Research has shown that there is cause for concern about the level of fishing effort on these species and it is generally agreed amongst fisheries managers that effort and the total catch should be contained.

(d) South east trawl The south east trawl fishery is the principal source of Australian-caught fish from major metropolitan markets. It also supplies a significant quantity of fish for processing and some for export.

The 1980-81 catch from the fishery was in the vicinity of 17,000 tonnes. Biologists have estimated a sustainable yield of 30,000-35,000 tonnes from the main sector in the fishery. However, these figures have not been fully substantiated. Nine species groups make up the major component of the catch and while some of these species are considered to be under-exploited, scientists consider that certain species are being subjected to considerable fishing pressure and may well be over-exploited; management of the fishery is complicated by its multi-species nature and the fact that some areas are fully exploited and vessel numbers are excessive, whereas other areas,particularly offshore waters, are under-exploited.

(e) Southern bluefin tuna The southern bluefin tuna (Thunnus maccoyii) fishery is fished by both Australia and Japan with each nation concentrating to a large extent on the juvenile and adult stocks respectively. With the exception of exports (about 20 per cent) of whole fish, the catch is sold exclusively to domestic canneries. The catch has increased significantly. In 1977-79 the catch was in the vicinity of 11,500 tonnes whereas for 1981-82 the catch increased to over 21,000 tonnes. The Japanese catch on the other hand has declined from 4,000-5,000 tonnes to 2,000-2,500 tonnes in the AFZ; however, it has remained steady overall. Scientists have warned that the present fisheries are steadily reducing the number of spawning adults and that the nations involved may need to adopt more stringent management practices.

2.4 Scope for expansion into other fisheries

(a) Northern demersal trawl and pelagic resources Prior to the declaration of the Australian fishing zone in 1979, the Taiwanese were reportedly catching about 70,000 tonnes of demersal and pelagic fish in this area. The region is now largely fished by Taiwanese under a bilateral agreement with Taiwanese fishing interests which limit the catch to about 20,000 tonnes of demersal fish from a TAC of 27,500 tonnes, and 7,000 tonnes of pelagic species from a TAC of 9,000 tonnes.

The demersal catch comprises a predominance of low unit value small species more favoured on Asian than Australian markets.

Most of the catch is likely to continue to be exported in the near future. The Government is, however, commencing a major research program to review the biological and economic aspects of the exploitation of these trawl resources.

The northern pelagic species (tuna, shark and mackerel) are assessed, on our present rather limited understanding of the stock structure and distribution, to be close to fully exploited (especially shark) by the current foreign fishery. Any significant development by Australian industry will be at the expense of the allowed foreign catch. Australian development of these species will depend very much on cost and marketing consideration. Given the distance of the fishery from established domestic markets, future development will depend on the success of Australians in also marketing the pelagic catch overseas. The Australian Government is currently examining a number of joint venture proposals aimed at increasing Australian participation in these fisheries.

(b) Northern tuna The Coral Sea tuna (yellowfin, bigeye) handline fishery prosecuted by Japanese and more recently Australian fishermen, currently produces approximately 600 tonnes a year during a very short season in October and November in response to environmental conditions: Prospects for expansion of this fishery are currently assessed to be promising. However, given the over-supply of tuna for canning on the world and domestic market, development will be to a large extent determined by access to other markets, such as sashimi.

(c) Squid Squid (*Nototodarus gouldi*) resources of South-east Australian waters offer a significant opportunity for expansion and development. 8,000 tonnes of jig caught squid were taken in 1979-80 by Japanese operators conducting feasibility fishing projects in partnership with Australians. The subsequently depressed world market for squid in Japan has reduced interest in and development of the fishery for this resource. The Government is, however, interested in foreign proposals to develop this resource.

(d) Western Pacific Ocean skipjack tuna Skipjack tuna (*Katsuwonis pelamis*) resources offer a potentially enormous opportunity for fishery expansion. Unsubstantiated estimates of the standing stock of this region have been set as high as 10 million tonnes, with a monthly turnover of 20 per cent. A biologically potential annual fishery yield of 12 million tonnes, based on 50 per cent capture of the turnover, has been suggested. Part of this fishery(estimated 50,000 tonnes) occurs in Australian waters. The economic and technical constraints attendant with realising such catches, especially in view of the depressed world tuna market and the vast expanse of ocean occupied by these fish will need to be given careful consideration. Furthermore, a fishery based on this resource will have to be managed on a co-operative basis as the indications are that the stock is pan-Pacific.

(e) Southern pelagic The existence of some 40,000-70,000 tonnes of jack mackerel (Trachurus declivis) and anchovies and pilchards, have been known for some time. However, Australian interest in developing these resources has been minimal, mainly due to a lack of suitable markets. The USSR, however, did express an interest in establishing joint ventures for jack mackerel following the proclamation of the AFZ in 1979. This species in particular is potentially more amenable to industrial product utilisation, e.g., fish meal, silage, fish protein concentrate (FPC) and pet food. Previous efforts in Australia to develop an FPC industry failed through lack of market outlets and seasonal fluctuation in supply caused by the migratory nature of the species.

(f) South-eastern demersal fish Promising exploratory catches of up to 7 tonnes in single trawls of newly discovered demersal resource called "orange roughy" (Hoplostethus atlanticus) have been taken in southern waters at depths of about 1,000m. The species occurrence is patchy and the reason for aggregations is not yet understood. Imports of this species (estimated 3,000-5,000 tonnes) from New Zealand in previous years had ready acceptance and a major impact on other species in the domestic finfish market. The fishery appears to exist over a short spawning season and occurs at the same time as other trawl fisheries in south eastern Australia, which reduces the opportunities for maximum all-year utilisation of the existing fleet.

3. Markets and Trade

3.1 Exports

The Australian fishing industry has traditionally had a significant export oriented sector centred on crustaceans and molluscs. There is limited demand for these high value products in Australia, largely because of our relatively small population. Thus an increase in output, especially of prawns, has resulted in substantial growth in seafood exports over the past decade. The value of exports has risen even more rapidly than the quantity exported due to higher prices. In 1981-82 exports were valued at a record $325million, compared with $76 million a decade earlier (see Table 1). The average unit value of headless prawns exported rose by 16 per cent annually during the decade, rock lobster tails by 9 per cent and frozen abalone by 15 per cent.

Table 1 Value of Marine Product and Exports: Australia 1972 - 73 and 1979 - 80 to 1981 - 82
$000 F.O.B.

	1972/73	1979/80	1980/81	1981/82
Rock Lobsters				
- Tails	29,783	59,752	50,915	77,719
- Whole	2,471	11,108	20,611	13,110
Prawns				
- Headless	24,039	58,673	45,785	48,131
- Other		58,909	51,839	93,439

table continued...

Abalone				
- Canned	5,073	12,393	19,353	16,214
- Frozen	2,789	13,652	17,306	25,307
Tuna				
- Canned	75	45	121	3,598
- Frozen	899	7,060	4,794	9,795
Scallops	4,967	5,131	12,631	11,128
Other	2,351	13,071	5,706	9,929
Total Edible	72,447	239,793	229,561	308,370
Pearls	1,385	13,339	18,500	15,029
Other Non-Edible	1,771	2,650	1,880	1,631
Total	75,603	255,782	249,941	325,030

In the early 1960's over 75 per cent of Australian exports were accounted for by one product, rock lobster, and sent to one market, the United States. Since then there has been some diversification both of product and markets. Nevertheless Australian exports are still highly dependent on two products, rock lobster and prawns.

Following is a brief outline of Australia's main seafoods exports:

(a) Rock Lobster The United States is the principal market for Australian rock lobster taking about 80 per cent of our exports. These are nearly all in the form of lobster tails. Other major suppliers are Brazil, South Africa and New Zealand. Australia's share of the market has risen from 26 per cent five years ago to about 40 per cent last year. This reflects Australia's relatively stable level of exports to the market at a time when total U.S. imports fell from 15,400 tonne in 1977 to 10,400 tonne last year. Most of this fall was accounted for by reduced supplies from South American countries and South Africa.

Table 2 Imports of Lobster Tails by Country of Origin: United States (tonnes product weight)

Year	Australia	Brazil	Rep. S. Africa	NZ	Other	Total
1977	4,127.7	2,358.7	2,676.2	1,134.0	5,080.2	15,376.8
1978	4,082.3	2,948.4	2,358.7	1,224.2	3,584.2	14,197.8
1979	4,445.2	2,721.6	1,814.4	1,088.6	4,036.9	14,106.7
1980	4,399.9	2,131.9	1,814.4	1,179.3	2,948.4	12,473.9
1981	4,211.0	2,718.0	1,179.3	1,256.0	1,076.7	10,441.0

Figures may not add to total due to rounding.

Source: U.S. Department of Commerce: National Marine Fisheries Service.

In recent years an increasing proportion of Australian lobster catch has been exported in whole form to the Japanese market. To a large extent this trade complements our exports of lobster tails. This is because the Japanese market prefers smaller lobsters, which are discounted in the lobster tail market.

Australia supplies one third of the Japanese market in 1981, edging out Cuba to become principal supplier for the first time.

Table 3 Whole Lobster Imports: Japan

Year	Australia	Brazil	Rep. S. Africa	NZ	Other	Total
1977	327	1,687	309	96	1,083	3,502
1978	843	1,847	426	1,036	1,537	5,689
1979	1,560	1,603	409	680	1,358	5,610
1980	641	2,299	375	267	1,039	4,621
1981	1,788	1,289	430	503	1,394	5,404

Given the already heavy exploitation of the Australian lobster resource, it is unlikely that exports will expand in the future. However, the trend towards the export of whole lobster to Japan is likely to continue because it is usually more profitable than lobster tails for smaller sized lobsters. The market, however, is limited and very competitive for small lobster.

(b) Prawns Australia's annual prawn exports have ranged in the past five years from 7,700 tonnes in 1977-78 to 15,600 tonnes in 1981-82. Although exports have shown a general upward trend, most of the annual variations have reflected variability of the resource.

The great bulk of these exports go to Japan (between 70 per cent and 80 per cent) with South Africa and the United States significant markets in some years.

Australia is the fifth largest supplier of prawns to the Japanese market usually accounting for about 6-7 per cent of the total. Most of these exports are relatively large prawns and processed under stringent hygiene and quality conditions. Consequently, Australian prawns for many years have fetched the highest average prices on the market. However over recent years we have been facing greater competition from increased imports of Chinese "Taisho" prawns and a marked upgrading in the quality of Indonesian product.

Table 4 Imports - fresh, frozen prawns: Japan

Year	India	Indonesia	Thailand	Aust	Other	TOTAL
			Quantity (tonnes)			
1976	26,901	25,510	9,850	6,190	54,883	123,334
1977	25,803	25,701	7,227	7,742	58,307	124,780
1978	31,580	28,338	8,377	7,546	68,121	143,962
1979	38,757	29,621	9,295	10,955	70,045	158,673
1980	35,249	27,569	8,850	8,053	63,535	143,256
1981	40,049	24,193	10,321	11,522	75,640	161,725

In most areas prawn resources are regarded as fully or over exploited. Thus, while there will be large catches in some years and there may be scope for increasing the value of the catch through better management, the amount exported is unlikely to show a major upward trend.

(c) Abalone Australian abalone production has been rising in recent years; landings were 6,700 tonnes in 1980-81 and are believed to have exceeded 7,000 tonnes last year.

In 1981-82 Australia exported 2,800 tonnes of frozen abalone and 1,200 tonnes of canned abalone. There are year to year variations in the amount exported in frozen and canned form in response to shifts in market prices.

Japan is the principal market for both frozen and canned Australian abalone. Over the past five years Japan has taken 70 per cent of Australian abalone exports and just under 40 per cent of canned. Hong Kong is also a significant market taking 25 per cent of frozen and 30 per cent of canned abalone over the same period.

Australia dominates both the Japanese and Hong Kong abalone markets.

In 1981 Japan imported 1,900 tonnes of frozen abalone of which 1,600 tonnes came from Australia; Australia supplied nearly all Japan's imports of canned abalone which have ranged from 600 to 700 tonnes over the past five years.

Table 5 Abalone Imports (tonnes product weight): Japan

Fresh, Chilled or Frozen

Year	Philippines	Hong Kong	Australia	Rep. Korea	US	Canada	Chile	Other	TOTAL
1977	24	-	515	46	5	387	2,369	1	3,347
1978	14	23	1,206	6	45	385	1,170	-	2,849
1979	30	-	1,202	1	126	147	2,931	7	4,443
1980	10	-	1,135	12	91	106	368	3	1,724
1981	3	-	1,619	-	136	60	73	2	1,896

In the frozen abalone market Japanese buyers have imported large quantities of Chilean loco which have competed with Australian abalone with some success in the lower priced end of the market.

Australian dominance of the Hong Kong market is considerably less than in Japan. Up to last year Chilean loco was the main product imported with Australia supplying about 40 per cent of imports. Last year Australia's market share exceeded 50 per cent for the first time since 1975. Australia is the principal supplier of canned abalone with about 30 per cent of the market although it faces strong competition from South Africa, the US and New Zealand.

Table 6 Abalone Imports (tonnes product weight): Hong Kong

Fresh, chilled or frozen

Year	Australia	South Africa	Chile	US	Other	TOTAL
1977	250	19	258	85	12	624
1978	408	21	463	8	16	916
1979	477	19	511	(a)	153	1,161
1980	498	17	691	18	26	1,250
1981	459	17	299	9	25	809

Year	Australia	US	New Zealand	South Africa	Singapore	Other	TOTAL
			Canned				
1977	458	786	103	241	9	26	1,623
1978	403	670	136	230	22	81	1,542
1979	395	597	197	207	59	33	1,488
1980	510	207	258	243	60	314	1,592
1981	376	182	199	184	26	331	1,298

(a) less than 1 tonne

Source: Hong Kong Census and Statistics Department, Hong Kong Trade Statistics.

Because of resource limitations it is likely that Australian exports of abalone will remain around current levels with year to year fluctuations reflecting seasonal conditions and temporary increases in fishing effort.

(d) Tuna In recent years, Australia has exported an average of some 5,000 tonnes of tuna annually. Typically, this has represented about 20% of the Australian catch; the balance being canned for domestic consumption.

Nearly all the exports have gone to Italy where they are canned for the European markets. Australia supplies about 5% of Italy's import requirements; major suppliers being France, Mexico, Japan and the Republic of Korea.

In the light of the currently depressed prices, tuna exporters are actively looking for new and better returning markets, especially following the record catch last season. Growth in tuna exports will therefore be largely influenced by developments in world markets, the extent to which the Australian industry can take advantage of them and the relative returns from overseas markets compared with the domestic market.

(e) Other Exports Small quantities of whiting are exported to Japan, and a variety of seafoods including redfish, snapper and eels are freighted live to European markets, notably Greece. However, prospects for any substantial increase in fish exports, other than tuna, are not good in the medium term.

3.2 Domestic consumption and imports

Australians are estimated to have consumed around 7 kgs of seafoods per person in 1981-82 although it is believed that the statistics considerably understate actual consumption levels (see Table 7).

Fresh and frozen fish represent about 50 per cent of the seafood consumed followed by prepared or preserved seafoods such as tinned and smoked, (40 per cent) and crustaceans and molluscs (10 per cent).

Table 7 Apparent per capita consumption of Seafoods: Australia

Edible Weight (kg)

SEAFOOD	1975-76	1976-77	1977-78	1978-79	1979-80
Fresh & Frozen (edible weight)					
Fish					
- Australian	1.5	1.4	1.7	1.7	1.5
- Imported	1.6	1.6	1.7	1.5	1.9
Crustacea and Molluscs	1.0	0.9	0.9	0.9	0.8
Seafood otherwise prepared (product weight)					
Australian	0.7	0.5	0.5	0.5	0.5
Imported					
- Fish	1.7	2.0	1.9	1.6	1.9
- Crustacea & Molluscs	0.4	0.5	0.4	0.3	0.3
TOTAL SEAFOOD	6.9	6.9	7.0	6.6	6.9

About half of the fish eaten in Australia in 1981-82 was imported. Imports were most important among canned and other prepared fish where they comprised about 80 per cent of consumption, and among fresh and frozen fish, where they were about 60% of consumption. The great bulk of fresh and frozen crustaceans and molluscs came from domestic sources.

The proportion of Australian fish consumption which was imported has shown little change since the early 1960s ranging from 50 to 55 per cent.

The important part played by imports has meant that all segments of the Australian fishing industry are affected by developments on world markets.

The relatively small contribution which fish makes to the Australian diet has meant that prices and availability of other foods exert a considerable influence on the market for fish. Less than one per cent of Australian food consumption is fish and almost two per cent of household food expenditure is on seafood. In particular, the prices of beef (annual consumption 47 kg), lamb (16 kg), and poultry (20 kg) play an important part in determining price levels on the domestic fishing industry. As illustrated in Table 8 below, in recent years the price of beef and sheepmeats has risen at less than the rate of inflation (about 10% annually) and this, combined with relatively cheap imports, has had an important dampening effect on fish prices.

Table 8 Percentage Change in Retail Prices
Weighted average of 6 State capital cities

1978 to 1981

	1978 %	1979 %	1980 %	1981 %	1982(1) %
Fish	+ 9.0	+ 13.9	+ 5.1	- 1.3	+ 0.6
Beef & Veal	+ 24.7	+ 2.5	+ 2.2	- 2.0	+ 0.6
Lamb & Mutton	13.9	+ 14.3	+ 1.5	+ 1.1	+ 3.7
Poultry	+ 1.5	+ 4.7	+ 9.8	+ 9.8	+ 6.7

Source: Australian Bureau of Statistics. (1) June 1981 to June 1982.

Following is a brief account of trends in these markets:

(a) Fresh and frozen fish In 1980-81 Australians consumed approximately 113,327 tonnes (live weight) of fresh and frozen finfish. Of this, only 40% was supplied by the domestic fishing industry. Imports came mainly from New Zealand (29%), South Africa (27%), and Japan (18%).

Despite developments in the Australian trawl fish industry over the past decade imports have maintained a consistent share of the market in excess of 50% and in recent years this proportion has approached 60%. The more recent increase in imports of fresh and frozen fish partly stems from the inability of the Australian industry to keep pace with demand, especially for frozen fish and in part because of the increased availability of relatively cheap, high quality fish from countries such as New Zealand, Argentine, Chile and South Africa.

The Australian trawl fishing industry has tended to concentrate on supplying the restaurant and fresh fish markets and imported fish have supplied the take away, food service, institutional (canteens, hospitals etc) and processed fish (fish fingers, frozen packs) markets.

Table 9 Australia - apparent quantity of fresh and frozen finfish available for consumption 1972-73 to 1980-81

(tonnes live weight) (a)

Year	Exports	Imports	Domestic production	Avail. for consumption (production plus imports minus exports)	Imports as % of consumption
1972-73	667	48,054	38,997	86,389	55.6
1973-74	1,148	51,285	42,725	92,862	55.2
1974-75	839	44,362	40,780	84,303	52.6
1975-76	1,145	45,545	41,081	85,481	53.3
1976-77	1,374	51,532	45,127	95,285	54.1
1977-78	1,459	50,981	47,122	96,644	52.8
1978-79	2,012	50,450	47,764	96,202	52.4
1979-80	3,805	65,557	50,593 (c)	112,345	58.4
1980-81	2,874	67,733	48,468 (c)	113,327	59.8

(a) Imports and exports have been converted to live weight using the following factors: 1.33 whole and beheaded: 2 fillets and other prepared or preserved: 1 fish finger.

(b) Based on fisheries returns which are believed to significantly understate production.

(c) Department of Primary Industry estimates.

Sources: Australian Bureau of Statistics, Fisheries (various issues).

In more recent years there has been increased penetration of the fresh fish and restaurant trades by imported fish, mainly from New Zealand, much of which is air freighted into Australia.

Over the past two years three large plants have been established in Australia to produce fish fingers and other value added frozen fish. These plants are believed to have expanded these segments of the market, especially the market for fish fingers. However, they have not resulted in any increased use of Australian fish in these markets as all the requirements have been imported.

(b) Canned fish The market for canned fish in Australia is currently about 25,000 tonnes product weight (or some 60,000 tonnes live weight (equivalent)) (see Table 10). Over the past decade the market has grown strongly, averaging 2.8 per cent per annum.

Table 10 Canning Fish Availability: Australia (Tonnes Product Weight) 1972-73 to 1980-81

Year	AUSTRALIAN Aust. Salmon	Tuna	Total	IMPORTS Salmon	Tuna	Other	Total	Total Avail.	Imports as % of Total
1972-73	2021	5242	7263	4590	38	7456	12084	19347	62.5
1973-74	1843	4178	6021	6901	538	8518	15957	21978	72.6
1974-75	2176	4656	6832	3657	2356	8733	14746	21577	68.3
1975-76	1475	4485	5960	3279	213	5447	8939	14899	60.0
1976-77	1556	4248	5804	5960	656	6087	12702	18506	68.6
1977-78	1355	5171	6526	6727	1529	6976	15232	21758	70.0
1978-79	1004	4734	5738	4016	1520	5099	10635	16373	65.0
1979-80	1037	5703	6740	5124	2931	5817	13872	20612	67.3
1980-81	1008	7632	8640	7471	2327	6789	16587	25227	65.8

Features of developments in the market in recent years have been a subsequent increase in apparent consumption of tuna, mainly as a result of higher catches. Salmon consumption has also risen sharply owing to increased availability of product from North America. There have also been greater imports of herrings and sardines. The only canned fish item to consistently fall in consumption over the past decade has been Australian 'salmon' (a species of perch). There are suggestions that the resource has been over-exploited.

Much of the growth in canned fish sales over the past decade can be attributed to good marketing and tuna and salmon in particular are well promoted through the media and instore advertising. However, over the past year or so consumption has been effected by health scares associated with imported salmon.

(c) Crustaceans and molluscs As well as being significant exporter of high value crustaceans and molluscs, Australia is also an important import market, especially for shrimp. Last year imports of crustaceans and molluscs were just over 12,000 tonnes valued at $A62 million. Most of these imports were shrimp from Malaysia and China.

The sharp rise in prawn imports over the past two years has reflected the cheaper quantities available on world markets following the downturn in market demand especially in the United States and Europe and the block listing of prawns from some South East Asian countries on the United States market.

3.3 Barriers to Trade

The Australian seafood market is a relatively open one and we face few barriers to trade on overseas markets.

On the Australian market imports are free of duty with the following exceptions

- canned tuna	- duty 15%
- fish pastes, balls, potted or concentrated fish	- duty 5%
- crustaceans and molluscs, extracts and pastes	- duty 5%

New Zealand, Papua New Guinea and islands of the South Pacific are exempt from these duties.

On overseas markets, rock lobster faces no impediments on the U.S. market and the import duty for prawn exports to Japan is 3%. Abalone exports to Japan are dutiable at 10% on frozen and 12% on canned. There is a duty of 5% on whole cooked lobster entering Japan and this also applies to most species of fresh and frozen fish of the type currently exported from Australia, such as whiting.

Frozen tuna is Australia's most important export to the EEC and enters duty free because it is an important source of raw material for canning firms in Italy. However, Australian prawns and whole lobsters which are exported to the EEC (mainly France), face duties of 18% and 13% respectively.

Squid, a prospective developing fishery, is dutiable at 8.6% in Japan but under the recent GATT agreement this will progressively fall to 5% by 1988. Processed squid faces a 15% duty in Japan.

None of Australia's major seafood markets impose quotas on existing exports. However, Japan does have a quota regime for certain fish products - the only one of major interest to Australia being the quota on squid and cuttlefish.

Overall, the general trend has been for duties and quotas on seafood to be liberalised, both as a result of GATT negotiations and the increased need for imports by some of the major consuming nations, such as Japan, as a result of their exclusion from traditional fishing grounds following the declaration of 200 mile fishing zones.

4. An Economic Assessment

For most of the 1970s the Australian fishing industry was reasonably profitable. This reflected rising prices on overseas markets, improvements in productivity and a relatively stable cost environment. This profitability resulted in sharply increased investment in new vessels and improved equipment in all the major fisheries.

The rise in fuel and associated costs since the late 1970s caused a sharp drop in returns. This was accentuated by a slowdown in the rate of price increases on world markets associated with the downturn in economic activity since the early 1980s. In addition, there was an increase in the amount of imported fish available which, combined with lower meat prices, put pressures on domestic fish prices.

This general decline in profitability was exacerbated by the increased investment in fishing effort during the period. For example, boat numbers in the east coast prawn fishery off Queensland rose from 800 in 1978 to 1400 in 1981. In addition, there were significant improvements in gear and technology in this period. There was also a significant increase in boat numbers in both the tuna and trawl fisheries. In other major fisheries such as prawns (in some areas) and rock lobster, increases in numbers were restricted through limited entry schemes, and the main increases in effort resulted from larger vessels, increased engine power and more sophisticated fish finding equipment. The form in which these increases in effort have taken have depended to a large extent on the management regime in force.

To sustain these investments, many fishermen borrowed heavily and subsequently had difficulty in making repayments as profitability fell, fuel costs increased and interest rates rose.

Not all fisheries have been equally hard hit by these trends. For example, abalone and rock lobster fishermen have been considerably less affected by fuel price rises than prawn and fish trawlers or tuna fishermen. Furthermore, price falls did not all occur at the same time. Prawn prices, although depressed between 1979 and 1981, are showing evidence of recovery this year. Tuna and abalone prices, on the other hand, have been relatively strong until fairly recently.

The Government has asked an independent body, the Industries Assistance Commission, to examine the adjustment needs of the industry and to consider whether any changes in management rules or other regulations would assist adjustment.

5. Outlook

Any assessment of the future trends in the structure and competitiveness of the Australian fishing industry rests on two broad assumptions.

The first concerns the development of new resources. Nearly all Australia's fish resources are quantified, although with varying degrees of reliability, and it appears that there are limited opportunities for development of new resources.

Australians may expand their operations in fisheries in the AFZ now being exploited by foreigners. In the short term at least, there are a number of marketing and technical problems to be overcome before Australians can economically exploit these resources - this is an area to which we will be devoting considerably more research effort over the next few years.

There will be some new development of exploited fisheries, especially in northern Australia. Also species such as tuna (other than southern bluefin), squid, octopus and sea urchin which occur off south eastern Australia may be developed if market conditions prove favourable. However, as a general framework it is reasonable to assume that the Australian fishing industry will have to make more effective use of traditional resources rather than rely on the expansion of the industry through development of new fisheries in contrast to the position prior to about 1975.

The second assumption, and one that is far less certain, is that costs and prices will not significantly move in favour of the fishing industry. This assumption rests on perceptions about development in world economic activity, with its implications for the prices of fish products and input costs, especially the cost of fuel.

World economic activity has fallen in recent years and it would be optimistic to expect any resurgence in activity over the short to medium term. This has implications for overseas demand for Australian seafood products which rose in price in the 1960s and 1970s in response to a growing world economy with increased demand for luxury seafoods. Although the current world recession has not led to any fall in seafood prices, it has slowed the rate of growth. Accordingly, it could be expected that prices on overseas markets will continue to increase over the next few years, but at a slower rate than Australian fishermen and exporters have come to expect.

On the domestic market, the Australian industry can continue to expect keen competition from lower cost producers of imported fish, especially from developing fisheries off New Zealand and South America where fishing operations have expanded with the extension of fisheries jurisdiction.

Furthermore, the industry is facing increasing competition on its traditional export markets, especially for prawns, from low cost producers and it will need to retain a competitive edge, in order to maintain its markets.

On the cost side, we expect little amelioration in the rate of growth in fuel prices. The Australian Bureau of Agricultural Economics expects fuel prices to increase in real terms by 1 per cent annually over the rest of this decade.

Technically the industry is improving its productivity, especially in the areas of more fuel-efficient fishing methods and improved fish finding and catching techniques. It is not clear whether the recent increases in fuel prices will result in major changes in fishing methods. The immediate response appears to have been a fall in the value of vessels and licences in the more fuel intensive fisheries. Improved fishing technology and fleet management is helping to offset higher fuel costs and, in some areas, causing a significant increase in fishing effort. Generally, this is not being matched by a commensurate rise in the catch.

The industry has shown considerable innovation in reacting to changes in market requirements. In recent years, it has responded to market needs by directing an increasing proportion of its lobster exports to the more profitable Japanese market for whole lobster, by developing a trade in bulk pack prawns, as distinct from the traditional headless pack, and by more sophisticated marketing of abalone. Also, there appears to be scope for further marketing improvements for tuna and fresh fish generally.

Over the next decade, therefore, the Australian industry is likely to be characterised by adjustment of the catching sector and further development of management regimes aimed at achieving balanced and profitable exploitation of increasingly well defined, but clearly limited resources. Also there may be some substantial changes in fish marketing in response to changing food marketing and consumption patterns.

APPENDIX 1

RESOURCE FACT SHEET

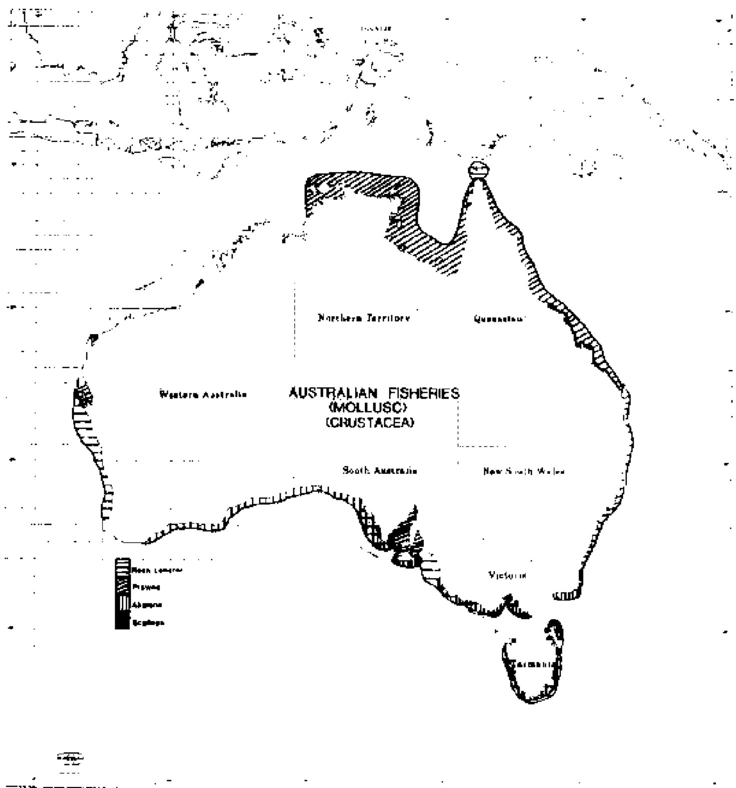
COASTAL FISHERIES

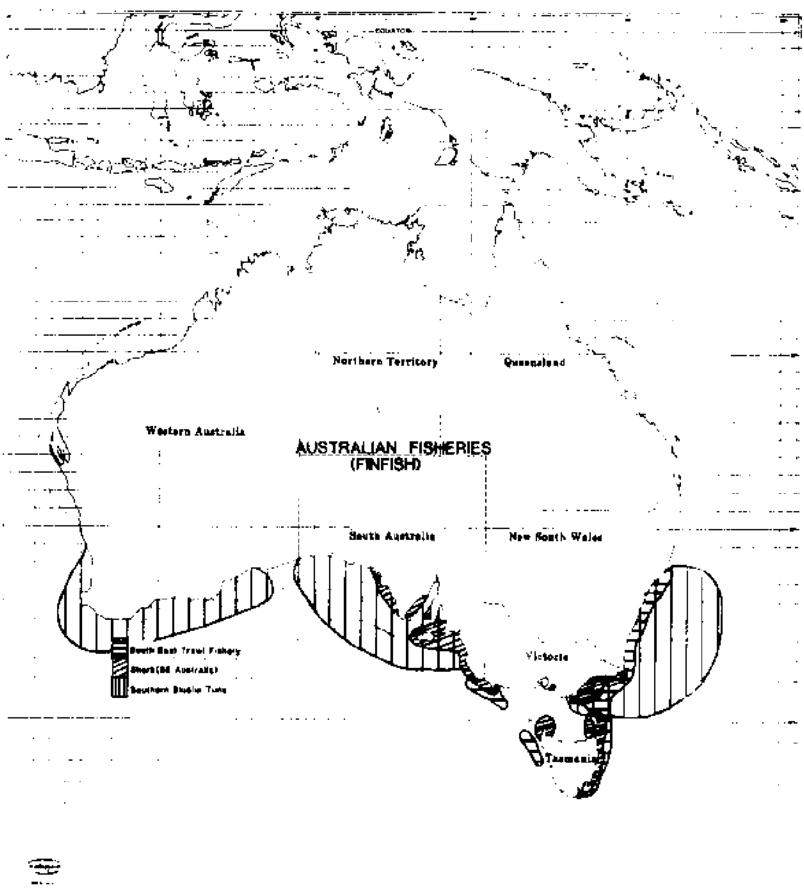
Fishery	Major Species	Fishing Techniques	Present Production (000 tonnes)	Value $Am	Principal Market	Potential	Management
(1) Australian Fisheries							
Rock lobster							
Southern	Jasus novaehollandiae	Trapping in pots	4–5.5	21–23	Export	No significant increase can be expected (nsi)	Limited entry with pot numbers controlled
Western	Panulirus longipes cygnus		8–12	57–62			
Prawns							
S. Australia	Penaeus latisulcatus	Trawling	2.2–2.8	10–11	Export	nsi	Limited entry gear control
W. Australia	P. latisulcatus P. esculentus P. merguiensis	Trawling	3–3.5	13–17	Export	nsi	Limited entry gear control
Northern	P. merguiensis P. esculentis	Trawling	6.5–12.5	43–83	Export	11.5–18	Limited entry
East coast	P. merguiensis	Trawling	6.5–7.7	43–48	Export	Inshore resources fully exploited. Possible increase from deepwater	
Scallops	Pecten meridionalis Mimachlamys asperrimus	Dredging	6–10	5–10	Domestic Export	Highly variable	Limited entry and bag limits
Abalone	Haliotis ruber H. laevigata	Skin divers	6–7	11–28	Export	nsi – culture techniques may generate increases	Limited entry

Shark SE Aust	Galeorhinus australis Mustelus antarcticus	Gillnet longlines	7-8	8-10	Domestic	nsi	Directed to small shark because of mercury content
SE Trawl	Rexea Solandri 40% Redfish 15% Neoplatycephalus spp. 12% Nemadactylus spp. 12%	Trawling	17	15	Domestic	Some incidental species are overexploited, total resource estimated at 30-35,000 tonnes	Proposals for limited entry with effort control being studied
SE Deep Water Trawl		Trawling	not known	not known	Domestic	Exploratory fishing has taken good catches of Orange roughy, a fish which is a significant import	
(2) Australian and Foreign Fisheries							
Tuna	Southern bluefin (Thunnus maccoyii)	Longline (Japan) Poling Purse seine	1.5-3 16 5.5	22-32 6.3 3.0	Japan, Domestic and Export	nis - may be overexploited	
Northern Deep water Tuna	Yellowfin and bigeye tuna	Longline (Japan) Handline (Japan) Poling (Australia)	 0.6-1 0.1	1.5	Japan Australia	Australian poling shows some promise for development	Foreign fishing under bilateral agreements
(3) Foreign Fisheries							
NW Trawl	Mixed tropical	Pair trawl	20	12-20	Taiwan	40-60,000 tonnes	Foreign fishing under bilateral agreement

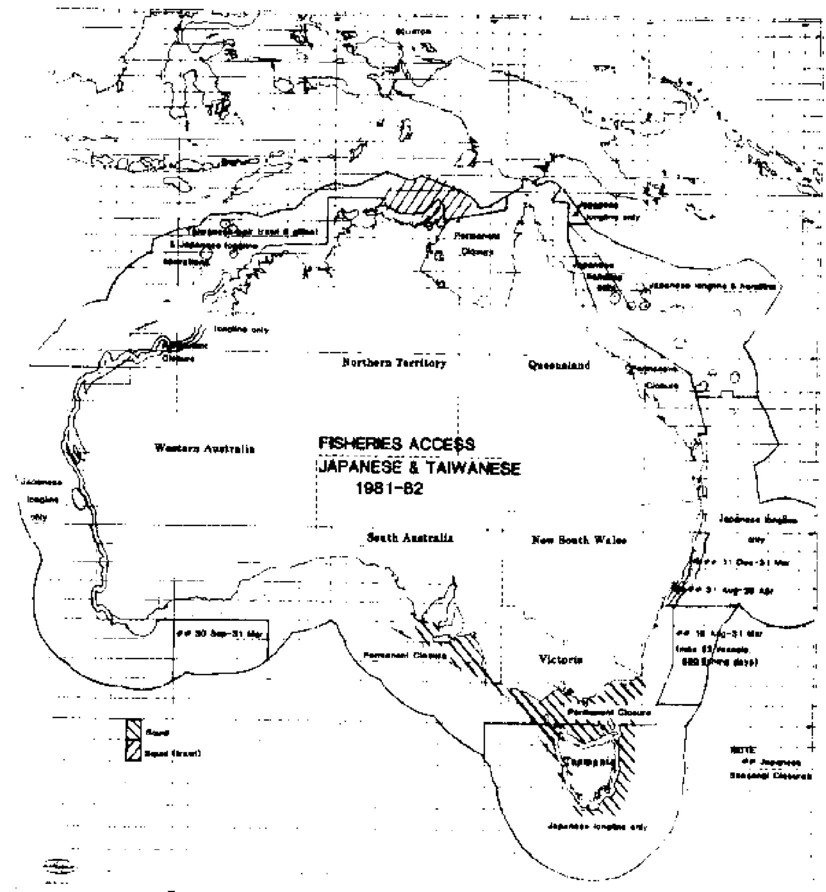
Northern Pelagic	Shark, mackerel and tuna	Gillnet	7	3.5–4	Taiwan	9,000 tonnes	Foreign fishing under bilateral agreement
Squid South east	*Nototodarus gouldii*	Jigging	8.3 in 1979–80		Japan	Commercial resources off SE Australia	Feasibility fishing involving foreign vessels in SE Aust 1979–80
	Ommastrephes bartrami	gillnet					
(4) Unexploited Resources							
Great Australian Bight	Demersal and pelagic	Trawl	-	-	-	3,000 tonnes demersal 10,000 tonnes pelagic	-
Skipjack Tuna	*Katsuwonus pelamis*	Poling Purse seine	-	-	-	25–50,000 tonnes	-
Jack Mackerel	*Trachurus declivis*	Purse seine	-	-	-	20–50,000 tonnes	-
Pilchards & Anchovy	*Sardinops neopilchardus* *Engraulis australis*					Estimated 20,000 tonnes. No large concentrations found	-
Lantern & light fish	*Maurolicidae* *Gonostomidae* *Scopelidae*	-	-	-	-	Believed substantial off SE Australia if can be developed	-

Appendix 7


Northern Territory
Queensland
Western Australia
AUSTRALIAN FISHERIES
(MOLLUSC)
(CRUSTACEA)
South Australia
New South Wales
Victoria
Tasmania

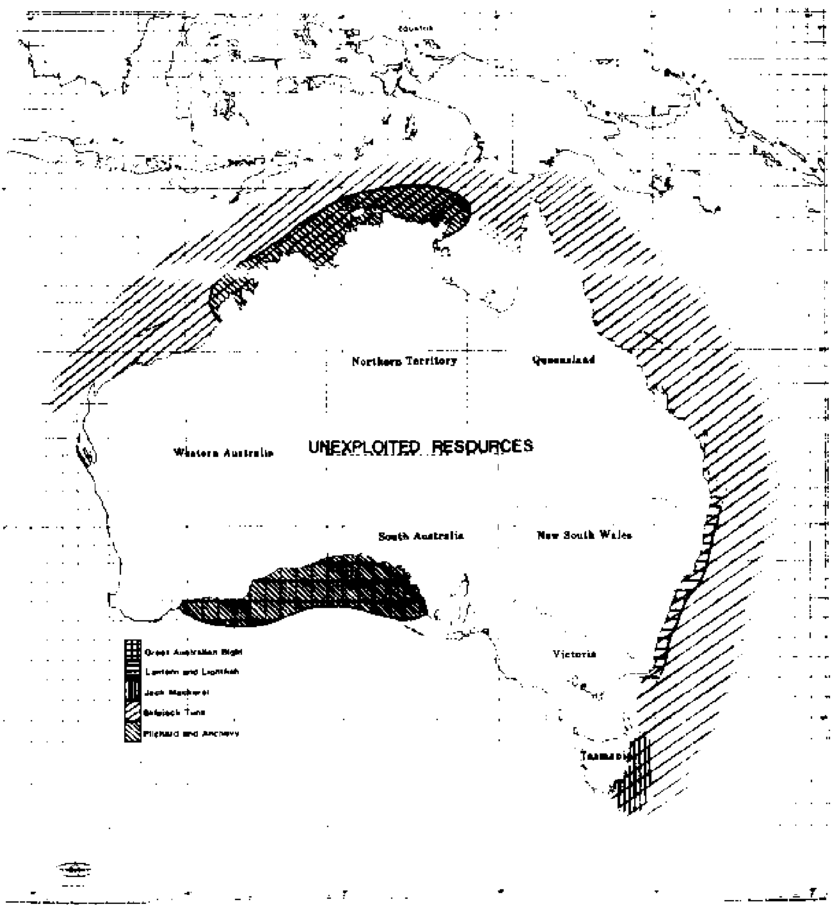

Northern Territory
Western Australia
AUSTRALIAN FISHERIES
(FINFISH)
South Australia
New South Wales
Victoria

Appendix 4



FISHERIES ACCESS
JAPANESE & TAIWANESE
1981-82
Northern Territory
Queensland
Western Australia
South Australia
New South Wales
Victoria
Tasmania
Permanent Closure
Japanese longline only
longline only
Permanent Closure
Japanese longline only
Squid
Squid (trawl)

Appendix 5


Northern Territory
Queensland
Western Australia
UNEXPLOITED RESOURCES
South Australia
New South Wales
Victoria
Great Australian Bight
Lantern and Lightfish
Jack Mackerel
Skipjack Tuna
Pilchard and Anchovy

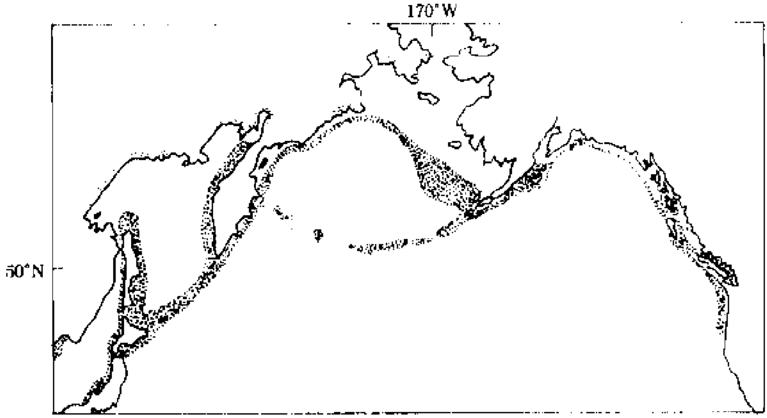
Demand and Market Conditions for Fishes in Japan, Especially Minced Alaska Pollock

Yutaka Hirasawa
Tokyo University of Fisheries
Tokyo, Japan

Alaska pollock or North Sea pollock is the largest resource of a single species of fish in the world. Its geographic distribution covers all the northern Pacific waters along coasts and islands and especially along the south Kamchatka peninsula and in the southeast Bering Sea where the best fishing grounds are located. The total catch of Alaska pollock was 4,581,000 mt. in 1980 including the estimated catch of North Korea. (Figure 1, Table 1) (Alverson, 1981)

Owing to some special characteristics, Alaska pollock is not suitable for processing using normal methods. Average size is about 40 cm. long in a relatively unexploited resource, but soon decreases to 25-30 cm. long once the fishery is developed. With this small size of fish, there is a very low recovery rate of only about 20% and productivity is correspondingly low even if splitting and cutting machines are used. Freshness deteriorates at a very high rate due to the softness of the flesh which has a high water content. Costly treatment is needed to keep it in good condition. The most difficult characteristic is the presence of many parasites in the flesh which have to be picked out by hand if Alaska pollock is processed as a fillet. This requires many workers.

On the other hand, the processing method for producing minced fish has many merits. Firstly, it is possible to process large amounts of small size fish with high productivity. The main process in the production of minced fish is squashing the gutted and headed fish. The crushed meat is then separated from skin, bone and tail. Secondly, in the case of minced fish, parasites are not a problem. After the meat is separated from the bones and skin, it goes through a washing process two or three times in order to remove water-soluble protein and the remains of skin and other matter. After this process, salt, sugar and some seasoning are added to the washed meat and it is then frozen. The third merit is that this minced fish which is the material used for



Source : Alverson : Pacific Pollock, Natural Resources Consultants, Oct. 1981

Figure 1. Geographic distribution of Alaska pollock

Figure 1. Geographic distribution of Alaska pollock

Table 1. Pollock production by countries in 1979

(UNIT : 1,000 MT)

	Total	Eastern pacific	Western pacific
Total	4,581	1,008	3,573
U.S.S.R.	2,166	74	2,092
Japan	1,515	778	737
Korea (south)	298	104	194
Korea (north)	550*		*550
Other	52	52	

* estimated

fish cake products can be conveniently kept in cold storage for one and a half years.

To make fish cake products from minced fish, other ingredients such as starch, water, eggs and seasonings are added. After these have been mixed with the minced fish processing can be by either steaming, baking or frying. To produce fish cake products of high quality it is necessary to add minced fish produced from other species. Depending on the amount of minced fish of other species which is added, a high quality type of fish cake can be produced. Alaska pollock minced fish has an important role as a cheap basic material for fish cake products and the techniques used by processors for making their products taste good using as much Alaska pollock minced fish as possible are carefully guarded secrets.

Among the many types of fish cake on the market, the main products are:

steamed fish cake	- kamaboko (Japanese name)	
baked fish cake	- chikuwa	"
fried fish cake	- agekamaboko	"
fish sausage and ham		

There are many reasons for the increase in the consumption of fish cake products. First the demand for animal protein in Japan increased due to higher incomes generated by rapid economic growth which started in 1955 and accelerated after 1965. At that time the price of meat and meat products was very high compared to fish and fish products. As a result, the demand for fish has increased enormously since 1955. Second, fish cake products are highly competitive and their prices are lower than other fish and meat products as they use low quality fish which is not suitable for traditional Japanese ways of preparing fish (raw or grilled fish). Fish cake products are popular with Japanese as a cheap protein food. Since 1955, the price of fish has been rising at a rapid rate due to higher incomes. However, at the beginning of 1960, a new technique for making minced fish from pollock was developed. This made it possible to use the huge unexploited resources in the seas around northern Japan and the North Pacific, which until then had not been utilized although their existence was known, because of the special characteristics of pollock which have already been mentioned. Third, fish cake products do not have a strong fishy smell. The water soluble proteins, fat and other ingredients which give fish its special smell are extracted so that many people who do not like to eat fish can eat fish cake.

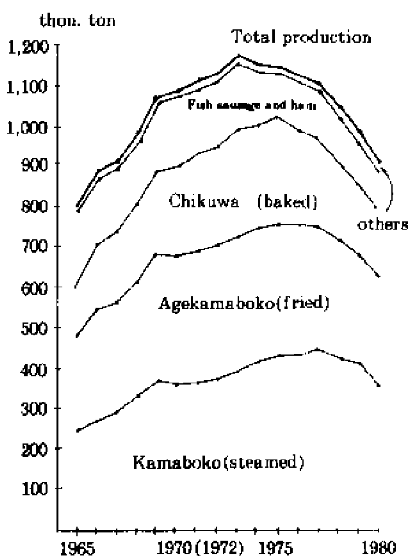


Figure 2. Production of minced fish products

Figure 2 shows the annual production of each type of fish cake product. The increase and decrease in production have been remarkable. Increased production was due to the expansion of pollock fisheries and decreased production currently is due to the 200 mile limitations, but there are also other important reasons and the main purpose of this paper is to clarify what they are.

Table 2 shows the increasing and decreasing trend of minced fish production from pollock. The production of minced fish on land means that it is made with pollock caught in the sea near Japan and in the western North Pacific. Pollock caught there is brought back to land by fishing boats under 350 tons which do not have minced fish making equipment on board. The decrease in catch has been very severe due to the curtailment of allocations of pollock by the U.S.S.R. The production of minced fish at sea means that it

Table 2.

The production of minced fish in Japan

(unit : ton)

	Total A	on land	at sea B	B/A × 100
1970	261·4	118·5	142·8	55
1971	321·4	137·9	183·5	57
1972	354·8	161·3	193·5	55
1973	382·7	159·1	223·6	58
1974	348·8	152·8	195·3	56
1975	355·8	164·1	191·7	54
1976	379·0	191·2	187·8	50
1977	351·8	180·2	171·7	49
1978	309·7	127·3	182·4	59
1979	289·4	109·0	180·4	62
1980	281·9	98·7	183·2	65
1981	301·3	108·5	192·8	64

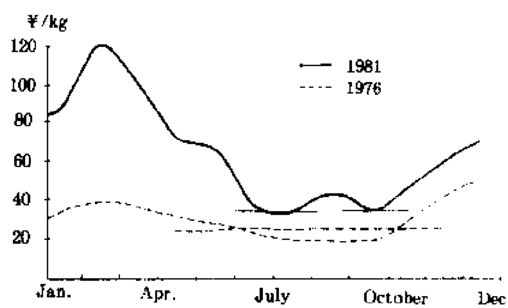
Source : National Association of Minced Fish

is made with pollock caught in the eastern North Pacific within 200 miles of the U.S.A. There are two types of pollock fishery here; one is the mother factory ship with catcher boats and the other is made up of factory trawler ships each working independently. The production of minced fish at sea is very stable due to the large allocation of pollock by the U.S.A.

The quality of minced fish produced on land is not so good and its price is about a half that of minced fish produced at sea due to the poor quality of the landed pollock. Fishing boats in the western North Pacific have to stay on the fishing ground for several days and keep their catch on ice. On the other hand, pollock caught in the eastern North Pacific is processed the same day it is caught.

The main fishing season for pollock in the western North Pacific is from December to March and the price is rather high during this period because of the roe. The main fishing season in the eastern North Pacific is from June to September and the pollock caught during this period is used for making minced fish.

Figure 3 shows the monthly change of pollock prices at fishing ports in Japan. Up to 1976, the fluctuations in price were not so severe

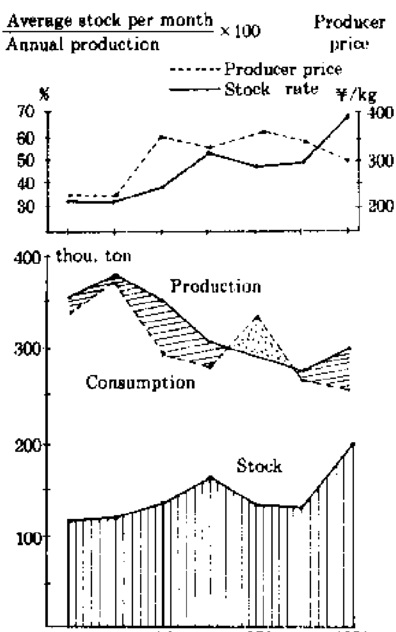


Source : National Association of Minced Fish

Figure 3. Price change of pollock at port by month

because of the high level of catches before 1977. At that time the amount of roe produced was large and its price was not so high remaining closely related to the price of pollock. On the other hand, the monthly fluctuations in prices in 1981 were severe and the price during the winter season was very high compared to other months because of the high price of roe. Since 1977 the roe of pollock has become an expensive commodity.

The horzontal lines drawn in Figure 3 show the price levels of pollock which represented the break even points for minced fish factories in 1976 and 1981. The horizontal line in 1976 from July to October was above the fish price. Therefore, even without roe some profit could be made from minced fish. In the winter months the main profit was made from processing the roe,and minced fish was a by-product during these months. The price of pollock was much higher than the break even point price in this period but the meat, after the roe had been taken out, was very cheap and the price of the meat was much lower than the price from May to November. By 1981 the price level representing the break even point had risen about 40% but this level was just at the lowest price of pollock. Due to the high price and small catch of pollock, production of roe was poor and did not make big profits in the winter. However, the price of the meat after removal of the roe has to be low to keep the minced fish business profitable. With the high price of pollock during the winter season in 1981, many processors could not break even. Since 1977, the economic condition of pollock processors as well as those who are engaged in the pollock fishery has been deteriorating.



Source: National Association of Minced Fish
Figure 4. Relation of production, consumption, stock and price of minced fish.

Figure 4 shows the relation between annual production, consumption and stocks of minced fish. The annual stocks of minced fish are averages of monthly stocks. The stocks increased from 1976 to 1978 notwithstanding a decrease in production. This was mainly due to the high price of minced fish which caused decreased consumption. The price of minced fish remained fairly stable after 1978, but consumption has continued to decline up to the present. In 1981 the production of minced fish increased a little compared to the previous year, and stocks went up sharply owing to the falling trend of consumption and the price is going down again. What is the reason for this severe reaction of stocks to the small increase in production? Before analysing this, it is better to study the situation more precisely.

According to Figure 5 , the price of minced fish made at sea was very stable before 1981. This minced fish is produced by large fishing companies and is of high quality. In addition to the good demand for this high quality product, the selling power of large fishing companies is relatively strong compared to that of small and medium scale processors who own the factories based on land. The price of minced fish produced on land fluctuated sharply and it was very clear that there was a close relationship between price and the amount of stocks. However, in 1981 the situation changed and even with falling prices the amount of stocks increased.

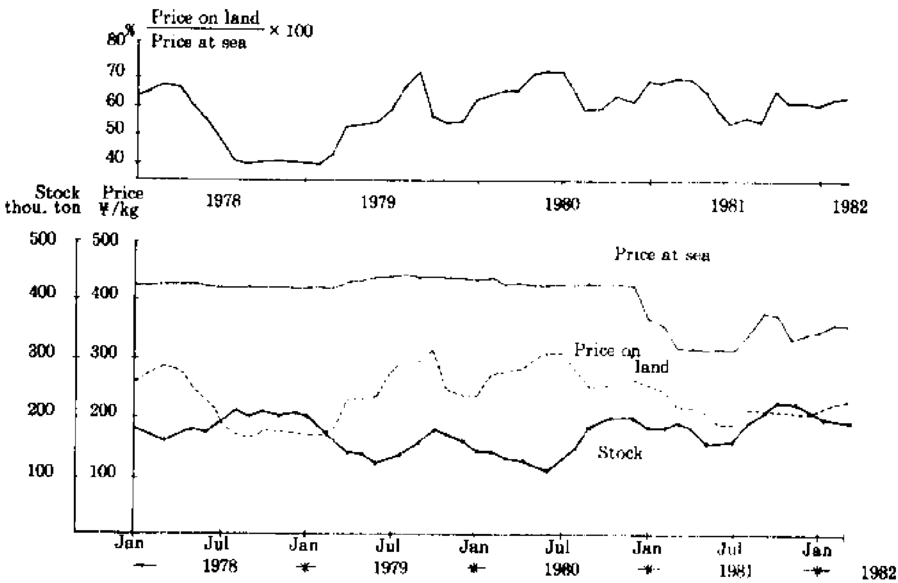


Figure 5. Relation between stock and price of minced fish

The demand for minced fish has been decreasing and even the price of minced fish produced at sea has become unstable and is showing a dedeclining trend. To clarify this phenomenon, it is necessary to analyse the general trend of demand for animal protein in Japan.

The General Trend of Demand for Animal Protein Especially for Fish

The annual per capita intake of animal net protein has almost exactly doubled over the past twenty years in Japan. (Table 3) The annual per capita intake of meat including eggs and dairy products in 1960 was very low, but increased about four times over the period from 1960 to 1980. However, the intake of fish has been fairly stable. In the case of meat, the supply can be increased to meet increased demand by higher domestic production and imports. However, in the case of fish, the

Table 3.
Annual per capita intake of net animal protein

(unit:gr.)

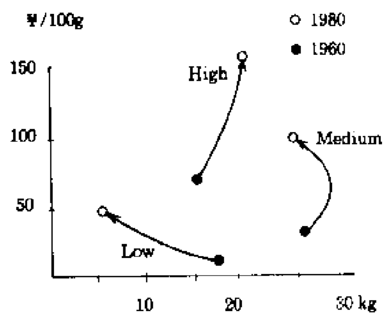
	Total	Vegetable	Animal		
			Sub total	meat	fish
1960	69.5	48.3	21.2	5.6	15.6
1965	73.8	46.9	26.9	10.5	16.4
1970	76.5	44.7	31.8	15.2	16.6
1975	79.1	43.4	35.7	17.6	18.1
1980	80.7	41.6	39.1	21.2	17.9

Source : Ministry of Agriculture, Forestry and Fisheries

supply cannot be increased to satisfy the increased demand because the fishery resources cannot be expanded and Japanese resources have beer fully exploited for a long time. The supply of fish remains limited compared to the supply of meat, eggs and dairy products. Imports of fish have increased very sharply for the past ten years, and especially following the 200 mile limitation. The types of fishes imported are high price/ high quality species such as shrimp, crab, salmon and its roe. A large part of fish imports consists of frozen products and their transportation and distribution require high cost facilities. Owing to the high cost of transportation only high price/high quality fishes have entered the Japanese market.

On the other hand, the Japanese domestic catch has been quite stable for the past ten years and even with the limitation of 200 miles the total catch has not decreased. However, by examining the composition of the catch it is very clear that the amount of low price/ low quality fishes like sardines has been increasing and of high price/ high quality fishes has been decreasing. On the face of it, it would seem that the demand for fish in Japan is very strong because imports of fish are continuing to increase in addition to the huge amount of the domestic catch. But the proportion of non-edible fish, which used to be consumed as edible fish in former times, has increased to 30% of the total catch. Production of sardines has increased to the level of three million metric tones but about 90% of this now goes straight to the fishmeal factories.

There are very clear long-term trends in fish consumption. For example, in the case of low quality fishes such as sardine, mackerel and saury, the yearly intake of fresh fish of this quality was 20 kg. per capita twenty years ago, but it was down to only about 7 kg. in 1980. Over the same period, the rate of price increase for these low quality fish was very moderate. (Figure 6) In the case of high quality fishes such as crab, shrimp, salmon, bluefin tuna, sea bream and others, the intake has increased only a little due to the limitation of supply, but their prices have risen surprisingly steeply due to the strong demand for such high quality fishes. It is symbolic that in the case of medium quality fishes such as skipjack, flatfishes, squid and others the trend has been quite different. In the first half of the same period, the intake of fish of this quality increased following high quality fishes. However, in the last half of the period, the trend reversed and intake decreased following low quality fishes. Since 1975, the intake of animal protein has been growing larger based on an increased supply of meat. The feeling that there is a need to consume more animal protein



Source : Statistics Bureau of Prime Minister's office

Figure 6. Trends of raw fish consumption by quality

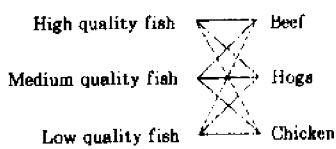


Figure 7. The correlation between fish and meat

is gradually disappearing and competition in the market between fish and meat is becoming severe.

There is a general relation between meat and fish which can be illustrated as in Figure 7. The correlation between high quality fishes and beef is very strong as shown with the solid lines. When the price of beef goes up, the demand for high quality fishes goes up and vice-versa. When the price of hogs goes up, the demand for high quality fishes will go up to some extent, but its influence is not so strong as shown with the broken line. In the case of chicken, the demand for high quality fishes may not be influenced by a rise in the price of chicken as shown with the dotted line.

At the beginning of 1960, the mass production of broilers started in Japan. Using the battery system for production, there is little need for expensive land which has an extremely high price in Japan. In addition, it is easy to import relatively cheap feed for broilers from the U.S.A. From about 1970, the mass production of hogs was started by large scale producers. The percentage of total hog production coming from large scale units has been getting larger for the past 10 years. High density stock raising methods are becoming widely adopted for hog production using cheap imported feed. As a result, the high cost of land is not so significant due to its high productivity.

In the case of beef production, the situation is quite different from that of broiler or hog rearing. A comparatively large area of land is needed for rearing cattle. Conditions for the production of beef are not very favorable in Japan, and the supply of beef has remained limited for a long time notwithstanding the great demand for beef. In the past, the policy in Japan has been to control free trade and set a rigid quota for imports of beef and this policy continues to be followed up to this time. There is a great demand for beef and beef consumption would probably increase to about five or ten times the present amount if the price of beef were allowed to fall to the present price level of hogs as a result of a change in government policy and the liberalization of imports of beef. But, it is very clear that the intake of all other animal protein would be severely affected and would decrease in proportion to the increase in the beef supply. The impact of free trade or an increase in the import quota for beef would cause great damage to the interests involved and fisheries are not immune to this damage.

Recent Trends in the Consumption of Animal Protein, Especially Fish

Figure 8 shows the total amount of annual per capita calorie intake. Before 1970, total calorie intake gradually increased inspite of a fairly steep decline in calories obtained from starchy foods. The intake of fish, meat and other food items all went up. At this stage the demand for fish appeared to be very stong because the intake of fish gradually increased despite a high rate of price increase. Even now most fishermen and fish merchants believe that there is a strong demand for fish. Their reason for thinking in this way is based on the fact that the intake of fish gradually increased and its price rose faster than other food items for a long time. At the stage where the intake of animal protein is not very high, everyone wants to increase his consumption of animal protein when his income rises. Generally speaking, the demand for meat is stronger than for fish in Japan, and many people want to buy more meat, especially beef. However, the average price of meat is higher than fish and,due to their limited income, Japanese consumers are not able to eat meat until their demand for animal protein has been satisfied. In order to fill the gap, many people have to eat fish as the price of fish is competitively low. Even if the rate of price increase for fish is higher than for meat, people will continue to buy fish as long as there is a price differential between fish and meat.

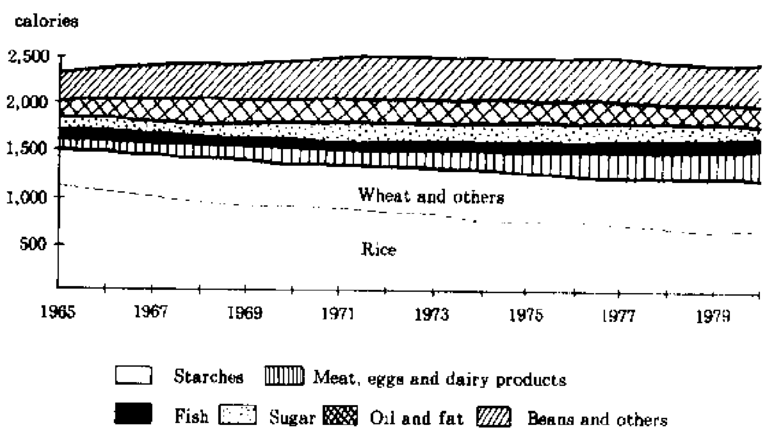


Figure 8. The intake of calories by food group in Japan

The above mentioned trend changed markedly after 1970 when the total calorie intake started to level off as it neared the ceiling for the average Japanese. The total per capita intake of calories is calculated to remain stable and will not increase much above the level of 2500. At the same time the intake of calories from starchy foods has also been static. The percentage of total calories provided by starchy foods is rather high in Japan as compared to other developed countries. It is not clear why it has remained so high and it is difficult to judge whether it will fall or not in the near future.

The observation that the calorie intake from starchy foods has levelled off points to a serious situation due to the fact that the increase in meat intake has a direct effect on the demand for fish. It is easy to see from Figure 8 that the intake of meat has continued to expand and this has reduced the share of other food groups including fish. Another more serious effect on the demand for fish is that the intake of calories from rice is continuing a decreasing trend.

The calorie content of 100 g. of meat is about 250 and the calorie content of fish is about 110. Given the same level of total calorie intake, the increase in calories from meat will have a direct impact on other foods, especially fish. More over, the decreasing trend in the calorie intake from rice has a strong influence on the demand for fish; the intake of fish has been closely linked with rice over a long period. Fish dishes are considered to be very suitable for eating together with rice. From ancient times the preparation of fish dishes in Japan was designed to accompany the eating of rice. For example, the Japanese delicacy "sushi" is a typical method of preparing fish with rice and the amount of fish needed for one dish is just in proportion to the amount of rice. "Sashimi", which is made from raw fish without any cooking, is another typical Japanese delicacy. The Japanese cannot eat sashimi with bread or any other grain except rice.

It is said that the present composition of calories from different sources in the Japanese diet is an ideal one. According to the FAO, the calorie composition made up of carbon, protein and fat should be within the ratio of carbon: 57-68%, protein: 12-13%, and fat:25%. On the basis of this ratio, Figure 9 illustrates the calorie composition of diets in Japan, Italy and the U.S.A. In the case of Japan, the calorie composition is a regular triangle, but the calorie composition in the other two countries make distorted triangles. It is very clear that the realization of this rational composition in Japanese food consumption is simply due to eating a large amount of fish. Fish has a rather low calorie

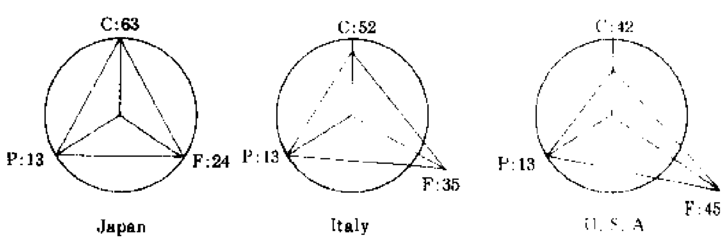


Figure 9. The rate of calorie intake from carbon (C), protein (P) and fat (F) in Japan, Italy and USA.

content compared to meat and the percentage of fat is relatively low. More over, the fat in fishes is unsaturated fatty acids which do not cause cholesterol accumulation in the blood system. If the present trends in eating behavior continue with the intake of meat steadily increasing, sooner or later the ideal balance in the calorie composition will collapse in Japan. An indication of this danger is already apparent.

Figure 10 shows the consumption trends for meat and fish by age groups. Japanese consumption statistics do not provide data on the intake of individuals by age group. The statistics that are available give only the per capita household consumption classified according to the age of the chief of each household. With these statistics we cannot get a completely accurate result, but we can get some idea of the approximate situation. In general, the rate of expenditure on fish as a percentage of total food expenditure increases as the age stratum goes up, and 45 year old persons seem to be the border line of eating behavior. In Japan the general tendency is that above this age the intake of fish increases because older people prefer light food to heavy food. But, in 1970 the expenditure rate on fish was rather high compared to the situation in 1980. By 1980, the expenditure rate on fish had decreased very sharply in only ten years. It is difficult to imagine how much this rate of expenditure on fish will decrease over the next ten years.

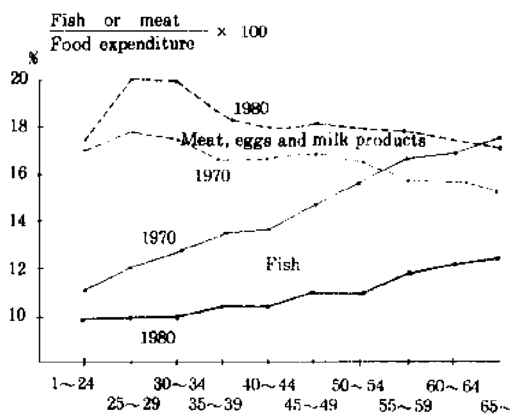


Figure 10. Consumption trends of meat and fish by age group

On the other hadd, the expenditure rate on meat including eggs and dairy products has gone up in contrast to fish. It should be kept in mind that the percentage of younger generation households is very high. It is a notable phenomenon that in younger households (25-34 years old), the rate of meat consumption is high and is continuing to increase up to the present. The rate of meat consumption for those under 24 years old has an irregular tendency. Many of the heads of those households are bachelors and their living and eating behavior is quite different from that of married people. Except for this youngest class of household, the rate of meat consumption has increased sharply for the past ten years. The same trend is sure to continue for the next ten years.

There are many reasons for the shift in demand from fish to meat. In addition to the inconvenience caused by the smell and bones of fish, there have been many fundamental changes in the living styles of people over the past twenty years. One of these basic changes has been the increase in the number of young households with small families. Many of these families live in apartments. They do not like to cook fish because of its smell and the smoke cooking it creates. It is rather inconvenient to have to dispose of heads, bones, tails or other parts. More over, recently the young housewife does not know how to cook fish. Before World War II the system of large families was common in Japan. Under this system, the younger women were able to learn the various cooking methods from the older women but nowadays they do not know or have no interest in learning about methods of cooking fish.

According to income elasticity of demand calculated by the cross-section method every three years, there are differences in demand for fish and meat. In Figure 11 it is easy to see which is the stronger in terms of demand. I have selected from among the many meat products three items, ham, sausage and bacon, in order to simplify the comparison between fish and meat. To the Japanese consumer these three meat products are nearest to the products made from minced fish. Although the income elasticity of all these foods was found to be decreasing in each of the years examined, there are substantial differences between the meat products and the fish products. The elasticity of minced fish products is much lower than the elasticity of meat products and the average elasticity of all food items in Japan which is about 0.3-0.4.

Among minced fish products with low elasticity, fish sausage and ham are significantly lower than other items. New techniques for making fish sausage and ham were developed beginning in 1955 and rapidly expanded due to the cheap price of these products mainly made with tuna. The quality of these products was not very good owing to the long voyages of the tuna fishery and lack of freezing facilities.

Fish sausage and ham were substitutes for meat products and from 1960 the production of meat products gradually increased replacing fish

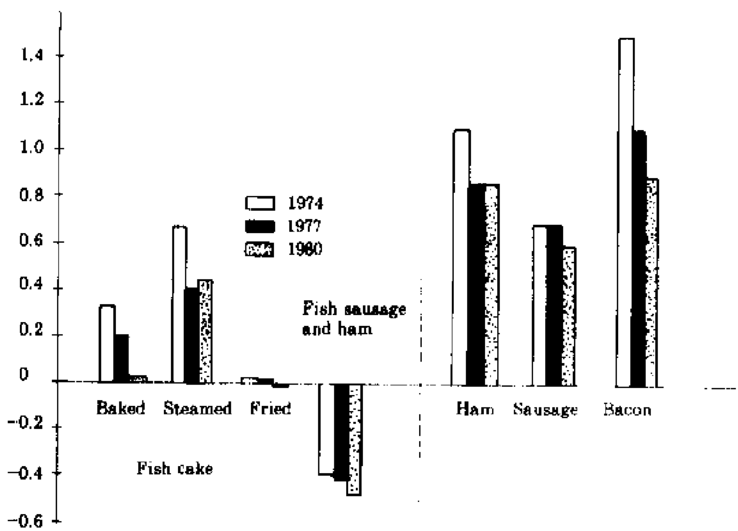


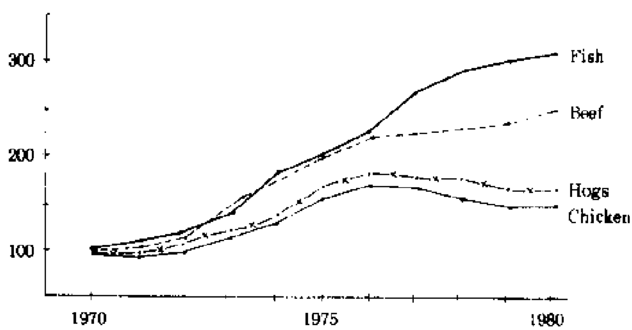
Figure 11. Income elasticity of minced fish and meat products (cross section)

products. In addition, the production of tuna began to drop due to the overexploitation of tuna resources. The price of tuna increased so much that it could no longer be employed as a material for making such cheap items as fish sausage and ham. The advent of super-low temperature refrigerators made it possible to utilize frozen tuna for the raw fish or "sashimi" market which guarantees the highest price for fish. Thus, fish sausage and ham making companies have had to change to minced fish as a cheap material but the taste is inferior to the former products and this has caused the reduction in demand.

Just as there has been a decreasing demand for low quality foods, the demand for minced fish products has declined. Only steamed fish cake, "kamaboko", has a competitively high elasticity and demand has remained remarkably high up to 1980. As will be discussed in the last part of this paper, given the trend of decreasing demand for minced fish products, we cannot expect a bright future for the industry.

Comparison between the Price of Fish and Meat

Figure 12 shows the producer's price index for fish and meat for the past ten years. The rate of price increase for fish is higher than for meat and this trend is quite the same in the U.S.A.



Source : Statistics Dept. of Ministry of Agriculture, Forestry and Fisheries

Figure 12, Producers price index for fish and meat

There are many reasons for the sharp rise in the price of fish. First, in addition to the continuing trend of overexploiting the resources, the reduction in the amount of high quality fish due to the 200 mile limitation has severely affected the price. Second, speculation with fish, especially high quality and imported fish has caused the price to go up. Although the impact of the 200 mile limit on Japanese fisheries has been absorbed somewhat by now, speculation with fish products often occurs in the expectation of higher prices. Third, owing to the high production costs of fisheries many fishermen cannot keep their business profitable without increases in the price of fish. The second oil shock was particularly severe for fishermen.

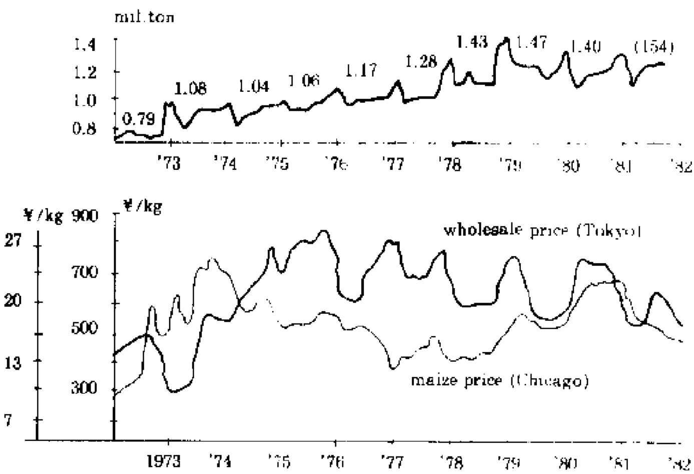
Here some explanation is needed to clarify the gravity of the situation for Japanese fisheries. For the past twenty-five years, that is from the beginning of the period of rapid economic expansion in Japan, the rate of increase of the price of fish was always higher than that of other foods. It has been natural for fishermen with a long experience of getting higher prices to think that the price of fish was always going to go up compared with other prices. As the price goes up, fishermen can make a good profit. But, almost all fishermen do not like to pay taxes, so they invested their profits in a well equipped large size new fishing boat. Before the 200 mile limitation, fishermen used to replace their fishing boat every seven years on average and it was not rare to find cases of boats being replaced after four or five years in more profitable fisheries. For individual fishermen to own a new and large boat is a way of making sure that they can maintain their competitive position in fisheries. In addition, the banks, including the government and cooperative credit institutions, were eager to lend money to those involved in fisheries. As a natural result, the amount of borrowing as a percentage of total assets was very high, usually in the range of 80-90 percent. Accordingly, the annual cost of depreciation and interest was very high in addition to the increasing wages which rose in proportion to landing value. Using well equipped and larger size fishing boats, the landing value was always going up.

This dream-like expansion period of Japanese fisheries was terminated by the 200 mile limitation and the second oil shock. These two factors brought about a fundamental disequilibrium. On the one hand, the demand for fish declined due to its high price in an era of plentiful supply of animal protein. On ther other hand, the production cost of fisheries could not be reduced because of the high cost of oil and other materials, which was made worse by the weakening of the yen exchange rate. For one or two years fisheries businesses went bankrupt one after the other and all the remaining ones are going through a critical time as they are holding large debts. It is not easy to cut production costs. For example, Japanese fishing boats are shaped just like a tub and their consumption of oil is correspondingly high. In Japan, the limited entry system regulations cover mainly the number of boats and their size which is decided according to tonnage calculated from the measurement of designated parts of the boat. Fishermen who want to increase the size of their boats ask the shipyards to make the boat's shape like a tub for in order to obtain a large boat within the same tonnage limitation, shipbuilders have to increase the parts of the boats which are not included in the tonnage calculation. With these tub-like fishing boats fishermen cannot reduce their consumption of oil. Given the bad economic conditions at the present time none of the fishermen are able to replace their boats with new energy-saving types. They have accumulated too many debts to borrow money for new boats.

On the other hand, in contrast to fisheries, it seems that the production costs for rearing livestock will not increase much in the near future. The percentage of feed cost in the total production cost of meat is about 60-70 percent although this varies a little bit of course for different years and different types of meat. But, the feed used for livestock rearing is imported, mainly from the U.S.A., and, as feed expenditure is about a half of the total, the price of imported feed is a deciding factor for the Japanese live stock industry. When the price of feed goes up, production cost goes up, and, as a result, due to the high price of meat, the demand for meat goes down. In relation to the supply of meat in the Japanese market, the price of international grain is one of the most important factors.

Figure 13 shows the relationship between production and price of hog meat in Japan and of maize in Chicago. Here, in order to simplify, I will take only hog and maize because hog meat accounts for half of the total meat supply and maize is about 70% of the total imported feed.

Before the first oil shock the rising trend of hog meat production was eminent but the amount of production was not so large. From 1973 to 1976, hog meat production remained rather stable. There are two reasons for this. One is the high price of international feed after President Nixon declared a prohibition on the export of soy beans due to a shortage of grain in the U.S.A. With this high price of feed, livestock farmers in Japan had to revise their optimistic attitude. The other reason is the economic recession caused by the first oil shock which severely affected the demand for meat and caused the price of hog meat to go down. The recovery of economic activity was rather quick after the oil shock, but hog meat production did not increase much from 1973 to 1976 due to the high price of maize. As a result, the price of hog meat again went up due to the recovery of demand. But with this price rise, the demand for hog meat again fell significantly and this was the situation of meat demand just before the 200 mile limitation. At the end of 1976 livestock farmers heard that the price of fish would be going up due to the decrease in production when the 200 mile limitation went into effect. Expecting a high price for meat following fish price increases, many livestock farmers tried to increase their production. From 1977 to 1980 the amount of hog meat production increased rapidly and the falling trend in maize prices encouraged farmers to expand. In 1980, the demand for meat in Japan could not keep up with the large expansion of meat production. In that year the whole livestock industry had to set production controls to maintain meat prices. However, fish-



Source : Statistics Dept. of Ministry of Agriculture, Forestry and Fisheries

Figure 13. Relationship between price and production of hogs meat in Japan

ermen and fish merchants including the large fish companies did not pay any attention to the supply of meat and they simply thought that the price of fish would rise much higher than the price in the year that the 200 mile limitation started. It is natural that they should have thought so for the price of fish had been increasing for the past 25 years. Following this line of thought, they began to speculate buying fish at high prices in Japan and in other countries. These high priced fish had to be stored in refrigerators as inventory waiting for market prices to rise further. The next stage was the collapse of fish prices which also affected the prices of certain fish products in foreign markets. At the present time the production controls for meat including hogs are being maintained. In the case of dairy products, overproduction and lower prices are more evident than in hog farming.

From Figure 13 it is easy to understand the relationship between the price of hog meat and maize. Except for exceptional periods such as the oil shocks, the Nixon shock, and the 200 mile limit shock, the wholesale prices of hog meat in Tokyo have been fluctuating in accordance with the international maize price. Before 1977 the low production of grain in the U.S.S.R. was the big factor disturbing the world market, but recently production in the U.S.A. has been increasing using improved techniques and the low production in the U.S.S.R. has not disturbed the international trading of grain in the world. For about the next ten years it seems that the supply of grain, especially maize, and its price will remain rather stable on the international market. Based on this forecast, the supply of feed for the Japanese livestock industry will be plentiful and the production cost of meat in Japan will remain fairly stable. On the other hand, it seems that the production costs of the fishing industry will continue to increase because it is proving difficult to cut present fishing costs in spite of great efforts. The general trend of decreasing catch per unit of effort will wipe out the gains from such energy saving efforts within a few years.

Present Situation of the Minced Fish Industry and the Future Prospects for New Style, High Quality Products

The consumer price of minced fish products has risen surprisingly compared to other fish and fish products according to data obtained from the Annual Report on Family Income and Expenditure Survey made by the Bureau of Statistics of Japan's Prime Minister's Office.(Figure 14) Since 1977 the price of fish has been increasing very sharply, but the price of marine fishes caught near to Japan has not gone up as much as those caught from foreign waters. On account of the strict production controls on eggs and dairy products, their prices are gradually going back up to the level of the 1960s. In the case of meat, the price has been gradually going up like eggs and dairy products, but this trend is the average of all meat products.

The same report gives the consumer prices of meat per 100 g. in Tokyo. (Figure 15) The consumer price of beef is very high and is getting higher year by year due to the limited supply. The highest quality beef comes from a domestic breed of cattle and the price of this beef is about two times or more than the medium quality beef which comes from dairy breeds of cattle. The price of imported beef is two thirds that of the medium quality domestic beef. The mass production of domestic cattle is difficult at the present time. In order to command a high price, very special rearing techniques have to be used. In the case of dairy cattle, the scale of stockraising is gradually expanding and some

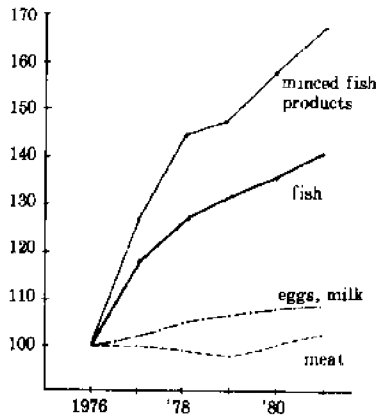


Figure 14. Consumer price index (Tokyo)

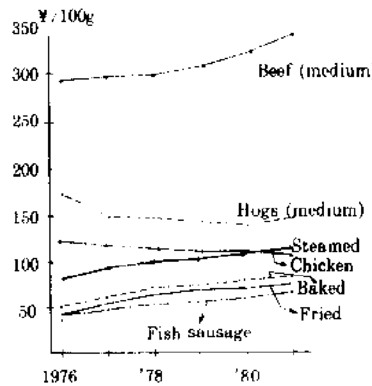


Figure 15. Consumer price (¥/100g)

increase in supply can be expected. As for imported beef, recently Japanese people are getting to know and like it.

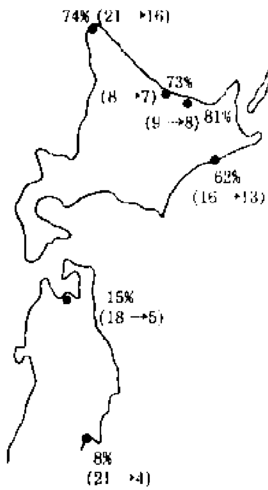
The consumer price trend for hog meat and chicken is noteworthy. As shown in figure 15, the prices are falling. This is mainly the result of large scale production and the cheap price of imported feed.

The price of minced fish products used to be very low compared to meat, but recently the price differences are getting smaller and the price of steamed fish cake has overtaken the price of chicken and is approaching the price of hog meat. It is no wonder that recently the demand for minced fish products has decreased given their high price compared to meat. But the rate of increase in the price of minced fish is higher than for minced products as shown in Figures 14 and 15.

The processors of minced fish products cannot make a profit from selling their products at present prices because of the high price of materials. The minced fish factories on land are grouped in the northern part of Japan (Figure 16) due to the proximity of the fishing grounds in the North Pacific. The numbers shown in parentheses indicate that the number of businesses making minced fish in 1977 has decreased to the present number and the percentages shown indicate the operating ratio in relation to full capacity through a year. The factories located in the northern island have a better operating ratio due to their geographic advantage in getting pollock from fishing boats. A comparison of production cost composition can easily be made between medium scale factories in the minced fish industry and meat products industry based on the annual statistics by Ministry of International Trade and Industry. (Figure 17) The percentage of material costs in the minced fish industry has not changed during the past ten years. Over this period the price of fish material increased sharply, but at the same time other costs also went up mainly as a result of the oil shock. In the case of the meat products industry the percentage of material costs went down very sharply due to the decreasing cost of meat, especially as the main materials utilized by ham and sausage factories were cheap imported hog and other meats for which there are no import quotas.

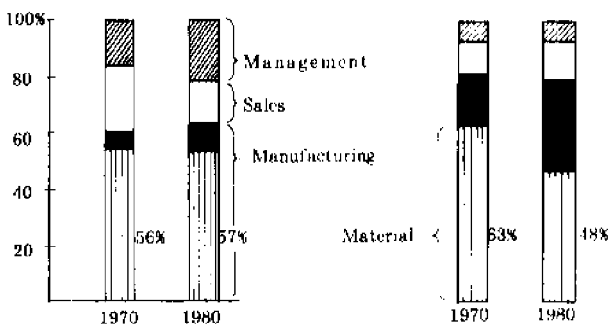
The makers of minced fish products usually mix good and not so good quality minced fish depending upon the quality of the final product they wish to produce. There are two main types of production: one is to make good quality and high priced products and the other is the reverse aimed at low income mass consumption.

The demand for the latter type of products is weakening recently. Many processors now want to change from making cheap products to good quality ones but to develop high quality products they need some special techniques, more capital, and a brand with a good reputation. Many small and medium scale producers cannot change their production method. As a result, the demand for minced fish made on land is falling and the demand for good quality products made at sea is increasing.



Source : National Association of Minced Fish

Figure 16. Operating rate of factories on land making minced fish in northern Japan

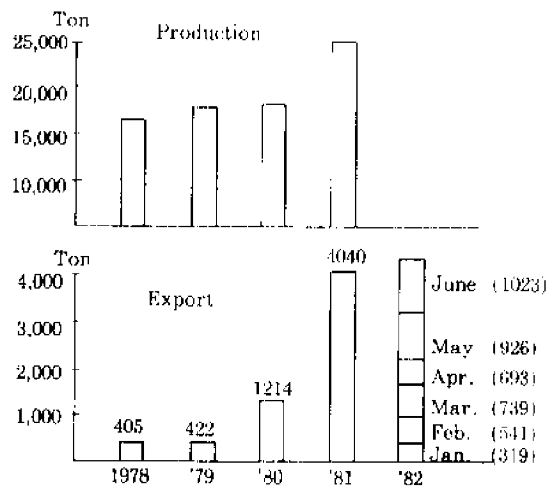


Source : The Ministry of International Trade and Industry

Figure 17. Composition of production costs of minced fish and meat industries

As for the future prospects for minced fish, it is fairly certain that there will not be much increase in the total consumption of minced fish products and, gradually, there is likely to be a decreasing trend.

The prospects for good quality minced fish products are more hopeful. For example, there is a new steamed fish cake product called "kaniashi kamaboko" which means king crab legs-like steamed fish cake. The shape, texture and flavor are a little like king crab meat with some seasoning added which is made from low quality crab meat and other ingredients. Recently the potential of this product has been reevaluated and large companies making fish cake are continuing to enter into production at the present time. The production of kaniashi kamaboko is shown in Figure 18. In 1981 the increase in production was very high and it continued to increase this year. In addition, the amount of exports has tripled in each of the last three years. From 1982 to the present time this trend is continuing. Based on the monthly increase of exports, it may be forecasted that this year's exports will easily exceed 10,000 tons of which about 70% is to the U.S.A. and 30% to Europe. Due to the serious decline in crab production and its high price in recent years, especially in the U.S.A., people cannot afford to eat much real crab. The demand for this imitation, therefore, is likely to expand both in Japan and in other countries.



Source : National Association of Minced Fish

Figure 18. The production and export of kaniashi steamed fish cake

Observing this trend, many minced fish product makers are very eager to develop other new style products of high quality and if they are successful this may halt or reverse the declining trend in the demand for minced fish products.

Fishery Development and Seafood Trade in Taiwan

Ching-Chun Chen
Council for Agricultural Planning and Development
Taipei, Taiwan, Republic of China

1. Introduction

The island of Taiwan is located in the subtropics between North Latitude 21°45'25" - 25°37'53" and East Longitude 119°18'3" - 122°6'25", bordered by the Pacific Ocean on the east, the Taiwan Strait on the west, the East China Sea on the north and the Bashi Channel on the south. The Taiwan Strait is about 200 km wide and the narrowest span of the Strait between Taiwan proper and mainland China is only 130 km, with the Pescadores located about halfway in between. Washed by the strong Kuroshio Current, the main current on the east side and the branch current on the west side, the island is favored by the migration of many pelagic species, such as mackerel, horse mackerel, Spanish mackerel, tuna, skipjack, bonito, sardine, anchovy and spear fishes and has a very high potential of exploiting these fisheries resources. A temperate climate and copious rainfall promote a propitious environment for the growth of fish; a long coastline indented by harbors,bays and inlets facilitates the operation of fishing craft. Besides, fishermen are hardworking and receptive to modern technologies, and government support is forthcoming. For thirty years, Taiwan's fishery industry has logged a growth pace faster than any other in the agricultural sector.

There is no doubting the importance of fisheries to the economy of Taiwan in terms of either its production value or its contribution to popular nutrition, foreign exchange earnings or employment. The proportion of fisheries in the aggregate gross production value of agriculutre jumped from 8% in 1960 to 20% in 1980. At present, fisheries contribute 11.8 g or 36.7% to the per-capita daily intake of animal protein. Fishery exports fetch some US$700 million a year in foreign exchange earnings. Frozen fish and shrimps rank in fact as the foremost agricultural export item. The fishery industry directly employs about 300,000 people.

Fishery trade expands along with the growth of the economy and fisheries. An advancing fishery industry improves supplies, while a growing economy provides the effective demand required for sustaining increases in production. The continued expansion of fisheries in the past three decades has raised per-capita consumption and brought about surpluses in fishery trade.

Nowadays Taiwan's fishery industry is, however, faced with a number of difficulties, such as rising oil prices, increases in wage rates, declining competitiveness in foreign markets due to raised production costs and drops in output. In 1981, for instance, fishery production fell by 2.6% and exports suffered a fall of 4.8%, which show a vicious cycle may take place between them.

II. Fishery Development: Its Past and Present

1. A historical review

The fundamental features of Taiwan's fisheries were developed during the period of Japanese occupation (1895-1945), and the gear used as well as the process of production were typically Japanese. However, almost all the fishing vessels and the other production facilities were completely destroyed during World War II. As the result of continued efforts made by the Government and the private enterprises concerned, during the past 30 years, Taiwan's fisheries have not only been reconstructed, but also achieved a brilliant success. The yearly output, at less than 100,000 m.t. in years before 1950, has now reached around 940,000 m.t. The gross production value has soared from less than US$20 million to US$1,280 million. Between 1950 and 1980, real growth averaged 8.8% a year, compared with 2.7% for crops, 2.1% for forestry, and 7.8% for animal husbandry.

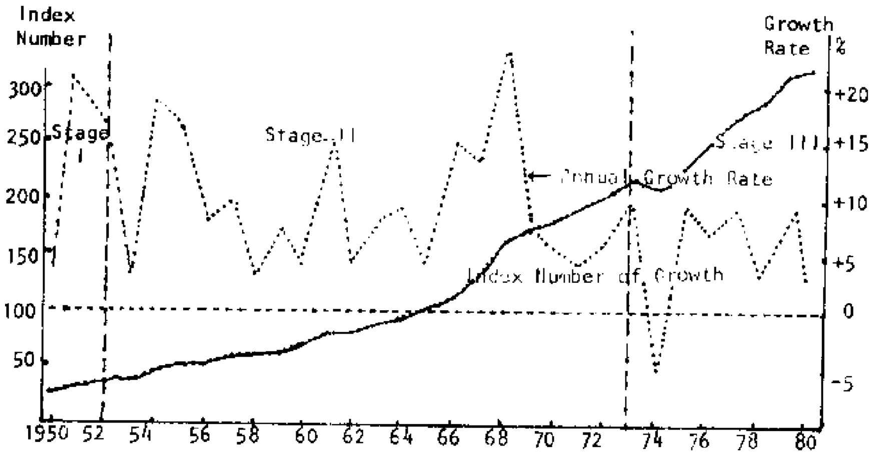
Fishery development falls into three stages. The first stage, before 1952, was one of recovery from devastation during World War II. Various promotive measures finally restored normal production which had by 1952 reached the prewar peak of 110,000 m.t. in 1940. This period averaged a growth rate of 13.5% a year. The 1953-1972 period, as the second stage, witnessed development on a planned basis. Under the auspices of a series of economic plans, such measures as incentives to investment, technical innovations, and improved public facilities ensured development on schedule. A yearly pace of 9.4% growth was maintained.

The third and present stage since 1973 was a period of adjustment and meeting challenges posed by energy crises, rising oil prices, and the 200-mile economic zone imposed by coastal countries. Growth in production has slowed down and the production structure undergone changes, resulting in a smaller growth rate of 5.2% a year. Figure 1 represents the fishery development described above.

2. The development of fishing craft and fish ponds

In 1940, there were 1,479 powered fishing craft with a total tonnage of 29,284. But most of the fishing boats engaged in deep-sea and inshore fisheries were commandeered by the Japanese Navy, damaged or lost during the war. With 1940 as base year, the powered fishing fleet in 1945 shrank to a mere 47.13% in number and 30.38% in tonnage. The excess of loss in tonnage over that in number indicates that most of the vessels lost in war were of a larger size. On the other hand, the number of sampans and bamboo rafts increased very rapidly to meet the needs of coastal fisherman

Fig.1. Trend of Taiwan Fishery Development, in Real Terms



immediately after the war when marine fisheries were completely confined to the coastal areas.

With continued Government assistance and encouragement in the form of loans or foreign exchange allocations for the construction of powered fishing boats, mechanization of sampans, procurement of diesel engines and gear, etc. the number of powered fishing vessels has greatly increased since 1953, particularly those engaged in inshore fisheries. At the end of 1980, Taiwan's powered fishing fleets comprising various type of operations totalled 13,938 in number at a total of 487,470 tons and 1,571,690 horse power, representing increases of 942% in number and 1665% in tonnage as compared with the peak level of 1940. The increase in number was mostly in powered vessels of medium and small sizes. The number of non-powered sampans and bamboo rafts also greatly increased since the Restoration of Taiwan in 1945, contributing to production increase in coastal fisheries. With the progress of projects on the construction of medium and small size boats in inshore fisheries and mechanization of sampans and bamboo rafts, the increase in number of non-powered sampans and bamboo rafts has slowed down. They were 2,603 and 14,086 respectively at the end of 1980. Since 1958 such mechanized sampans have been classified as powered craft in official statistics and production made by those boats has been calculated under the category of inshore fisheries. The acreage of fish culture in Taiwan at the end of 1980 was 60,570 ha., showing a 50% increase from 1960. Of the fish ponds, 32.6% were in brackish water, 28% in fresh water and 25.3% in shallow sea.

3. Categories of fisheries and their structures

For statistical and administrative purposes, fisheries are classified into four main categories, namely deep-sea, inshore, coastal and culture. This system is based on the type and tonnage of the fishing craft, the gear used, the relative distance of fishing areas, and the methods of fish production.

Deep-Sea Fisheries - Under this category are included all otter and bull trawlers, tuna long liners of over 50 tons, and large type purse seiners.

Inshore fisheries - Under this category are all powered boats which do not come under deep-sea fisheries, including mechanized sampans. They are purse seiners, torch-light netters, stick-held dip netters, drag netters, tuna long liners of below 50 tons, sea bream and miscellaneous fish long liners, hand liners, pole and line boats, spear fishing boats, whale catcher boats, and coral fishing boats.

Coastal fisheries - Under this category are those which employ fishing craft without power, mainly sampans and bamboo rafts; or those which do not employ any boat to produce fish and marine plants along shores and from rivers, streams and lakes. The gear used include all types of nets and hooks, such as beach seines, set nets, cast nets, torch-light nets, drift nets, surrounding nets, swing bell nets, gill nets and angling.

Fish culture - Under this category are the rearing of fish, crabs and shrimps in ponds, reservoirs and paddy fields as well as the culture of oysters and clams in shallow waters.

In the early 1950s, coastal fisheries ranked as the most important, followed by inshore operations, aquaculture and deep-sea fishing. The planned development introduced emphasized the use of labor-intensive, small and medium power craft and the motorization of powerless vessels so as to raise their productivity. Modern technologies were also introduced to develop migratory fish resources in waters surrounding the island of Taiwan. As a result, the production of inshore fisheries began to surge after 1955 to make this fishing category the most important. By the latter half of the 1960s, increased national capital accumulation and technical improvements had facilitated the development of deep-sea fishery. With the aid of both foreign and government credits the construction of deep-sea fishing vessels is booming. The year 1967 saw deep-sea fisheries moving forward to lead the other operations. By 1972 deep-sea production had amounted to one half of the industry's total. Aquaculture has been growing at the greatest rate in the past ten years. Between 1970 and 1980 its output jumped from 72,724 m.t. to 175,008 m.t., averaging an annual rate of growth of 12%, compared with 3.7%, 4.0% and 1.4% for deep-sea, inshore, and coastal fisheries, respectively. At a time of threatening energy crises and changes in jurisduction over ocean fish resources, such a trend is exerting a stabilizing effect on Taiwan's fishery production.

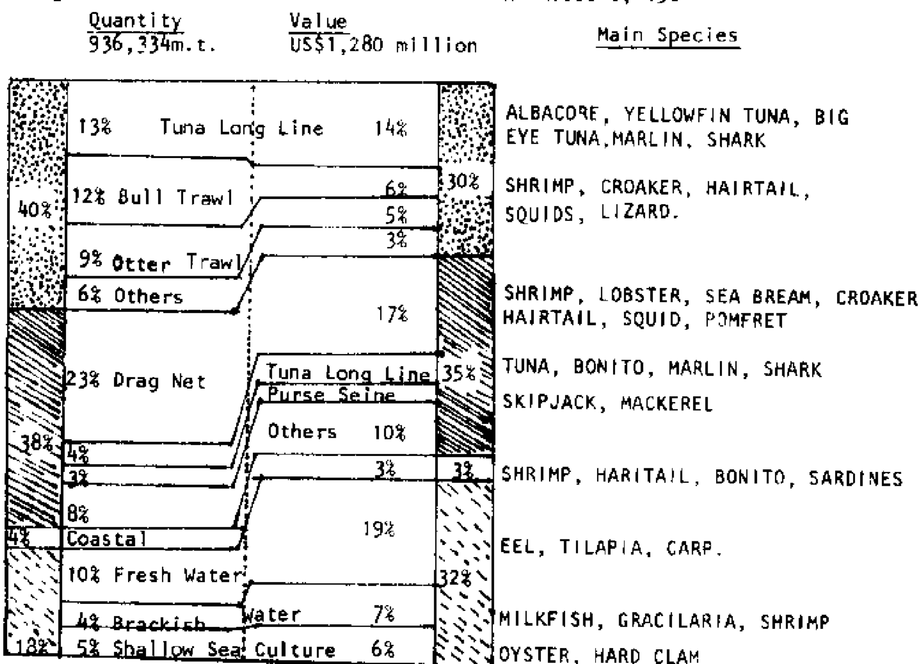
Figure 2 gives Taiwan's fishery categories and their products

4. Domestic demand for fishery products

Increases in domestic consumption and in exports result from rising production. The local population consumes over 90% of the fishery products destined domestically. Contributory to domestic fish consumption are national income, price levels, cooking skills, and easy transportation. The per-capita consumption a year leapt from 11.95 kg. to 38.74 kg. between 1950 and 1980. The growth rate, however, has shown gradual decrease from 6.1% in 1950s to 4.6% in the 1960s, and further to 1.3% in the last decade.

Another factor in the increasing demand for fishery products is population growth. The population of Taiwan expanded at a rate of 2.6% annually,

Fig. 2 FISHERY CATEGORIES AND THEIR MAJOR PRODUCTS, 1980



Note: for DEEP-SEA FISHERIES, INSHORE FISHERIES, COASTAL FISHERIES, AQUACULTURE

from 8.1 million to 17.6 million between 1950 and 1980. During the 30-year period, total consumption soared from 96,000 m.t. to 682,500 m.t. Growth in both the population and domestic demand has been the major force behind Taiwan's fishery development over the years. (See Table 1)

III. A Review of Fishery Trade

I. Import and export

Fishery imports mostly consisted of salted fish, canned fish, and common squid in the years before 1961. For eight years (1953-1961) imports declined by 33.3% a year. Beginning in 1962 fishery imports rose by 30% annually, mainly as a result of increased demand for feed products by the burgeoning eel and livestock industries in the 1965-1975 period. The import of fish meal in fact increased at a fast rate of 53.4% a year amounting to over one half of the total fishery import volume by 1981, fish meal accounted for 91% by quantity or 51% by value of the total. Other major imports included common squid, cattlefish, and seaweeds.

Fishery exports were minimal in the years before 1960; they were mainly liver oil, agar-agar and other seaweeds. Only in 1961 did the export of fishery products begin to rise fast owing to the introduction of refrigeration equipment aboard fishing vessels and ashore as well as the remarkable development of the food-processing industry. Between

Table 1 Demand for Fish in Taiwan

Year	Population (1000 persons)	Per capita consumption (kg)	Agg. demand for food (1000 m.t.	Demand for fodder (1000 m.t.)	Percentage of self-sufficiency (1) %	(2) %
1950	8,056	11.95	96.3	..	87	..
1955	9,691	18.68	181.0	..	100	..
1960	11,392	21.67	246.9	..	105	..
1965	12,962	27.74	259.6	..	147	..
1970	14,585	34.18	498.4	45	123	112.9
1971	14,917	34.34	512.2	52	127	115.2
1972	15,180	35.28	533.8	50	131	118.8
1973	15,424	37.00	570.1	38	132	124.7
1974	15,701	34.25	537.8	53	128	118.1
1975	15,991	35.56	568.6	169	136	105.7
1976	16,293	35.27	574.9	126	139	115.7
1977	16,655	35.05	583.7	139	143	118.3
1978	16,950	36.48	618.3	176	141	111.5
1979	17,282	38.09	658.1	206	139	107.5
1980	17,619	38.74	682.5	180	136	108.5

Note: (1) Estimated based on edible product only.
(2) Estimated based on edible and nonedible product

Source : Taiwan Food Balance Sheets, Council for Agricultural Planning & Development

1961 and 1980 fishery exports skyrocketed 34% a year; in 1981 due to a decline in domestic production and a sluggish foreign market to a mere 4.8%. (See Table 2)

In terms of quantities, fishery imports and exports have grown at about 30% a year in 1950-80. In the same period the real value of imports averaged a growth pace of 25.3% a year, while that of exports grew by 42.7% annually, indicating a favorable trade balance. In 1980, for instance, fishery trade registered a surplus of US$578 million.

2. The export structure

Fishery exports fall into two kinds: primary and processed. Processed products can further be classified as frozen, canned and other. Fishery exports from Taiwan are mostly primary products in terms of either values or quantities. At a time of increased production costs, fishery products should be processed as many times as possible to boost their value added and increase the fishery production value.

In the past 20 years, primiary products saw their export value rise from US$157,000 to US$397 million, while the value of processed exports leaped from US$3,000 to US$165 million. Processed fishery exports have grown at a faster rate and this trend is likely to continue. Still processed items at present amount to only one-fourth of the total fishery exports.

Table 2. Fishery Production, Imports & Exports

Unit: 1,000m.t. US$1,000,000

year	production		import		export	
	quantity	value	quantity	value	quantity	value
1950	84.2	17.0	..	..	..	..
1955	180.6	43.1	10.9	1.4	0.4	0
1960	259.1	61.7	1.1	0.6	0.7	0.2
1965	381.7	81.9	2.1	0.9	0.6	2.7
1970	613.2	178.9	37.6	9.1	104.5	68.0
1971	650.2	208.7	48.2	11.7	112.7	83.1
1972	694.3	266.1	49.2	13.0	127.9	119.1
1973	758.5	374.4	37.4	28.2	150.0	196.0
1974	697.9	402.5	54.1	27.5	132.0	186.0
1975	780.0	457.3	154.0	57.2	149.6	255.6
1976	810.6	567.4	100.2	63.4	167.4	340.9
1977	854.9	744.3	109.8	81.2	206.0	444.0
1978	885.0	859.6	147.8	122.0	224.0	580.8
1979	929.3	1082.6	172.5	155.9	226.7	655.2
1980	936.3	1280.1	170.8	170.4	240.1	748.4

Source: Taiwan Fisheries Yearbook, Taiwan Fisheries Bureau

Exports made directly from base ports abroad mainly include tuna, marlin, sailfish, shark, bonito and skipjack, mostly in frozen form. Exported through the customs are tuna, eel, bonito, skipjack, striped prawn, and dorado. Products sold fresh, frozen or chilled rank first, in terms of either quantities or values, followed by those canned. Only a small quantity of exports are dried or salted products. (See table 3)

Table 3 Main Seafood Exports in 1980

Unit: m.t. US$1,000

	Fresh, or chilled	Frozen	Dried, or Smoked or Salted	Prepared or Preserved
Export through the customs				
Tunas	34,361(11,594)	474(286)	0	51,964(19,512)
Skipjack, Bonitos	0	8(9)	2,906(668)	6,821(2,723)
Marlins, Sailfish	2,683(920)	1,485(681)	0	0
Dorado	0	4,941(2,888)	0	0
Seabreams	528(169)	712(277)	0	0
Sea eel	382(4)	235(273)	0	17(7)
Eel	359(47)	-	86,109(9,332)	4,096(403)
Striped prawn	709(53)	15,360(1,697)	-	-
Grass shrimp	179(20)	264(35)	-	-
Hard calm	0	-	169(30)	1,137(231)
Sold at foreign base ports				
Tunas	142,381(76,084)			
Skipjack, Bonitos	218(233)			
Marlins, Sailfish	8,821(4,992)			
Sharks	764(1,033)			
Squids	1,097(446)			
Cod and flat fish	127(72)			

Note: Figures parenthesized denote quantities in metric tons, whereas those without parentheses denote values in thousands of U.S.dollars

Source: Agricultural trade statistics of Taiwan, CAPD

3. Export market analysis

In 1961 the only foreign markets for Taiwan's fishery products were the U.S., Japan and Hong Kong. By 1973 the list of foreign markets had been greatly expanded to include over 20 countries, still the U.S. and Japan remained the most important two. Japan because of her proximity took 73% in value of Taiwan's fishery exports in this year, while the U.S. market accounted for only 17.4%, which had dropped from a peak of 90%.

Seven years later, in 1980, the foreign markets rose in number to over 40. Japan as the leading outlet represented 34.1% of Taiwan's export value of fishery products, followed by the U.S. with a 6.1% share. The concentration coefficient of Taiwan's fishery exports has shown a downward trend, declining from 90.9 in 1961 to 75 in 1973 and further to 60 in 1980, which is a favorable development although the coefficient is still regarded as relatively high.

IV. Major Export and Import Items

Taiwan's major fishery exports are tuna, eel and shrimp; fish meal is the foremost import item.

1. Tuna

As the most important product and export of Taiwan, the tuna has for the past ten years amounted to 10% to 12% of the total fish catch. The tuna output remains somewhere between 90,000 and 110,000 m.t. a year. Tuna exports fetched US$229 million in 1980, representing 32.6% of the total export value. The tuna catch is mostly sold at foreign base ports; only some 30,000 - 40,000 m.t. comes from vessels operating in inshore and coastal waters.

Sold by deep-sea vessels at foreign base ports: The amount of tuna sold through oversea base ports has shown steady increase since 1968 along with the fast expansion of the tuna fishing industry. By 1973 this volume had reached 92,967 m.t., but it has since varied with changes in production and demand. The production value in nominal terms leaped from US$80.9 million in 1973 to US$142.4 million in 1980, but after adjustment for inflation the value stayed about the same. The exports through foreign base ports are not expected to rise as a result of operations difficulties and depressed prices. (See Table 4)

Exported through the customs: Exports through the customs amounted to only 10,767 m.t. in 1973; they increased to 31,393 m.t. in 1980. The yearly growth averaged 16.5%. Their production rose in value from US$11.7 milion to US$86.8 million during the same period. In 1973 fresh, frozen and chilled tuna exports amounted to 88% of the total tuna sold through the customs. In recent years, however, preserved -- especially canned - tuna products have greatly increased to emerge as the leading export. In 1980, for instance, such products rose to around 60%, in both quantity and value, of the total tuna exports.

Tuna products sold through foreign base ports - which number over 40 - go mostly to Japanese and American firms, and those cleared through the domestic customs have Japan, West Germany and the U.S. as their major outlets taking about the same market shares. Other foreign markets

Table 4 Tuna Exports

Unit: m.t., US$1,000

	1973		1977		1980	
	Quantity	Value	Quantity	Value	Quantity	Value
Total	103,734	92,548	106,037	148,806	107,477	229,180
Through the customs						
sub-total	10,767	11,688	20,348	38,794	31,393	86,799
Fresh or chilled Frozen	9,502	10,184	9,055	18,644	11,595 286	34,361 474
Dried or Smoked	0	0	0	0	0	0
Prepared or preserved	1,265	1,504	11,293	20,150	19,512	51,964
Sold at foreign base ports						
Fresh or Frozen	92,967	80,860	85,689	110,012	76,084	142,381

include the Netherlands, Belgium, Sweden, Saudi Arabia, Canada and Australia.

2. Eel

The eel - the most important fish cultured in fresh water - was first exported to Japan, in 1968. The 1970-1976 period saw rapid growth in eel culture showing a rate of as high as 45.3% a year. By 1980 the eel yield had topped 33,079 m.t., which, valued at US$182 million, accounted for 43.4% of the production of the fish culture industry. Capital and technology-intensive, eel culture depends upon imports for its supply of eel fry and fish meal, which result in high production costs. Because of their high prices, eel are mostly exported - amounting to over 70% of the total production. Eel exports were value at 26.5% of total fishery exports. Between 1973 and 1980 eel exports rose from 7,022 m.t. to 26,149 m.t., registering an annual growth rate of 20.7%. The export value during the same period surged from US$36.7 million to US$186.4 million, indicating a 26.1% growth rate a year or 15.5% in real growth. (See Table 5)

Most eel exports are fresh, chilled or frozen; the percentage was 95% in 1973 and 63% in 1980. Exports to Japan - mainly roast, seasoned and frozen - greatly increased after 1967 and totaled 9332 m.t. in 1980, which amounted to 35.7% in value or 46.2% in quantity of total eel exports. Only a small volume is dried, smoked or preserved for export. Japan takes over 95% of Taiwan's eel exports. Some 25,024 m.t. valued at US$181 million went to Japan in 1980. Other market like Ryukyu, Hong Kong, and the U. S. are small and unsteady.

Table 5 Eel Exports

Unit: m.t., US$1,000

	1973		1977		1980	
Item	Quantity	Value	Quantity	Value	Quantity	Value
Total	7,022	36,729	18,211	104,972	26,149	186,398
Fresh, frozen or chilled	6,680	34,456	17,014	94,872	16,412	96,188
Dried or smoked	245	1,681	784	6,877	0	1
Frozen roast not seasoned	...	...	...	...	9,332	86,109
Preserved	97	592	413	3,223	405	4,101

Source: Agricultural trade statistics of Taiwan, CAPD

3. Shrimp

The shrimp catch totaled 80,725 m.t. in 1980, of which 68.7% came from inshore operations. The 1980 shrimp exports totaled 12,340 m.t. or 16.5% of the year's output. They were valued at 10.1% of the same year's fishery exports. Most export shrimp are fresh, chilled or frozen, accounting for 92% of the total shrimp export. Because of the strong domestic demand, the export of shrimp grows only slowly. Exports mostly go to the U.S. and Japan, which accounted for 26.4% and 43.3%, respectively, in 1980. (See Table 6)

Table 6 Shrimp and Lobster Exports
(Fresh, chilled or frozen)

Unit: m.t., US$1,000

Item	1973		1977		1980	
	Quantity	Value	Quantity	Value	Quantity	Value
Total	11,415	28,681	7,663	33,895	12,340	53,801
Spiny lobster	572	2,317	251	1,835	14	144
Striped prawn	374	1,582	1,169	9,704	1,750	15,236
Grass shrimp	55	182	0	6	55	443
Sand shrimp	256	483	15	35	2	6
Slipper lobster	-	-	-	-	527	4,091
Others	10,158	24,118	6,228	22,316	9,992	33,882

Source: Same as Table 3

4. Fish meal

The import of fish meal has maintained steady and fast growth; it skyrocketed from 13,302 m.t. to 140,442 m.t. during the 1967-1980 period, averaging an annual growth rate of 26.4% in quantity, or 37.4% in value. This trend is expected to continue in the long run.

Imports mainly came from Japan and Thailand in the early years. By 1980 the sources of supply had been greatly diversified, with Japan still providing 35.3% of the requirements. Other important furnishers are Chile (24.5%), Thailand (8.3%) and West Germany (8.2%). (See Table 7)

V. Fishery Development and Trade

1. Relationship between fishery development and trade

Export opinions differ about the contribution of fishery trade to economic growth. Because of their high income elasticity and relatively high unit prices, fishery products can exert a stimulating effect upon economic development, as was expressed by W.W. Rostow (Rostow, 1964). After a study of Canada's fishery and fur exports, M. H. Watkins (Watkins, 1963) also came up with the conclusion that fishery exports had been the guiding spirit of the economic take-off of Canada.

In Taiwan, competition in the international market has resulted in technical innovations and introduced new economic ideas in the fishery industry. On the other hand, foreign exchange earnings and increased incomes have provided the fishermen with a strong incentive to boost

Table 7 Imports of Fish Meal for Fodder

Unit: m.t., US$1,000

Country	1973 Quantity	1973 Value	1977 Quantity	1977 Value	1980 Quantity	1980 Value
Total	27,240	9,690	89,792	46,698	140,442	89,400
Canada	0	0	214	104	3,129	1,917
Chile	0	0	20,109	9,790	34,434	17,636
Denmark	0	0	0	0	8,468	6,005
West Germany	0	0	2,813	1,852	11,476	8,683
Japan	18,589	7,371	40,811	22,453	49,516	35,229
Rep. of Korea	0	0	1,818	1,097	2,760	2,030
Peru	0	0	7,108	3,379	8,541	4,592
South Africa	0	0	2,428	1,382	1,955	1,301
Singapore	50	14	923	475	150	74
Thailand	6,953	1,872	3,606	1,516	11,625	6,394
U.S.A.	649	103	1,774	736	4,018	2,248
United Kingdom	0	0	2,171	1,455	422	341
Others	999	330	6,017	2,459	3,948	50

Source: Same as Table 3

fishery expansion and management improvement. Exports have also wrought favorable alternations in the fishery production structure by turning fishery into a fully commercialized industry, by shifting emphasis from quantity to quality improvement, and by replacing cheap products with those of high economic value. Steady export expansion made possible a 8% growth rate in the fisheries in the 1960s and 1970s. The percentage of exports increased from 0.3% to 25.6% in the same period. Great increases in the production of such high-priced products as tuna, eel, marlin, sailfish, and grass and striped shrimps raised their production value as a whole to 23.1% in 1980 from 7.9% twenty years ago. As a percentage in value of total agricultural exports, fishery products have greatly risen in importance; it rose from 0.4% in 1960 to 21.9% in 1970 and further to 33.4% in 1980. Fishery exports, while based upon the growth of the fishery industry, contribute to fishery development and economic growth.

2. Obstacles confronting fishery development and trade

Because of large transfers of labor to other industries, the fishery industry is facing worsening labor shortages. In 1960 the motorized fishing vessels averaged 10.9 persons per vessel, which decreased to 9.4 persons in 1980. The crew size per ton also shrank from 0.46 to 0.27 persons during the same period. Besides, quite a large number of fishing vessels remain to be motorized. At a time when labor productivity has yet to be greatly improved, the reduction of fishing vessel crews can only add to the cost of production and works against efficiency aboard fishing vessels.

Another serious impediment lies in the great rise in oil prices. The price of the grade A fuel oil jumped from US$92 per kg. in 1974 to US$236 in 1981. Depressed fish prices in recent years have also cut into the profits.

Another factor of great improtance is the imposition of the 200-mile economic zone, which reduces the fishing grounds available to the fishing fleet of Taiwan and swells production costs.

On the demand side, the per-capita consumption of fishery products had by 1980 reached 38kg. a year, which is not likely to grow noticeably. The increase of consumption hereafter will have to depend upon population growth as well as improved quality. Recession-induced decreases in foreign demand, protectionist measures and fast fishery development in other developing countries have militated against the further expansion of fishery exports out of Taiwan.

There is evidently a causal relationship between difficulties faced respectively by fishery development and fishery trade. Taiwan's fishery trade is also exposed to the following unfavorable factors.

Rising production costs: Rising labor rates in addition to spiraling oil prices have reduced the competitive edge of fishery products in foreign markets. A 100-200 tonnage tuna fishing vessel, for example, incurred US$145,000 in production costs in 1978, but it saw these costs soar to US$360,000 in 1981.

Marketing failure: Despite massive exports, Taiwan's fishery products have yet to enjoy a sales network abroad. U.S. and Japanese firms dominate foreign sales, especially for deep-sea fishery products. These firms also act as purveyors of fuels and other supplies required by Taiwan's fishing vessels. They almost monopolize the foreign outlets and earn huge profits. Unless a foreign-sales netwrok is set up, any slight adverse change in the international market is bound to affect exports.

Inefficient exporters: The exporters of fishery products are often too small in operating scale, deficient in capital, lacking modern management concepts, not well-informed about foreign market situations, and too slow to respond to changes in foreign trade policies. Faulty transporatation arrangements are often also responsible for delays in delivery or unsatisfactory quality.

Processing problems: The processing of fishery products is liable to the following limiting factors: 1) Most factories are small in scale or process products that do not permit year-round operation. 2) Great increases in the price of raw materials and in labor rates result in a large rise in manufacturing costs. 3) There is ample room for improvement in processing techniques and quality control.

Products and market concentration: The fishery exports are relatively small in number and the market concentration coefficient is high. Major exports are limited to tuna, eel and some others, while Japan and the U.S. remain the chief outlets. Despite some improvement in recent years, the fishery exports are still subject to foreign market changes to too great a degree.

VI. Conclusions

For many years the fishery industry of Taiwan, operating under auspicious conditions and logging impressive growth, made very significant contributions to the economic by boosting domestic production, employment opportunities, and foreign exchange earnings. Recently, however, this industry has been, and will continue to be, burdened by quite a number of adverse developments, such as changes in international fishery rignts, rising labor costs, and increases in oil prices.

With its propitious natural conditions, the fishery production of Taiwan is, however, likely to at least ensure self-sufficiency in fishery supplies in the future. But the net export of fishery products will probably disappear in the long run under the impact of fierce international competition. Measures aimed at minimizing the effects of the adverse factors and stimulating fishery growth included:

1. Make a thorough overhaul of various production costs and profits so as to eliminate operations of a low return, especially the energy-wasting ones.

2. Improve on-board equipment, especially labor-saving and refrigeration equipment, to alleviate labor shortages and protect fishery products.

3. Gather information on foreign market and trade regulations and organize large trading companies for the purpose of promoting fishery exports.

4. Upgrade processing techniques and strictly enforce inspection to ensure the production of commodities up to the standards.

References

1. Agricultural Trade Statistics of Taiwan, Council for Agricultural Planning and Development (CAPD), Executive Yuan, Taipei, Taiwan, Republic of China

2. Anderson, L.G., The Economics of Fishery Management, Johns Hopkins Univ. Press, 1977.

3. Basic Agricultural Statistics, Department of Economics and Planning, CAPD, Executive Yuan, Taipei, 1981.

4. Bell, Frederick W., Food From the Sea: The Economics and Politics of Ocean Fisheries, Westview Press, Inc., 1978

5. Chen, C.C., Investment and Development of Taiwan's Fisheries, 1970 (In Chinese)

6. " , International Trade of Fishery Products of Taiwan, 1982 (In Chinese)

7. Gordon, H.S, "The Economic Theory of A Common - Property Resource: The Fishery", Journal of Political Economy (April 1954) P124-42

8. Howe, C.W. Natural Resource Economics, John Wiley 1979

9. Liu, C.J., The Contribution of Farm Product Exports to the Development of Taiwan's Agriculture, 1978 (In Chinese)

10. Rostow, W. W., The Economics of Take-off into Sustained Growth, London, 1964, P18

11. Taiwan Fisheries, Taiwan Fisheries Bureau, PDAF, 1972

12. Taiwan Food Balance Sheets, CAPD, Executive Yuan, annual.

13. Taiwan Agricultural Yearbook. Taiwan Provincial Department of Agriculture and Forestry (PDAF), annual.

14. Taiwan Fisheries Yearbook 1980, Taiwan Fisheries Bureau, PDAF, 1981

15. Trade of China, Chinese Maritime Customs, Statistical Series, Statistics Department, Inspectorate General of Customs, Taipei, Taiwan, ROC, annual

16. Watkins, M. H., "A Staple Theory of Economic Growth", in Canadian Joural of Economic and Political Science (29), May 1963, P141-158

Abstract

The fishery industry, endowed by nature with favorable conditions, is of crucial importance to the economy of Taiwan. The industry's gross production value, accounted for 20% of that of the agricultural sector in 1980. Fishery products provide for 37% of the animal protein intake of the population and earn an annual average of over US$500 million in foreign exchange, contributing significantly to popular nutrition and foreign trade.

The seafood trade showed a deficit in the 1950s; exports began to expand rapidly in the following decade because of fishery development at home and a growing demand in the international market. Factors contributing to fishery expansion include technological innovation and increased investment on the supply side. Conducive forces on the supply side are a strong and growing market both at home and abroad.

In 1960-1980 fishery production rose by 8% annually compared with 2.2% population growth and 2.9% per-capita consumption increase. Seafood exports registered a 43% growth rate in contrast with 25% for imports during the same period of time. The year 1980 recorded US$748 million in seafood exports consisting mainly of tuna and eel, which together accounted for 59.1%. Other export items included skipjacks, bonitos, dorado, lobster and shrimps. Fishery imports were valued at US$171 million in the same year,of which 51% consisted in fish meal.

Fishery development in the future is very likely to be adversely affected by labor shortages and rising fuel prices, which would result in increased costs. The 200-mile economic zone imposed by coastal countries is bound to limit the fishing grounds available to the fishing fleet of Taiwan. Such factors have greatly lowered the comparative advantage of fishery production of this country.

To overcome the various difficulties facing it, the fishery industry will have to promote technical innovations, devise ways of cutting down production costs, and adjust its production structure by discarding unproductive sectors and focusing upon those of great growth potential. Besides, efforts should be made to step up sales promotion and increase the value added of exports.

Speculation, Risk and Consumer Demand in Japanese Markets for Herring Roe

Andrew G. Alley
Economic Development Policy Council
Victoria, British Columbia, Canada

Introduction

Among Canadian and "U.S. fishermen and processors roe herring/herring roe[1] has been one of the most controversial, speculative and misunderstood exports to Japan" (American Embassy, Tokyo, 1982, p. 21). The purpose of this study is to contribute to an increased understanding of the behaviour of prices and of consumption patterns in Japanese markets for herring roe (kazunoko).

A major portion of roe herring supplies originates in North America where harvests take place successively in California, British Columbia and Alaska, during the first seven months of each year The final product, Kazunoko (herring roe), is consumed in Japan throughout the year, with the peak period of consumption occurring during the New Year season (Atkinson et al., 1981). As a result, supplies of kazunoko and roe herring must be held in inventory for many months, and speculation regarding price expectations in December plays an integral part, along with demand in year-round markets, in determining prices paid throughout the year.

An Overview of the Herring Roe Industry

Kazunoko is a traditional Japanese seafood which at one time was a staple in the Japanese diet (Fraser et al., 1976). As a result of stock depletion, particularly in Japanese waters, and of a gradual

---

[1] Roe herring is the fish with the roe still inside; herring is roe after removal from the fish.

reduction of Japanese access to foreign-distant water fisheries, Japanese catches of herring declined steadily during the period from 1926 to the present (Atkinson et al., 1981). Accordingly, domestic supplies of herring and herring roe have also fallen, and the Japanese have been forced to look to foreign imports to supply their markets. Throughout the 1960's, imports of roe herring and of the roe itself were severely restricted through the imposition of import quotas. These quotas were originally set up to provide some compensation to fishermen for the loss of income and jobs caused by declining domestic catches. "The Japanese government assigned exclusive control for herring imports to the Hokkaido Federation of Fishery Co-operatives, whereby profit from the import business could be redistributed among members of the Co-op" (Ibid., 1981, p. 50). Low domestic catches and the restriction of imports combined to put pressure on prices in the early 1970's. As a consequence, the Japanese government removed the import restriction on herring roe in 1972. A quota restriction on the import of round herring has remained in force, although it has been increased substantially from 10 000 tonnes in 1971 to 42 500 tonnes in 1980 (Ibid., 1981). It is this more recent period, from the early 1970's to the present, that we are concerned with in this study. This period is discussed in the remainder of this section and is supported by the data listed in the Appendix.

With the advent of "trade liberization", Japanese imports of herring roe increased eightfold in 1972 to 8 140 tonnes and wholesale prices for kazunoko dropped by about 50 percent. Between 1972 and 1974 the Chinese supplied almost 50 percent of the imports, while 35 percent were imported from Canada (Ibid., 1981). Over this period, imports from both major suppliers continued to increase and real wholesale prices declined. Total imports reached 13 142 tonnes in 1974 and, due to a large carryover from 1973, consumption was an estimated 15 892 tonnes, a 65 percent increase over 1973.

A significantly different pattern was evident from 1975 to 1978. In 1975, imports from China dropped dramatically due to stock depletion, from 6 000 tonnes to 1 000 tonnes (Schwindt, 1982). At the same time roe herring landings were expanding in British Columbia (B.C.) and, as a result, B.C. emerged as the primary source of supply. B.C.'s market share increased steadily from 57 percent in 1975 to about 80 percent in 1977 and 1978 (Atkinson et al., 1981). This dominance of the market put the province in a position to influence prices of herring roe. The potential to affect prices through supply management was recognized by the Federal Department of Fisheries and Oceans at the time. In a series of papers by Fraser et al. (1976) and Fraser (1979), an attempt was made to estimate a demand function for herring roe in order to determine the level of harvest where monopoly rent would be maximized. The consensus of fisheries managers at the time was that roe herring catches were being held at conservative levels well below the maximum sustainable yield of the herring stocks. More recently, stock conservation has become the primary concern and it appears unlikely that an economic supply management objective was ever the primary factor considered in setting allowable catches. Nevertheless, during this period from 1976 to 1978, real wholesale prices for kazunoko increased steadily and, while total imports declined, the estimates of annual consumption were more erratic.

Throughout the years of 1979 and 1980, the herring roe industry was subjected to some rather severe shocks; prices were incredibly volatile and the repercussions of consumer resistance to rapidly increasing prices were felt throughout the industry, in Japan and in North America. In 1979, total imports of herring roe were down by 20 percent from the previous year, due almost entirely to a sharp reduction in the B.C. roe herring catch. Competition for this reduced catch was fierce and ex-vessel prices were bid up dramatically. At the same time, B.C.'s market share declined as production from most other sources remained constant, with the exception of Alaska where landings were up by about 60 percent. The estimated total supply of herring roe in 1979, including the previous year carryover, was down significantly from the previous year. Consequently, real prices in Japan increased by over 70 percent, to levels which met with considerable consumer resistance. This was the year the bubble burst. The market collapsed as a result of record high prices, stories of speculation and of hoarding inventories, and a ban on the use of hydrogen peroxide as a bleaching agent.[2] The year culminated in one of the first consumer rebellions in Japan (American Embassy, Tokyo, 1982). Consequently, the market didn't clear and Japanese companies were left with expensive unsold inventories, estimated at 4 000 tonnes at the year-end. In 1980, prices fell to 1979 levels and consumption recovered, but year-end inventories remained high.

Methodology and Results

Atkinson et al. (1981) describe Japanese tradition regarding the consumption of kazunoko as follows: "This is a special product and so far as known is eaten only in Japan and traditionally, kazunoko is one of the foods that should be served as part of the New Year celebration. It is especially served to the newly-married for its kanji, or Japanese characters, means numerous children and progeny is highly desirable. However, the serving of kazunoko is not limited to the week or so of the New Year celebration. It is now frequently served in the more expensive Japanese-style eating places throughout the year and carries with it when served to a guest a feeling of prestige and honour (Casal, 1967)". Although no direct estimates of seasonal consumption patterns are available a study by Foodwest (1979) reports that "there are apparently two consumer markets which are loosely based on quality differences. There is a fairly constant demand from higher class eating and drinking establishments which serve lesser quality roe as an appetizer. This market accounts for roughly 40 percent of consumption. The other 60 percent is consumed during the New Year holiday. Higher quality, whole skeins of roe are packed in small wooden boxes and are purchased as gift items during the holiday season."

From the brief overview presented in the preceding section it is apparent that, throughout the 1970's Japan has become increasingly

---

[2] This ban appears to have been modified to a regulation which permits the use of hydrogen peroxide for bleaching, but requires that every measurable amount of the bleach be removed before the product is approved for import or marketed (Atkinson et al., 1981).

dependent on North American fisheries for supplies of herring roe. These fisheries take place during the first seven months of each year and as a result, a large proportion of annual production must be held in inventory for consumption during the New Year season. In a commodity market of this nature one would expect a consistent pattern of increasing real prices, at a rate greater than or equal to the real rate of interest,[3] as inventories are accumulated and held each year. Further, to the extent that there are two separate markets for kazunoko, differentiated by time of year and quality of product, one would expect consumer behaviour to differ between these markets. It is likely that fewer substitutes exist for kazunoko during the New Year season than during the off-season and consequently, that consumer demand is less price elastic during the New Year season.

This section will attempt to characterize the dynamics of real price behaviour for kazunoko on a seasonal basis, and to model consumer demand in the traditional New Year gift market and the year-round restaurant market. The implications of this latter analysis will then be explored as they relate to the behaviour of firms in allocating inventories over time, and to changes in the relative importance of these markets in response to price changes.

Model formulation

Seasonal price patterns were estimated using average monthly real prices for kazunoko traded on the Tokyo central wholesale market for the years 1970 to 1980. Since the majority of kazunoko is imported from April through July, dummy variables were used to distinguish between the periods January through March and April through December. The following trend model was used, with the intercept set to zero, in order to estimate the rate of change of real prices during the two specified periods:

$$P_t = (C_1 D + C_2)(1 + r)P_{t-1} \qquad (1)$$

where P_t and P_{t-1} = Real monthly price in period t and t-1 respectively

D = 1 from January through March and 0 otherwise

r = Japanese demand loan real rate of interest

$C_1 + C_2$ = Monthly rate of change in real prices relative to the market real rate of interest from December through March

C_2 = Monthly rate of change in real prices relative to the market real rate of interest from March through December.

---

[3] The market rate of interest serves as a measure of the minimum opportunity cost of capital.

In order to estimate a demand function for consumption the following quantity dependent model was defined:

$$Q = AB^{b}\ Y^{c} \qquad (2)$$

where

Q = the equilibrium quantity demanded

P = real price

Y = real income

b = price elasticity of demand

c = income elasticity of demand

Taking the natural logarithm of equation (2) and using dummy variables to distinguish between the months of January through September and the months of October through December a regression model was specified as shown in equation (3).

$$\text{LOG } Q_t = (1 + D)\text{ LOG } A + (b_1\ D + b_2)\text{ LOG } P_t + cY_t \qquad (3)$$

where

Q = Quantity demanded per capita in period t

P_t = Real price in period t

Y_t = Per capita real income in period t

D = 1 from January through September and 0 otherwise

$b_1 + b_2$ = Price elasticity of demand from January through September

b_2 = Price elasticity of demand from October through December

C = Income elasticity of demand

Date evaluation

Monthly wholesale prices and quantities of kazunoko traded on the Tokyo Central Wholesale Market (T.C.W.M.) were used to estimate equation (1) and equation (2). This data represents an aggregation of various grades of kazunoko and consequently prices will be affected by changes in the mix of product quality. The likely effect of this bias is to overestimate average prices during the New Year season and to underestimate prices during the off-season. Moreover, changes in quality from year to year would also introduce a bias.

In the model of seasonal consumer demand, T.C.W.M. prices and quantities traded were used as a proxy for retail prices and for consumption. The quantities were pro-rated by available estimates of annual consumption and hence, the results depend on an assumption that these quantities are representative of national consumption patterns.

Japanese regulations require that domestic landings, but not imports, are distributed through the wholesale markets. However, a small portion of imports are apparently also sold through the wholesale markets (Atkinson et al., 1981). If the monthly consumption patterns are different for domestically produced kazunoko than for imports, or if the proportion of imports sold through the wholesale markets varies on a monthly basis, then a bias will be introduced into the estimates of consumption. Also, the estimates of the domestic portion of annual supplies may be conservative as some roe herring imports which are subsequently processed in Japan may not be included.[4]

In order to estimate the quantity demanded in Japan on a per capita basis, the adjusted quantity estimates were divided by monthly population statistics. Similarly, Japanese G.N.P. divided by population provided an estimate of per capita income. One additional bias may be introduced by these estimates. There was no attempt to adjust the data for family size, hence changes in the number of consumers per household will not be reflected in this estimate of disposable income (De Voretz, 1982). Finally, all the money variables were deflated by the Japanese consumer price index. This computation introduces no obvious bias.

Results

In estimating seasonal price patterns, equation (1), the following results were obtained, with the t- statistics shown in brackets[5]:

$$P_t = (-.130D + 1.026)\ (1 + r)P_{t-1} \qquad (4)$$

$$(-3.93)^*\ (64.77)^*$$

$$\bar{R}^2 = .78$$

The estimated monthly rate of real price change relative to the real rate of interest over the study period was:

	Rate of Change	T-test for rate of change = 1
March through December	1.026	1.63
December through March	.896	-3.72*

* indicates parameter significance at a 95% level of confidence.

4 These imports are difficult to quantify since they are included with other herring imports such as food herring and an unknown proportion of North American roe herring exports are processed in China and South Korea for re-export to Japan.

5 Results corrected for negative serial correlation.

The above results support the seasonal characterization of herring roe industry as real prices tend to increase, at a rate greater than or equal to the real rate of interest, from March through December each year. Moreover, during the months January through March the average monthly real price of kazunoko displays a significant downward trend. This trend is likely due to a falling off of demand after the New Year season and to a reduced proportion of high quality product in the aggregate amount of kazunoko being traded. The estimated price decline after December is noticeably larger than the rate of increase during the months prior to December. This provides an indication of the risk inherent in misjudging demand in the New Year market and having to carry over large supplies, presumably with a limited shelf life, to the following year.

As previously noted, there are apparently two consumer markets for kazunoko distinguished by time and by quality of roe. In estimating seasonal demand for kazunoko, equation (3), the following results were obtained, with the t- statistics shown in brackets[6]:

$$\text{LOG } Q_t = -37.6 + 9.40D + (-1.58D - .24) \text{ LOG } P_t - 2.93 \text{ LOG } Y_t \quad (5)$$

$$(-1.75) \quad (2.30)^* \quad (-2.72)^* \quad (-.52) \qquad\qquad (.76)$$

$$\bar{R}^2 = .56$$

	Elasticity of Demand	T- test for Elasticity = 1
Off season price:	-1.34	-8.34*
New Year season price:	- .24	-2.72*
Income:	2.93	1.17

* indicates parameter significance at a 95% level of confidence or better.

The above results conform to expectations as the quantities demanded are inversely related to prices and positively related to income. The price elasticity of demand during the off-season is significantly different from that of the New Year season. Moreover, demand during the off-season appears to be price elastic, that is quantities demanded are relatively responsive to changes in price, and demand during the New Year season, price inelastic. Finally, the model provides some support to the characterization of kazunoko as a luxury

---

[6] Results corrected for positive serial correlation which would indicate either that some significant explanatory variables are absent from the model or there are problems with the data such as the aggregation of various grades of kazunoko.

good, as demand appears to be income elastic. One explanation for the insignificant T-test may be that the data covered too short a period to generate much variation in income.

Conclusions

The results suggest the following conclusions. First, the speculative nature of these markets is illustrated by the consistent pattern of price increases prior to the New Year season and by the sharp decrease in prices after the New Year season. This latter decline is likely a reflection of a seasonal shift in demand, a reduction in the proportion of higher quality kazunoko in the quantities transacted, and quality deterioration relative to new supplies anticipated during the following year. One can see that the risks involved in misjudging the New Year seasonal market are substantial. Second, demand during the New Year season appears to be price inelastic whereas demand throughout the year, during the off-season, is price elastic. The implications of this conclusion warrant further discussion.

Prices throughout the year reflect both current demand and anticipated prices for the New Year season. If high prices are anticipated due, for example, to expectations of lower than average supplies, one would expect firms to allocate an increased proportion of their inventories to the price inelastic New Year market. Thus a reduction in annual supplies would have a relatively greater impact on the supplies available for the off-season markets. In addition, demand in the off-season is price elastic, so high prices will have a relatively large negative impact on consumption. It follows that expectations of high prices during the New Year season will alter the relative shares demanded in favour of the New Year market as a consequence of the differential in price elasticities. In the event that firms over-estimate demand or underestimate supply for the New Year season, one would expect firms to carry inventories into the following year to a more price elastic market, rather than lower the price demanded during the New Year season.

Acknowledgements

The author wishes to thank Dr. Don De Voretz of Simon Fraser University, and Bruce McRae, Frank Blasetti, and Kelvin Mak of the Economic Development Policy Bureau for their helpful suggestions in preparing this paper.

References

American Embassy, Tokyo. 1982. Exporting U.S. Fishery Products to Japan. Japan Market Information Report. 28p.

Atkinson, Clinton E. and Yoshio Katsuyama. 1981. The Marketing of Herring and Herring Products in Japan. Prepared for The Alaska Native Foundation, Anchorage, Alaska. 118p.

Canada Department of Fisheries and Oceans. 1980. Annex to the Worldwide Fisheries Marketing Study: Prospects to 1985, Japan. Ottawa, Ontario. 74p.

_____ 1982. Japanese Fish Market Report. Ottawa, Ontario. 11p.

Casal, U.A. 1967. The Five Sacred Festivals of Ancient Japan: Their Symbolism & Historical Development. Sophia University in co-operation with Charles E. Tuttle Company (Rutland, Vermont and Tokyo, Japan). 114p.

De Voretz, D. 1982. An econometric demand model for Canadian salmon. Canadian Journal of Agricultural Economics. Vol. 30, No. 1, pp. 49-60.

Foodwest Consultants. 1979. The British Columbia Herring Industry. Prepared for the Marine Resources Branch of the B.C. Ministry of Environment. Victoria, B.C. 120p.

Fraser, G. Alex and Will McKay. 1976. An Analysis of the Japanese Herring Roe Market. Unpublished Paper for the Economics and Special Industry Services Directorate (Department of Fisheries and Oceans). Vancouver, B.C. 23p.

Fraser, G. Alex. 1979. An Updated Report to An Analysis of the Japanese Herring Roe Market. Unpublished Paper for the Canadian Department of Fisheries and Oceans. Vancouver, B.C.

Japan Marine Products Importers's Association. 1978-1981. Imports of Marine Products by Country. Tokyo, Japan.

Orth, Franklin L., James Wilson, James A. Richardson and Sandra M. Pidde. 1981. Market Structure of the Alaska Seafood Processing Industry, Volume II, Finfish. University of Alaska, Sea Grant Report 78-14. 300p.

Schwindt, R. 1982. Industrial Organization of the Pacific Fisheries. Prepared for the Commission on Pacific Fisheries Policy. Vancouver, B.C. 160p.

APPENDIX

HERRING ROE SUPPLY CONSUMPTION AND PRICE: 1971 TO 1981[1]
(quantities in tonnes and prices in Yen/kg.)

	Imports	Domestic Supply	Previous Year-end Inventories	Total Supply	Consumption	Average Wholesale Real Price Dec.	Average Wholesale Real Price Annual
1971	1 291	2 403		3 655	3 655	7 620	6 508
1972	8 140	2 364		8 640	8 640	4 542	3 618
1973	12 093	500		12 593	9 593	3 360	3 408
1974	13 142	500	3 000	16 642	15 892	2 954	2 391
1975	8 497	500	750	9 747	9 347	4 496	3 745
1976	12 289	500	400	13 189	11 244	3 452	3 305
1977	11 225	500	1 945	13 670	10 000	3 840	3 552
1978	9 988	1 000	3 670	14 548	13 658[2]	5 066	4 278
1979	8 221	1 000	1 000	10 221	6 221	7 326	7 155
1980	5 810	2 000	4 000	13 810	9 000	3 730	3 797
1981	7 992	1 308[2]	3 000	12 300	11 400		

---

[1] - Orth et al., 1980. All data from 1971 to 1977 with the exception of prices.
- Japan Marine Products Importers Association, 1978-1981. Imports from 1978 to 1981.
- Canada Department of Fisheries and Oceans, 1980. Domestic supplies from 1978 to 1980 and previous year-end inventories from 1979 to 1981.
- Ibid., 1982. Consumption in 1980 and 1981.

[2] Estimates.

Note

The views expressed in this paper are entirely those of the author and should not be interpreted as representing those of the provincial government.

ABSTRACT

The Japanese market for herring roe is a commodity market in which speculation plays an integral part. A major portion of the supplies for this market originates from the roe herring fisheries in North America, which take place during the first half of each year. The final product, herring roe, is consumed in Japan throughout the year, with the peak period of consumption occurring during the New Year season. As a result of the structure of this industry the product must be held in inventory, in a semi-processed or processed form, for a substantial portion of each year. The available data on market transactions are used to estimate seasonal price patterns and consumer demand in two separate markets for herring roe. The results are discussed as they relate to the behaviour of firms in allocating inventories between these markets.

Seafood Trade Between Japan and the United States

Tsunenori Kusakawa
Tokai University
Shimizu, Japan

Overview of Japanese Fisheries

Convention on the Law of the Sea including 200mile EEZ was adopted by UNCLOS III on April 30, 1982, by a recorded vote of 130 in favor to 4 against, with 17 absentions. Voting against includes the United States as well as Israel, Turkey, and Venezuela.
In this convention, "coastal state has sovereign right for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living," and coastal state has also "jurisdiction with regard to the establishment and use of artificial islands, installations and structures, marine scientific research, and the protection and preservation of the marine environment."
With regard to fisheries, coastal state can determine arbitrarily the allowable catch, its capacity to harvest and the allocation of surplus for other states, of its own EEZ. Many coastal states have already set up their 200mile zone as domestic law, not waiting the entry into force of the convention, and the number of such states has gone up to ninety as of January, 1982.
Especially the establishment of 200mile zone by the United States and USSR gave a way to the coastal states to set up the zones, and affected Japanese fisheries seriously.
The establishment of the 200mile zone by many states has given considerable influence upon the structure of world fisheries and international trade of fishery products.

Japanese fishery

Japan harvested 44% of its marine fishery catches within 200 miles from the coasts of foreign states in 1974 and in

1977, when the United States and USSR established their fishery zones, it dropped to 30%.

Table 1. Japanese Fisheries whithin 200 Miles from the Coasts of Foreign States

(Unit:1000t)

	1974	1975	1976	1977
Japan's total catch	10,808	10,545	10,656	10,764
Catch in marine fisheries (excl. marine culture)	9,749	9,573	9,605	9,695
Catch within 200 miles from the coasts of foreign states	4,256	3,744	3,496	2,897
United States	1,585	1,410	1,348	1,187
Canada	26	21	25	18
USSR	1,630	1,386	1,229	698
China	180	152	118	178
R. Korea	209	177	127	146
N. Korea		64	80	27
Australia	18	12	8	9
New Zealand	78	80	166	244
Other states	530	432	395	390

Sourse: Ministry of Agliculture, Forestry and Fishery

The reduction of catches within the fishery zone of USSR was remarkable where 1,229 thousand tons in 1976 dropped to 698 thousand tons in 1977. The main species which showed the sharp reduction was Alaska pollack (suketou-dara).
The Russo-Japanese relations in fishery is mutual based on the agreements, and the USSR's allocation to Japan has been fixed at 750 thousand tons since 1979.
The relations between the United States and Japan in the fishery is Japan's unilateral catch in the U.S. FCZ and the quota to Japan after the entry into force of FCMA of 1976 is 1,201 thousand tons in 1977, 1,250 thousand tons in 1978, 1,205 thousand tons in 1979, 1,404 thousand tons in 1980, 1,207 thousand tons in 1981 and 1,149 thousand tons in 1982. In spite of the reduction of catches in the 200mile zones of foreign states, the total catches of Japan's marine fishery have not reduced. This is explained, as in Fig. 1, by the increase of off-shore fisheries compensating the reduction of distant water fisheries. This, however, does not mean that the Japanese fishery has been successfully moved into a fishery of resource management type that utilizes amply its own 200mile zone from a fishery mainly supported by the distant water fishery, but means an incidental coincidence between the dawn of the 200-mile era and the heavy catches of sardines (iwashi) and mackerel (saba) in the off-shore fisheries. The establishment of 200mile zone, price hikes of the fuel oil and materials after the oil-shock, changes in the needs of consumers--- these are the points to which the Japanese fishery must make match itself. It can be said that it contains many unsolved problems inside.

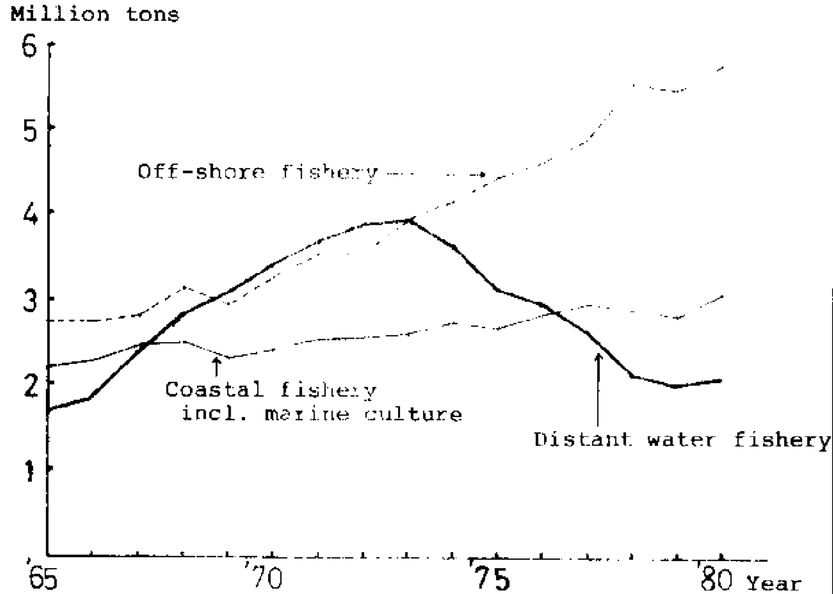


Fig. 1 Trend on Japan's Marine Fisheries Catch

Source: Ministry of Agriculcure,Forestry and Fishery

Supply and demand

The Japanese are the world's leading fish-eating people. In 1980, Japanese obtained 17.9g per day per capita of animal protein from fishery products, which is 45.8% of the total intake of animal protein. The supply and demand composition of fishery products is shown in Table 2. The total demands of fishery products are between 11-12 million tons since 1975, and the demands of edible fishery products are between 7.5-7.8 million tons, which both can be considered to be almost constant. In the domestic production, the edible fishery products are in declining tendency from the peak of 1976, but the non-edible fishery products increased to 3.0 million tons in 1980 from 2.4 million tons of 1975. The import of edible fishery products increased to 1.2 million tons in 1979 from 0.75 million tons in 1975 and it was 1.0 million tons in 1980. The portion of imported edible fishery products in the domestic consumption of edible fishery products shows an increase from 4.6% of 1970 to 10.0% of 1975 and 16.4% of 1979, but it decreased to 13.3% in 1980. These facts clearly describe, taking into consideration the production and the import by species, the increase of domestic production for low-priced non-edible fishery products and the increase of imports for high-priced edible fishery products. It is also conceivable that they have close relationship with the changes of eating habits of the Japanese people which are liking to the higher class fishery products such as tuna (maguro) and prawns (ebi), simplified cooking method of fishery products at home and increase of the opportunities of eating out. Meanwhile it can be pointed out the increase of importance of the imported edible fishery products in the domestic consumption.

Table 2 Supply and Demand of Fishery Products in Japan

(Unit:1000t)

	1970	1975	1976	1977	1978	1979	1980
Total supply	9,539	11,006	11,126	11,974	11,665	11,655	12,085
Domestic production	8,794	9,918	9,990	10,126	10,186	9,948	10,396
Edible	6,853	7,552	7,693	7,678	7,368	6,959	7,466
Non-edible	1,941	2,366	2,297	2,448	2,818	2,989	2,930
Import	745	1,088	1,136	1,848	1,479	1,707	1,689
Edible	294	752	866	999	1,082	1,235	1,027
Non-edible	451	336	270	849	397	472	662
Total demand	9,539	11,006	11,126	11,232	11,741	11,751	11,727
Domestic consumption	8,631	10,016	10,097	10,380	10,695	10,736	10,704
Edible	6,356	7,549	7,763	7,565	7,742	7,546	7,709
Non-edible	2,275	2,467	2,334	2,815	2,953	3,190	2,995
Export	908	990	1,029	852	1,046	1,015	1,023
Edible	791	755	796	671	740	738	817
Non-edible	117	235	233	181	306	277	206

Source: Food Balance Sheet, Ministry of Agriculture, forestry and Fishery

Note 1 The differences between total supply and total demand are the increase or decrease of stocks.

2 Figures in 1980 are preliminary.

Domestic distribution

There have been changes in the domestic distributions of edible fishery products in Japan. Once the circulation of edible fishery products in Japan maintained by the wholesale market system that goes through the wholesale markets at the place of production and the place of consumption. But from the beginning of 1970's, the feature of the wholesale market system has changed, and non-wholesale market circulations which do not go through the wholesale markets but go through the outside, have become to have considerable importance, thus making the route of circulation complex. This has been caused, when seen from the consumption side, by the changes in the circulation mechanisms such as the

growth of the mass-selling shops and the growth of fast food chains industry. When seen from the supply side, it has been caused by the increase of frozen fishery products, increase of imported fishery products and increase of processed fishery products. The backgrounds that has made the changes of circulation are the establishment of nationwide network of the frozen warehouses based on the development of freezing technologies, equipment of freezing appliance on the fishing boats, and the increase of freezing carriage.
The Japanese once enjoyed the seasons of the year by the change of species of fishery products they ate, but recently they cannot see the seasons in this manner.
These changes in the circulation of edible fishery products are helping the big fishery companies and sogo-shosha (universal commercial houses) reign the market. These tendencies are strong especially in the imported fishery products and frozen fishery products.

Import and export

Once Japan was the biggest exporter of marine products in the world, and its import was negligible. But from 1971, Japan became the importer and in 1979 the trade balance of fishery products amounted to an excess of import of 734 billion yen. Now Japan is still one of the largest exporters of fishery products, and is, at the same time, the world largest importer. In 1979, 27% of world trades of fishery products on value basis was import by Japan. Recently there appears the fisheries which cannot stand without export to Japan, in some coastal states. That are, for instance, squid or cattlefish (ika) fishing in Canada, R.Korea and Thailand, prawn (ebi) fishing in India and Indonesia, and tuna (maguro) fishing in R.Korea.
It is said, as a matter of course, that the fishery products whose domestic demand exceeds the domestic production are imported and vice versa. It is seen the tendencies, from the view of Japan's import, export and domestic demand of fishery products, that the higher priced marine products which were once exported are now put to the domestic consumption and are even imported to fill the shortage, and that the lower priced domestic marine products are exported or used as non-edible products.
In 1980, the import of shrimp, prawn and lobster (called generically ebi) marked 35% of the total import of edible fishery products which, as compared with previous year 1979, is 20% lower in value basis or 10% lower in volume basis. This decrease is considered to be caused by the increase of stock. "Ebi" is imported from about 60 states out of which Indonesia,India, Australia and China are the main exporters to Japan. "Ebi" is the typical import item in Japan and about 75% of the domestic demand is supplied through import. Frozen skipjack (katsuo) and tuna are mainly imported from R.Korea and Taiwan, 90% of the total import are from these two states.
As to the import of squid and octopus (tako), due to that they are not eaten by many nationals, almost the world import is made by Japan.

Table 3 Export and Import of Fishery Products in Japan

(Unit: 1 billion yen)

Year	Export	Import	Balance	Major three states: Export	Major three states: Import
1965	119	37	82	U.S.A., U.K., W.Germany	Taiwan, R.Korea, Peru
1966	130	30	100	U.S.A., U.K., W.Germany	Taiwan, R.Korea, U.S.A.
1967	117	69	48	U.S.A., U.K., W.Germany	R.Korea, Mexico, China
1968	126	72	54	U.S.A., U.K., W.Germany	R.Korea, U.S.A., China
1969	125	94	31	U.S.A., U.K., W.Germany	R.Korea, U.S.A., China
1970	141	115	26	U.S.A., U.K., W.Germany	R.Korea, China, Taiwan
1971	147	153	-7	U.S.A., U.K., Netherlands	R.Korea, Taiwan, China
1972	162	190	-28	U.S.A., U.K., W.Germany	R.Korea, Taiwan, China
1973	173	300	-127	U.S.A., U.K., W.Germany	R.Korea, Taiwan, U.S.A.
1974	202	323	-121	U.S.A., Netherlands, U.K.	R.Korea, China, Taiwan
1975	169	386	-217	U.S.A., U.K., Netherlands	R.Korea, Taiwan, Indonesia
1976	221	564	-343	U.S.A., U.K., Netherlands	R.Korea, Taiwan, Indonesia
1977	184	658	-474	U.S.A., Netherlands, Taiwan	R.Korea, Taiwan, U.S.A.
1978	171	676	-505	U.S.A., Netherlands, Taiwan	U.S.A., R.Korea, Taiwan
1979	196	931	-734	U.S.A., Netherlands, Taiwan	U.S.A., R.Korea, Taiwan
1980	265	764	-499	U.S.A., Hong Kong, Nigeria	R.Korea, U.S.A., Taiwan

Source: Ministry of Finance

Note: Export= FOB , Import= CIP

Table 4 Import of Fishery Products by Item in Japan

(Volume: 1000t, Value: 1 billion yen)

	1970		1975		1978		1979		1980	
	vol.	val.	vol.	val.	vol.	val.	vol.	val.	vol.	val.
Edible total	259	99.3	619	367.9	993	646.6	1013	899.1	858	716.6
Frozened shrimp, prawn and lobster	57	49.3	114	137.5	150	222.5	164	313.2	148	248.9
Frozened tuna and skipjack	51	9.1	110	39.5	119	47.0	123	69.6	101	59.2
Frozened cuttlefish and squid	15	3.9	59	29.3	118	42.6	156	75.8	94	48.0
Frozened octopus	36	3.8	75	24.1	78	25.9	62	39.0	63	44.2
Frozened salmon	5	2.0	7	5.8	50	52.3	55	58.4	39	31.9
Frozened herring	7	0.5	9	1.9	7	2.6	14	5.0	30	10.6
Frozened crab	1	0.3	10	4.8	32	31.7	41	42.2	34	32.3
Hard roes of herring	1	0.8	8	14.0	10	35.1	8	54.6	6	17.9
Hard roes of salmon	5	6.4	4	11.9	8	22.9	8	26.6	9	20.2
Non-edible total	115	15.3	92	17.6	125	29.9	138	31.7	179	47.8
Fish meal	95	6.7	71	5.9	84	9.3	99	9.8	139	17.3
Fishery products total	375	114.6	711	385.5	1018	676.5	1151	930.8	1038	764.3

Source: White Paper on Fisheries, 1981
Ministry of Agriculture, Forestry and Fishery

Note: Value=CIF price

Table 5 Export of Fishery Products by Item in Japan

(Volume: 1000t, Value: 1 billion yen)

	1970		1975		1978		1979		1980	
	vol.	val.	vol.	val.	vol.	val.	vol.	val.	vol.	val.
Edible total	472	115.9	465	133.2	470	132.0	468	135.4	515	186.8
Frozened tuna and skipjack	69	14.0	34	3.3	89	13.8	59	11.0	91	25.1
Canned mackerel	161	19.6	194	35.7	173	35.4	180	35.4	210	52.8
Canned tuna and skipjack	66	28.9	48	27.7	42	25.0	38	26.5	38	35.5
Canned sardine	0	0	6	1.3	41	8.0	50	10.2	55	13.2
Non-edible total	107	24.8	138	35.5	285	56.9	260	61.0	212	78.6
Pearl (volume=t)	85	14.7	38	17.7	169	26.4	145	32.1	149	51.4
Fish oil	49	3.9	79	7.4	214	18.2	191	15.9	161	13.8
Fishery products total	579	140.7	603	168.7	754	188.9	728	196.4	727	265.3

Source: White Papar on Fisheries, 1981
Ministry of Agriculture, Forestry and Fishery

Note: Value= FOB price

Salmons (sake), crab (kani), hard roes of salmons (sujiko) and hard roes of herring (kazunoko)---so-called "hokuyo-mono (northern sea products)"---are the import items that have marked an rapid increase after the establishment of 200mile zones by the United States and USSR. They are described later.
The main export items of Japan are canned fish---mackerel (saba), skipjack, tuna and sardine---,and frozened skipjack and tuna for cannery. Though non-edible, pearl and fish oils are the important export items of Japan.

Sea Food Trade between Japan and the United States

Fishery products trade between Japan and the United States goes into an excess of import by Japan since 1977 when the United States adopted the 200mile Fishery Conservation Zone. The items whose import of Japan have increased are salmons (including king, red, silver, pink and chum), crab, salmons roes and herring roes, and they are now ranked at higher positions in the import of fishery products by Japan from the United States.
Regarding salmons, Japan was once exporting canned salmons to the United States, but nowadays these are items that will go first among the imported fishery products from the United States. In 1981, 84% of Japan's imports of salmons were from the United States.
The supply of salmons in Japan is composed of fishing in the northern sea, catch at the coasts and rivers, and import. In the past, the production was mostly from the northern sea , but, because of anadromous stocks, the salmons fishing of Japan in the northern sea was regulated by INPFC (the International Convention for the High Seas Fisheries of the North Pacific Ocean), and also Russo-Japanese Negotiations on salmons have reduced the catch quota to Japan year by year. The quota has been fixed at 42,500 tons since 1978.
On the other hand, the catch at the coasts and rivers of salmons has shown the steady increase by the advancement of techniques in the artificial fertilization and the expantion of the release, thus reaching to about 100 thousand tons in 1981 from 20 thousand tons in the 1960s. The import of salmons will be affected by the tendencies of the domestic consumption and the catch at the coasts and rivers in the future. The import of salmons marks a drastic decrease in 1980. This decrease is considered to be caused by the excessive stock made from the increase of import in 1978 and 1979 motivated by speculation, and rich catch at the coasts and rivers.
The hard roes of salmons and of herring are favorite food specific to Japanese, and many Japanese taste with relish them like the Occidentals do with caviar.
The domestic demand of salmons roes mainly depends on the import. The import was 5.8, 6.7, 7.8, 7.8, 8.6 and 10.7 thousand tons through 1976 to 1981 respectively. There are some domestic productions of salmons roes. The estimation was about 3 thousand tons in 1980. The domestic production has been showing the increase with the increase of the catch at coasts and rivers.
Over 85% of Japan's import of salmons roes are from the

Table 6 Japan's Export and Import of Fishery Products to/from the United States

(Unit: 1 billion yen)

Year	Export	Import	Balance
1965	32	3	29
1966	42	6	36
1967	33	5	28
1968	34	6	28
1969	37	9	28
1970	42	9	33
1971	40	10	30
1972	60	8	52
1973	62	24	37
1974	62	16	46
1975	38	22	16
1976	57	28	29
1977	39	62	-23
1978	33	105	-71
1979	36	144	-108
1980	54	99	-45

Source: Ministry of Finance

Note: Export= FOB, Import= CIF

United States and it is followed by Canada.
Almost all of the domestic demand of herring roes depends on the import. The import of herring roes was 11.7, 10.2, 9.6, 7.7, 5.4 and 7.6 thousand tons through 1976 to 1981 respectively. In addition to the above, there are some herring roes which are produced from imported herrings.
The estimated volume is about 2 thousand tons in 1980.
The main exporters of herring roes to Japan are Canada and the United States, and they are followed by China and R.Korea. The import of herring roes also marked an acute drop in 1980. This is mainly because of the inconfidence the consumers in the domestic circulation, the consumers meeting with the speculative import, price hike in the domestic market and losing purchase motives.
The import of herring is not liveralized, but the import quota showed the increase recently. The import recorded 13.7 , 30.1 and 50.1 thousand tons in 1979, 1980 and 1981 respectively. Herrings are almostly imported from Canada and the United States.
The import of crabs was 12.5, 18.3, 31.8, 40.5, 33.8 and 31.0 thousand tons through 1976 to 1981 respectivery. In 1981, the import from the United States holds about 70% in volume in the total import.
From an overall view on the import by Japan of fishery products from the United States, it is clear that the inclination to higher class marine foods of Japanese consumers and the decrease of catches in the north Pacific due to the establishment of 200mile zones are fundamental factors of the increase of import.
The main export items of Japan to the United States are

Table 7 Japan's Major Import Items in the Edible Fishery Products from the United States

(Volume: 1000t, Value: 1 billion yen)

	1976		1977		1978		1979		1980		1981	
	vol.	val.	vol.	val.	vol.	val.	vol.	val.	vol.	val.	vol.	val.
Salmon, frozen (excluding fillet)	2.4	2.6	14.8	16.9	40.8	43.0	48.0	51.5	33.0	27.5	60.2	65.9
Hard roes of salmon, dried, salted or in brine; smoked	4.5	13.3	5.6	18.1	6.3	18.7	6.8	23.6	7.4	17.8	9.5	27.5
Crab, fresh (live or dead), chilled or frozen	4.5	3.8	11.5	12.1	25.9	28.3	34.5	37.4	27.1	26.8	21.3	25.2
Herring, frozen (excluding fillet)	1.0	0.3	8.7	2.9	5.4	2.3	6.4	3.7	21.5	8.5	22.3	8.4
Hard roes of herring, dried, saltedor in brine; smoked	1.2	2.8	0.7	2.0	0.7	2.4	1.1	6.9	1.4	4.6	1.8	5.4
Sea urchin	0.4	1.2	0.5	1.6	0.5	1.3	0.8	2.5	0.6	2.2	0.6	2.7
Cuttlefish or squid, fresh, chilled or frozen	1.1	0.2	2.4	0.5	1.9	0.4	3.0	0.8	1.6	0.4	2.2	0.7

Source: Ministry of Finance

Note: Value= CIF price

Table 8 Japan's Major Export Items in the Edible Fishery Products to the United States

(Volume: 1000t, Value: 1 billion yen)

	1976		1977		1978		1979		1980		1981	
	vol.	val.	vol.	val.	vol.	val.	vol.	val.	vol.	val.	vol.	val.
Flatfish, fillet, frozen	22.6	9.9	16.4	7.8	16.1	6.1	11.1	4.4	12.2	5.0	10.0	4.7
Albacore, boiled in water, in airtight containers	15.0	13.5	6.4	6.3	8.3	5.9	5.6	4.3	6.9	6.4	4.0	4.1
Albacore, frozen (excluding fillet)	14.0	6.0	1.1	0.5	5.3	1.7	2.9	2.5	4.1	2.0	6.2	3.3
Skipjack, boiled in water, in airtight container	5.0	2.9	4.0	2.7	8.0	3.7	6.8	3.6	5.6	4.3	4.6	3.1
Cod, fillet, frozen	6.0	2.0	6.5	2.8	4.8	1.6	6.3	2.5	3.3	1.6	4.1	1.8
Skipjack, frozen (excluding fillet)	12.7	2.5	22.9	5.1	11.7	2.3	5.7	1.3	28.4	8.3	3.3	0.9
Oysters, boiled in water, in airtight containers	1.3	0.7	0.4	0.3	1.3	0.7	1.8	1.0	1.7	0.9	1.3	0.7
Sardines, in tomato, in airtight container	0.2	0.0	0.1	0.0	0.5	0.1	1.2	0.3	1.8	0.5	1.8	0.5
Yellowfin tuna, frozen (excluding fillet)	1.3	0.3	0.5	0.1	4.8	1.1	0.3	0.1	2.0	0.8	1.6	0.5

Source: Ministry of Finance

Note: Value= FOB price

frozen fillet flatfish and cod, frozen albacore for cannery, and canned skipjack and tuna.
Though not edible, pearls rank top in the export of fishery products from Japan to the United States.
It is seen the stagnancy in the export of edible fishery products from Japan to the United States, as a whole.

When Japan-the United States trade of fishery products is viewed from Japanese side,the first serious problem for Japan is the linkage of the catch quota and the trade of fishery products.
The Part C of AFPA(American Fisheries Promotion Act) which is an amendment of FCMA of 1976, provides as a factor of consideration in the determination of the allocation among foreign states of the TALFF, with other factors, that "whether, and to what extent, such nations are cooperating with the United States in the advancement of existing and new opportunities for fisheries trade, particularly through the purchase of fish or fishery products from United States processors or from United States fishermen."
Concerning this, a problem called the "the case on purchase of Alaska pollack" occured recently. This is the problem regarding to the purchase of Alaska pollack which is caught by the U.S. fishermen, by the Japanese factory boats on the sea.
Alaska pollack is an important species which amounted to 74% of the Japanese actual catch of 1,180 thousand tons in the U.S. FCZ, in 1980. And about 75% of the Japan's total catch which amounted 1,552 thousand tons in 1980, came from in the fishery zones of the United States and USSR.
The minced Alaska pollack is the very important material for the processed fishery products in Japan.
This kind of purchase was started in 1981, and in that year, two fishery companies, Taiyo and Nippon Suisan, made a test purchase of total of 14 thousand tons. This test purchase was, at first, promised by Japan to check the enactment of Breaux Act. In this purchase of 7 thousand tons each, both companies reported that they "lost 20 thousand yen per ton (The fishing and food industry weekly 6/25,1982)." It means that this purchase was a reluctant one for the two companies and the Japanese fishery industries to keep the catch quota in the U.S. FCZ.
For 1982, Japan offered to the United States a purchase of 40 thousand tons at first and 60 thousand tons later on.
At the Japan-U.S. Trade Conference held in March 1982, The United States requested this amount to be 200 thousand tons in 1982 and to be made to 400 thousand tons in next three years(Asahi shimbun 4/28 1982), and it made this problem go on the rock.
The United States has introduced the partial allocation system from 1982 in stead of the year-basis allocation system. In this system, the United States exhibits the predetermined catch quota to the foreign states, and 50% of which is allocated at the beginning of the year and for the remaining 50% allocation is made in April and July after assessment by the United States. The predetermined catch quota for Japan for 1982 was 1,148,800 tons. And 50% of

them was allocated at the beginning of 1982, but at the time of second allocation in April, the United States gave only 15% of the quota, not 25% as expected. This measure by the United States is undoubtedly in line with AFPA, for the increase of the export of Alaska pollack.

In order to recover this 10% reduction and at the same time to give a path to the deadlocked negotiations for the revision of Japan-U.S. Fishing Pact which is expiring at the end of 1982, Japan gave a compromise in the import of Alaska pollack, and in June 1982, the United States and Japan reached to a basic consent in this problem(Nihon Keizai shimbun 6/12 1982). The content of consent is that Japan would purchase Alaska pollack from the U.S. fishermen by 120 thousand tons between June 1982 and May 1983, and by 200 thousand tons from June 1983 to May 1984.

After this consent, the United States noticed to Japan a recovery of 10% reduction and an allocation of 25% for July and thus Japan secured the prededermined catch quota for 1982, with a reduction of 1.5 thousand tons due to unlawful fishing.

It is reported that the aforementioned negotiation on the revision of Japan-U.S. Fishery Pact was concluded in August 1982(Japan Times 8/23 1982). It was reported that the contents of the new 5-year fishing pact has more strict conditions for Japan compared to the present 1978-1982 pact, which provides:

1. basically the catch quota shall be decided by the U.S.
2. the catch quota is to be allocated on the partial basis, not on the year basis.
3. the catch quota is to be determined by taking into consideration Japan's import of the U.S. fishery products , contribution to the U.S. fishery industry and other factors.

A memorandum is attached to the new pact, which states;

1. the United States confirmed it would pay attention to Japanese claims that quotas should be set through mutual consultations.
2. the United States would try to prevent unilateral U.S. quota allocation from disrupting Japan's fishery.

This new pact is also clearly in line with the U.S. fishery policies which is provided in AFPA.

It seems that the background of the United States' requirement on an increase of the export of Alaska pollack is the poor catch of crabs at Bering Sea. It means that the United States is going to rebuild the crab boats into boats for Alaska pollack.

It can be pointed out, however, some doubts in either case. The first case is the case that the catch quota of Alaska pollack for Japan is decreased by this kind of purchase, though it is inconsistent with the linkage of the catch quota and the trade of fishery products. In this case, Japan's catch of Alaska pollack in the U.S. FCZ will decreased to 650-700 thousand tons in 1984 from 871 thousand tons in 1980, and Japanese fishing boats for Alaska pollack will have to be reduced accordingly. Further, there is no guarantee that the United States shall not require the more increase of Japan's purchase after 1984, as requested 400 thousand tons in the aforementioned conference.

The second case is the case that the catch quota for Japan is not decreased, though it is unreasonable from the view point of resources management. In this case, some questions arise. They are;

is the resources sustainable ?

is the Japanese market consumable ?

Moreover, it is doubted the influence to the catch quota for other states such as R.Korea and West Germany.
Thus the linkage of the catch quota and the trade of fishery products not only troubles the Japanese fisheries, but may affect the marine resources of the United States, Japanese market, and other fishing states in the U.S. FCZ.
Changes in the import of marine fishery products by Japan may affect the trade of marine fishery products of other states.

Other problem in the U.S.-Japan sea food trade is Japan's speculative imports. These had brought serious impacts on Japanese consumers and the fishermen of foreign states, as seen "the case of herring roes". Speculative imports by Japan not only do not contribute the development of the U.S. fisheries, but confuse the Japanese market.

The United States will undoubtedly continue to promote the development of its fishing industry, and as a result, the fishing in the U.S. FCZ by other states will be decreased with the increase of the U.S. catch. It seems that the Japan's contribution through the increase of import only put off the reduction of Japan's catch in the U.S. FCZ. This kind of measures will not invite the fundamental solution of fishery problems lying between the United States and Japan.

It is desirable to establish the basic understandings about each other's fisheries and demands of sea food products, for the stable development of sea food trade between Japan and the United States.
Facing the era of world wide enclosure of resources, the world trade of sea food products will become more and more important. The above pointed basic understandings will contribute the establishment of worldwide orderly sea food trade, since the two states share very important position in the trading.
For this end, it would be very important to carry out successive studies about international sea food trade in cooperation with each state.

References

Hirasawa,Yutaka. and others. edited by Kawasaki,Ken. and Tanaka, Shoji. 200mile era and Japanese Fisheries, Koseisha Koseikaku, Tokyo, 1982,

Hirasawa,Yutaka. Nihon Suisan Dokuhon(The Japanese Fisheries Book), Toyo Keizai Shinposha, Tokyo, 1979, Ministry of Agriculture, Forestry and Fishery, White Paper on Fisheries 1980 and 1981, Tokyo, 1981 and 1982,

Ministry of Agriculture, Forestry and Fishery, Statistical Year Book on Fisheries and Aquaculture of 1980, Tokyo, 1982,

Ministry of Agriculture, Forestry and Fishery, Food Balance Sheet, Tokyo, 1981,

Ministry of Finance, Export and Import Statistics 1976-1981, Tokyo, 1977-1982,

edited by Ministry of Foreign Affairs, Fisheries in the 200-mile era, Sekai-no-ugokisha, Tokyo, 1980,

Ministry of Foreign Affairs, The International Convention for the High Seas Fisheries of North Pacific Ocean (INPFC),

Ministry of Foreign Affairs, Japan-U.S. Fishery Agreement,

Ministry of Foreign Affairs, Japan-USSR Fishery Agreement,

Ministry of Foreign Affairs, USSR-Japan Fishery Agreement,

Ministry of Foreign Affairs, Japan-USSR Agreement on Fishery Cooperation,

Nakatate,Kou. and Yoshiki,Takeichi. Tomorrow's Japanese Fisheries, Kaibundo, Tokyo, 1978,

Ono,Seiichiro. Suisangyokai(Fishery Industry), Kyoikusha, Tokyo, 1980,

Prime Minister's Office, Annual Report on the Family Income and Expenditure Survey 1980, Tokyo, 1982,

Suisansha, Suisan Nenkan(Fisheries Yearbook)1975-1980, Tokyo, 1976-1981,

United Nations, United Nations Press Release, Sea/494, New York, 1982,

United Nations, Convention on the Law of the Sea(Working Paper 1. 7 June 1982), New York, 1982,

U.S. Department of Commerce, Fisheries of the United States 1978-1981, Washington D.C., 1979-1982,

U.S. Government, American Fisheries Promotion Act,

U.S. Government, Fishery Conservation and Management Act of 1976

News Papers: Asahi Shimbun,Japan Times,Nihon Keizai Shimbun, and The Fishing and Food Industry Weekly,

Status of and Problems in Seafood Export in Korea

Chung-Yul Yu and Hyun-Woo Chung
National Fisheries University of Busan
Republic of Korea

ABSTRACT

Korea's fishing industry now aims at fulfilling domestic demand, increasing fisherman's income, and diversifying export markets. Demand for fish, particularly processed products, has also increased. To meet this demand, the government allowed general species import in 1978.

Korea's fish exports began with laver exports to Japan before 1945. Exports have increased over the past 20 years, aided by the government's export-oriented policy.

In 1977, Korea was the world's third largest fish product exporter. The distant water fleet made this possible, contributing half those fish between 1962 and 1976. By 1980 however, it contributed only 41 percent of exports valued at $854 million. This reduction was caused by 200 mile exclusive fishing zones and increased oil prices.

A major economic problem is that over 75 percent of Korea's exports are to Japan (65.4 percent) and the U.S. (11.1 percent). Diversification efforts have increased to include sales in over 100 countries, but U.S. and Japanese sales still predominate.

These problems weaken the international export market, including factors of price and non-price competition. To strengthen competitiveness, an overall policy should be set for all fisheries. For expansion, the following strategy is required:

<u>To reduce the prime costs for price competitiveness</u>: a) improve labor productivity by modernizing fishing vessels and facilities, b) rationalize management by realizing economies of scale or unifying

export channels by items, c) more exploration of fishing resources and further development of sea culture, d) improve distribution channels.

To strengthen non-price competitiveness: a) more diplomacy on fishing zones, catch quotas, and joint ventures, particularly liberalization of Japanese I.Q. items and diversifying markets, b) export of items selected, c) strengthened inspection.

- -

I. Status and Trend of Korean Fisheries

A. General Background

1) Production-Sector and Species

The fishery industry of Korea has grown rapidly since the first Economic Development of 1962, making Korea one of the ten most producing countries in the world and by 1977 Korea was the third largest fish exporting country, though ranked 5th in 1979 according to Yearbook of Fishery Statistics by FAO.

The total catch in 1980 was estimated 2,476 thousand metric tons, valued at US$ 3,000 million at the constant price of 1975, contributing the proportion of 1.6% to the nations's GNP. And fishing population at the end of 1980 was estimated 864,792 persons which was equivalent to 2.3% of the total population.

Fishing fleet at the end of 1980 was 77,574 in number and 770,687 G/T in tonnage which are, as compared with those of 1972, increases of 14.6% and 70.5% respectively. And powered vessels represent 65.9% in number and 96.1% in tonnage, nonpowered vessels being on a substantial decrease. The average gross tonnage of 1980 was 771 thousanad G/T, which is of course increasing every year as shown Table 1.

Fishery production includes distant waters fisheries from deep-sea fishing, adjacent waters fisheries from coastal and offshore fishing, shallow sea and inland waters fisheries.

The deep-sea fishing industry, which was grown rapidly since its start in 1968 and became a promising export industry, is steadily on the decline, especially since 1976. Deep-sea fishing is distinguished by the size of the vessel, usually over 200 tons and by the shore-away period, usually over a month. Deep-sea fishing progressed from sea shore (coastal) fishing and then off-shore fishing made the rapid development with the purchase of used Japanese vessels on a loan basis. The most important landings of this fleet are tuna, Alaska pollack and other demersal resources. Alaska pollack are caught in the Pacific Northern Sea, demersals in the coasts of Las Palmas and Morocco of the Atlantic Ocean and tunas in other oceans.

Off-shore fishing is on a steady increase. With the continental shelves in the Yellow Sea and the Southern Sea of Korea, and the cold current from the Pacific Northern Sea.

Off-shore fishing areas yield not only pelagic resources but also such high-priced fish as demersals. The vessels, though small vessels of usually 10 to 150 tons, consist of purse seines, Danish seines, pair-trawlers, gill-netter and stow-netter.

Shallow sea culture for products like laver and oysters continues to be increasing. Most of laver products were exported to Japan up to 1960s but recently the domestic demand is rising and thus laver products yield larger profits to producers. And developments of techniques in oyster culture enabled the producers to export oyster to various foreign countries.

2) Consumption

Domestic consumption is steadily increasing, accounting for 71.6% of the total production 2,476 thousand M/T of 1980, whereas export accounts for the rest 28.4% which is a decrease of 11.7% from a year earlier.

The consumption trend is that with economic growth the demand for high-grade fishes and processed products is increasing. The domestic consumption of processed products account for 51.1% against 48.9% of live & fresh fish. The reasons for the increase of processed products are more demand from importing countries and preference for the products with modernization of processing methods. During 1960s such simple curing methods as salting, drying, pickling were used but in 1970s such modern processing in factory as paste-making, freezing and canning has been developed. And recently mixed feed production made from fish meal is increasing, totaling 3.5 million M/T in 1980 and the reduction has become one of the promising industries.

Prices of fishery products are rising at the rate of 46.2%, in parallel with wholesale price increase. The elasticities recently calculated by Korea Rural Economic Institute are as follows:

	Price	Income
Fishes	-0.3313	0.5323
Shells	-0.63	1.35
Sea-weeds	-0.77	1.12

3) Distribution

Distribution channels of fishery products are also more complicated in Korea than those of other products. In case of live & fresh fish, 5 or 6 stages of channels make the mark-up of 70 to 110%, retail market channel making larger proportion of mark-up.

Concerning distribution structure in Korea, fishermen sell their catch on a consignment basis to the cooperative wholesale units located up and down the coast. These wholesale cooperative auction this fish to licensed, first-hand wholesalers, or sell to them directly. These licensed wholesalers then sort, divide and sell the auctioned goods either on a commission basis or direcctly to the retail markets.

4) Major Ports

The majority of the landings are unloaded and sold in the southern and western ports, Pusan, Yosu, Gunsan, Masan, Mockpo and Samchonpo, because it is difficult to transport fresh fish to distant inland markets, especially in hot weather and these are also large population centers and a substantial amount of the landings are also unloaded at Muckho and Sockcho.

B. Current Production

In 1980, Korean fishery showed a slow growth in production. Hike of oil prices and deterioration of fishing environments in south Pacific Ocean including New Zealand affected distant waters fisheries so greatly as to record the minus growth of 9.9%

Sea culture and adjacent water fisheries grew at the rate of 24.6% and 4.8% respectively, and contributed greatly to the nation's total catch of 1980 247,600M/T which is a slight increase of 2.2% over the previous year, whereas exports of fishery products in 1980 recorded a decrease of 8.8% as compared with the previous year, remaining at US$ 854 million.

From 1960 to 1976 the total catch has been on a steady increase with rapid growth of distant waters fisheries but from 1977 the distant waters fishing has been in stagnant conditions due to proclamation of the 200 miles exclusive economic zone by major coastal countries initiated by Ec countries and the increase of operating costs by the oil shock. The yearly decreasing rates of distant waters fisheries against the total are 19.1% to 30% as shown in Table 2.

C. Export Status and Trend

Korean fishery has been continuously increasing since the first Economic Development Plan and fishery industry took a remarkable part in the nation's export performance during 1960-70's. It contributed the proportion of 12% to total export in 1960 and 11.9% in 1969 but the export portion decreased as shown in Table 1.

In the first stage of fishery export (60s and 70s), exports of distant waters fisheries showed a favorable trend, representing the half of total export of fisheries and making Korea one of the largest fishery exporting countries.

In 1979, Korean fishery export was valued at US$936 million dollars, which accounts for 6.2% of the nation's total export amounting to US$ 15,055 million dollars and 1979 export of fisheries showed an increase of 24.5% over the previous year (US$ 752 million).

1980, however, saw a decrease in export performance. 1980 exports were valued at US$ 854 million, which is a decrease of 8.8% from the previous year (US$ 936 million). The decrease was attributable to the decreased catch in the field of distant waters fisheries which were badly affected by proclamation of 200-mile fishing zone and world-wide stagnation caused by oil shock and especially the export prohibition of frozen products due to cholera.

Total fishery export valued at US$ 854 million of 1980 consisted of distant fisheries 41%, frozen products 12%, fresh fish 15%, fishing nets 11% and pickled & salted 10%. As compared with that of 1979, fresh, pickled & salted, canned and fishing nets increased but other items suffered the decrease. (Refer to Table 3)

II. Export Performance by Items and Markets

A. Export Items

Items for export in the beginning were only such several items as fresh fish, dried laver, but new products were developed, contributing to raising the export profits.

The comparision for export items Between 1962 and 1979 shows the significant difference. In 1962 fresh live fish was the major export item, representing proportion of 35.1% of the total fishery exports and other fisheries 26.9%, dried seaweeds pickled & salted 24.6% (mainly dried laver and agar-agar) and frozen products 11.2% but in 1979 tunas were major items representing 48.8% of the total and frozen 13.2%, fresh fish 12.7%, fishing nets 6.4%, canned 2.8%. Significant and notable are the change of the major export item and the increase of processed products.

Export unit prices also showed a favorable trend. US$ 0.5 average per kg in 1962 rose up to US$ 2.26 in 1979, which is an increase of 452%. Especially the price of distant waters waters fishery, rose to 1.69 from 0.27 in 1963, thus contributing greatly to the increase of fishery experts.

B. Export Markets

The steady increase of exports of fishery products has been sustaine by exploration of overseas markets. Although the major markets are still confined to Japan and U.S.A. which accounts for three-fourths of the fishery exports, the markets are now extended to nearly 100 countries (97 in 1979) including East Asia, Central Asia, Europe, Africa and Australia.

Japan is the largest market for the fishery exports representing 65.4% of the total 1979 fishery exports, followed by U.S.A. 11.1%, Spain 4.3%, Taiwan 1.4%, Iran 1.2%, Singapore, Canda, Nigeria and Italy 0.9%, Gana 0.8% and Hongkong 0.7%. Among them increasing their imports repidly are Iran, Spain, Panama, Canada, Taiwan and Netherlands. (Refer to Table 4)

C. Export Trend of Major Items and Markets

1) Fresh and Live Fish

The major market for fresh and live fish is Japan to which Red China and North Korea are also exporting some items but Korea is maintaining comparative superiority in terms of quality.

Exports of fresh and live fish are on a high increase, from US$ 50,124 in 1973 up to US$ 119,126 in 1979. Of the total value US$ 119,126, Japan accounted for 93.5%, U.S.A. for 0.3%. As compared with 1978 export records, Japan, Spain, Saudi Arabia, France are increasing their imports.

2) Frozen Products

Exports of frozen products have been increasing sharply thanks to 'instant food' age during 1970's, marking US$ 100 million in 1977. In 1979 exports of the products were valued at US$ 123,479 thousand, which is a large gain of 212% over 1975.

The major markets are Japan (86.1%) which and U.S.A. (8.3%) which represent 94% of the total export. Species-wise, cuttle fish accounted for 24%, sea eel for 16.2%, shrimp for 9.4%, etc.

3) Pickled & Salted Products

Export of pickled & salted products decreased in 1979 to US$ 19,351 thousand from US$ 23,338 thousand in 1978 due to the shortage of raw materials. Japan (84%) and U.S.A. (7.2%) were also the major markets, representing 91.2% of the total export.

4) Squid

Dried and seasoned squids have been one of major export items but from 1979 they saw a decrease of 72% in export from 1975, recording the value of US$ 9,040 thousand due to decrease of the catch and the price rise in domestic markets.

Most of the exports were processed products and the markets are mostly confined to Japan (49.8%) and Taiwan (37.5%). Taiwan is rapidly increasing their imports at the rate of 37% but Japan is decreasing at the similar rate.

Of the total export amount US$ 9,040 thousand, dried squid accounted for 83.2% and seasoned for 16.8%.

5) Dried Sea-Weeds

Exports of dried sea-weeds are on a increase, recording US$ 40,724 thousand which is a rise of 49% over the previous year.

Species-wise, salted sea mustard represented 45.4% of the 1979 total, eusiforme 23.7%, agar-agar 15.0%, laver 4.0%

6) Canned Products

Although exports of canned products represent only 3% of the total fishery export, the significance of canning industry in the national economy is great and the products are one of the promising items for export. And it is well shown in the export increase from US$ 10,224 thousand in 1975 up to US$ 25,940 thousand in 1979 which is a surprising gain of 254%.

The export items for canned products are so varied as to include oyster, Jack mussels, short necked clam, these four of which represent 80% of the total exports.

The largest market for canned products is U.S.A. which accounts for 51.9% of the 1979 total. Other markets are Japan (8.3%0, Canada (7.1%), West Germany (5.9%), etc.

7) Other Fisheries

Other fisheries are also on the increase thanks to the development of new products. The 1979 total exports were valued at US$ 61,370 thousand which represents a 3% increase over the previous year. The major items are file fish (31.2%), lug warm (20.9%), dried oyster (11.9%), dried anchovies (3.7%).

The major market it too confined to Japan (72.7%). Other markets are Hongkong (7.2%), Taiwan (5.8%), U.S.A. (4.4%).

8) Distant Waters Fisheries

Export of distant waters fisheries were on a sharp increase. US$ 625 thousand in 1963 rose up to US$ 456,509 thousand in 1979, which recordedan increase of 730 times but in 1980 there was a decrease of 8.8% from 1979 due to factors described earlier.

The major items are tunas (51.4%), demersals (48.6%). The export markets are so varied as to cover 45 countries. The major markets are Japan (63.2%) and U.S.A. (15.6%) and other markets are Spain (8.1%), Italy (1.7%), Gana (1.3%).

9) Fishing Nets

Exports of fishing nets are also on a steady increase in spite of import restrictions and the shorage of raw materials. In 1979 the exports amounted to US$ 80,455 thousand which is an increase of 30% over the previous year.

The markets cover 90 countries and the major countries are as follows: Nigeria (10%), Canada(7.9%), Bangladash (7.6%). Singapore (5.7%), Saudi Arabia (5.0%), Japan (4.6%), U.S.A. (4.3%) and Iran (4.2%).

III. Inspection System & Commodity Standards

A. Status of Inspection

Fishery Products subject to inspection in 1960s were mainly such simple processed products as dried products and sea-weeds but from 1970s such high-level processed products as frozen and canned have been increasing and 65 items subject to inspection in 1962 increased to 335 items in 1980. The major items inspected in 1980 were frozen products (66.2%), salted products (14.4%), canned (4.5%).

B. Inspection Law of Fishery Products

The law and the decree covers almost all the Korean Fishery products for export. The law consists of 22 articles and the decree of nine articles. The outline of the law is as follows:

1) Purpose (Article 1): The purpose of this law is to improve the quality and to promote fairness of the specifications.

2) Definition (A.2) "Fishery products" in this law shall mean the products which are manufactured and processed using marine animals and plants as raw materials or materials.

3) Object of the Inspection (A.3): The following items should be inspected by Director of Fisheries Inspection Center:

(1) Frozen Products
(2) Dried Products
(3) Seasoned & Processed
(4) Canned Products
(5) Bottled Products
(6) Liver oil, Fish oil (marine mammal fats included)
(7) Fish meal, Fish fetilizer
(8) Dried Sea-Weeds
(9) Agar-agar
(10)Other designated by Presidential Decree (Designated at present are fish paste, frozen products with boiled shell)

4) Contents of Inspection (A.4): Inspection shall be conducted on raw materials, quality, dryness, seasoning & processing, sorting, quantity, weight, packing and others designated by the decree by the Ministry of Agriculture and Fisheries.

5) Inspection Result (As. 6 & 7): Fishery products should show the inspection result and "Certificate of Inspection Passed" should be handed to the applicant. (A. 6) Fishery Products which failled in the inspection cannot be sold locally or exported. (A. 7)

6) Reeszmination (A.9): In the following cases reexamination should be conducted:
(1) In case the contents are in danger of alteration and packages are broken.
(2) In case sign of inspection result or certificate of inspection passed was damaged to the extent that it cannot be distinguished.
(3) In case the validity of the inspection is overdue.

7) Inspection Official (A. 14): Inspection should be conducted by government officials qualified for inspection of fishery products. The qualification for the officials shall be provided by Presidential Decree.

8) Penalty (A. 19): Violators of the following cases shall be sentenced under two years or fined under two million won (US$ 2,740).
(1) In case the products subject to inspection did not receive inspection.
(2) In case the products which did not pass the inspection are sold locally or exported.
(3) In case inspection was conducted in unjust way.
(4) In case sign of inspection passed was fabricated.

C. Inspection Standards

Inspections standards are given for all of the fishery products subject to inspection. The examples of these standards applying to some items are as follows:

1) Frozen Products
(1)Fishes
Shape: No damage or no transformation
Color: Original color or almost no alteration from the orginal
Freshness: No odor
Volatile Basic Nitrogen (VBN) should be under 25mg per 100g of sample (inspection when necessary)
Sorting: Size should be almost equal and no other thing mixed Miscellaneous: Almost nothing
Grazing: Grazing should be made to prevent rusting
Temperature: With rapid freezing the temperature in the central part should maintain under minus 18°C (but in case of tunas under minus 40°C)
Bacteria: Under 1000 per 1g of sample (inspection when necessary)
Hezard: No hazards allowed (inspection when necessary)
Packing and Inspection methods are also provided.

(2) Shell Fishes

Almost the same as frozen products above except the fresheness of 20mg

(3) Other Fishery Products

Almost the same as frozen products above except the freshenss of 50mg

2) Dried Products

(1) Laver
-The quality standards are divided into four grades: Excellent, First Grade, Second Grade, Third Grade and the quality becomes less good in proportion to the grades.
-Basic standards which apply to all grades are as follows:
Color: Original color
Shape: Length 206mm
Width 189mm
Weight: Over 225g per 1 sok (=100 pieces) in case of dried laver but over 130g in case of conventional lavers
Dryness: Seasoned Laver; water contents under 5%
Dried Laver; water contents under 15%
Other conditions are also provided but omitted here.

(2) Dried Squid
Dryness: Water contents under 20%
Shape: The back should be shaped like an isosceles triangle
Weight: Large; over 800g
Medium; 36-42cm
Small; 27-36cm
Small & small; under 27cm
Dryness: Water contents under 24%
Standards and methods of packing are provided in the attached sheet of the law.

D. Problems

Strenthening of inspection regulations is required for mass, speedy and fair transaction in the domestic market and further for the sound development of the fishery industry, making the export expansion possible.

Pocessed products such as canned, frozen can be checked accurately in terms of quality and amounts supplied, but in case of the products made from simple processing, such as paste, pickling, salting and drying, checking the quality and amounts supplied is not done accurataly because they are not processed automatically and inspection of the quality is only applied to the exports.

IV. Import of Fisheries

Import of fisheries for domestic demand was completely prohibited until 1977 but improvement of diet pattern affected by economic growth has created great demand for fisheries. So in order to stabilize the rising prices and to increase exports of processed fishery products restricted import of general species was allowed in 1978.

Import for domestic demand in 1979 was estimated at 18,985 M/T and import of raw materials for processed exports at 30,418 M/T. From 1980, however, import for domestic demand has been prohibited mainly for protection of adjacent waters fisheries.

V. Suggestions

Export played the role of engine for Korea's economic growth for the past 20 years. Export-oriented policy was most suitable for economic conditions of sufficient human resources but insufficient capital and scarce resources.

Export of fishery products, whose proportion in total export amount is small but whose profitability is substantial, should be developed steadily to make maximum use of sufficient marine and human resources, to make best use of capital available and eventually to increase the national income.

Korean fishery industry, however, is facing difficulties. It is due to not only such overseas factors as 200-mile exclusive fishing zone,payment of fishing fee and fish catch quota but also such domestic factors as fluctuation in fishing resources, lack of storage facilities, inelasticity of demand and small-scale management of fishing industries.

In addition, increase of operating costs due to first and second oil shocks is darkening the propects for the future of fishery industries. Another seious matter is ocean pollution by which the fishing activities are restricted to the extent.

Accordingly, the core of the problem in the steady increase of export of fishery products becomes the weakness of the international (export) competiveness. To strenthen the weakening export competiveness, the factors involved in the price and non-price competition should be checked and improved.

Therefore, the following overall approach to the whole range of fisheries should first come:

A. Overall Approach

The overall approach which aims at full supply of domestic demand at reasonable prices and steady export increase can be outlined as follows;

1) For Development of Adjacent Waters Fishing
a) Protection of fishery resources
b) Development of sea culture field

c) Improvement of fishing facilities; modernization of fishing vessels especially in tonnage

2) For Development of Distant Waters fishing
a) Fishery agreement for fishing in exclusive coastal zones
b) Negotiation for further catch quota
c) Further development of joint ventures
d) Exploration of new fishing areas
e) Rationalization of fishery management of the industries

3) Improvement of Distribution Channels
a) Centralization of consignment markets in coastal areas
b) Strengthening of wholesale cooperatives market system on inland areas and marketing process
c) Improvement of processing rate and packing with strengthened inspection
d) Establishment of processing complex and systemazation of distribution channels
e) Stabilization of the fish prices; more storing with price stabilization fund and supply of distant waters fisheries to local markets

B. Strategy for Export Expansion

The overall approach to make steady development of adjacent (sea culture) and distant waters fishing and improvement of distribution channels should be continuously pursued and successfully progressed and it will surely strenthen the export competitiveness in terms of price and non-price competition.

In parallel with the overall approach, the following specific strategy should be pursued for steady export increase:

1) To strenthen price competitiveness
a) Stepping-up of labor productivity
b) More facilities for storage
c) Realization of economy of scale and unification of export channels by products
d) Curtailment of domestic inflation

2) To strengthen non-price competitiveness
a) Diversification of markets; too confined to Japan and U.S.A. (74% of the total)
b) Selective export by items; fisheries with small dometic demand, high-priced fishes and processed products with high export profitability should be exported
c) Increase of processed products; by continuously allowing the import of raw materials and improvement of quality
d) Efforts to make I.Q.(Import Quota) Items of Japan liberalized; the items represent 10% of total export to Japan and 10% higher tariff rates applied to I.Q. items.
e) Strengthening of inspection system; for quality improvement inspection should be thoroughly conducted on domestic-oriented items.

APPENDIX

General Index

Table 1

	Unit	1976	1977	1978	1979	1980
Added Value	Billion Won (constant 75)	239.47	252.99	213.72	222.75	226.98
(Against GNP)	(%)	2.1	2.0	1.5	1.5	1.6
Total Catch	thousand M/T	2,047	2,421	2,354	2,422	2,476
Processed Total	"	247	242	303	315	365
Fishing Fleet	" G/T "(Vessels)	662 66	683 66	756 70	753 75	771 78
Rate of Powered vessels	% (tonnage)	91.4	93.2	94.3	95.8	96.1
Tonnage per vessel	G/T	10.26	10.30	10.75	10.10	9.94
Export performance	US$ millon	567	703	752	936	854
Fishery export/total export	(%)	7.0	6.7	5.9	6.2	4.9
Wholesale price Index	1975=100	112.1	122.2	136.5	162.1	225.2
Price Index of Fishery Products	1975=100	125.1	177.3	217.0	285.1	358.4

Sources: Office of Fishery Administration, the Ministry of Commerce & Industry, The Bank of Korea 1981.

Table 2

Catch Trend by sectors 1)

Unit: Thousand M/T

	1976	1977	1978	1979	1980
Adejacent Waters	839 (34.9)	812 (33.5)	837 (35.6)	879 (36.3)	813 (32.8)
Sea Culture 2)	426 (17.7)	517 (21.4)	424 (18.0)	522 (21.5)	587 (23.7)
Off-Shore Waters3)	418 (17.4)	496 (20.5)	526 (22.3)	525 (22.1)	603 (24.4)
Distant Waters	724 (30.0)	596 (24.6)	566 (24.1)	486 (20.1)	473 (19.1)
Total	2,407 (100.0)	2,421 (100.0)	2,354 (100.0)	2,422 (100.0)	2,476 (100.0)

Fishery Export Performance

Table 3

Unit : US$ Thousand

Item / Year	Live & Fresh Fish	Frozen	Squid	Pickled & Salted	Canned	Agar-agar	Sea-weeds	Laver	Distant waters Fisheries	Other Fisher-ies	Fishing Nets	Total
1970	11,353	5,994	10,335	1,566	375	1,227	1,525	11,592	37,663	1,109	7,313	90,052
1971	18,217	8,001	9,361	2,629	1,885	1,171	2,678	4,479	55,103	2,074	9,113	114,981
1972	27,306	12,510	11,435	4,554	5,006	1,731	3,234	3,223	68,032	5,382	10,091	152,564
1973	50,124	32,300	22,918	17,701	8,229	3,361	5,709	10,244	79,749	11,402	18,221	260,021
1974	60,507	35,183	23,995	8,424	9,748	6,302	7,674	1,953	90,246	16,279	30,629	290,940
1975	62,412	58,411	31,976	14,577	10,224	4,555	9,092	1,392	183,413	22,549	30,141	428,742
1976	76,797	80,764	25,588	19,236	14,555	4,681	18,779	1,136	262,546	29,029	34,297	567,408
1977	90,470	10,010	12,828	15,599	33,542	5,054	24,104	2,522	313,487	47,935	48,522	703,073
1978	111,955	120,326	10,695	23,338	42,443	-	27,412	-	294,674	59,479	61,682	752,004
1979	119,126	123,479	9,040	19,351	25,940	-	40,724	-	456,509	61,370	80,455	935,994
1980	128,338	102,653	-	85,506	28,230	-	-	-	351,865	69,932	93,388	852,912

Source: Central Cooperatives of Fishery Industries, 1981.

*1) ( )indicates the rate cf composition
2) In land fisheries included
3) Whaling fishing included

Source: Office of Fishery Administration 1981.

Yearly Export by major countries

Table 4

Unit: US$ Thousand

	1975	1976	1977	1978	1979	Comparison 79/78	Composition (%)
Total	428,747	567,408	703,073	752,004	935,994	124	100
Japan	267,096	346,441	461,026	456,509	612,315	134	65.4
America	38,630	73,293	95,284	119,328	103,669	87	11.1
Spain	33,373	48,866	24,855	19,705	40,024	203	4.3
Free China	8,546	14,303	13,522	15,696	12,680	81	1.4
Italy	4,657	3,732	7,486	10,668	7,969	75	0.9
Iran	4,020	3,624	9,491	9,774	11,414	117	1.2
Canade	2,241	3,784	6,571	8,906	8,502	95	0.9
Singapore	3,357	2,765	4,777	8,158	8,734	107	0.9
Gana	3,294	2,447	4,276	7,289	7,447	102	0.8
Hong Kong	5,716	6,504	8,719	6,578	6,998	106	0.7
Australia	1,284	2,472	4,565	5,377	4,322	80	0.5
Morisus	393	2,274	3,999	4,225	3,908	92	0.4
Kenya	3,259	1,581	1,581	3,636	1,099	30	0.1
Nigeria	6,277	6,003	4,842	3,622	8,079	223	0.9
West Germany	2,460	2,956	2,690	2,720	2,238	82	0.2
Netherlands	2,863	2,284	1,453	2,586	4,872	188	0.5
Panama	3,028	3,761	1,844	2,501	3,135	125	0.3
Others	38,254	40,318	46,052	64,726	88,589	137	9.5

Source: Office of Fishery Administration

European Seafood Markets

Selected European Seafood Markets

Robert E. Dignon
Northern Products Corporation
Seattle, Washington, USA

I consider it a real privilege to be permitted to speak before you people at this International Seafood Conference here in Anchorage.

I have my own company, Northern Products Corporation, and have been in the seafood trade business since 1935. When I started with Northern Products Corporation in 1935 our main item of trade was mildcured salmon. We also handled frozen salmon but at that period of time mildcured salmon was our principal product of export to the countries of Western Europe, principally Germany.

At that time when Hitler was in power in Germany, through one of his trade ministers the German government invoked the barter system. This turned our to be a very complicated method of trade and in Northern Product's case we went so far as taking Deutz Diesel engines in exchange for salmon. However, we could not sell enough Deutz engines to permit any substantial trade of salmon so we had to go out and secure barter permits. All in all the barter system as I found out in the very beginning of my trading, was very cumbersome, complicated and inefficient. This system may be all right for trading for countries on a one to one basis by the nations, but certainly not in everyday trade relations involving hundreds of companies. I hope the free world will never have to resort to this method of balancing payments, you might say, to carry on international trade.

In my years of experience in the salmon business there have been many surprises, so to speak, and interesting situations developed. There were two I would like to recall at this time. One was at the outset of World War II and the other very recently.

In September of 1939 just prior to the outbreak of World War II, we made a large shipment of mildcured salmon from Vancouver, B.C., for Hamburg, Germany discharge. While the shipment was en route down the

Pacific Coast World War II started and this vessel, as I recall the name was TACOMA, was diverted to South America and used as a supply ship for the German cruiser GRAF SPEE. The mildcured salmon we had on board was unloaded at Buenos Aires, Argentina prior to the ship being activated as a supply ship. We finally were able to ship from Argentina under refrigeration this cargo of mildcured salmon to New York, NY. Due to the outbreak of World War II and the closure of European markets the mildcured salmon market in New York was very flat so we finally decided to ship this entire quantity to Norway. The shipment arrived in Oslo about a week before the Germans invaded Norway. Of course we had not been paid for this salmon and we did not get paid until World War II ended five years later.

The most recent incident I have in mind was a shipment we made recently to Italy on Sight Draft terms. While the shipment was en route we were notified that the bank on which we had drawn this draft, Banco Ambrosiano in Italy, had gone under. We were very much concerned that we might not get paid for this shipment but fortunately we got the money just about four days ago.

In recent years the trade in frozen salmon, especially from the Pacific Coast to Europe, has become a major item of commerce. In fact, the Japanese are now our largest buyers of salmon, salmon roe, herring roe, crab and shrimp.

This recent trade with Japan and also Europe has resulted in more and more processing plants being built, especially freezer ships, and also more and more catcher vessels. In fact the fishery has become so important that the State of Alaska, for example, has had to evolve a licensing system for trolling vessels, gillnetters and purse seiners.

Furthermore, along the coasts of Oregon, Washington and California the various state governments with the federal government have had to curtail drastically the number of days the trollers can fish in certain areas. For example, just this past season the trolling season for silver salmon off the lower Washington Coast only lasted 6 days. The states of Washington and Oregon had allocated a quota of 89,000 silvers to be commercially caught by trollers between Cape Ledbetter in Washington to the Canadian border the quota was 216,000 silvers, which were caught in about 19 days. All in all, the shortest fishing season for salmon trollers, especially for silvers, in history. The trollers are very disgruntled over this severe closure as their income has been drastically limited.

In Alaska a quota of 255,000 troll kings was allocated for southeastern Alaska. This was a sharp reduction from the previous year's quota and this was the third year in which a quota system had been used for the southeastern Alaska trollers.

These allocated and short seasons were primarily intended for the benefit of the Columbia River Indians who claimed that they were not getting their share of the salmon that normally enters the Columbia River system. These curtailed seasons have created a very difficult marketing situation for us this year as the supply from these specific regions has been drastically reduced. However, the Canadian province of British Columbia has had no such restrictions and we understand their catch is slightly above normal to date. Furthermore the Canadian dollar is at a 20 to 24 percent discount in comparison to the

U.S. dollar so that we in the U.S. are facing a very difficult problem of competition from our Canadian competitors in our sales to Europe.

Another severe problem we have had this year in exporting seafood products is the strong U.S. dollar. France is one of our major importers, especially of frozen troll caught silvers and king salmon. Two years ago the French franc was four to the dollar, now it is over seven francs to the dollar. Naturally this has made it difficult for many of our French buyers to purchase in their noraml manner.

In addition to these factors probably one of the most pressing problems in the future will be the competition we will be facing from Norwegian farm salmon. Over the past 10 or 12 years in conjunction with the Norwegian government the Norwegian people have developed a crash program, you might say, of developing a very excellent method of growing salmon in their fjords. Their technology has enabled them to grow salmon of excellent quality, desirable sizes, fine fat content, that has been accepted in the very finest restaurants in Europe and also here in the U.S., plus finding more and more acceptance in smoked fish processing plants in Europe. The production of this farm salmon has grown by leaps and bounds in recent years. Last year over 8,000 tons were marketed, this year of 1982 it is expected that between 12,000 and 15,000 tons may be marketed. Some are predicting that by late 1980 or in the early 1990s the Norwegian farm salmon system may be able to produce up to 50,000 tons. If this figure should ever be reached we will have great difficulties in marketing our Pacific Coast salmon unless we can find a greater diversification of markets at lower prices.

As you may gather from my remarks the export trade of one of our major commodities, salmon, is like other businesses, some ups and downs, and a person has to be very alert to changing conditions in order to stay alive in this fast moving world.

World Tuna Market(s) America and Western Europe: New International Division of Labor and Market Crisis

Denez L'Hostis
College de France
Concarneau, France

The World Tuna Fishery - General Background

In 1980, the world catch of tunas and tuna-like fish was about 2.5 million tons, consisting primarily of skipjack, yellowfin, albacore (white meat) big-eye and bluefin. About 1.7 million were taken in the entire Pacific. About 450 thousand tons come out of the Atlantic Ocean and 150 thousand tons out of the Indian Ocean. The two prime species caught are the skipjack, around 50-700 thousand tons per year and the yellowfin with 500 thousand tons.

On a world basis, about 1.5 million are taken by only six countries: Japan is the leading nation with around 700-800 thousand tons a year. The United States is second with 200-250 thousand metric tons, followed by South Korea and Taiwan at 125 thousand tons. Spain and France fish about 100 thousand tons per year.

These fish are caught in varying quantities throughout all the tropical and temperate waters of the major oceans, primarily between 30° north and 30° south latitudes. All the major commercial species are highly migratory fish.

There are two scientific management bodies, one in the Eastern Pacific, the Inter American Tropical Tuna Commission (IATTC), and the other in the Atlantic Ocean, the International Commission for the conservation of Atlantic tunas. It has been a crisis situation for years now in tuna management in the Eastern Pacific. The Latin nations, led primarily by Mexico and Costa Rica, are trying to renegotiate the IATTC convention: they want to establish their ownership rights to all tunas taken within the EE zone. The U.S. point of view is of course quite the opposite: they have developed the fishery and the technology and they have historic rights in the Eastern Pacific. The U.S. position is that the fish which is highly migratory should be available to whoever can catch them. Because the fishery is over capitalized, additional fishing effort must be controlled.

Yellowfin stocks in the ocean appear to be overexploited. Skipjack could support to some extent greater sustained efforts.

The world tuna fishery has been expanding continuously during the last half century, mostly in response to a steady growth in demand. Its expansion has been made possible by technological progress in fishing techniques and by the availability of tuna stocks around the world.

Developing countries, drawing on low cost labor (Taiwan, South Korea) and sometimes on low cost energy (Mexico) are still expanding their scope of operations.

The International Trade

Fresh tuna is of little importance in international trade. Most tuna traded on international markets is in a raw frozen condition. Some cooked loins, canned tuna and dried tuna are marketed internationally, but the tonnage is limited.

Frozen raw tuna, a staple commodity, has relatively free access to the principal world markets, compared to canned tuna, restricted as a result of national trade barriers, economic conditions and local eating habits.

For example, imports of canned tuna in oil; the leading item in the U.S. market, are restricted by a 35% ad valorem duty. Imports of canned tuna in brine have a 6% ad valorem duty and are controlled by an annual quota.

In the USA, in 1981 there were embargoes on tuna imports from seven countries, namely Spain, Peru, Costa Rica, Senegal, Congo, Mexico and Ecuador. Some of the embargoes were imposed under the term of the Marine Mammal Protection Act, others were based on seizures of U.S. tuna boats under 200 mile limits of individual foreign countries.

The pricing process

The trends in frozen raw tuna prices in the U.S., Japan and Western Europe are very similar. The landed U.S. price is generally a good indicator of world market prices for frozen tuna, such as frozen skipjack in Japan.

There are only three consuming areas in the world: the USA, Japan and Western Europe. The U.S. is the largest consumer, with a final demand equivalent of 700 thousand tons of raw tuna, practically all in canned form.

Japan, the second consumer, is around 450 thousand tons, consuming it in fresh or frozen form.

There are three big markets in Western Europe: Spain, Italy and France with a final domestic demand each between 60,000 tons and 100,000 tons.

But today, the major problems come from the international situation of the final demand, depending dramatically from the status of the U.S.

tuna industry and market. In fact, only a few fishing nations, traditional and a few new entrants are trying to satisfy the final world demand.

In 1981, the world wide tuna industry has been reporting to have had excellent catches, weak markets and high inventories, resulting in 1982 in a collapse of the market in the USA.

The role of big multinational tuna companies (parts of food groups), mostly U.S., or Japanese is growing in their drive to try to regulate the periodical inadequacy between supply and demand.

Western Europe - The World's Third Largest Tuna Market

The principle producing countries are Spain (100,000 T) and France (70,000 T). The other countries have neither tuna fishing fleets nor tuna packing facilities, except Italy. This country has a large tuna canning industry, but relies almost entirely on imports of raw frozen tuna (80,000 T).

Canned tuna consumption is still rising in Western Europe, mostly in the canned form. The Japanese, who had been primary exporters of frozen and canned tuna to Europe have lost their dominance. New competitors, besides Spain and France themselves, are Taiwan, the Philippines and some developing countries associated with the EEC.

All EEC countries maintain the same tariff rates on products from non-EEC nations. Fresh frozen tuna intended for further processing enters the EEC duty free, but is subject to a "reference-price" (minimum import price).

Fresh/frozen tuna entering the EEC is subject to a 22 percent ad valorem duty, when not used for further processing. Canned products draw a 24% ad valorem duty. In some cases there are restricting quotas for imported canned tuna.

Each of the major tuna domestic markets in Western Europe show market characteristics which are unique (national or local preferences and tastes for certain species of tuna and condiments and additives).

Prices in Europe are a reflection of the price trends in the USA more than those of Japan, but prices of canned tuna on the shelves are higher than in the United States.

The growth of the tuna fleets of France and Spain has led to a substantial increase of the share of domestic supply of raw material.

The immediate outlook is fairly optimistic compared with the U.S. market. The major opportunities lie with low priced and relatively low quality canned tuna in West Germany and in Great Britain.

The tuna market inside the EEC is protected through three means:

1. The existence of a reference price calculated on the basis of frontier-prices of the previous three years. Under this price, the exports of third nations can bear taxes.

2. A European processing price.

3. A safety clause in case of deep crisis. Thus, in 1975, all the tuna imports for further canning had been prohibited.

The French market

France has a large tuna fleet of modern purse seiners, which produces more tonnage than can be processed and marketed domestically. The surplus of raw frozen tuna is sold on the world market, mostly to the USA (sold with annual contracts between U.S. canner(s) and SOVETCO) and Italy. French purse seiners fish mostly off the coast of West Africa (in 22 EE zones!) and usually transship their fish at Dakar or Abidjan to "African" financially controlled canneries or to canneries in France, Italy and Puerto Rico. (Senegal and Ivory Coast production have duty free access to the French market). Frozen tuna for direct canning or for export is handled exclusively by the national privately owned central agency called SOVETCO. The French tuna market mechanics obey the so-called "administration guidance," where many industrial aspects defined by the French administration are quasi-informal. SAUPIQUET is the leading company with 40% of the final canned tuna market.

Tuna makes up 30% of the total French canned fish consumption, 95% of the total catch being used by canneries which number 31. The preferred canned tuna pack is in brine (59%) and in oil (26%).

The total supply of tuna is a function of three important phenomena:

1. The decrease of the supply by "small-scale," artisanal fisheries.

2. The geographical diversification of the sources of supply.

3. The foreign investment in joint ventures, both in fleet and canneries.

The national production of canned tuna is decreasing in favor of African canned tuna (50%).

The future of the French tuna industry is linked to two major conditions:

1. The security of the supply that can be assumed by redeploying the fleet activities (Indian Ocean and South Pacific).

2. The restructuration of the processing industry, today much too scattered and in a weak position in front of new entrants (Star Kist) and the concentrated large scale distribution.

The Spanish market

Spain is now Europe's largest tuna producing nation, fishing primarily in the Atlantic Ocean. The Spanish have developed a sizeable tuna export trade:

1. For frozen tuna to Italy and Puerto Rico. The Canarian Islands play an important role in this trade (Japanese, Taiwanese and Cuban longline fleet).

2. For canned tuna to Libya.

The domestic market is rather well protected: the preferred species is locally caught albacore and the preferred tuna pack is in oil (75% of the final consumption). The industry shows no real leader, except three major firms. The final distribution still relies on numerous small retailers.

In the future, the entrance of Spain into the EEC may be profitable for the tuna industry, because of the following factors:

1. Competitive fishing and processing labor costs.

2. Access to new grounds of catching, negotiated by the EEC commision.

3. Quality of many items.

4. Opening of the duty free EEC market.

The West German market

West Germany imports all its tuna products (in the canned form: 15,000 T). The primary foreign supplier is Taiwan (2/3). Importers or brokers handle the majority of all canned tuna imports, and sell to a central purchasing organization which supplies local wholesalers and retailers. The Japanese items are present in the catering sector.

The preferred canned pack is in oil or dressing. Sales are sensitive to shifting prices (there is no brand leader).

The United Kingdom market

Annual consumption of canned tuna, totally imported, is about 10,000 tons. The major importer, John West Foods of the Unilever group, handles more than 50% of the canned tuna imports. The major suppliers are Japan (35%), Ivory Coast and Fiji and emerging developing countries. The imported pack is generally in oil.

The Italian market

Italy is importing roughly 80,000 tons of frozen tuna per year, from countries such as Spain, France, South Korea and the Ivory Coast. Most canners buy through agents or brokerage firms. The primary fish desired for canning is yellowfin, which is mostly packed in olive oil.

The four major companies represent 55% of the final market. They are: TRINITY-ALIM, MAZZOLA IGINO, STAR, PALMERA. There are dozens of retail brands, with high loyalty. Heavily promoted, high priced brands of good quality tuna account for 75% of the market. Most canned food sales are still made through a very large number of small retailers.

The U.S. Tuna Industry

The purse-seine fleet

To reduce the uncertainty due to the possibility of market induced supply shortages, most large food processors have been involved in fishing operations. You have to keep in mind there is a major investment in the national distribution system, and processors need reliable supply.

Since tuna fishing is pretty risky, most of the financial lending institutions are rather reluctant to lend money to an independent skipper who wants to buy a new seiner of about $12 million. If a processor can provide the financial backing necessary for this independent skipper to buy a new boat, it is very likely that a fisherman will be willing to contract his catch to that processor. The canners can offer a wide range of financial and contractual arrangements.

There is a very limited pool of talented skippers with successful fishing capability in both the Eastern tropical Pacific and in the Eastern Atlantic.

"In general it looks as if that" is "the way the processors had found to compete for raw tuna: by competing for skippers" (1).

The power of the skippers through the ATSA (American Tuna Sales Association) seems limited when negotiating prices: the fishermen is a price taker and not a price maker.

The U.S. catches are essentially taken in international waters or in the Economic Exclusive zones of foreign countries (95% of the total catch). During the past decade the Pacific catches accounted for 92% of the total. The Eastern Pacific is still the major zone of fishing for the U.S. fleet (170,000 T in 1980). However, since 1978, the conservation policy has effectively disappeared: the decline of the fishery has become a reality (catches and yield) and the yellowfin stock has been overexploited. Because of this considerable international pressure on the stocks, the U.S. vessels have had to move to the Western Pacific. An enormous supply of skipjack tuna has resulted in expansion of canning operations in American Samoa.

The U.S. tuna canning industry

About 40% of the tuna used by the U.S. canners is caught "domestically" by the U.S. fleet. Imports of frozen tuna represent more than 300,000 tons (2) (50%) and the rest is imports of canned tuna (10%). The U.S. is the largest buyer of tuna in the international market. Japan was in 1981 the major supplier of raw tuna with 18% of the total, followed by the Philippines (9%), France, and Papua New Guinea.

Imported canned tuna is subjected to a substantial duty of 35 or 45% ad valorem when in oil, and tuna in oil used to be the major product in the U.S. Imported canned tuna in brine has a duty of 6% when inside a quota (20% of the national pack) and 12.5% outside the quota.

The mechanics of the market and the U.S. final demand

The United States represents about 40-45% of the utilization of the world tuna catch, with an annual per capita consumption of about three Kgs (live weight equivalent).

Eighty percent of the world catch of albacore is consumed in the U.S. Albacore commands the highest price of all tunas because of its high yield and consumer preference for white meat.

Tuna accounts for nearly 70% of the canned seafood sold in the U.S. It is consumed in some 86% of U.S. households. Decades of pervasive sales promotion have boosted the tuna industry, along with the magnitude of the catch, the year-round character of the fishery, vertical integration monitored by big companies, permitting through high capital investments constant modernization of the technologies involved in harvesting, processing and marketing. Moreover, intense competition has forced innovation and kept prices low. The companies are supported by the Tuna Research Foundation which has developed a fine industry food publicity program.

There are two main types of marketing systems and distribution procedures: the broker system and the processor-owned marketing system. Some processors use both systems. Most canned tuna used to be sold through the food broker system until 1981.

Retail sales are made through two different marketing "procedures": private label and advertiser's or processor's national brands. Private label business is generally an operation with lower margins and lower label loyalty. Name brands usually sell at slightly higher prices than private label brands.

The institutional trade, including imports, makes up 15 to 20 percent of the total market (the primary institutional pack is the 66 1/2 ounce (1.88 Kg) can referred to as the four-pound tin. About 80% of the tuna packed for institutional consumption is light meat, domestic and foreign caught fish (Japan and Ecuador).

The largest segment of the U.S. tuna market is the household consumer, accounting for about 25 to 30 million standard cases each year. The preferred pack is the light meat, chunk style in soya oil, with a shift towards canned tuna not in oil. The most popular can size is 6 1/2 ounces, or about 200 g.

Although it is a quasi oligopolistic industry, competition at the retail level is very fierce (there are 200 or so different brands of canned tuna on the retail shelves). With Lent being a traditional heavy sales season, companies are offering hefty discounts to supermarkets. For example, canners have been giving heavier promotional allowances in 1981 up to $13.00 a case for domestic chunk light tuna and $6.00 a case for domestic solid white, compared with allowances of $4.00 to $10.00 in 1980.

Consumer purchases of canned tuna are particularly sensitive to price relationships between tuna and its substitutes, such as other seafoods, beef and poultry. This characteristic makes prognostication difficult.

The cross price elasticity of tuna with its substitutes has yet to be proven, according to certain academic sources. In 1969, Dr. Bell in a prospective analysis was proposing the following world demand function for tuna products:

$$\frac{C}{N} = f\left(\frac{P_T}{P_W}, \frac{Y/P_C}{N}, \frac{P_S}{P_W}, \frac{M,f,p}{P_C}\right)$$

Where C = total consumption of tuna
N = population
Y = aggregated revenue in \$
P_T = wholesale price for tuna
P_W = wholesale price index
P_S = wholesale price for salmon
P_C = final consumption price index
$P_{M,F,P}$ = consumption price index for meat, fish and poultry

Today, the market growth seems limited, confined to the additional needs generated by population increases.

In the USA there are two large food processors which account for about 60% of the overall supply:

Heinz - Star Kist

&

Ralston Purina - Van Camp

and the rest is scattered among a couple of smaller companies.

Star Kist is today the leading company in the U.S. and world market. Its market share was 35% in March 1982, compared with 27.5% in 1980. The company's goals in 1982 are oriented in three directions:

1. To reduce or stabilize the unit cost of raw material.

2. To optimize permanently the volume of inventories of final product.

3. To implement its Western European markets.

A Worldwide Tuna Glut

Seafood sales have been very flat during the first half of the year in the USA, leading to a layoff of almost 6,000 workers in two of the biggest companies alone. In fact, this industry that kept 2,400 U.S. tuna fishermen employed and pumped \$650 million a year into the U.S. economy has run aground.

In addition to foreign competition who sell their catch to Puerto Rico and Samoa, fishermen are being squeezed by the sky-rocketing prices of energy and recurring boat seizures in territorial disputes by developing nations, which enforce a 200 mile limit which the U.S. does not recognize. Congress reimburses fishermen for fines and penalties, but not fishing time and confiscated cargo. Boat owners and fishermen are caught between the tuna glut and rising operating costs. Foreign competition (too many boats, too many plants) and overabundance of American beef and chicken do not help at all.

Inventories had swollen and capacity utilization had dropped sharply. The Bumble Bee tuna cannery (45,000 tons of canned tuna in 1981) was closed in May for an indefinite time. Star Kist, the nation's largest canner, closed for three weeks all three of its canneries at Terminal

Island, American Samoa and Mayaguez, idling more than 5,300 workers. Star Kist has been asking for deep cuts in frozen tuna prices: offering for example $975 per ton for prime yellow tuna instead of $1,200 a few months before.

All the U.S. tuna firms belong to large multinational food companies, a situation which has never prevented wrong decisions! These wrong decisions seem to be due to some general characteristics of the seafood industry:

1. It is a world market for raw and canned tuna.

2. It is a very speculative business.

The scrutiny of the future of the tuna market does not seem obvious with big U.S. companies.

The investment decision for shipbuilding concerns sophisticated $10 million boats, the life of which is at least 10 years. On the other hand, the market prognoses are very difficult in the mid-term run (one year) in the USA.

For example, the closure of the Bumble Bee plant in California takes place two and a half years after the purchasing of the plant from Sun Harbor Industries, the tuna-canning arm of the bankrupt West Gate California Corporation once headed by C. Arnhold Smith. This purchase was part of an expansion program designed to broaden the company Castle and Cooke's acquisitions in order to sustain earnings even if one of its product lines fell on hard times.

The decision to create a tuna venture with Mexico has been blamed a few months later on Van Camp by the parent company Ralston Purina.

One month before temporarily closing its plant, Star Kist came to an agreement with SOVETCO in France to buy as much frozen tuna from Africa as SOVETCO could forward. According to one Star Kist vice-president, there are "three ways to get this industry back on its feet." "One is to pray. The second is to catch tuna world-wide. The third is to get a higher consumption of canned tuna."

Among the woes the U.S. tuna industry is facing is legislation proposed by an eastern senator primarily to protect Atlantic coast tuna fishermen. This senator is leading a move to amend national law to include migratory tuna within the country's 200 mile zone.

Today, the strategical priorities for the U.S. companies which have not definitely closed their plants is to wait for the reopening of the U.S. market. The urge for raw tuna is no longer the matter, the world supply being fair at cheaper prices than in the USA.

The U.S. companies have oriented their processing investments outside the U.S. continent to better cope with production costs, (labor costs, fuel costs) and to be closer to the resource. This explains the volume of investments realized in the Western Pacific in recent years. Is it the beginning of the dismantling of the California tuna industry? Is this state becoming a distribution center, and the packing going on in Puerto Rico and American Samoa?

The 1982 U.S. crisis seems as hard as in 1975, however the Western European industry resistance is higher. The strategy for European companies looks different from that of the U.S.: they want to protect their national market and eventually try to increase their exports of tuna in raw, frozen and canned form. Their priority is still resource access, compared with Star Kist's will to expand its market, mostly in Western Europe.

International Division and Regulation of Markets

We cannot analyze the world seafood market and especially the world tuna market without taking into account the behavior of multinational companies. This analysis leads us to choose a concept of International Division of Labor (3) which is not only limited to international trade, but contains the industrial dimension.

As in other numerous economic sectors, along with the energy crisis, two principal phenomena have emerged in recent years.

1. On the one hand, the rapid increase of harvesting and exporting (frozen and canned items) from developing countries.

2. On the other hand, the structural change of the relative powers among the industrial countries and companies.

Three different approaches of the IDL can be distinguished today:

1. The international approach

2. The polar approach

3. The transnational approach

The international approach is only prolonging the conventional analysis of the IDL (comparative costs, international specializations, ...). It tries to emphasize new major aspects.

The decision to create "domestic" industries has become a reality in the developing countries.

Above all, the transnational firms are a menace for the industrial countries, caught between competitive multinational companies and new young industries in the third world.

The polar approach concerns the detection of one or many dominating poles of the world economy, through economic or political geography. In that case the IDL is the mirror of the interrelationships of the forces in the world. From there originate different scenarii of the new IDL, the origin of which is fundamentally geo-political.

The concept of "world economy" announces the end of the crisis after a geographical shift of the world powers. After the domination of London, then New York City, comes the era of the Pacific zone, because this zone welcomes the most impressive and dynamic transnational firms, and represents one of the most important industrial growth.

Two consequences occur: the capitalist system is solving the crisis by moving its center: The old center is going to proletarianize.

Two inadequacies occur: one is to only foresee a geographic solution for the crisis, minimizing the analysis of the deep economic causes of the world industrial crisis; second is to underanalyze the resistance capacity of the industrial countries dominating the IDL, mostly through their national transnational companies.

The transnational approach is stressing the role of the multinational corporations. They are considered to be the major factor in the distribution of the industrial activities in the world. The industrialization of the underdeveloped countries is only a new stage of competition between the multinational companies. Many authors think that it is a sham question to talk about new International Division. Must we then create the concept of world division interfirm (and intra-firm) instead of IDL?

This situation results in the shift of the comparative advantages of the industrialized countries towards the high technological industries with the menace of deindustrialization for some developed countries (such as France in the canned industry).

The big multinational companies have not succeeded in creating a unique market for final tuna products. Yet, they play a very important role in the orientation of the world marketing and pricing of raw frozen tuna. Competition in this oligopsonistic market is based on prices more than on species or on quality.

The international business strategies are changing: For the resource towards the South-West Pacific by widening the first level geographical market and for the markets towards Western Europe. This world market is still typical of a north-south division: resource "belongs" mostly to the south, technology and markets are located in the north. However, in recent years new developing countries have emerged, with the support of transnational corporations (processors or traders). This emergence cannot allow us to be very optimistic as to the monitoring or control of the world market. Competition is keen between these new tuna fishing nations and traditional fishing countries.

For all these principal investors, there is an important gap between expectations on market conditions, limited in the short term, which are affected by exogenous variables, and the expectations of the fish stocks and consequently ship-building decisions.

If there is a kind of homogenization of the tuna world market, the regional disparities are nevertheless important. In fact, the canned tuna world market does not operate under free trade conditions.

Comparatively, all these analyses come to the same conclusion: with the widening of the world tuna industry, increasing risk and uncertainty due to:

1. The evolution of the final world demand for seafood.

2. The cost of raw material and energy.

3. The fluctuation of currency-rates.

4. The strategies of competitive nations and companies.

The response to the issues raised herein may be: either the endeavor to create new collusions solutions between firms, or state and national multinational firms and/or can we or must we promote a partial institutionalization of international relations in the seafood market in order to limit the market aberrations and collapses?

Footnotes

(1) King, Dennis. Transient Tropical Tuna, Status of the Fishing Industry, San Diego State University 1978.

(2) Round weight equivalent.

(3) Defined as the allocation of economic activities between regions.

Price Instability and European Market Channels for Fresh Mussels (*Mytilus Edulis*)

Jos G.P. Smit and Wil Smit
Department of Fisheries and Forestry
The Hague, Netherlands

Fresh fish trade (including crustaceans and molluscs) usually possess certain elements that define extent and structure of its market. One of them is that we deal with a perishable product. As each species may possess an individual characteristic period in which trade and consumption have to be completed it is nevertheless a common constraint for the industry. As a case-study the European fresh mussel market will be presented, a market in which sufficient elements common to the present European fresh fish trade in general can be recognized. On the other hand it may show general aspects of markets of fresh molluscs in other parts of the world.

Overview of the European Industry

Production and consumption of fresh mussels in the areas on the Atlantic and North Sea coasts average nearly 0.2 million metric tons. Division of production and consumption among the countries concerned is shown in Figure 1. As Northern countries (the Netherlands, the United Kingdom, Eire, the German Federal Republic and Denmark) account for some 40 per cent of production and only for 15 per cent of consumption about 25 per cent of total production follow a stream North-South, mainly from the Netherlands into Belgium and France.

Consumers

Geographically the consumer market in this study is limited to France, the Benelux countries and the German Federal Republic. Fresh mussels are indeed consumed on the British Isles and in the Southern European countries but these are separate markets with few connections with the market on the Western European continent. For the same reason imports from Spain into France are omitted in the study.

On a population of 140 million the number of more or less regular consumers of fresh mussels can be estimated at 35 million people (25 million in France, 7 million in Belgium, 3 million in Holland and Germany). The corresponding number of mussel buying households will be about 10 million (7 million in France, 2 million in Belgium, 1 million in Holland and Germany). In connection with total consumption it appears that regular mussel consumers will buy mussels between 5 and 6 times a year.

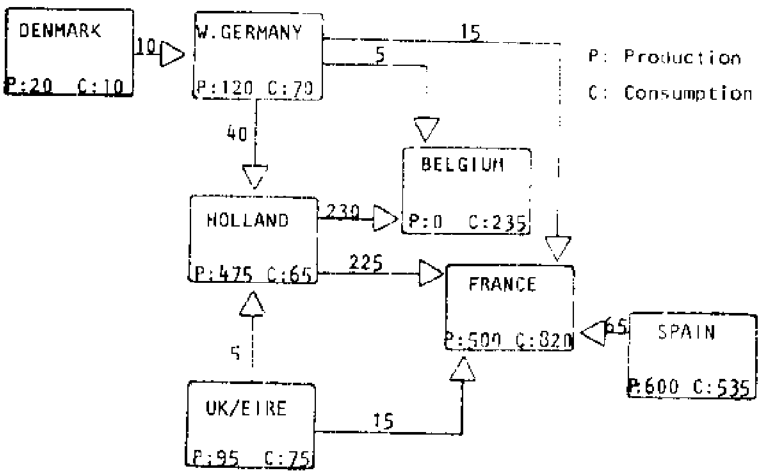


FIGURE 1. PRODUCTION, TRADE AND CONSUMPTION OF FRESH MUSSELS IN WESTERN EUROPE (excluding mussels for preserving purposes; x 100,000 kgs cleaned product)

Culture methods and their effects

As a result of natural conditions and historical development culture methods differ from one area to another. In Northern regions (North of France up to Denmark) culture is generally carried out on sea bed as to the South mussels are grown "standing" (pole culture in France) or "hanging" (raft culture in Spain). Sea bed culture is generally a large scale operation. Cost of removing sand and cleaning only allow for an extensivated production. Standing and hanging cultures hardly require techniques for cleaning and sand removal, but on the other hand the way of production and harvesting need relatively more manpower, leading to an intensivated culture. Thus the growers of pole and raft mussels are able to organize packing of a ready-for-consumption product, selling it to wholesalers. In the case of sea bed culture the trade chain is completed by cleaning and packing enterprises. These "packers" accept the mussels in bulk (shiploads), store them in desanding plots, clean them in factories and sell them packed to wholesalers, importers and retailers.

Market channels

A number of different people are involved in the organisation and maintenance of the market channels which link growers and consumers. In France a number of "mareyeurs" maintain the flow of mussels from the coastal area to the inland retailers. In the Netherlands some twenty packers prepare and pack the raw material and distribute the prepared product amongst their customers at home markets and abroad.

Apart from these more or less specialised processors and traders fresh mussels pass through wholesalers with a full seafood assortment. Most important are about twenty importing wholesale dealers in France having a dominant market share of sea food products in this country. Some of these companies are more or less specialised in mussels and other molluscs. The centers of the French market are the wholesale market of Rungis near Paris and the port of Boulogne. In the Benelux countries a large part of production is sold directly from the packers to retailers. Next to it a number of fresh sea food wholesale dealers provide the market. Most of them have mussels as a minor item on their product lists. In the Dutch coastal regions and in Belgium the distinction between wholesalers and retailers is not always clear as many firms combine both functions.

Finally a large number of fish retailers are involved in marketing fresh mussels. In all important consumption areas the traditional fish shops still dominate the sea food market. These shops are mainly dealing in fresh fish, smoked products, shellfish and molluscs. Frozen products are of minor importance as the fish retailers prefer to avoid direct competition with supermarkets and the like and expect more profit on wet fish.

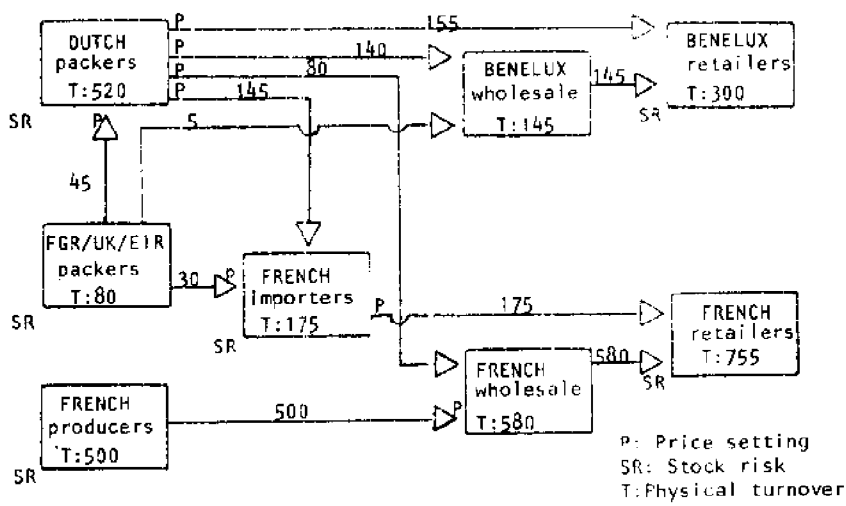


FIGURE 2. STREAMS OF FRESH MUSSELS INTO FRENCH AND BENELUX MARKETS (x 100,000 kgs cleaned product)

General Marketing Features

Although mussels are consumed both fresh and canned or cured fresh consumption is the main destination. In dealing with this fresh market three properties of the product define the framework in which production, trade and consumption take place. Firstly this mollusc has to reach the consumer alive. Secondly it is generally a relatively cheap food stuff; in the Netherlands edible weight is priced on a level approximately two thirds of that of fresh cod. And thirdly its edible weight constitutes only 20-30 per cent of shell-on weight. This means that upon leaving its natural surroundings the product has to be cleaned, packed and transported rapidly. On the other hand cost of those operations are often difficult to be kept within range. And finally transport range and consequently markets to be taken into account will be limited.

Physical distribution

Under Western European climatologic conditions fresh mussels can be kept alive 3 to 5 days after leaving sea water conditions. Consequently it is a very perishable product that must complete its trade cycle rapidly. It will be clear that any participant in this market is not prepared to take large risks of excessive stocks.

Storage. In general the mussels are kept in wet stock as long as possible. To the French pole or "bouchot" culture this is easy as the mussel can be harvested according to market outlooks. In the Netherlands an important role in controlling the storage problem is played by the packers. All mussels are kept at least two weeks on special sea bed cleansing plots in order to get them sand free and to regain their vitality after being fished and transported from the growers' plots. This period can be extended unlimitedly thus creating a wet buffer between the supply offered by growers and actual sales. So both in France and in the Netherlands fresh mussels can be delivered on order out of stock. The risk of spoiling mussels owing to excessive storage time is restricted in this way. This procedure differs from the fresh fish trade in which wholesalers' risks of perishable stocks are substantially larger.

Transport. On the European continent packed mussels are usually transported in closed or low temperature trucks. Recently Health Services in Belgium and France made efforts to impose cooled transport of mussels. At the moment these proposals have not yet resulted in operative legislation. From technological point of view there are many problems attached to creating a continuous cool chain of preferably 4-8 degrees C for these products. The first difficulty is to get the live mussels coming out of 5-20 degrees C water on a low temperature. In addition research proved that mortality is high if by some reason the cool chain is interrupted. At the present market conditions it is impossible to extend the cool chain up to the consumer's coolbox. A lot of mussels are retailed at open markets or by retail shops lacking cooled storage facilities.

First hand price determination

In pole and raft culture it is the wholesalers with their oversight of production capacity who set prices. These prices are generally valid for a certain period and for a group of suppliers. Sea bed culture leads to a market position where the packers make their bids towards growers and towards their customers, be it wholesalers, importers or retailers.

In the Netherlands first hand sales occur auction-wise. This market is completed by a minimum price system in which growers and packers agree a certain minimum price for the season together with minimum quality standards. In times of large supplies shiploads which do not reach this price are bought on account of a special withdrawal fund and stored on special sea bed plots. At the season's end this stock is sold back to interested growers and thus the mussels return into the production circuit. The withdrawal fund - difference between minimum price and proceeds of sales of returned mussels - is made up by a levy on total production. Apart from setting a bottom in the market this system has a social effect to the extent that growers whose mussels do not meet a market are provided with an income out of common funds. It should be mentioned that this withdrawal system is self supporting without any government aid.

On the auction level price flexibility is rather high, a ten per cent increase of production causing some fifteen per cent price fall. Its absolute value is substantially higher than comparable figures of other products from the sea in this area. This is the result of fluctuating supplies. In addition an important factor in the distribution of fresh products is the flexibility that the processing industry and the intermediate trade should show. As was seen serious problems on short run do not exist because of available wet stocks. In addition all musselpackers, traders, retailers and regular consumers are accustomed to a seasonal production. However the strongly alternating annual supplies are a burden to all specialised companies. Shortfall in supplies can only partly be compensated by imports from neighbouring countries. Processors and traders have to increase and decrease their activities nearly to the full extent of annual changes in supplies. Fortunately prices are even more flexible resulting in surprising constant turnovers.

Marketing effort

In the European practice advertizing for mussels is mainly supported by growers and specialised packers on the one side and by fish retailers on the other side. Organisations of mussel growers in France and in the Netherlands provide funds for advertizing by national press, by commercials and for organizing events to gain publicity for the product. In 1982 Dutch mussel growers and packers financed a joint budget of some 1 per cent of total sales, being a low percentage as compared with marketing budgets of some other food products and sweets amounting to some 10-15 per cent. Most common advertizing by retailers concerns point-of-sale advertizing or advertizing in the local press. Special promotional activities for mussels by intermediate wholesalers are rare. Mussels are not the main concern of these companies as in most cases they only pass mussels to customers asking for them.

Several other product promotion activities also take place. In a number of mussel growers localities annual "mussel festivities" are held, mostly in the holiday season, including free mussel meals for the public. In several towns around the Belgian-French border also annual fairs are held at which mussel eating is an important item. Some retailers have their own way to increase mussel sales by discounts, special sales and so on. Finally restaurants occasionally organize special mussel menus or mussel days, advertizing them in the local press. In a number of cases those promotional activities of retailers and restaurants are sponsored by Dutch packers.

Government influence

The influence of Public Services on this market is fairly limited though increasing steadily. There are no catch restrictions from the European Community nor imposed EC market regulations. The only EC legislation concerns the maintenance of free trade between Community countries and a common external tariff. This tariff is of minor importance for the fresh mussel market described in this paper on account of transport ranges.

Most national governments have worked out legislation governing the use and destination of coastal waters. In this sense in the long run the influence of national governments on the supply of mussels might be increasing. In all Western European countries the pressure on the use of coastal areas by several types of users like tourism, off-shore industry and various fishing activities is gathering strength rapidly. In addition the available areas suitable for mussel farming are threatened by pollution problems.

Moreover national governments are involved in legislation concerning Health Services. It is clear that such a very perishable product needs close control on quality. Enforcement of regulations is carried out by National Institutes or Fisheries Boards.

Special Marketing Features

The Western European fresh mussel market is a rather heterogeneously one. From the viewpoint of competition relations, price determination and distribution systems the market can be divided into a couple of market segments. In the next paragraphs some features will be described which typify each segment. It will lead to the conclusion that even within the common framework of the fresh fish marketmodel peculiarities occur due to marketing environment.

Benelux countries

The first market to be mentioned includes the group of consumers within the geographical area Belgium, parts of the Netherlands and the German Federal Republic. In Belgium - a country lacking production of mussels in home waters - mussels nevertheless have a long tradition as a cheap kind of food, sometimes described as "workmans food". Mussels and chips (moules et frites) is a common meal at market fairs and in inexpensive restaurants. In the Netherlands consumption is indeed concentrated in the Zeeland production area, cities like Amsterdam and Rotterdam and the Southern provinces bordering on the Belgian market. In these consumer concentrations mussels are an inexpensive food as well. However in other parts of the Netherlands mussels curiously pass for a more or less exclusive meal, perhaps as a result of limited market supplies in those regions. At the end few Dutch belong to the regular consumers of fresh mussels. Nevertheless the number of consumers seems to increase slowly as people learn to appreciate this product during their holidays at the seaside.

For destinations in the Benelux area fresh mussels are usually put in retail packings containing 2 kgs of the cleaned product. This ready-for-consumption package meet preferences of both wholesalers and retailers. Moreover the relatively small sales of mussels in many fish shops prevent stocking in larger quantities. A number of Dutch shops usually sell no more than 10 to 20 retail packs a week. Finally consumers in this region appreciate this kitchen ready way of packing. In the Benelux market it is mainly the retailer who has to face dry stock risks, as he has to estimate sales for a short period. As a rule wholesalers only act as an intermediate, passing orders from retailers on to the packers. A recent survey among fish retailers in the Netherlands revealed this to be one of the main reasons of an occasionally reserved attitude towards selling fresh mussels. In this respect some 40 per cent of the retailers showed a more or less negative approach. This especially holds in areas with a low level of consumption. Incidentally other factors seem to affect the attitude towards selling fresh mussels adversely as well. In this respect sometimes insufficient retail margins were mentioned as well as the voluminosity of the product in proportion to its financial turnover.

Neither in Belgium nor in the Netherlands and the relevant part of the German Federal Republic wholesale markets exist where wholesalers sell products out of stock to retailers. Most fish shops are supplied by wholesale dealers on order. In addition some 40 per cent of fresh mussels are distributed directly from packers to retailers. This last way of distribution is only feasible in areas with a high rate of consumption. Transport costs are comparatively high as mussels require much space and usually only 20 to 25 shops are within a day's truck range.

The Benelux market is practically exclusively supplied by the Dutch packers, mostly situated at Yerseke in the Zeeland province. They meet only slight competition from other mussel producing countries. Only during times of shortage raw mussels are imported by the packers from the German Federal Republic, Ireland, Denmark or the United Kingdom. In this way the packing industry at Yerseke is a turnstile for the distribution of mussels from neighbouring countries in the Benelux area.

Moreover in this market segment the product has no outstanding substitutes. In Belgium there may be other (meat) products of snack bars. In the Dutch survey the fish retailers were asked which products were bought as a substitute if no mussels were available. Some 60 per cent of the shop owners replied that the customer would buy no other product but leave the shop evidently looking for another shop hoping to be more successful.

The absence of tough competition in the Benelux market is confirmed by a comparatively low price elasticity of demand ex-packing industry. On the basis of time series this figure was estimated to be -0.35. Nominal price level at the auction was Dfl 0.30 to 0.80 per kgr during the last seasons. Ex-packer prices varied between Dfl 1.25 and 2.00 per kgr and purchase price for the retailers between Dfl 1.50 and 2.00 per kgr. And finally consumer prices were from Dfl 2.40 and 2.80 per kgr. It must be kept in mind that auction prices concern the raw material, of which some 20 to 35 per cent is lost in the cleaning process.

France

The French consumers of mussels are concentrated in the coastal area, in Paris and suburbs and in the mining towns in Northern France next to the Belgian border. The market in the mining area in many ways looks like the Belgian market, mussels being a common workmans food. Sales culminate at the annual fairs in September and October. In the remaining parts of the country "moules marinées" (steamed mussels) are a common and inexpensive starter on the menu.

The French market segment has a more complex structure than the Benelux one. Several types of mussels are coming into this market. Some 50 per cent originate from the French pole (bouchot) cultures. The remainder is imported from the Netherlands, Ireland, the German Federal Republic and the United Kingdom. In addition from time to time mussels from wild banks along the coast of Northern France are supplied.

Like in the Benelux countries fresh mussels are nearly exclusively sold by specialised fish retailers. That is to say by fish shops or restaurants. Only a small share is distributed by supermarkets possessing completely assorted sea food departments. Mussels for French destinations are usually packed in 20 or 30 kgs burlap sacks. In this way the fish retailer can supply his customers the quantities they want. Apart from that the shopper is able to check and compare freshness and quality of the product.

In France stock risks seem to be shared by wholesalers and retailers. The imported product is delivered on order. On the other hand dealing on the central wholesale market means that the wholesaler will not know exactly how much retailers will buy. Consequently wholesale dealers have to face the problem of passing the mussels to their buyers in proper time. It should be mentioned however that storage risks will not be very serious in this market because of the high consumption rates in concentrated areas.

With respect to wholesaling fresh mussels in France the market at Rungis near Paris is very important. Retailers from Paris and its suburbs come and provide themselves with their products at this central wholesale market. The French wholesale market is dominated by about twenty all round dealers of sea food. Some of these companies are more or less specialised on mussels. These business houses are the main importers of mussels from neighbouring countries. They are represented at the port of Boulogne while they are the most important suppliers at the Rungis Central Market.

At any moment and in any spot in France there exist a continuous competition between mussels of different origins. The quoted group of French wholesalers have a dominant position in this competition system. They are the only market participants who have information on available quantities and qualities in all relevant production areas as well as on the price levels to be obtained. Each season a vast quantity of mussels is flowing into France. The French home production however is rather unstable and imports have to fill divergent gaps. On the other hand in exporting countries the French market is more or less considered as an outlet for mussels which cannot be sold elsewhere. However in years that production in all or most countries is abundant this outlet function deteriorates into what looks like dumping.

Substitutes for mussels in France have to be found in two directions. In Northern France it will tend to be inexpensive snacks and products of fish and meat. In other parts of France it may be other important fish and nonfish starters in the same price range.

Both the competitive situation and the slight dumping traits result in a high price elasticity of exports to France. For the Dutch export this elasticity ex-packing industry was estimated to be -1.31. In recent years the price of (raw) Dutch mussels for the French market were also on a level of Dfl 0.30 to 0.80 per kgr at the auction. Ex-packer prices varied between Dfl 0.75 and 1.15 per kgr as the retail price range was FF 3.50 to 4.50 per kgr (Dfl 1.60 to 2.10 per kgr). Ex-vessel prices of French (bouchot) mussels recently amounted to FF 3.10 to 3.40 per kgr. The level of wholesale prices was about FF 3.50 per kgr as consumer prices were about FF 7.50 to 8.00 per kgr.

The hotch-potch of mussels of diverging origin is more or less simplified at retail level. The entire supply of mussels is divided into two main groups. The French consumer is familiar with "moules de bouchot" and imported mussels. It is customary that wholesale and retail prices of bouchot mussels are twice as high as those of the imported product. One can wonder how this rule can maintain itself in course of time despite of changing qualities, supplies and processing technology. It is not easy to determine whether this price level difference is induced by consumer preferences or by the dominating influence of the French wholesalers.

Topics of Fresh Mussel Marketing

In the first paragraphs of this paper it was outlined which are the possibilities and restrictions that govern production and processing of mussels due to the properties of the product. This framework can be completed with a summary of some peculiarities of marketing this mollusc in Western European countries.

- Introducing a product like fresh mussels to new consumers is a lasting process.
- Apart from some consumption out-of-doors virtually all mussels are retailed by fish shops.
- The mussel trade is still subject to a low rate of integration and concentration. Various functions of marketing are shared by a large number of participating companies at several levels in the trade chain.
- In this complex market poor storage properties of the product involve a tendency to pass stock risks to the retailer.

Current Outlook

It must be observed that the selected topics were found valid on the market of the Western European continent during the past decades. Validity of these main features in similar markets at another time or in other countries will depend on specific market environment. Abandoning this discussion the four topics will be used to discuss some strong and weak points of these markets which have to be faced to maintain the existing market and to create new ones for similar products in other parts of the world.

Specialised fish shops

The structure of retail trade seems to be of major importance in marketing these types of products. A very perishable product like fresh mussels is not really suitable to be sold at a supermarket or other modern selling points. These organisations are apt to prefer using their scarce shop space for frozen and canned sea food or non-sea food. In this sense it is very important for the European industry to see how the specialised fish shops will perform in the future. Some years ago it was a general opinion that these small enterprises were fighting a lost struggle against time. However this view had to be altered. Specialised fish shops still have 95 per cent of the French fish market. Fish shops in the Netherlands did a good job during the last decade. The increased profitability and perhaps the increased general unemployment have attracted many young people who brought this business to life again. Recent information from the German Federal Republic seem to show similar trends in that country. The favourable outlook of specialised fish retailers is a strong factor of the European market.

On the other hand this accent on the existence of specialised fish retailers will mean that it will be very difficult to develop new markets in countries or regions where these shops are scarce.

Consumer acceptance

As another peculiarity of the mussel market the consumer acceptance of this product was mentioned. In Europe as well as in other parts of the world it is proven repeatedly that gaining new consumers for fresh mussels is a very difficult and lasting process. The European market has indeed been developed during times when large groups of people were lacking sufficient animal protein. This process cannot be repeated in this part of the world under present conditions. On the other side once a mature market has been established this will be an exclusive market as there will be few substitutes for the product.

A number of influences are relevant to improve consumer acceptance. Notably an adequate control of growing, processing and physical distribution of fresh mussels is required. Sales may be seriuously affected because of press reports on cases of diseases in connection with the consumption of fresh molluscs. In France and in the Benelux countries consumption was reported to be down after publicity on cases of poisoning and cholera in Spain and Italy. In addition a bad experience after buying mussels of poor quality will prevent a new trial for a long time. In the most important markets in Western Europe quality control was improved continuously to the present high level. However quality problems might still be a hindrance to develop new markets. An adequate governmental support in this sense by legislation and control is very important for these markets.

In practice controlling the quality is narrowly connected with a proper management of storage and stocking risks. The acceptance of the product by retailers will improve if ways can be found to limit the risks of the retailer. In addition to a joint tackle of storage problems by retailer and wholesaler it will be possible to check the quality of the product at the very moment it is bought by the consumer. Again storage and stock risks are not serious on mature markets. But during the difficult building up stage it often is a major prevention to both gaining shelf space and consumer acceptance.

Incidentally increasing acceptance of fresh mussels by new customers meets a pronounced taste threshold. Especially in regions with a yet weak market this is an extra difficulty to overcome. One way to do this is gaining acceptance by introducing processed mussels in the first stage of developing such a market. Canned or cured mussels meet a notably easier threshold in consumer circles. On top of that these processed mussels are easier to stock by retailers. Consequently they find their way both through specialised fish shops and by other food outlets such as groceries and supermarkets, as such approaching a larger number of prospective consumers. A basis being laid for a new group of mussel consumers marketing the fresh product will be the next step. The features of the processed mussel market are not discussed in this paper.

To be sure consumer acceptance can indeed be improved by increasing the marketing effort. In this respect mussel growers and eventually processors or packers should realise that maintenance or enlargement of demand is their duty in the first place. Still many mussel growers - and fishermen in general - have the opinion that they should do the catching as the trade does the marketing. Wholesalers and retailers however generally have more important products on their product lists than mussels are. On these conditions a demand pull strategy to draw customers into fish shops is the most effective way to spend a marketing budget. In European countries advertizing is concentrated on maintaining a tradition of mussel consumption in the present consumption areas. Previously it was shown that some 25 per cent of total population in the countries concerned use to have some 5 mussel meals a year (in the Franco-Belgian area this figure amounts to some 50 per cent and in the Dutch-German region some 5 per cent). These figures indicate that much can be done yet to increase consumption per household and to enlarge the number of mussel consuming households in the present continental markets. If sufficient supplies are available regularly new markets could be developed in countries where market environments are favourable.

Non-integrated market structure

The final topic of this market to be discussed is the low rate of integration. It was shown that the structure of the wholesale market can be called oligopolistic whereas the culture and the retail market virtually have a pronounced atomistic structure. As a matter of fact this scattered structure is commonly seen in all traditional markets of similar products. In the past is was proven that these complex marketing systems functioned very well in the current market environment. It must be kept in mind incidentally that other market organisations may exist successfully elsewhere. The low rate of integration involves that several instruments of the marketing mix have to be shared by a number of market participants. Two consequences of this atomistic market structure will be discussed as they are of major importance for the future viability of the European mussel market.

Firstly it seems that markets of this type can hardly be influenced by individual companies nor governments. As so many people take their decisions in this complex market structure with many feed backs the system will hardly be pushed out of balance as a result of individual companies' market behaviour. Any decision will be compensated by reactions of other participants. Basic questions like ceasing production or replacing the product by another one which are relevant for a number of industrial products are meaningless in this market. This means that this market in a way derives its continuity from its complexity. Market outlooks will only change on behalf of worsening or improving market environment.

On the other hand the complex market structure in which it is difficult to take common decisions may have negative consequences. The price instability was already mentioned previously, indeed also in the title of this paper. Another example are the problems which occur in organising consistent publicity campaigns which may have an increasing importance in future years.

Returning to the Western European mussel market outlooks seem rather favourable. The increasing technological knowledge allows growers, processors and traders to manage the quality of this difficult product ever better. In addition they succeed in keeping costs of cleaning, packing and distribution limited. Marketing outlooks are good due to the weak rate of competition between production centres, the absence of major substitutes and a constant or slowly increasing number of consumers.

It will be interesting to see how these markets will sustain in a future in which numerous new products with very efficient distribution systems will be proceeded. The traditional mussel trade will have to adapt to other production and processing technologies, to shifting consumer preferences and to advanced marketing methods. On the other hand it has to rely on its present prepositions.

Aquaculture in Scandinavia: Some Economic and Market Aspects

Rainis Cedrins
The Swedish University of Agricultural Sciences
Uppsala, Sweden

1. Aquaculture and fisheries

The world population has constantly increased over past centuries. One of the main reason for this occuring situation is that mankind has been able to provide food for a growing population. A significant progress of the landbased production of food was accomplished at an early stage when productiontechniques changed from hunting to cultivation and breeding. However the traditional fisheries still are characterized of the principles of hunting.

Fish is a central component in the world supply of food. To provide additional food for a growing population consequently requieres additional increase in world fisheries if the diet remains constant.

Is this possible to accomplish by the fisheries that are based on the principles of hunting?

The present situation and future prospects of fisheries in my opinion are the following:

- The global catches have increased during the last twenty years.

- A continuous increase of catches is expected, but the condition for this is that overexploitation is prohibited and eradicationthreatened species will get a possibility to restore.

- Deep-sea fishing becomes more and more regulated. Far-reaching government proceedings about quotas and boundaries will determine the extent of the fisheries in the future. Complicated systems of price-regulation and government subsidies will determine the profitability.

- The development of energyprices will drastically influence the profitability as the fisheries are very energyrequiring.

- Competition with the oilindustry for certain seaterritories.

- A continuous risk of a disturbed ecological balance.

The resources of the sea and lakes are consequently restricted. We have to rely on the possibilities to cultivate fish, crustaceans and algae to a greater extent. That is aquaculture.

2. A survey of the global aquaculture

Aquaculture is defined as man's effort to make a balanced manipulation with the growth, breeding and mortality of waterliving organisms in order to improve the yield.

The global yield of aquaculture and fisheries was 73 million metric tons 1979 (seals and whales not included). The share assignable to aquaculture was 8,7 million tons or 12 percent.

Table 1. The global yield of waterliving organisms 1979 and the share assignable to aquaculture

Species	Total, million metric tons	Assignable to aquaculture, million tons	% assignable to aquaculture
Seawaterfish	55	0,6	0,1
Freshwaterfish	7	2,6	37
Crustaceans	3	0,07	0,2
Molluscs	5	3.2	64
Algae	3	2,2	73
Total	73	8,7	12

Source: FAO

Aquaculture based on freshwater is mainly assignable to carp production in China and India. Production of algae is widely spread in Japan. Among the cathegory of molluscs the musselproduction in Netherlands and Spain and the oysterproduction in France must be mentioned.

3. A survey of the aquaculture in Scandinavia

In the Scandinavian countries aquaculture is dominated of the salmonid species that are marked coldwaterfishes.

Common for all the Scandinavian countries are its big waterresources. All the five countries have great shores. In Norway there is a lot of deep fiords. Sweden and Finland have archipelagos consisting of thousand small islands. Above that Sweden has 87 000 lakes of more than five acres that cover nine percent of the total area. Finland - that is called the land of the thousand lakes in the travel folders - has 55 000 lakes. Norway has 300 000 lakes and water bodies that cover five percent of the total area.

A lot of these costal areas, lakes and waterbodies are extrememly suited for aquaculture regarding to temperature, quality of water, current situation, shelter from the wind and weather etc.

Aquaculture in Scandinavia is managed with three different purposes.

- Compensatory cultivation. The purpose is to compensate the damage on the fishpopulations because of waterpower projects, log-driving or other activities that cause waterpollution.

- Sportfishing cultivation. The purpose is to reinforce and complete the existing population of wild fish.

- Commercial cultivation. The purpose is to produce fish and other water organisms for human consumption.

This paper will deal with commercial cultivation, although other forms must also be considered from an economic point of view.

The Swedish water power industry yearly put out about 2,3 million salmon smolts in the Baltic sea, that make salmonfishing possible for all the fishermen around this sea.

About 60 percent of the total salmon population in the Baltic sea is based on compensatory cultivated salmon.

The yearly catches has during last time been about 2 500 metric tons. Danish fishermen account for about 1 000 tons of this amount and Swedish fishermen account for about 600 tons.

This kind of salmonfishing is stagnating. The problem is that the catchingmethods today are so effective that very few single salmons will become fully grown. The fully grown salmons are not enough to reproduce youngs to keep up the population. More than 50 percent of all salmons are caught in the sea just when they have reached the minimum size of 60 centimetres (23,6 inches). The countries around the Baltic sea have still not been able to agree about a limitation of this resourcewasting fishing. If nothing happens the supply of salmon in the Baltic sea will disappear.

The kind of fish that will be chosen for commercial cultivation is depending upon several conditions:

- High market price

- Rapid growth

- Possibility to reproduce in a cultivation environment

- Biological requirements

  - close populations
  - resistibility against disease
  - patience against removal
  - low foddercoefficient
  - late sexual maturity

The commercial aquaculture in Scandinavia is therefore concentrated upon

* Rainbow trout (salmo gairdneri) in sea, lakes and ponds

* Atlantic salmon (salmo salar) in the Norwegian fiords

* Blue mussels (mytilus edulis) on the Swedish westcoast and Norwegian southcoast

Some commercial attempts have been made by multinational companies to cultivate European eel (anguilla anguilla) in recirculating systems where warm waste water from steelworks have been used. Eel has the optimum growth at + 25 deg C (+ 77 deg F) to be compared with rainbow trout that has the optimum growth at + 16 deg C (+ 61 deg F) and Atlantic salmon with the optimum growth at + 13 deg C (+ 55 deg F).

However these attempts have not resulted in commercial production while the activity is not economically justifiable with existing marketprices.

Concerning fish farming that still is on experimental stage but probably will be of commercial importance in the future, the Norwegian attempts to cultivate cod must be mentioned. Presently the supply of fresh cod for the fresh fish market is insufficient during long periods of the year. The cultivated cod can be slaughted when market price is at it's peak. At last the Swedish attempts to cultivate signal crayfish (pasifascatur leniusculus) as compensation for the plaguestricken European crayfish (astacus astacus) in ponds and lakes where coarse fish is eliminated and also certain attempts to cultivate freshwater shrimps (macrobrachium) in recirculating systems based on warm waste water must be mentioned.

Regarding aquaculture that allready is of commercial importance the economic and marketing problems are quite uniform for rainbow trout production and musselproduction. The difference is that the technology of musselproduction is quite different and that musselproduction is only performed in salt water. The musselproduction is based on longline-cultivation. A number of long ropes are sunk down in the water. Naturally produced larvae will then attach to the ropes and grow. The time of growing from larv to marketready mussel is 16 months. The total musselproduction in Sweden was 2 000 metric tons 1981 and will be about 4 000 metric tons 1982. The total production potencial is estimated to 50 000 metric tons. In Norway the production potential is considerably smaller.

Rainbow trout production has the greatest economic importance in the total Scandinavian aquaculture today. The production methods are somewhat varying in the countries, In Sweden and Norway the production is based on floating net cages. In Denmark the production is performed in special cultivating ponds. Water is transported from small rivers to these ponds. In Finland the production has sofar been concentrated to large channel- and pondsystems in the wide lakedistrict in the eastern part of the country. But net-cage production will be of great importance in the future. Even the Norwegian salmoncultivation is performed in large netcages.

In the case of rainbow trout it is of importance to distuingish between the small so called plate-size fish, whose size (slaughtered weight) is 180-250 grams (6,3-8,8 ounces), and the bigger fish whose size is 800-4 000 grams (28,2-140,8 ounces). The two forms must be seen as two different products with different refiningpossibilities, marketing- and competition conditions.

In plate-size production fingerlings weighing 50-100 grams (1,8-3,6 ounces) is put out in the cage or pond in spring. The fish is fed during the hot months of summer and is slaughtered in autumn when the water is colder and growth is decreasing. Big size production can be performed in two ways. One way is to put out bigger fingerlings (more than 100 grams) and cultivate during one season in the same manner as plate-size production. The other way is to buy fingerlings of ordinary weight (50-100 grams) and cultivate during two seasons. The limitation with the former method is difficulties to get big fingerlings. In the latter method the fish must be kept in the cages during winter and this can be dangerous with regard to ice and freezing water. The fish dies if the water temperature falls below 0 deg C (+ 32 deg F). This often happens in saline waters. Therefore cultivation of big rainbow trout is rare on all Danish coasts and the Swedish west- and southcoast.

Another production risk is that part of the fishpopulation will reach sexual maturity and consequetly be useless for human consumption. In all rainbow trout production also fish of medium sizes will be produced. These mediumsized fishes are very hard to sell.

An international comparison shows that the Scandinavian countries are dominating in the global production of salmon and big rainbow trout.

Table 2. Production of cultivated salmonid fish in some of the main cultivating countries 1981. Metric tons

Country	Rainbow trout weighing 180-500 grams (6,3-17,4 ounces)	Rainbow trout weighing more than 500 grams (17,4 ounces)	Atlantic salmon
Sweden	1 000	1 000	
Norway		4 000	7 000
Denmark	19 000		
Finland		7 000	
United Kingdom	4 500	700	1 000
Western Germany	12 000		
Italy	21 000		
France	21 000		
Japan	20 000		
USA	20 000		

Source: Own specification from the official statistics in the above mentioned countries

3. Aquaculture in Sweden

Although the Swedish production of rainbow trout is not exceptionally large compared to other countries, the development has been very rapid. The annual production was 250 metric tons 1978. Since that time the annual production has been doubled every year and was 2 000 metric tons 1981. There are 130 fish farms today in Sweden. Many of these are not properly planned regarding the economic aspects. The size and specializations are very different for the farms. There are

* about 100 small farms yearly producing 1-10 metric tons of rainbow treut in 1-3 cages. The small farms means part-time occupation.

* about 30 medium sized farms yearly producing 10-50 metric tons of rainbow trout in 4-10 cages. These farms can be classified as familly farms.

* a few large farms yearly producing more than 100 metric tons of rainbow trout in more than 10 cages or in a recirculating system. These farms can be classified as industrial enterprises.

In many cases the small farm are linked with fisheries. The feeding is often based on caught coarse fish and the running costs are consequently low. Usually the small farmers sell the product on the local market. Hence the demand is limited and it is seldom room for two farmers on the local market. The medium sized farms are often managed by persons who have earlier started in small scale. As the technical skill, market contacts and the selling possibilities have improved the farm has grown. The production of the medium sized farm cannot be sold at the local market but is usually sold to a wholesaler who in turn sells the product to retailers in densely populated areas.

The large farms are often concentrated upon plate-size rainbow trout production where the advantages of large scale production are most obvious depending upon the possibilities of automatization and mechanization in slaughtering, gutting and refining. The large farm has employees in the production and a specialized staff for economy, technique and biology. The farm itself try to control all the stages of the production chain. A few farms in Sweden can be classified as large farms. In other countries however multinational companies have engaged in aquaculture and started large scale plants often based on recirculation and warm waste water from other forms of production as heat and nuclear power stations, steel industries and cementworks. The problem is that the water from these activities often contains harmful substances that must be removed, and an insufficient content of oxygen. I Sweden marketing problems will be added. The nuclear stations are so emotionally controversial that the producer had to calculate with negative consumer attitudes.

The discussions are today many concerning what kind of farm type will be the most suited for Swedish conditions. Here one has to calculate not only the microeconomic aspects but also macroeconomic aspects as regional-, occupational- and trade policy. Some experts claim that a large-scale and controlled breeding will dominate in the future. However the largescale investments that hitherto have been tested in Sweden have had very little success.

The Swedish production of rainbow trout was 2 000 metric tons 1981. During the same year 800 metric tons of rainbow trout and 5 000 metric tons of salmon were imported. Rainbow trout is not separately reported in the Swedish trade statistics but is included under "other salmonide fish". This cathegory also include caught arctic char, lake trout, brown trout and white fish. All import from Denmark and Japan in table 3 refer to plate size rainbow trout, whereas all import from Norway refers to big rainbow trout. Smaller quantities of rainbow trout are imported from U.S.A.

Tabel 3. Swedish import of "other salmonide fish" 1981. Metric tons

Country	Fresh and refrigated	Frozen	Total
Denmark	256	94	350
Norway	46	185	231
Canada	12	342	354
USA		48	48
Japan		107	107
Other contries	2	66	68
Total	316	842	1 158

Source: Swedish National Board of Statistics

The big rainbow trout that Sweden, Norway and Finland produced in a quantity of 10 000 metric tons 1981, is considered to be of the same quality as caught salmon. At the same time the salmon on the Swedish market is of very different quality. The caught Atlantic salmon is considered to be of better quality than the imported Pacific salmon.

Even the Pacific salmon consits of different species and varies in quality. The salmon that is used as a lure in the Swedish shops and periodically is sold for 20 Swedish crowns/kilogram (1,5 $/pound) is often chum salmon or pink salmon. Often it is caught after the spawning and then the fish is quite emaciated. Finer species of Pacific salmon as king salmon and red salmon seldom are imported because they are considered to be too expensive. The cultivated big rainbow trout and salmon cost about 65 skr/kg (4,8 $/lbs). The cultived plate size rainbow trout costs about 40 skr/kg (3 $/lbs).

The total imported frozen salmon to Sweden consist to 98% of Pacific salmon from U.S.A., Canada and Japan (table 4). The total Swedish import of salmon has increased. It was 4 300 metric tons 1975 and 4 600 metric tons 1979. Sweden is not exporting cultivated salmonide fish. This is mainly due to the fact that the supply is too small and the barriers of duty too high.

Table 4. Swedish import of salmon 1981. Metric tons

Country	Fresh and refrigated	Frozen	Total
Denmark	28	12	40
Norway	552	90	642
Canada	15	2 282	2 297
USA	4	1 655	1 659
Japan		218	218
Other countries	9	128	137
Total	608	4 385	4 993

Source: Swedish National Board of Statistics

Today cultivated fish in Sweden is sold through the following channels:

- producer co-operatives
- fish wholesalers
- chain stores for convenience goods
- direct sales to retail trade and consumers
- the fish processing industry

Most of the 17 co-operatives owned by fishermen sell very small quantities of farmed fish. Instead they concentrate upon caught fish that the members supply. It is a question of mass catches of fish and the argument is often price rather than quality. Modern marketing methods are almost non-existing. The prices offered to the fishfarmers are often too low to be accepted.

The number of the fish wholesalers is about 60, to which should be added a few wholesalers specializing in deliveries to institutional caterers. A problem encountered in connection with planned fish campaigns is that the farmers have not been able to guarantee large quantities. Among the institutional caterers, the restaurants have been the main buyers of salmon and rainbow trout.

Chain stores for convenience goods are today dominated of three large blocks that together have a marketshare of 70%. This concentration has favoured the large food producers as the blocks are striving for large rational purchases and similarity in product mix and quality over the whole country. Of course this is a disadvantage for the fish farmers who has no own co-operative. The quantity that a singel farmer is able to supply is quite uninteresting for the blocks who demand large and guaranteed supplies.

Concerning direct sales to retail trade and consumers earlier has been mentioned that small fish farmers usually sell the greater part of their production via direct sales on the local market. The farmer, very often a former fisherman, is well acquainted with the sales channels. A higher price is often obtainable but the local market is very limited.

The fish processing industry has noticed that today consumers ask for processed forms of fish like cod and plaice. Tests made with new types of fish have not been succesful. However the industry is still interested in novelties. Particularly if the prices of the above metioned types of fish continue to rise drastically. The breeders must be able to guarantee quantities of at least 100 metric tons, delivery dates and quality.

Farmers who are producing a big rainbow trout are often smoking it themselves. In the future this will be more difficult as the public health acts and foodmanaging acts will be strengthened.

4. Aquaculture in Norway

Norway is the greatest nation of fisheries in Europe. The catch was 2,6 million metric tons 1981 with a firsthandsvalue of 3,8 milliard Norwegian crownes (0,6 milliard $). Only 30% of the catch is used for human consumption. Even if the national consumtion is large, about 40 kg (88 lbs)/inhabitant and year, a total population of four million inhabitants will only consume 5% of the total catch. Consequently a large part must be exported. The long distances to the markets have caused that a large refining industry has developed.

The great knowledge and experience how to handle, market and refine the fish has during last years even been utilized in aquaculture.

Aquaculture is a rather new industry in Norway. This industry was started at 1970 when some farmers began to cultivate rainbow trouts and salmons of several years duration in the fiords. The fiords are free from ice during the whole year due to the gulfstream. Most of the farms are based on netcages, that are placed at narrow passages where the tide causes good watercirculation at the same time as the cages are protected against rolling.

The slaughted rainbow trout has an average weight on 2,5 kg (5,5 lbs). The salmon has an average weight on 4 kg (8,8 lbs). Basically it is the salmon production that is expanding.

Table 5. Production (slaughted quantity) of cultivated rainbow trout and salmon in Norway 1971-1982. Metric tons

Year	Rainbow trout	Salmon
1971	450	100
1973	1 000	200
1976	2 000	1 400
1978	2 000	3 000
1980	3 000	5 000
1981	4 500	8 500
1982 (prognosticated)	4 500	10 000

Source: Norske Fiskeoppdretteres Forening.

The firsthandsvalue for the Norwegian cultivation of salmonide fish was 350 million Norwegian crowns (56 million $). 1981.

The salmon cultivation will expand even in the future as the activity is concentrated upon export. 90% of the production is exported. The production potential is calcultaed to be about 25 000 metric tons/year. As a comparison can be mentioned that the total global catch of Atlantic salmon was 8 000 metric tons 1981. The total global catch of Pacific salmon was 600 000 metric tons.

However rainbow trout production will not expand in the future because the export posibilities are poor. Only 25 % of the production is exported and the home market is of course limited. The rapid growth has not only had positive effects. Especially the increase in production around 1973 caused a large excess supply of middle sized rainbow trout that resulted in prices that could not cover capitalcosts. To avoid continued overproduction the goverment introduced a production licence, where the permited maximum production volume was 8 000 cubic metres. This volume made possible an annual production of about 60 metric tons of salmon or 100 metric tons of rainbow trout within the existing technique.

An other aim with the licence was to influence the development in order to get the best regional effect of the activity. The government tried to prevent that a few multinational companies took all the production.

Within the permitted volume the farms have however had possibilities to expand as the technique in aquaculture has improved. There are about 200 producing farms today and many of them have an annual production of more than 100 metric tons of salmon.

Today the Norwegian government is discussing to remove the licence.

The Norwegian fisheries are not profitable today and have large government subsidies. The Norwegian aquaculture however is said to be the second profitable industri in the country. Only the oil industry is more profitable.

The reasons for this development are

- that the production has been successful from biological as well as technological aspects. Unlike the other Scandinavian countries the water pollution problems assignable to aquaculture are small and the competition from other industries about the water resources is insignificant.

- that the demand has been increasing. Salmon of high quality is of limited supply in Europe.

- that the industry has developed a strong economic organization.

The third reason shall here be explained more in detail.

Fiskeoppdretternes Salgslag A/L (FS) was founded 1978. It is the farmers businessorganization. Its activities can be summarized as follows.

. Settle agreements concerning prices, delivery and terms of payment with the customers. These agreements are binding for all customers.

. Determine which firms shall have the right to buy from the farmers.

. Make marketing activities.

. Responsibility for freezing and storing of the excess supply.

FS does not buy or sell the member products. The organization is financed through a system where the producer and buyer pay 1 1/4% of their turnover to the organization.

As early mentioned it is difficult to develop a market outside Scandinavia for the big rainbow trout. In the European countries outside Scandinavia the consumers prefer plate sized rainbow trout. Some attempts to sell a big smoked rainbow trout in those countries have however given certain expectations about a future market. The smoked rainbow trout then has a competition in the Pacific salmon imported from America and Japan.

A great problem is the duties. The duty on big rainbow trout designed for smoking is 7% in the EG-countries. In fact this duty is somewhat doubtful as the production in the EG-countries of this fish is very insignificant. The duty on plate sized rainbow trout where the EG-countries have own production is 12%.

The cultivated salmon has better exporting possibilities than the rainbow trout, 90% is assignable to the EG-countries. The total consumtion of salmon in the EG-countries is about 50 000 metric tons a year. Their own catches are only 5 000 metric tons on annual basis. As the demand for salmon is much bigger than their domestic supply, there has hitherto not been a duty on fresh salmon. However 1/1 1981 a duty of 3,5% was introduced on fresh salmon from Norway. The EG-countries have large refiningindustries for fish themselves and consequently there is a high duty, 14%, on smoked salmon. Therefore most of the Norwegian export consists of fresh salmon. The duties are one of the explanation for salmon exportprices falling 30% during 1981. The farmers have demanded severe conditions from the Norwegian government in the international trade proceedings. Among other things they also required that the agreements of duties and quotas concerning aquaculture and fisheries should be aquainted with potential agreements for the EG-countries to take part in the Norwegian oil prospectings.

However the farmers have realized that it is dangerous to be too dependent upon a single market. Consequently a small export of salmon to U.S.A has developed. During 1981 40 metric tons were exported but during the first six months of 1982 400 tons were exported. During november--april when Pacific salmon is not caught on the American westcoast the cultivated Atlantic salmon must be an attractiv product. The future market potential will partly depend on the development in the airfreight and packing sectors.

5. Aquaculture in Denmark

Denmark is the second largest nation of fisheries in Europe. The catch was 2 million metric tons 1980 and the firsthandvalue about 2,5 milliard danish crownes (0,4 milliard $). This position has been reached through a very rapid growth during 1965- 1976. Denmark doubled its fisheries during this period from 840 000 metric tons to 1 900 000 metric tons. As a comparison can be mentioned that the fisheries of Sweden decreased from 380 000 metric tons to 210 000 metric tons during the same period. The Danish aquaculture has not the same natural relationships to the fisheries as the aquaculture has in the other Scandinavian countries. Firstly the Danish fisheries are concentrated on deepseafishing. Aquaculture on the other hand is performed in ponds situated close to small rivers in the inland parts of the country. The natural conditions for cultivating salmonide fish at the sea are bad in Denmark, mainly due to the climate. During winter there is a risk for freezing water and during the summer the temeperature can be so high that there is risk for disease and parasites.

Secondly the aquaculture in Denmark is no subsidiary occupation. There are about 500 farms today with 1 000 persons employed in the primary production. Most of the farms are large. An annual production of 200 metric tons is quite usual. The fish farming is concentrated on plate size fish. This size is most suited for an automatized production.

Most of the farms were etablished during 1950-1960. Later it has been very difficult to etablish due to deficient possibilities to find a good location. Most places suited for cultivation are allready occupied and furthermore there is competition for waterresources between aquaculture, agriculture and urban areas. Aquaculture has also been limited by environmental restrictions during last years. Even if the market demand exceeds the quantity of 19 000 metric tons that was produced 1981, the remaining quantity could hardly be produced due to the deficient water resources.

About 90% of the total production is exported, mainly to Western Germany. The size (plate size) and colour (white) are quite adapted to the German market. The demand for rainbow trout is great in Western Germany. 1980 240 000 metric tons were consumed. Only 11 000 metric tons of this consumtion were produced in Germany.

During the 1960's Italy and U.S.A. were also large importers of Danish rainbow trout. However Italy has become self-supporting through domestic rainbow trout cultivations. In U.S.A. imports of Danish rainbow trout was prohibited 1970 due to a virus disease. The Danish aquaculture has a strong business organization called Ørredfonden. It's major assignment is to promote the economic conditions for the farmers and stimulate the export as well as the homemarkets. The organization also provides technical and economical advisory service and finances certain research projects. The above activities are financed through a system where every farmer pay 1/10 Danish crown for every kilogram produced fish.

6. Aquaculture in Finland

Finland is the smallest fishing nation in Scandinavia. The total catch was 120 000 metric tons 1981. The aquaculture has developed independently of the fisheries. The activity was started around 1965 and is mainly concentrated on big rainbow trout. The large increase in production has occured during the last years. 1975 2 000 metric tons were produced, 1978 3 000 tons and 1981 7 000 tons. Most of the farms are large. The farms are mainly located in the lakedistrict at the southeast parts of the country. Here the farmers have built large channel systems and hundreds of ponds close to lakes and water bodies in sheltered forestareas. However these cultivations cannot expand anymore because of environmental restrictions. New etablishments are mostly situated in the archipelago and based on net cage technique.

All production is sold on the home market, partly due to the insufficient supply of caught fish. Another explanation is the adequate marketinorganization, named Lohikunta. It's task is to give the members guaranteed sellingprices. This is accomplished by negotiations with the large wholesalers. Lohikuntas activities are partly financed by a system where the fodder producing companies pay 1,5% of their turnover to the organization and partly by member fees. Lohikunta also act as an intermediary in the purchases of fingerlings to the farmers.

7. Aquaculture in Iceland

To the Scandinavian countries also Iceland is regarded. Fisheries are the most important industry in Iceland. Although the population is only 200 000, the country is the third fishing nation in Europe. 1,6 million metric tons were caught 1980. However the fisheries of Iceland are in great difficulties just now, due to inflation, increasing energyprices and limitations of the catching areas. Aquaculture for human consumption is very insignificant. Net cage cultivation in the sea is very difficult to manage while the differences in tide can be 4 meters (4,5 yards). Moreover the fiords are shallow and the climate very unpredictable. But Iceland has other possiblities in aquaculture. There is probably no other salmon producing country which has such good requirements for successful smolt rearing and ocean ranching as Iceland has.

Its thermal springs and reliable supply of uncontaminated groundwater are certainly unique. Moreover the absence of commercial netting at sea and along the coast (it is prohibited by law) guarantee the maximum return of oceanranched salmon.

Allready existing farms are producing 800 000 smolts a year. Periodically exports to the Norwegian farmers have been large.

8. Conclusions and summarizing aspects

In all the Scandinavian countries there is an ongoing discussion regarding the advantages and disadvantages of aquaculture.

The disadvantages can be summarized as follows:

Disadvantages in the environment

Fish cultivation causes pollution in the water by waste from the fodder and excrements. The pollutions can generate growth at algae and other organisms. The break down of these organisms requires large quantities of oxygen. The result can be excess fertilizing and scarcity of oxygen in the total water body.

Risk for disease

Cultivated fish live in more densely populations compared to wild fish. Therefore the risk for disease is significantly higher.

In all scandinavian countries the veterinary resources devoted to aquaculture are too small in relation to the growth of aquaculture. In addition the insurance system is not presently working to all farmers satisfaction.

There is also a certain risk that disease can spread from farms to wild populations.

Competition about water resources

In certain situations aquaculture can be a physical obstacle for fishing and other forms of traffic on the water bodies. There is also risk for conflicts with the outdoor recreation because the shores can be blocked.

Economic disadvantages

Many of the farms that have been recently etablished have not been properly planned with respect to the marketing aspects. In Sweden for instance the beginner starts to produce plate size rainbow trout that is the easiest to cultivate. But with many beginners starting at the same time the market will soon face an excess supply. An other factor is that many farmers are more interested in the biological aspects rather than the profitability aspects of aquaculture, and therefore neglect the latter.

Nobody will have advantage of a low return enterprice.

The advantages can be summarized as follows:

* Advantages in the regional policy

In all Scandinavian countries a regional policy is pursued with the aim to cause vigorous communities in the sparsely populated areas. Key-words in this policy are small scale production, combined activities and refining of natural resources. Aquaculture can be performed in most Scandinavian waterbodies even if the biological conditions vary. Splendid conditions are found at the costal areas where the possibilities for the population to earn a living by fisheries and agriculture have deteriorated. Aquaculture can be managed as small scale production with a great contribution of own resources as knowledge, laborforce, boats, bridges, storage buildings and so on.

The capital investments are not especially high in the small and middle scale production. The working season generally does not coincide with the intensive periods in fishing and agriculture. Aquaculture is very suited to link with other activities. In some cases there are possibilities to etablish small local refinment factories that can even handle the local supply of wild fish. Especially in Finland such arrangements have been made.

Aquaculture can consequently improve the economic, occupational and infrastructural situation in problem areas.

* Social advantage

Aquaculture can in some areas replace or complete stagnating fisheries. Aquaculture has then the social advantage of providing employment close to the livingplace and that the familly's total laborforce can be used.

* Advantages in the national economies

Norway and Denmark have large incomes from the export of aquaculture products. Especially for Denmark this income is important as the balance of trade is very negative.

Even Sweden and Finland have problems with the trade balances. These countries have a large import of highly processed fish products. 80% of the consumed frozen codfillets and 95% of the consumed salmon in Sweden was imported 1980. The difference between imports and exports of fish and fishproducts was 1128 million swedish crowns (190 million$) in Sweden 1980.

An increase in the consumption of domestic produced aquacultural products could replace part of the imported fish products and improve the trade balance.

At last must be mentioned that aquaculture requires less energy than other forms of food production. This is very important as long as the energy prices remain at a high level and import of oil is substantial.

* Industrial advantages

The fish processing industry has a great interest in securing the domestic supply of high quality fish. There is a risk that the Scandinavian countries in the future will have increased difficulties to get this fish on the traditional fishingareas because of restrictions and limitations. Aquaculture can in some degree keep the industry with the required products.

* Advantages in the national defence

In an military blockade situation, where deepseafishing is not possible and the providing to the agriculture of imported fodder, fertilizers and fuel will be difficult, aquaculture, lake- and coastfishing will be of great importance for the domestic foodproduction. Aquaculture has good conditions to be combined with lake- and coastfishing.

References

Cedrins, R & Larsson, B. 1982 Svensk matfiskodling - Möjligheter och begränsningar. Aktuellt från Sveriges lantbruksuniversitet nr 309, Uppsala.

Cedrins, R & Larsson, B. 1979. Svensk matfiskodling - Ekonomi och marknad. Institutionen för ekonomi och statistik, Rapport 156. Sveriges lantbruksuniversitet, Uppsala.

Fiskodling - lagstiftning och tillämpning, 1982. Naturvårdsverket och Fiskeristyrelsen, Stockholm.

Gjedrem, T. (red.), 1979. Oppdrett av laks og aure. Oslo.

Larsson, B. & Cedrins, R. Probleminventering inom områdena fiskavel, fiskens utfodring och fiskodlingsteknik. Institutionen för husdjursförädling och sjukdomsgenetik, Rapport 40. Sveriges lantbruksuniversitet, Uppsala.

Larsson, B. & Rønningen, K. 1979. Matfiskodling i nätkassar. Speciella skrifter 1. Konsulentavdelningen, Sveriges lantbruksuniversitet, Uppsala.

Svensk Akvakultur. 1980. Forskningsrådsnämnden, Rapport 28-N, Stockholm.

Tvenning, Hans. 1980. Fiskeoppdrett. Oslo.

International Market Prices, Exchange Rates and Quay Side Prices for Fish Landed in Scotland

W.E.F. Oakeshott
Department of Agriculture
and Fisheries for Scotland
Edinburgh, Scotland

1.1. This paper is concerned with the international market for Atlantic cod. This is of particular interest to the UK because of the popularity of this species on our markets, and our dependence on imports to meet a large part of total demands.

1.2. The Scottish interest lies in the Scottish fishing industry's reliance on markets south of the border; it has been estimated that over 80% of demersal species landed in Scotland are 'exported' - before or after processing - to England and Wales.

1.3. There is good evidence that supply and demand for cod on the international market has a powerful influence on the levels of quay-side prices obtainable at our fishing ports. An assessment of the workings of this market is therefore essential for any proper understanding of price determination at our quay-side auctions.

1.4. The paper begins (paras 2.1 - 2.5) with a brief review of the supply side of the UK market for cod since the general extension of fishery limits in 1977. This is followed by an overview of international supply and demand (paras 3.1 - 3.5). Paras 4.1 - 4.12 discuss the behavior of this market in recent years from a UK and Scottish perspective. The approach throughout is essentially informal; a fuller and more detailed analysis requires statistical data which is not readily available.

UK Market for Atlantic Cod 1976-81: Sources of Supply

2.1. The extension of fishery limits early in 1977 had a major impact on the UK markets for Atlantic cod, because of the consequences for the activities of our deep-sea fleets which became excluded from many of their traditional fisheries. As a result UK landings of cod, which were already well below post-war peak levels because of the difficulties over the Icelandic fishery, were reduced by over 30% in a single year (1977), and continued to decline until 1980, by which time they had fallen to less than 50% of the 1976 levels.

2.2. This progressive shortfall in UK landings is shown in Table 1, which also indicates the extent to which extra imports have become available to fill the gap in total supply. Thus for example in 1980, when landings by the UK fleet had declined by over 100,000 tons relative to 1976, a major part of this shortfall was being supplied in the form of additional imports.

Table 1. Structure of UK Atlantic cod supply: 1976-1981 (thousand tons, landed weight equivalent)

	Landings by UK Vessels	Imports	Total Supply
1976	212	106	318
1977	148	106	254
1978	126	158	284
1979	110	197	307
1980	104	195	300
1981	116	185	301

2.3. These shifts in the structure of supply have involved important changes in the product balance. In particular, the market share of frozen processed products - fillets and blocks - has been increasing, while the share of fish frozen at sea - the main product of the UK freezer fleet - has fallen to a fraction of traditional levels. These changes in the product balances are indicated in Table 2.

Table 2. UK supplies of Atlantic cod 1976-1981: main product specifications (thousand tons (LWE))

	Fresh/* Chilled	Frozen≠ Whole etc	Frozen Blocks	Frozen Fillets	Total Supply
1976	163	69	31	55	318
1977	113	62	32	47	254
1978	149	30	41	64	284
1979	150	24	58	74	307
1980	150	21	62	67	300
1981	155	15	65	66	301

*Includes small quantities of imported fillets.

≠Includes some frozen at sea fillets.

2.4. There have also been changes in the product balance of UK imports, although these continue to be dominated - as in the period before the events of 1977 - by frozen fillets and blocks. This is shown in Table 3.

Table 3. UK imports of Atlantic cod 1976-1981: main product specifications (thousand tons (LWE))

	Fresh/ Chilled	Frozen Whole etc	Frozen Blocks	Frozen Fillets	Total Supply
1976	9	10	31	56	106
1977	17	10	32	47	106
1978	44	10	41	63	158
1979	55	9	58	74	196
1980	57	9	62	67	195
1981	44	11	65	66	185

2.5. In summary, the outstanding features of the UK market for Atlantic cod over the period since January 1977 have been as follows. First there has been a very marked reduction in the share of the market held by supplies landed by the UK fishing fleets. Secondly, there has been a major increase in the share held by imports. Third, these changes have been associated with shifts in the product balance, imported frozen fillets and blocks having largely displaced frozen fish landed by the UK freezer fleet.

International Supply and Demand

3.1. Atlantic cod is an international fishery distributed from the NE Arctic via the North Sea, Iceland and Greenland to the Atlantic coasts of North America. The main fisheries, with broad indications of their relative scale, are shown in Table 4.

Table 4. Main fisheries for Atlantic cod with indicative levels of offtake 1976-1980 (thousand tons)

	1976	1977	1978	1979	1980
NE Arctic	910	950	730	490	420
Iceland/Faroes	390	380	360	400	460
North Sea	250	230	310	260	290
Baltic Sea	220	180	170	240	360
N American Atlantic*	220	270	340	330	420

*Canadian and US fleets.

Sources: Various

3.2. These fisheries, which collectively account for most of total global supply, have generally yielded around 2m tons of Atlantic cod a year over this period. It is interesting to note the major reductions in offtake from the NE Arctic fishery, which reflect the consequences of the unsustainable high levels of offtake in the 1970s, and how offtakes from other fisheries have tended to expand to offset the shortfall.

3.3. The main participants in these fisheries are the European fleets, especially the UK and Denmark; Norway and Iceland; Canada; and the Eastern Bloc (especially the USSR and Poland). Reliable figures for the annual levels of catches by these various fleets are difficult to establish, but broadly indicative estimates are shown in Table 5.

Table 5. Possible indicative levels of catches of Atlantic cod by selected fishing fleets: 1976-1980 (thousand tons)

	1976	1977	1978	1979	1980
(UK)	(254)	(176)	(150)	(125)	(123)
Denmark	164	154	133	186	164
Norway	400	440	400	330	280
Iceland	280	330	320	360	430
Canada	190	240	300	370	390
Poland	100	60	70	90	120
USSR	470	430	320	210	250

Source: FAO

3.4. Fully comprehensive figures on the proportion of these supplies entering into international trade are not yet available. It is however clear that the volume of international trade has generally been increasing over the period as the main human consumption markets in Europe have sought to replace the shortfalls in landings by their distant-water fleets by extra imports. The main exporting countries are Canada, Iceland, Norway, Denmark and Greenland, and the main importing countries are the United States and the United Kingdom, but imports on a smaller scale are also made into other European markets, notably France.

3.5. The bulk of international trade is in the form of frozen fillets and blocks, the main movements being from Canada into the United States; and from Iceland, Norway and Denmark into the United States and the United Kingdom. There is also a more limited international trade in fresh cod, but this is of course limited to exporters/importers located close to the relevant fisheries.

The Operation of International Markets

4.1. We are interested in studying this international market because of its relevance to price determination on our quay-side markets for fresh supplies of cod landed by our fishermen. In short, there seems little doubt that so long as extra supplies are readily available on the international market at competitive prices, quay-side buyers having reasonable inventories, etc. will generally regard the price of marginal imports as setting limits to the prices they are willing to bid for local landings. Provided therefore that international supply is sufficiently elastic, the price level of extra imports will have a powerful influence on local quay-side prices. We are therefore interested in an assessment of the extent to which international supply - and especially the availability of potential extra imports into the UK are responsive to price signals.

4.2. Presumably this is something which could in principle be examined on an econometric basis, although the model might be difficult to set up because of the inter-relations between the various markets and products, and because of the influence of biological and stock-management considerations on the supply side of the market.

4.3. At some time in the future it may be feasible to put together a proper analysis taking account of these various realities. In the meantime however some guidance may be offered via a much more informal inspection of the behavior of the market in recent years - a period characterized as we have seen by major changes in the structure of supply and demands, presumably offering ample scope for adjustments, etc. in the interest of profit-maximization by all participants in the market.

4.4. For example, although not wholly unexpected, the immediate effect of the 1977 extension of fishery limits on the UK markets was to create a shortage of supply of fresh and frozen-at-sea cod; but also probably a fairly general and very natural uncertainty on the part of all participants in the market as to what the new regime was likely to imply. The immediate reaction by many buyers therefore seems to have been to attempt to protect their short-run positions by bidding for such supplies as were still coming into the markets. As a result, prices quickly moved up to unprecedented levels; in Scotland for example the average price of fresh cod at the quay-side auctions in the period January-March touched £500/ton, compared to £300/ton the previous year.

4.5. These high prices certainly attracted some additional imports of fresh cod - notably from EEC sources - almost immediately (see Table 3) which may have been consigned to the UK market on a more or less opportunistic basis. In the case of frozen fillets and blocks, however, the export and import of which requires negotiation between buyers and sellers, there was no immediate response, and prices of both imports and UK landings remained at a high level throughout the year. This incidentally was greatly to the advantage of the Scottish inshore fleet, whose activities had not been directly affected by the extension of fishery limits.

4.6. Prices on the other side of the Atlantic which had been moving upwards strongly the previous year (1976) (see Annex Table 2) also increased sharply, with the exception of ex-vessel prices which may have been influenced by special factors. Wholesale prices of frozen cod blocks, for example, moved up to an average for the year of 97c/lb compared with 75c/lb in 1976. Presumably this will have reflected a corresponding upward shift in the price level of imported supplies, although details of the relevant prices are not generally available. Certainly however there was a sharp increase in the price of imports from Canada (see Annex), the main single source of supply of frozen fillets and blocks into the United States market. This may have been partly a reflection of events on the UK markets, although at this stage trading links between Canada and the UK in respect of frozen fillets and blocks had not been fully developed. There was also a more limited increase in the price of imported Icelandic fillets towards the end of the year, perhaps reflecting the rising opportunity costs to Iceland of continuing to direct marginal supplies to the United States in preference to the UK.

4.7. The following year (1978) there were further but less dramatic reductions in landings by the UK's distant water fleets. By this time however the market had had time to assess the implications of the new regime, and UK imports of fresh and frozen supplies began to expand in response to the UK's high prices. In particular, there were large scale additional imports of fresh cod from community sources (notably Denmark and the Netherlands), and of frozen fillets and blocks from Norway and Iceland. These added an extra 50,000 tons (LWE) to total UK supply, considerably easing the supply situation and acting as an effective constraint on further upward movements in prices.

4.8. These relatively large scale extra imports into the UK do not appear to have been generally at the final expense of the US market. In fact while there were marginal reductions in the volume of imported blocks from Denmark and Iceland, these were offset by increased imports from Canada, where the fisheries were expanding. There was also a net increase in imports of frozen fillets, again largely from Canadian sources. As a result, prices were generally little changed on the previous year, apart from ex-vessel prices for fresh cod which began to move upwards from the relatively depressed levels of 1977 (see Annex Table 2).

4.9. The following years - 1979 and 1980 - are dominated from a UK perspective by the increasing value of sterling, which had begun to improve against most other currencies in the summer of 1978 and continued on an upward trend throughout 1979 and 1980. The extent of this appreciation for selected currencies is shown in Table 6.

Table 6. Prices of sterling in terms of selected currencies: 1978-1980

	US Dollar	Dutch Guilder	German Mark	Norwegian Crown	Danish Crown
Dec 78	1.98	4.04	3.73	10.11	10.40
Dec 79	2.20	4.22	3.81	10.89	11.81
Dec 80	2.35	5.02	4.02	12.12	14.18

4.10. This strong upward trend in the value of sterling naturally increased the attractions of the UK market to exporters, and extra imports - again mainly from the UK's traditional suppliers but including consignments from relatively new sources, including Canada, became available at increasingly competitive prices. These restored the UK's total supply to levels approaching those last seen in 1976, and effectively constrained any further upward movement in (real) quay-side prices which were broadly unchanged until 1980, when they began to weaken rather dramatically (see Annex).

4.11. It is difficult to obtain any very clear picture of the workings of the international market at this time. It appears however that Norway, Denmark and Iceland may have been switching supplies from the

United States to the United Kingdom in response to the increased attractions of sterling, and probably also to the increased competitive pressures from Canada in the US market, which was beginning to weaken as a result of the general recession. In any case, price movements on the United States markets were generally limited at this time in spite of the reduced level of imports of both frozen fillets and blocks (see Annex). There was however a marked increase in the dollar price of Icelandic fillets, which would of course be consistent with the possible switching of supplies from the US to the UK market which seems to be suggested by the figures for US imports. There was also a marked increase in the dollar price level of US imports from Canada, - but not until the middle of 1980.

4.12. In the event, sterling reached a peak in October 1980 - February 1981 and there were growing fears that additional imports of fish of all kinds onto the UK market might begin to seriously threaten the welfare of the UK fishing industry; and indeed imports in this period reached record levels.[1] As it happened however sterling soon began to depreciate against the dollar and most other currencies fairly sharply. This discouraged the further expansion of imports which might otherwise have taken place and over the year as a whole their volume was little changed on the levels established the previous year. Since then the value of sterling has continued to fall and there has been some reduction in the level of UK imports. For the time being however sufficient data has not yet become available to make any assessment of this phase of the market.

Comments

5.1. This overview of the operations of the international market for Atlantic cod is plainly very incomplete and otherwise deficient. It has however I hope indicated what may be the most interesting features of the markets' evolution since the general extension of fishery limits in 1977. These are the increase in the proportion of total supply moving into international trade, and the associated changes in the scale and direction of international trade flows in cod products.

5.2. The general impression I have from the story is that there is a considerable degree of flexibility on both sides of the market, which may always tend to be moving the system towards an equilibrium based on normal profit-maximizing considerations. This means for example that if someone in say Boston is trying to forecast the price he may have to pay for next years' imports of frozen cod fillets, he will have to take account of demand trends on the other side of the Atlantic and also of course of any likely movement in exchange rates, especially as between dollars and pounds. Similarly, if we in Scotland wish to take a view on the prospects for the price level at our quay-side auctions, we shall have to consider the outlook for supply and demand in the United States, and for our exchange rates, especially as between pounds and dollars.

---

[1] The disturbances to the UK market apparently caused by these extra imports was probably a major factor behind the protest 'tie-up' by large sectors of the UK fishing fleets which occurred at this time.

Annex

Table 1. Average first-sale prices of UK supplies of Atlantic cod: 1976-1981

(1) £/ton money of the day

(2) £/ton 1976 money (in parentheses)

	Quay-side Auctions				Imports*	
	Scotland		England & Wales		UK	
	(1)	(2)	(1)	(2)	(1)	(2)
1976	359	359	385	385	343	343
1977	540	(466)	516	(445)	494	(426)
1978	561	(447)	521	(415)	503	(401)
1979	616	(426)	562	(395)	508	(357)
1980	599	(357)	534	(318)	480	(286)
1981	556	(296)	505	(269)	488	(260)

*Prices of fillets and blocks converted to landed-weight equivalent.

Table 2. Average prices of United States supplies of Atlantic cod 1975-1981: selected products and markets

US cents/lb: (money of the day)

	(1) Ex-vessel	(2) Frozen Blocks (Wholesale)	(3)* Imported Frozen Fillets (Wholesale) Canadian	(4)** Imported Frozen Fillets (Wholesale) Icelandic
1975	25.6	57.7	62.5	N/A
1976	29.7	74.9	71.7	N/A
1977	22.9	97.1	91.1	127
1978	25.1	100.0	90.5	130
1979	30.2	103.9	88.5	155
1980	28.4	105.6	89.4	160
1981	N/A	N/A	108.2	172

Notes: (1) Ex-vessel prices relate to production and value of fisheries at major New England ports. Source: Food Fish Market Review.

(2) Wholesale prices for frozen blocks relate to prices to processors as quoted by producers, importers and brokers at Boston, Gloucester and New Bedford. Source: Food Fish Market Review.

(3)* 5 lb packs. Source as above.

(4)** 5 lb boneless. Source as above.

Table 3. United States imports of frozen Atlantic cod fillets and blocks 1976-1981 (million lbs product weight)

	Fillets	Blocks
1976	118	180
1977	122	205
1978	135	205
1979	145	193
1980	131	160
1981	142	158

Source: Groundfish Market Bulletins

Table 4. United States imports of frozen Atlantic cod fillets and blocks - main source of supply 1976-1981 (million lbs product weight)

	Canada	Iceland	Norway	Denmark	Total (All Sources)
1976	N/A	N/A	N/A	N/A	
1977	87	98	52	56	327
1978	105	106	48	48	340
1979	140	116	19	28	338
1980	136	103	12	11	291
1981	N/A	N/A	N/A	N/A	300

Source: Groundfish Market Bulletins

The Importance of German Seafish Markets in International Trade

Rolf Lasch
Institut für landwirtschaftliche
Marktforschung
Braunschweig, Federal Republic of Germany

1 The Markets for Seafish and Seafish Products in 1981

With domestic consumption of approximately 320 000 metric tons (t) in product weight or about 700 000 t in live weight and a population of 60 million inhabitants the Federal Republic of Germany is one of the largest markets for seafish and seafish products[1] in Western Europe. In 1981, the total value of sales amounted to US-$ 880 million.

1.1 Sectors of German Seafish Market

Although the seafish market is very diversified and includes numerous and varied commodities it is possible to divide this market into the following main product groups (figure 1):

- Fresh seafish
- Frozen seafish
- Shellfish (crustaceans and molluscs)
- Shellfish products
- Fish products
- Fresh and frozen herring.

It is particularly noteworthy that the herring sector is not comparable with the other product groups, because supplies on this market are almost totally absorbed by the domestic industry for manufacturing fish products. For this reason, herring for direct consumption is available only in very small quantities on the German market.

1) Including shellfish and shellfish products. Without fish meal and fish oil.

Consumption
1981

Fresh Fish	Frozen Fish	Shellfish
50 000 tons	50 000 tons	8 500 tons
US-Dollar 100 million	US-Dollar 106 million	US-Dollar 22 million

Fish Products	Shellfish Products
220 000 tons	11 500 tons
US-Dollar 600 million	US-Dollar 52 million

Figure 1

In order to compare the different sectors of the seafish market quantities of shellfish, shellfish products and fish products are presented in product weight while those of fresh and frozen fish are expressed in fillet weight[1], because 80 to 90 percent of fresh and frozen fish are bought by German consumers in the form of fillet.

The quantities and values of national fish consumption on the above mentioned market sectors in 1981 are also shown in figure 1.

1.2 Development of Seafish Markets since 1971

During the last ten years a comparison of domestic consumption of seafish and seafish products shows only negligible changes in sales quantities. But between the different products involved in consumption there occured considerable fluctuations within this period of time (figure 2).

The total consumption of fresh and frozen fish in 1981 remained about 100 000 t in fillet weight, corresponding 220 000 t in live weight. But the significant preference for fresh fish existing in 1971 decreased in favour of frozen fish. At present, this market is divided in nearly two equal shares, about 50 000 t fresh fish and 50 000 t frozen fish.

In terms of quantity, there was no fundamental change in consumption of processed fish products since 1971, but shares of different commodities varied notably. Especially herring products decreased, while sales of canned tuna and sardines expanded.

1) Conversion factor: 0.45.

Consumption
1971 and 1981

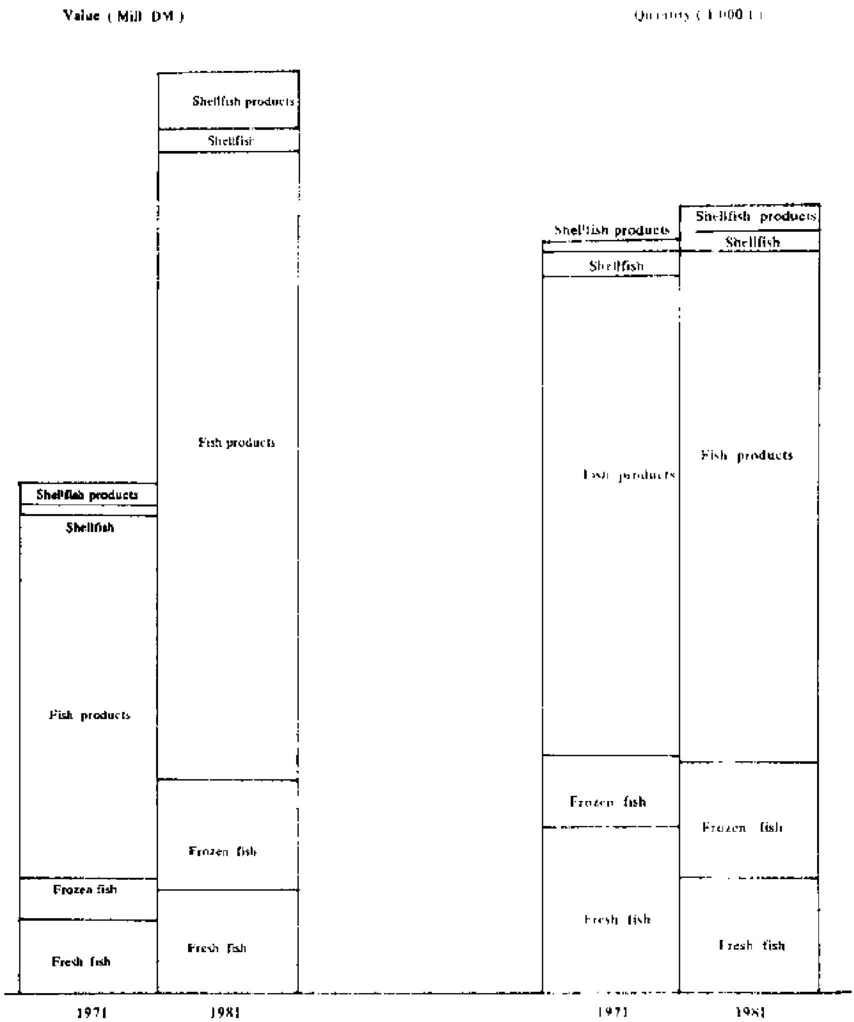


Figure 2

The decrease in consumption of shellfish was more than compensated by a higher demand for finished shellfish products. In 1981 the sales of shellfish totalling 8 500 t were 1 500 t below the amount sold in 1971. Sales of processed shellfish products, however, increased by 7 000 t as compared with 1971 (4 500 t).

This change in favour of finished products was accompanied by a significant increase in sales value. The value in this market sector increased from US-$ 35 million in 1971 to US-$ 75 million in 1981.

Due to the decline in domestic landings and diversified consumer requirements the German markets are increasingly dependent on world-wide imports. Because of the declining landings of fresh and frozen fish and because of the very small assortment of shellfish landings (almost only shrimps and mussels) the lack of supply has to be compensated by import deliveries.

Since 1971 imports of fish products show only a small increase but those of herring rawware for manufacturing fish products had a considerable upward trend.

2 The Importance of Foreign Trade for the Different Market Sectors

2.1 Fresh Seafish

In 1981 33 000 t of fresh fish from domestic landings and about 34 000 t (in fillet weight) from imports were available at the German market (figure 3). The exports of fresh fish amounted to 8 700 t (fillet weight) in 1981 (figure 4), mainly involved small cod and cod fillets from German landings, which were especially destinated for the French market.

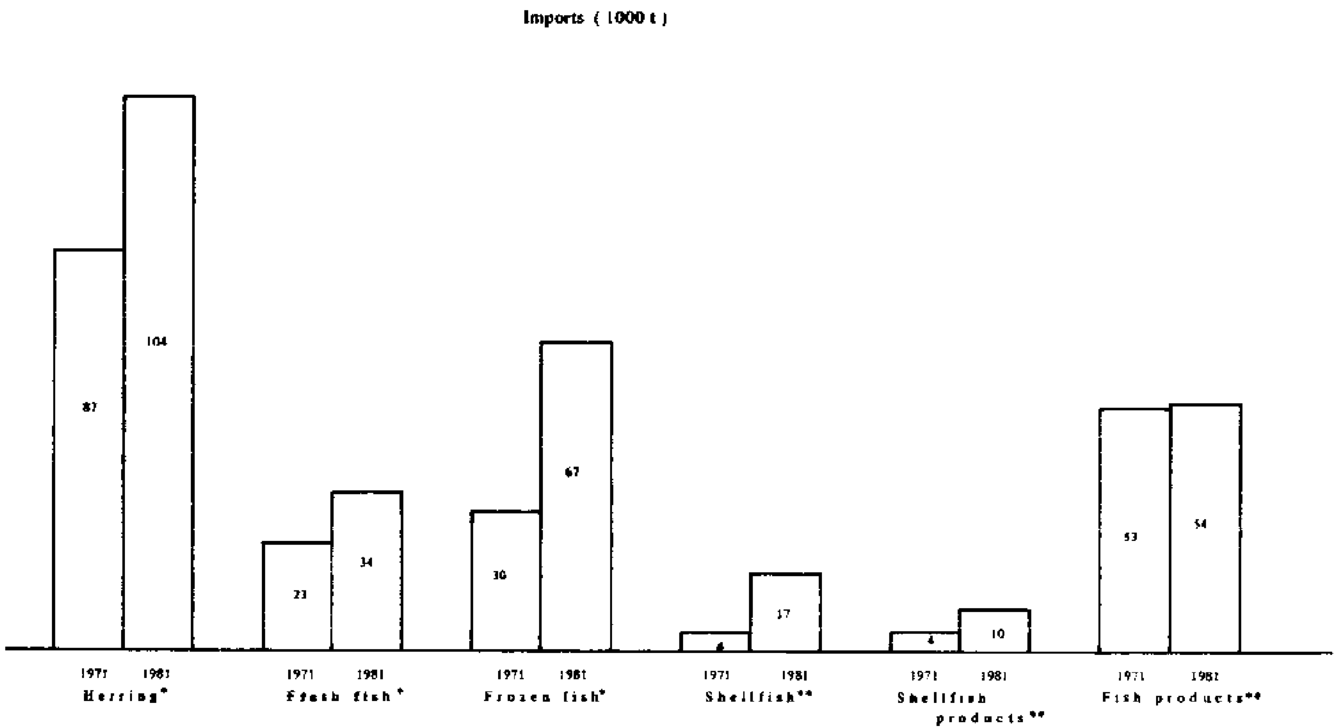
The most important species within imports are pollock, cod and ocean perch. There is a great demand for fillets as well as for whole round fish at the German market. In particular large size pollock is required by the processing industry for manufacturing so-called "Ölpräserven", i.e. salmon substitutes (Seelachs in Öl).

In 1981 more than 70 percent of total imports of fresh fish were covered by EEC-countries of which Denmark (cod), France (pollock) and the Netherlands (plaice, sole) were the leading suppliers.

Amongst the imports from third countries, i.e. countries outside the EEC, deliveries from Iceland (ocean perch) - with direct landings in German ports - and from Norway (pollock, haddock) are noteworthy.

Concerning import values, in total US-$ 80 million, the EEC-countries accounted for 76 percent of total fresh fish imports. Denmark led in value, accounting for 40 percent of total. France was second with 21 percent, and the Netherlands ranging third with 11 percent. Beside these EEC-countries, Iceland (12 percent) and Norway (8 percent) were important suppliers too.

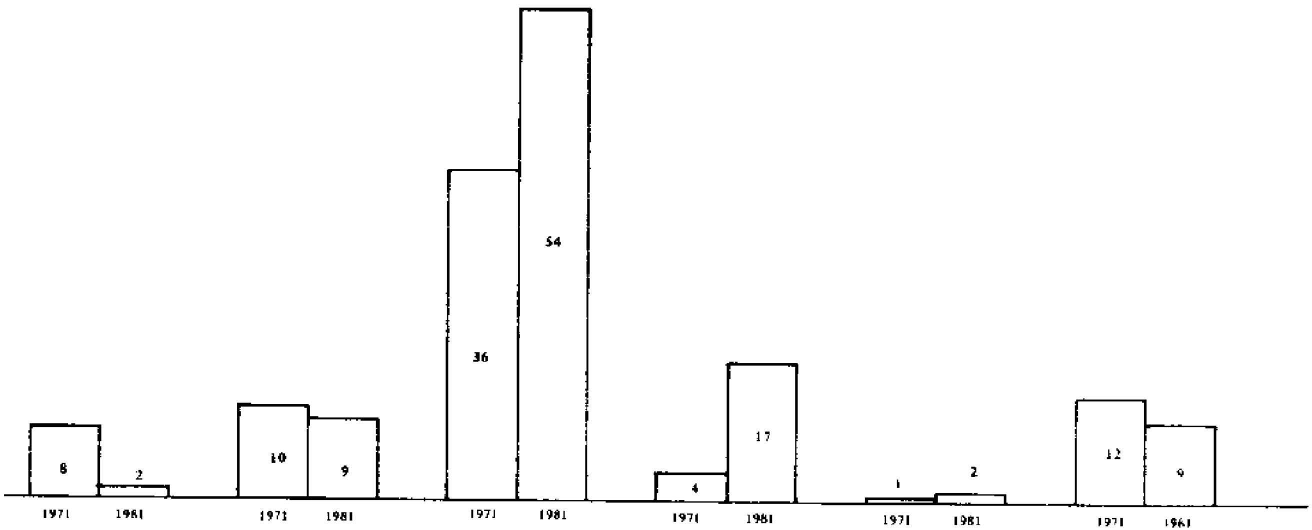
In summary, it can be realized that this market will be supplied both by domestic landings and by imports from the neighbouring EEC-countries. Sporadic Icelandic landings in



* Fillet weight. – ** Product weight.

Figure 3

Exports (1000 t)



* Fillet weight. – ** Product weight.

Figure 4

German ports and deliveries from Norway complete the assortment on the German fresh fish market.

2.2 Frozen Seafish

In 1981 the German landings of frozen fish amounting to 50 000 t (fillet weight) and the imports, totalling 67 000 t (fillet weight) (figure 3) were only partially destined for domestic consumption. A large part of the landed and imported frozen fish is used for processing on shore into convenience products like fish sticks and portions. These commodities then represent a substantial share of total exports of 54 000 t (fillet weight) (figure 4).

The German production of frozen fish - almost exclusively seafrozen - includes mackerels (12 900 t fillet weight), ocean perch (10 700 t), cod (4 000 t), ling (3 000 t) and blocks of minced fish (4 000 t). The greatest share is landed as fillets. Only limited quantities of mackerels and ocean perch are supplied as whole fish.

While among imports of frozen fillets pollock (20 400 t), cod (8 400 t), hake, i.e. South West Atlantic hake from Argentine (7 900 t), mackerels (2 500 t) and ocean perch (1 000 t) were the most important species, the foreign deliveries of whole frozen fish consist of a great variety of fishery items. Mackerels led in quantity with 44 percent, followed by sharks (14 percent), halibut (11 percent) and sprats (4 percent).

Most of these imported whole fish are used for manufacturing fish products like canned and smoked commodities, whereas the imported frozen fillets usually are destinated for domestic consumption or - with or without processing - for exportation.

Contrary to the fresh fish sector, only 45 percent of the imports of frozen fish came from EEC-countries, while third countries participated with 55 percent.

In 1981 Danish supplies amounting to about 11 000 t played a predominant part in the German market of frozen fish followed by the Netherlands and UK at the second and third place.

Among the non-EEC-countries the Faroe Islands anually supplies about 11 200 t frozen fish in fillet weight (mainly pollock). Also Norway (7 000 t, frozen mackerels, pollock and fish sticks and portions), Argentine (4 800 t hake), Iceland (2 700 t mainly frozen halibut), Canada (1 600 t), Peru (in particular pilchards), Japan (1 000 t) and the USA (600 t), both latter countries chiefly sharks, are important trading partners.

The total value of frozen fish imports amounted to US-$ 123 million in 1981, the shares held by EEC-countries and by third countries were US-$ 59 million or 46 percent and US-$ 66 million or 54 percent, respectively.

The Danish share of total import value amounted to US-$ 27 million. Therefore, Denmark is also in terms of value the most important supplier of frozen fish, followed by the other EEC-nations, the Netherlands (US-$ 17 million), France (US-$ 4 million) and the United Kingdom (US-$ 3.5 million).

Further important suppliers among the non-EEC-members are: the Faroe Islands (US-$ 17 million), Norway (US-$ 13 million), Argentine (US-$ 5.7 million), Japan, Iceland, Canada, the USA, Poland and Peru.

In contrast to the fresh fish market, the exports of frozen fish are of substantial importance for the German fish trade. In 1981, the exports of frozen fish totally reached about 56 000 t (fillet weight).

Cod (15 400 t), ocean perch (6 400 t), hake (4 800 t), mackerels (2 700 t) and pollock (1 500 t) dominated in exports of frozen fillets together with 9 800 t of fish sticks and portions.

The major species of whole fish, in order of importance, were: mackerels (8 500 t fillet weight), sharks (1 300 t) and ocean perch (900 t).

With 39 100 t, taking a share of 70 percent of the total exports, the EEC-countries represent the most leading customers for frozen fish from the Federal Republic of Germany. Among these countries, France accounted for about one-third of the total exports of frozen fish, especially fillets of cod, ocean perch, hake and fish sticks and portions.

The other important EEC-countries involved are: Belgium, the Netherlands and the United Kingdom, which particularly imported cod fillets and fish sticks and portions. Besides this, Italy buys large quantities of frozen sharks of Japanese origin from Germany.

Among the third countries, Czechoslovakia (CSSR) covered a great share of export of frozen mackerels from German landings while Austria is traditional importer of frozen cod fillets and fish sticks and portions.

Measured in value the EEC-countries also played a predominant role in exports of frozen fish, the total value reaching US-$ 113 million in 1981. These countries accounted for 77 percent (US-$ 88 million) of overall frozen fish exports as compared with 23 percent (US-$ million) delivered to third countries.

France with US-$ 33 million, Italy with US-$ 23 million, Belgium with US-$ 14 million, both the United Kingdom and the Netherlands with US-$ 8.4 million are the important customers within the EEC.

Concerning exports of frozen fish to third countries, Czechoslovakia (US-$ 10 million) and Austria (US-$ 8 million) are leading in terms of value.

Although sales of frozen fish on the domestic market measured in volume as well as in value - are almost equal to those of fresh fish, there are substantial differences in external trade of both items. While imports of frozen fish are twice as large as those of fresh fish, the export sales of frozen fish are even almost seven times larger than those of fresh fish.

Furthermore, in 1981 more than half of the imports of frozen fish was delivered by third countries, while the main importing countries for fresh fish all belong to the EEC.

2.3 Shellfish (Crustaceans and Molluscs)

At present about 8 500 t (product weight) crustaceans and molluscs valued at US-$ 22 million are consumed in the Federal Republic of Germany.

In 1981 landings of shrimps[1] and harvesting of common mussels reached 13 000 t each. These items amounting to 4 000 t of shrimps and 6 000 t of mussels played also a dominant role in export trade (16 800 t) (figure 4).

The Netherlands with 3 700 t of shrimps and 2 300 t of mussels and France with 2 600 t of mussels are the most important customers. In terms of value the export of frozen squid to Italy amounting to 2 100 t is notable. Furthermore, high valued exports of prawns[2] (US-$ 7.2 million) to the Netherlands (US-$ 4.2 million), to Italy (US-$ 1.3 million) and to France (US-$ 1 million) represented a large volume in value within the last years.

Three product items accounted for almost 95 percent of the total export value of shellfish. 80 percent were taken by shrimps and prawns valued at US-$ 14 million, 11 percent by squid (including octopus and cuttlefish) valued at US-$ 2 million and only 4 percent by mussels valued at US-$ 0.7 million.

In total, 98 percent of volume and 95 percent of value were exported to countries belonging to the EEC.

The main species in German imports of shellfish were squid with 5 100 t (31 percent), shrimps and prawns as well as mussels both categories with 4 800 t (29 percent) of the 1981 total (17 000 t).

In terms of value, shrimps and prawns amounting to US-$ 22 million (49 percent) were the most important commodities

---

1) Brown shrimps (lat.: crangon crangon). - 2) Lat.: pandalidae.

in import trade of shellfish. Other high valued items were: squid (US-$ 7.7 million) and lobster with US-$ 5.3 million.

In terms of volume, the imports of shellfish originated in 1981 to 55 percent from EEC-members and to 45 percent from third countries.

In order of importance, Denmark led in total import volume with a share of 23 percent followed by the Netherlands (16 percent), Poland (12 percent) and Thailand (6 percent). In 1981, the supplies from the People's Republic of China showed with 13 percent the highest results in value.

Concerning the external trade of shellfish, the following summary can be made: shrimps, prawns, mussels and squid were the most important species in foreign trade. While in import trade many suppliers of numerous countries all over the world are participating, the greatest share of German exports of shellfish was delivered to the Netherlands, Italy and France.

2.4 Shellfish Products

With a domestic consumption of 11 500 t (product weight), valued about US-$ 53 million in 1981, the German market for shellfish products gained increasing importance in recent years. It includes a wide range of different products mainly manufactured from crabs, shrimps and mussels. Almost one-third (3 900 t) of consumption was produced in Germany.

In external trade, particularly the imports amounting to 9 600 t and valued at US-$ 45 million reached a large volume. The exports of shellfish products, however, yielded only 2 000 t valued at US-$ 13 million in 1981 (figures 3 and 4).

Denmark was the principal supplier of shellfish products. This country accounted for nearly half of the total imports. Spain, Malaysia and Taiwan were further suppliers to the German market.

2.5 Seafish Products

The market for seafish products - with a domestic consumption of about 220 000 t (product weight) valued at almost US-$ 600 million - is the largest sector of German seafish markets. It involves canned fish and marinades - manufactured from herring or herring substitutes as pilchards and mackerels -, canned sardines and tuna, Ölpräserven i.e. salted fish products packed in oil, Anchosen i.e. sprats and small herring, preserved with a mixture of salt, sugar and spices, salted herring, smoked fish and fish salades.

A large part of this consumption volume - 166 000 t (product weight) or 66 percent - was produced by the German processing industry. Besides the domestic production fish products valued at US-$ 135 million were imported (figure 3).

In 1981 salted herring and smoked fish - both items occupying a predominant place consumer's favour - covered an import value of US-$ 21 million and US-$ 19 million respectively in 1981. The Dutch share took about 80 percent in value. Furthermore, the imports of smoked salmon from Denmark valued at US-$ 8.4 million are noteworthy.

The supply of the market with canned sardines and tuna is almost exclusively covered by imports, because there is no domestic processing industry in Germany. Imports of these canned products yielded values of US-$ 38 million for sardines and US-$ 21 million for tuna in 1981.

Taiwan (6 600 t), the Philippines (2 800 t), and Senegal (1 100 t) were the leading suppliers of canned tuna. Portugal dominated the German market of canned sardines with imports amounting to 5 500 t while Morocco delivered only 1 500 t last year.

Although large quantities of canned herring manufactured by the domestic processing industry are available at the German market, the imports (9 600 t) valued at US-$ 22 million had a considerable volume. The main suppliers were Denmark (5 000 t) and the Netherlands (3 400 t) covering 88 percent of all imports of canned herring products.

In terms of quantity, the import of caviar (300 t) was negligible but - measured in value - with US-$ 7.5 million of notable importance. The Soviet Union and Iran are still the traditional suppliers.

With regard to the export of fish products canned herring, accounting for 6 700 t and valued at US-$ 16 million, was the most important commodity in recent years.

In 1981 the EEC-countries took a share of 39 percent (2 600 t). France with 1 400 t and Austria with 1 800 t were the dominant customers of canned herring from Germany. But the distribution of canned herring, made in the Federal Republic of Germany is worldwide spread and includes numerous countries (Australia, Sudan, Switzerland, the USA, Canada, Lesotho and other).

3 <u>The Foreign Trade in International Comparison</u>

The sales in external trade divided in the different sectors are demonstrated in figure 5.

With an import value of US-$ 510 million, taking a 6 to 7 percent share of total imports of edible fish and fish products, the Federal Republic of Germany occupies together with France and the United Kingdom the third position in world fish imports. Only Japan and the USA each with imports valued about US-$ 3 to 3.5 billion and shares of 20 to 25 percent exceed the German fish imports.

External Trade

1981

Fresh Fish
Imports
US-Dollar 80 million
Exports
US-Dollar 18 million

Frozen Fish
Imports
US-Dollar 123 million
Exports
US-Dollar 113 million

Shellfish
Imports
US-Dollar 44 million
Exports
US-Dollar 17 million

Fish Products
Imports
US-Dollar 135 million
Exports
US-Dollar 34 million

Shellfish Products
Imports
US-Dollar 45 million
Exports
US-Dollar 13 million

Herring
(incl. semi-finished rawware)
Imports
US-Dollar 82 million
Exports
US-Dollar 2 million

Figure 5

Vice versa, Japan and the USA are also very important exporting nations both holding the leading positions in international export trade each valued at more than US-$ 1 billion.

Due to the structure and the age of the German fishing fleet a further drop of domestic landings of seafish must be anticipated in the future. If the demand for seafish and seafish products in the Federal Republic of Germany still remains on the same level as at present a further increase of imports will absolutely be necessary. These facts will open up favourable conditions to foreign suppliers at the German markets in the future.

Abstract

With a domestic consumption of about 700 000 t (live weight) the Federal Republic of Germany is one of the largest markets for seafish and seafish products in Western Europe. In 1981 the total value of sales amounted to 880 million US-$.

During the last ten years a comparison of domestic consumption shows only negligible changes in sales quantities but substantial fluctuations between the different commodities involved in consumption.

In 1981 the fresh fish market was supplied half by domestic landings and half by imports. Although the sales of frozen fish on the domestic market were almost equal to those of fresh fish, the imports of frozen fish were twice and the exports even five times as large as fresh fish trade.

In recent years the German consumption of shellfish and shellfish products got an increasing importance. In particular imports reached a large volume.

The market for fish products is the most important sector. Two thirds of the supply were processed by domestic industries.

With an overall import value of 510 million US-$ the Federal Republic of Germany ranges at the third position in world fish imports together with France and the United Kingdom. Due to the decline in domestic landings the supply of the German fish market will increasingly depend on imports.

An Analysis of the Import Demand for Fish in the United Kingdom

Trevor Young
University of Manchester
Manchester, England

While fish may account for a small part of the U.K.'s gross domestic product, the industry remains very important in a number of fishing regions and its future is still the subject of continued debate and controversy. Over the last decade or so the industry has had to adjust to a series of quite radical institutional and market changes and this paper is an attempt to focus on some aspects of the latter. In particular, it is clear that, whereas the total quantity of fish and shellfish landed has remained relatively constant (ranging between 1000 and 1166 thousand tonnes in the last 15 years), landings by British vessels has declined steadily from a peak in 1973, when domestic landings accounted for over 68% of total fish expenditure, to a market share which is now less than 50%. The gap has of course been filled by increased imports.

Given these developments, the paper sets out to investigate the nature of the demand for fish at the quayside level in the U.K. Specifically a demand system is formulated to explain the shares of total fish expenditure accounted for by imports of fresh and frozen fish, shellfish imports, and landings by British vessels. The chosen methodology is an extension of the Addilog model, namely the Generalised Addilog Demand System (GADS) suggested recently by Bewley (1982a) and described in some detail in the next section. The model is specified and estimated firstly for the three broad categories of fish expenditure listed above and then the system is extended by disaggregating the imports of fresh and frozen fish into four components: salmon and trout, and 'other fresh and frozen fish', distinguishing in each case between European and non-European sources. The analysis concludes with a simple simulation model which takes the estimated GADS model as its base and which generates long run stationary equilibrium values and forecasts to 1985 under various sets of assumptions.

The Generalised Addilog Demand System

Assuming that there are n mutually exclusive and exhaustive commodity groups in the demand system, the GADS model may be depicted as follows:

$$W_{it} = \frac{\exp[g_i(P_{1t}, \ldots , P_{nt}, E_t , u_{it})]}{\sum_{j=i}^{n} \exp[g_j(P_{1t}, \ldots , P_{nt}, E_t, u_{jt})]} \tag{1}$$

$$i=1, \ldots , n$$
$$t=1, \ldots , T$$

$$\text{where } 0 < W_{it} < 1 \; ; \; \sum_{j=1}^{n} W_{jt} = 1 \tag{2}$$

W_{it} denotes the per capita average budget share of commodity i; P_{it} is the price of the i^{th} good, and E_t is defined as total per capita expenditure.

While any functional form for g(.) would satisfy (2), Bewley (1982b) shows that a function linear in the logarithms of the variables with an additive disturbance provides a theoretically and empirically plausible set of Engel curves. Two forms are considered here:

$$g_i(.) = a_i + \sum_{j=1}^{n} b_{ij} \ln (P_{jt}/E_t) + u_{it} \tag{3}$$

$$\text{and } g_i(.) = a_i + \sum_{j=1}^{n} b_{ij} \ln P_{jt} + b_{io} \ln E_t + u_{it} \tag{4}$$

$$\text{where } \; E(u_{it})=0 \; ; \; E(u_{it}\, u_{js}) = \begin{cases} \sigma^2_{ij} & t=s \quad i,j=1, \ldots , n \\ 0 & t \neq s \end{cases}$$

Substituting (3) into (1) and taking the ratio of W_{it} to W_{jt} yields a form of the multinomial logit model suggested by Theil (1969). If $b_{ij}=0$, $i \neq j$, the system reduces to Houthakker's (1960) Addilog model. In the latter, the underlying additive indirect utility function necessarily implies symmetry of the Slutsky compensated price elasticity matrix. However, whereas the GADS model provides a more flexible demand system, the underlying utility function is unknown.

From (1) it can be shown that the own price, cross price and expenditure elasticities are as follows:

$$\eta_{ii} = P_i\left(\frac{\partial g_i}{\partial P_i} - \sum_j W_j \frac{\partial g_j}{\partial P_i}\right) - 1 \qquad i=1, \ldots , n$$

$$\eta_{ik} = P_k \left(\frac{\partial g_i}{\partial P_k} - \sum_j W_j \frac{\partial g_j}{\partial P_k} \right) \qquad i \neq k$$

$$\eta_{io} = E \left(\frac{\partial g_i}{\partial E} - \sum_j W_j \frac{\partial g_j}{\partial E} \right) + 1 \qquad i=1, \ldots, n$$

If the functional form of (4) is chosen, then

$$\eta_{ii} = b_{ii} - \sum_j W_j b_{ji} - 1 \qquad i=1, \ldots, n$$

$$\eta_{ik} = b_{ik} - \sum_j W_j b_{jk} \qquad i \neq k$$

$$\eta_{io} = b_{io} - \sum_j W_j b_{jo} + 1 \qquad i=1, \ldots, n$$

A demand system which is linear in its parameters can be derived by substituting (4) into (1) and applying an appropriate transformation, namely:

$$\ln\left(\frac{W_{it}}{\tilde{W}_t}\right) = \alpha_i + \sum_{j=1}^{n} \beta_{ij} \ln P_{jt} + \beta_{io} \ln E_t + V_{it} \qquad i=1, \ldots, n \quad (5)$$

$$\text{where } \ln \tilde{W}_t = \sum_{j=1}^{n} \bar{W}_j \log W_{jt} \text{ and } \bar{W}_j = \frac{1}{T} \sum_{t=1}^{T} W_{jt} \quad (6)$$

Although it is not possible to identify the a_i and b_{ij} parameters from (5), we have sufficient information for prediction of budget shares and for the derivation of elasticities. That is to say, it can be shown that:

$$\beta_{ii} = b_{ii} - \sum_{j=1}^{n} W_j b_{ji} = \eta_{ii} + 1 ,$$

$$\beta_{ik} = b_{ik} - \sum_{j=1}^{n} W_j b_{ki} = \eta_{ik} \qquad i \neq k ,$$

$$\text{and } \beta_{io} = b_{io} - \sum_{j=1}^{n} W_j b_{jo} = \eta_{io} - 1$$

Alternatively, a more convenient form for estimation may be selected. Namely,

$$\ln\left(\frac{w_{it}}{\bar{W}_t}\right)' = \alpha_i + \sum_{j=1}^{n} \eta_{ij} \ln P_{jt} + \eta_{io} \ln X_t + v_{it} \tag{7}$$

where $\ln\left(\frac{W_{it}}{\bar{W}_t}\right)' = \ln \frac{W_{it}}{\bar{W}_t} + \ln P_t - \ln P_{it}$

This form has the advantage that the estimated elasticities are generated directly and, if required, the Slutsky symmetry conditions can be imposed on the system by estimating it under the set of cross-equation restrictions,

$$\eta_{ij} = \frac{W_j}{W_i} \eta_{ji} + W_j(\eta_{jo} - \eta_{io}) \qquad \begin{matrix} i,j=1, \ldots , n \\ i \neq j \end{matrix} \tag{8}$$

Estimation

The demand system was estimated as a set of Zellner Seemingly Unrelated Regression equations. Where the same set of exogenous variables appears in each equation and there are no constraints across equations, the procedure is equivalent to OLS. Otherwise, a joint GLS procedure is adopted by iterating on the covariance matrix of residuals across equations.

We begin by presenting a 3-share demand model-imports of fresh and frozen fish, imports of shellfish, and fish and shellfish landed by British vessels. Because of limitations of space, only the estimated coefficients of the unrestricted model are presented (Table 1), although the system was also estimated under homogeneity and symmetry restrictions.[1] In order to remove the singularity of the system, one equation (shellfish) has been deleted.[2] Estimates of the expenditure and own-price elasticities are plausible in sign and magnitude and are significantly different from zero. However, with the exception of the results for British-landed fish, the cross-price elasticities do not accord entirely with *a priori* reasoning.

An attempt was then made to extend the analysis both by disaggregating the imports of fresh and frozen fish into salmon and trout imports and 'other fresh and frozen fish' imports and by distinguishing between European and non-European sources of supply in each case. This was approached in two ways. First, it was assumed that the import bill for fresh and frozen fish could be treated separately from other types of expenditure on fish and hence a 4-share model could be specified and estimated (Table 2). By imposing a block-diagonal structure on the price elasticity matrix, more plausible results were obtained than in the full GADS model. Nevertheless, the estimated cross-price elasticities are not entirely satisfactory and the

Table 1 a : Parameter Estimates for the 3-Share Model: 1966-1980*

	Const.	Ln PFF	Ln PSHELL	Ln PFSUK	Ln EFRPC
$\mathrm{Ln}\left(\frac{WFF}{\tilde{W}}\right)'$	-4.3847 (0.95)	-1.4520 (0.20)	-0.9617 (0.12)	-1.0054 (0.28)	2.4125 (0.28)
$\mathrm{Ln}\left(\frac{WFSUK}{\tilde{W}}\right)'$	2.4162 (0.41)	.2335 (0.09)	.4136 (0.05)	-.4781 (0.15)	.3059 (0.12)

* Standard errors in parentheses

Table 1 b : Estimated Elasticities

	PFF	PSHELL	PFSUK	EFRPC
TFF	-1.452	-.962	-1.005	2.413
SHELL	- .308	-1.196	-0.700	1.767
FSUK	.233	.414	-.478	.306

Table 2 : Parameter Estimates of the 4-Share Model: 1968-1980*

	Const.	Ln PSEUR	Ln PSOT	Ln PFSEUR	Ln PFSOT	Ln EFFRPC	DUM
$\mathrm{Ln}\left(\frac{WSEUR}{W^{+}}\right)'$	-2.983 (0.16)	-.9006 (0.37)	-.1089 (0.44)	-	-	.1072 (0.31)	1.0777 (0.20)
$\mathrm{Ln}\left(\frac{WSOT}{W^{+}}\right)'$	-1.415 (0.08)	-.1354 (0.11)	-.4245 (0.13)	-	-	-.1492 (0.17)	-.1392 (0.10)
$\mathrm{Ln}\left(\frac{WFOSEUR}{W^{+}}\right)'$	0.589 (0.08)	-	-	-.9263 (0.07)	.0138 (0.04)	1.1620 (0.06)	.0406 (0.42)
$\mathrm{Ln}\left(\frac{WFOSOT}{W^{+}}\right)'$	-1.784 (0.46)	-	-	-.7772 (0.40)	-1.0762 (0.21)	1.3628 (0.31)	-.4190 (0.22)

* Standard errors in parentheses. The estimated coefficients may be directly interepreted as elasticities.

expenditure elasticities for imported salmon appear surprisingly low. The alternative approach was to estimate a 6-share model in which the four categories of imported fresh and frozen fish were expressed as shares of the total expenditure on fish and in which imported shellfish and British landings appeared as before. The results of this exercise are presented in Table 3. With this model the best results were obtained by imposing both homogeneity and a block-diagonal structure as in the previous case. However the estimates of the parameters, particularly in the first two equations of Table 3, seem rather less convincing than in the foregoing analysis.

Simulation Analysis

The seven estimated share equations, presented in Tables 1 and 2, are combined to form the basis for the simulation analysis. That is to say, from Table 1 three endogenous variables WSHELL, WFSUK, and WFF are generated. The latter together with total fish expenditure (EFRPC) determines expenditure on fresh and frozen fish (EFFRPC), which in turn feeds into the 4-share model depicted in Table 2. Given exogenous fish prices, these expenditure shares can be translated by a series of identities into quantity terms. Although, with appropriate separability assumptions, the set of share equations could be treated as an independent system, the simulation exercise might be considered more meaningful if the scope of the model were broadened to include other market forces in the economy, in particular meat prices and some measure of national expenditure. Thus it was decided to incoporate two equations to determine the level of total fish expenditure (LEFRPC). The first is a simple regression, estimated by an iterative GLS procedure, to explain the quantity of total fish and shellfish:

$$\begin{aligned} LQFT = {} & \underset{(0.97)}{7.852} + \underset{(0.11)}{.3795}\, LQFT.1 - \underset{(0.11)}{.9877}\, LQFT.2 - \underset{(0.05)}{.2451}\, LPF.1 \\ & + \underset{(0.07)}{.3815}\, LPM + \underset{(0.10)}{.430}\, LCERPC \qquad 1968\text{-}1980 \end{aligned} \tag{9}$$

Standard errors in parentheses. $\bar{R}^2 = .89$ $d.w = 2.98$ $\rho = -.904$

For the simulation run, this equation is re-specified to formally take account of the autoregressive process and combined with the following identity:

$$LEFRPC = LQFT * LPF - LPOP \tag{10}$$

While further experimentation with the specification of this component of the model would have undoubtedly produced improved econometric results, these equations track the actual paths of the endogenous variables rather well (Table 4) and so are retained.

A stylised version of the complete simulation model is depicted in Figure 1.

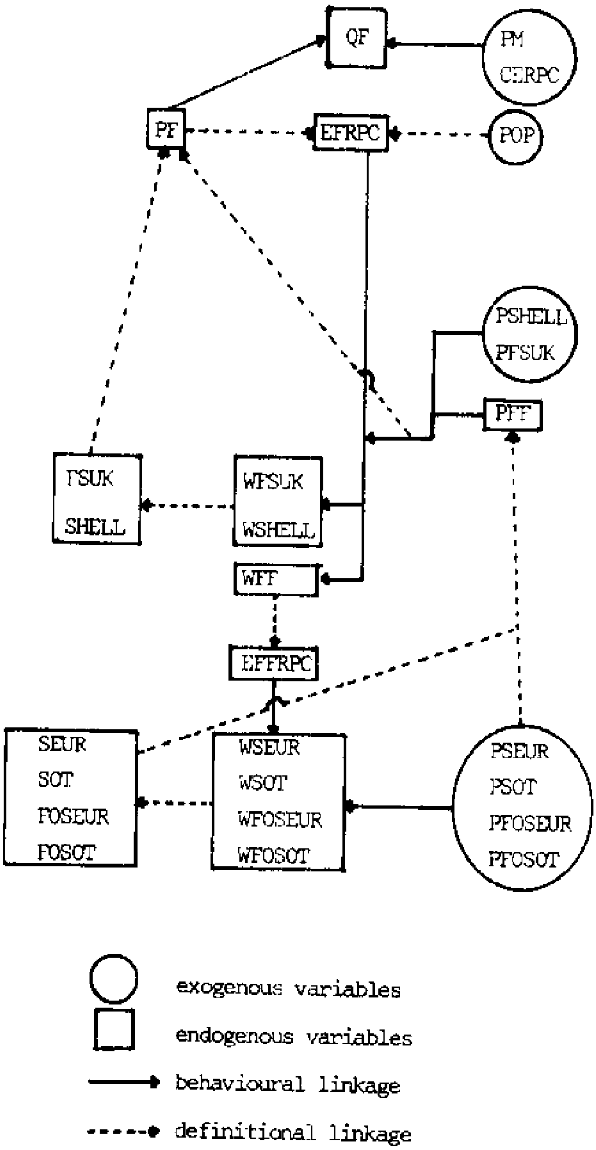
Feeding in values of the exogenous variables and starting values of the lagged dependent variables, the model is run over the period 1968-1981 and, judging by the Theil inequality statistics ($0 < U1 < 1$; $0 < U2 < \infty$) presented in Table 4, the model appears to

Table 3 : Parameter Estimates for the 6-Share Model: 1968-1980*

	Const.	Ln PSEUR/ EFRPC	Ln PSOT/ EFRPC	Ln PFSEUR/ EFRPC	Ln PFSOT/ EFRPC	Ln PSHELL/ EFRPC	Ln PFSUK/ EFRPC	DUM
$Ln\left(\frac{WSEUR1}{W1}\right)'$	-4.8334 (3.66)	-.3553 (0.45)	-.1667 (0.71)	-	-	.8586 (0.69)	-.6213 (1.23)	1.1373 (0.24)
$Ln\left(\frac{WSOT1}{W1}\right)'$	-3.4576 (2.22)	.2707 (0.23)	-.0894 (0.36)	-	-	.5787 (0.39)	-.8782 (0.75)	-.0783 (0.16)
$Ln\left(\frac{WFSEUR1}{W1}\right)'$	-5.0312 (2.04)	-	-	-1.6511 (0.42)	.0968 (0.11)	-.8222 (0.18)	-.6826 (0.79)	.0166 (0.04)
$Ln\left(\frac{WFSOT1}{W1}\right)'$	-12.205 (5.93)	-	-	-2.5398 (0.97)	-1.3002 (0.23)	-.0052 (0.79)	-.9889 (2.27)	-.2839 (0.31)
$Ln\left(\frac{WSHELL}{W1}\right)'$	-3.6326 (1.21)	.0063 (0.13)	-.0247 (0.19)	-.7113 (0.26)	-.0026 (0.06)	-.9776 (0.22)	-.2812 (0.51)	-
$Ln\left(\frac{WFSUK}{W1}\right)'$	3.0542 (0.89)	-.0511 (0.03)	.0016 (0.04)	0.4199 (0.19)	-.0007 (0.05)	.1819 (0.09)	-.6090 (0.35)	-

* Standard errors in parentheses. The estimated coefficients may be directly interpreted as elasticities.

Figure 1 : Simulation Model



track satisfactorily over this period. Indeed, when for comparison the 6-share model of Table 3 replaces the seven share equations in the simulation system, the results are much less acceptable (Table 4).

Table 4 : Theil Inequality Statistics

	7-Share Model			6-Share Model	
	U1	U2		U1	U2
WSEUR	.20	.39	WSEUR1	.23	.46
WSOT	.30	.61	WSOT1	.25	.50
WFOSEUR	.32	.61	WFOSEUR1	.53	1.33
WFOSOT	.45	.82	WFOSOT1	.60	1.23
WSHELL	.44	.79	WSHELL	.57	1.35
WFSUK	.38	.80	WFSUK	.39	1.06
SEUR	.32	.68	SEUR	.29	.62
SOT	.50	.85	SOT	.56	.98
FOSEUR	.34	.69	FOSEUR	.53	1.09
FOSOT	.40	.84	FOSOT	.40	.92
SHELL	.37	.76	SHELL	.37	.70
FSUK	.25	.47	FSUK	.44	.83
LEFRPC	.18	.35	LEFRPC	.17	.36

Several types of projected impacts of changes in predetermined variables on the endogenous variables of the system can be explored but for present purposes we confine our attention to generating long run stationary equilibrium values and some short term projections.

Table 5 reports projections of the principal endogenous variables for five year increments on the assumption that the exogenous variables retain their 1980 values. The first column lists the 1980 levels of the endogenous variables and the next three columns project these levels 5, 10 and 15 years ahead given this "no change" scenario. The final column presents the long run equilibrium positions given sufficient time for the system to converge. While domestic landings are projected to increase, their market share stabilizes at around 45%. On the other hand, a marked expansion in the imports of fresh and frozen fish is noted and in the course of these long run changes, the markets for European salmon imports and non-European "other fresh and frozen fish" grow substantially.

It is of course, unrealistic to expect the levels of all exogenous variables to remain constant over time and a more revealing exercise would be to permit all exogenous variables to vary. Table 6 reports the results of projecting the set of endogenous variables to 1985 under 3 sets of assumptions.

Table 5 : Projected Stationary Equilibrium: Exogenous Variables at 1980 Levels

Variable		1980 Actual	5-Year Lead	10-Year Lead	15-Year Lead	Long-run Equilibrium
WSEUR		.029	.040	.036	.034	.037
WSOT		.048	.045	.039	.036	.041
WFSEUR		.806	.778	.794	.802	.789
WFSOT		.116	.137	.132	.128	.133
WFF		.375	.393	.410	.418	.405
WSHELL		.147	.136	.144	.149	.142
WFSUK		.478	.471	.445	.432	.453
SEUR	(Thou. tonnes)	1.7	2.4	2.5	2.5	2.5
SOT	" "	4.2	4.2	4.2	4.1	[illegible]
FOSEUR	" "	204.4	213.7	[illegible]	[illegible]	[illegible]
FOSOT	" "	29.4	37.6	40.8	42.4	[illegible]
SHELL	" "	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FSUK	" "	753.1	772.6	792.0	802.4	785.4

Assumptions Set 1. U.K. population is assumed to remain constant throughout the projection period. For real consumer expenditure, the forecasts of the National Institute of Economic and Social Research (1982) are adopted, namely zero growth to 1981, 0.2% 1981/82 and 0.3% 1982/83. Thereafter a growth rate of 0.5% p.a. is assumed. The price of meat and all fish prices, except salmon prices, are assumed to fall in real terms from 1980 levels by 2% per annum. Real salmon prices are projected to fall by 4% p.a. In other words, it is conjectured that the recent trend of salmon prices decreasing at a faster rate than the prices of other types of fish considered here will continue.

In this scenario, there is a slight fall in total fish consumption but this overall trend conceals important differences in the performance of the individual fish categories. Domestic landings decrease by some 3%, with a subsequent loss of market share. On the other hand, all other categories experience a growth in demand; a particularly marked expansion in European salmon imports is noted.

Assumptions Set 2. Population and real consumer expenditure are assumed to follow the same path as above. Meat prices and all fish prices, except the price of shellfish, fall in real terms by 2% p.a. The real price of shellfish increases by 2% p.a. This scenario reflects the observation that imported shellfish prices have often not followed the same course as the prices of the other fish categories under consideration.

In this case, a small expansion of the total market for fish and shellfish takes place, with domestic landings increasing their share at the expense of both categories of imports. Shellfish imports fall by almost 25%.

Assumptions Set 3. Again population and real consumer expenditure are projected as under Assumptions Set 1. The real price of shellfish increases by 2% p.a., the real prices of salmon is assumed to fall by 4% p.a. All other prices decrease by 2% p.a.

Given this set of assumptions, British landings would account for half the market in fish and shellfish by 1985. This gain is made at the expense principally of imports of European 'other fresh and frozen fish' and of shellfish. Salmon imports are projected to rise by over a third, the main advance being made by salmon of European origin.

Conclusions

The paper has set out to apply to the U.K. market for fish a recent approach to the analysis of demand systems. The results of the econometric exercise are encouraging, although further work on the specification of the more disaggregated versions of the model seems desirable. The demand for imports is found to be elastic with respect to both price and expenditure, whereas demand inelasticity seems a feature of the market for domestically landed fish and shellfish. The simulation exercise, which examines the impact of changing relative fish prices, illustrates the sensitivity of domestic landings to changes in the price of imports. Although in two of the three simulation runs, domestic fish landings rise above 1980 levels, they still fall well short of the levels achieved throughout the 1970s.

Table 6 : Projected 1985 Levels

Variable			Actual 1980 Levels	Projected 1985 Under Assumptions 1	Projected 1985 Under Assumptions 2	Projected 1985 Under Assumptions 3
WSEUR			.029	.043	.049	.049
WSOT			.048	.045	.055	.053
WFSEUR			.806	.768	.751	.751
WFSOT			.116	.144	.145	.147
WFF			.375	.404	.361	.363
WSHELL			.147	.147	.136	.137
WFSUK			.478	.449	.503	.500
SEUR	(Thou.	tonnes)	1.7	3.0	2.7	3.0
SOT	"	"	4.2	4.8	4.7	5.0
FOSEUR	"	"	204.4	215.3	182.3	187.6
FOSOT	"	"	29.4	36.4	31.8	32.3
SHELL	"	"	33.5	34.5	25.4	25.[illegible]
FSUK	"	"	759.1	733.9	796.2	788.2

Notes

1. Indeed on the basis of the likelihood ratio test, with a small sample correction factor, the restrictions of homogeneity and symmetry are rejected.

2. The results are invariant with respect to the equation deleted. The elasticities in the deleted equation can be computed using the property of Cournot Aggregation, namely $\sum_i W_i \eta_{ij} = -W_j$.

Definitions (Data sources in brackets)

WFF - expenditure on fresh, chilled and frozen fish imports as a proportion of total fish expenditure (EFRPC).

WSHELL - expenditure on shellfish imports as proportion of total fish expenditure.

WFSUK - expenditure on landings of fresh, chilled and frozen fish and shellfish from British vessels as a proportion of total fish expenditure.

WSEUR - expenditure on fresh and frozen salmon and trout imports of European origin (EEC & EFTA) as proportion of total expenditure on fresh, chilled and frozen fish imports (EFFRPC) - WSEUR1 when expressed as proportion of total fish expenditure (EFRPC).

WSOT - expenditure on fresh and frozen salmon and trout imports of non-European origin as proportion of EFFRPC - WSOT1 when expressed as proportion of EFRPC.

WFOSEUR - expenditure on fresh and frozen fish imports other than salmon and trout, of European origin as proportion of EFFRPC - WFOSEUR1 when expressed as proportion of EFRPC.

WFOSOT - expenditure on fresh and frozen fish imports other than salmon and trout, of non-European origin as proportion of EFFRPC - WFOSOT1 when expressed as proportion of EFRPC.

$\tilde{W}$ - weighted average (defined as in equation (6)) of WFF, WSHELL and WFSUK.

W+ - weighted average (" " " " ") of WSEUR, WSOT, WFOSEUR and WFOSOT.

W1 - weighted average (" " " " ") of WSEUR1, WSOT1, WFOSEUR1, WFOSOT1, WSHELL and WFSUK.

PF - weighted real average price of total fish and shellfish i.e. PFF, PSHELL and PFSUK, weighted by their respective quantities, £/tonne.

PFF - average price of fresh, chilled and frozen fish imports, £ per tonne, deflated by retail price index (1975=1.00) [1,2].

PSHELL - average price of shellfish imports, £ per tonne, deflated by retail price index [1,2].

PFSUK - average price of fresh, chilled and frozen fish and shellfish landed by British vessels, £ per tonne, deflated by retail price index [1,2].

PSEUR - average price of fresh and frozen salmon imports of European origin, £ per tonne, deflated by retail price index [1,2].

PSOT - average price of fresh and frozen salmon imports of non-European origin, £ per tonne, deflated by retail price index [1,2].

PFSEUR - average price of fresh, chilled and frozen fish imports, other than salmon and trout, of European origin, £ per tonne, deflated by retail price index [1,2].

PFSOT - average price of fresh, chilled and frozen fish imports, other than salmon and trout, of non-European origin, £ per tonne, deflated by retail price index [1,2].

PM - implicit price index for meat and meat products (1975=1.00) [3].

EFRPC - total expenditure at the quayside on fish and shellfish, deflated by retail price index and population (£ per thousand head) [1,2].

EFFRPC - total expenditure at the quayside of fresh, chilled and frozen fish imports, deflated by retail price index, (£ per thousand head) [1,2].

QFT - total fish and shellfish landings (thousand tonnes) [1].

CERPC - total consumer expenditure, deflated by retail price index and population (£ per capita) [2].

DUM - dummy variable to take account of change in definitions of the regions of origin of imports in <u>Sea Fisheries Statistics</u> (pre-1972=0 ; 1972 and thereafter = 1).

POP - U.K. population, thousands [2].

TFF - total fresh, chilled and frozen fish imports, tonnes [1].

SHELL - total shellfish imports, tonnes [1].

FSUK - total wet fish and shellfish landed by British vessels, tonnes [1].

SEUR - fresh and frozen salmon and trout imports of European origin (EEC & EFTA), tonnes [1].

SOT - fresh and frozen salmon and trout imports on non-European origin, tonnes [1].

FOSEUR - fresh, chilled and frozen fish imports, other than salmon and trout, of European origin, tonnes [1].

FOSOT - fresh, chilled and frozen fish imports, other than salmon and trout, of non-European origin, tonnes [1].

Note: The natural logarithm of a variable X is denoted as LX or Ln X.

Data Sources

1. C.S.O., Sea Fisheries Statistics.

2. C.S.O., Economic Trends.

3. H.M.S.O., National Income and Expenditure.

References

BEWLEY, R.A. (1982a), 'The Generalised Addilog Demand System Applied to Australian Time Series and Cross-Section Data'. Australian Economic Papers, 21 No. 38: 177-192.

___________ (1982b), 'On the Functional Form of Engel Curves: The Australian Household Expenditure Survey 1975-76'. The Economic Record 58 No. 160: 82-91.

HOUTHAKKER, H.S. (1960), 'Additive Preferences'. Econometrica 28 No. 2:244-257.

NATIONAL INSTITUTE OF ECONOMIC and SOCIAL RESEARCH (1982), National Economic Review 100, May.

THEIL, H. (1969), 'A Multinomial Extension of the Linear Logit Model' International Economic Review 10 No. 3: 251 - 259.

Abstract

This paper reports the results of an investigation of the demand for fish at the quayside level in the United Kingdom. A demand system is formulated to explain the shares of total fish expenditure which are accounted for by the imports of fresh and frozen fish, the imports of shellfish, and the landings of fish and shellfish by British vessels. In particular, a Generalised Addilog demand model is specified and estimated with annual data over the period 1966 to 1980.

The system is extended by disaggregating the imports of fresh and frozen fish into four components: salmon and trout, and other fresh and frozen fish, distinguishing in each case between European and non-European supply sources. The estimated share equations then form the basis of a simple simulation model, which in turn is used to provide forecasts to 1985.

The U.S.S.R.'s Foreign Trade in Fishing Industry Products

Jan J. Solecki
University of British Columbia
Vancouver, British Columbia, Canada

Tasks and Resources

The four tasks of the Soviet fishing industry are: a) to provide fish products for consumers at home, b) to provide fishmeal for agricultural use, c) to supply other branches of the economy with fish and other aquatic materials for the production of commodities such as margarine, confections, pharmaceuticals, soap and textiles, d) to provide export commodities to ensure a positive trade balance. As an extra service, the fishing industry fleet carries on, or assists in carrying on, intelligence and scientific research activities for the government, various branches of the armed services and research organizations.

As the largest country in the world, facing both the Pacific and the Atlantic ocean systems, in her fisheries operations the Soviet Union is able to rely on the expanses of the open seas, the coastal zones and the inland waters. It is important to point out two things about the USSR's fishing industry development. First, that it expanded very rapidly in the period between 1950 and 1975, during which the average annual increase in the catch amounted to 344 thousand tons (see Table I); and second, that all this increase was achieved by expanding operations in the open sea primarily away from the native shores (see Table II). Thus, whilst in the post-war period, between 1940 and 1977, the total catch increased 6.8 times (from 1.42 mil.T. to 9.65 mil.T.), the catch in the open seas increased 14.8 times and in inland waters only 1.6 times (N. P. Sysoev, 1980).

Pursuing a "greedy big brother" policy, the Soviet Union made her presence felt widely in all the seas. For this she had expanded her fishing fleet so that even her closest competitor looked insignificant in terms of tonnage of vessels in use. According to Lloyd's Registrar of Shipping for July 1, 1978, the USSR had 578 vessels of over 100 T.,

TABLE I

LANDINGS OF FISH AND OTHER SEA PRODUCTS IN THE USSR
in millions of metric tons

1913	1.051	1951	2.142
1917	0.893	1952	2.107
1920	0.257	1953	2.195
1921	0.298	1954	2.505
1922	0.483	1955	2.737
1923	0.499	1956	2.849
1924	0.535	1957	2.761
1925	0.721	1958	2.936
1926	0.897	1959	3.075
1927	0.747	1960	3.541
1928	0.840	1961	3.724
1929	0.956	1962	4.167
1930	1.283	1963	4.670
1931	1.441	1964	5.171
1932	1.333	1965	5.774
1933	1.303	1966	6.093
1934	1.547	1967	6.538
1935	1.520	1968	6.784
1936	1.631	1969	7.082
1937	1.609	1970	7.828
1938	1.542	1971	7.785
1939	1.566	1972	8.209
1940	1.404	1973	9.005
1945	1.125	1974	9.622
1946	1.208	1975	10.357
1947	1.534		
1948	1.575		
1949	1.953		
1950	1.755		

	Planned *	Realized
1976	10.514	10.478
1977	10.671	9.651
1978	10.828	9.230
1979	10.985	9.359
1980	11.142	9.526

Sources: 1913-1963 Promyshlennost SSSR (USSR Industry). Statistika. Moscow. 1964. p. 437.

1964-1980 Narodnoe Khoziaistvo SSSR (USSR National Economy). Statistical Yearbooks. Finansy i Statistika. Moscow. 1965-1981.

*Narodnoe Khoziaistvo SSSR za 60 let (60 Years of the USSR National Economy). Statistika. Moscow. 1977. p. 21

TABLE II

USSR CATCHES BY TYPE OF FISHING GROUNDS

Year	Total Catch Mil.M.T.	Inland Waters Mil.M.T.	%	Open Seas Mil.M.T.	%
1913	1.051	0.896	82.7	0.182	17.3
1917	0.893	0.800	89.6	0.093	10.4
1928	0.840	0.619	73.6	0.221	26.4
1940	1.309	0.744	56.9	0.565	43.1
1946	1.104	0.556	50.3	0.548	49.7
1950	1.655	0.709	42.9	0.946	57.1
1955	2.674	0.811	30.3	1.863	69.7
1960	3.511	0.755	22.1	2.736	77.9
1965	5.725	0.944	16.5	4.781	83.5
1970	7.783	1.079	13.9	6.704	86.1
1975	10.311	1.202	11.7	9.109	88.3

From N. P. Sysoev. Ekonomika rybnoi promyshlennosti SSSR (Economics of the USSR Fishing Industry). Pishchevaia Promyshlennost. Moscow. 1977. p. 314.

---

with a total tonnage of 2,342,008 T., compared with her closest competitor, Japan, with 76 vessels and 165,761 T. (Rybnoe Khoziaistvo, 1979, No. 6, 35-36). To achieve this pre-eminence at sea, the Soviet Union channelled the bulk of her investment allocations for the fishing industry into the construction of deep-sea fishing vessels (see Table III). The main aim appeared to have been to grab as much as possible of the oceans' resources, regardless of whether the capacity was available to process, store and deliver these to the population. For example, it has been pointed out that Sakhalinrybprom (Sakhalin Fishing Industry enterprise), whose fleet constituted 94.5% of all the capital assets, developed a shortage of docking facilities, refrigeration capacities, ship repair facilities, and auxiliary vessels, so much so that fishing vessels had to unload away from their base, sustaining losses and wasting time (Afonin, 1980). This neglect can be seen from another set of data published. Thus, by the late seventies, in sea transportation, automation had taken place in 92.8% of operations in general, in 90% of road transportation, but only 70% in marine fishing ports (Sysoev, Shcherbaev, 1979). In 1950 the Atlantic and Pacific fisheries accounted for 886.1 thousand T. (th. T.), or 53.6% of the catch (Sysoev, 1977). Concentrating on the construction of ships to operate away from home waters has resulted, in 1977, in the Atlantic fisheries giving 5.08 mil.T. (52.4%) of the catch and the Pacific 3.42 mil.T. (35.4%), or together 87.8% of the total catch (Sysoev, 1980).

From World War II to the late seventies, the number of self-propelled vessels in the USSR increased threefold, and their engine capacity 21.2 times. The average engine capacity of vessels increased sevenfold. The number of vessels with an engine capacity of over 300HP increased 23 times between 1950 and 1977. At the beginning of 1978, these large-sized vessels made up 18.6% of the fleet in terms of numbers and 87% in terms of engine capacity. Vessels with engine capacity of 1200HP and

TABLE III

INVESTMENTS IN THE FISHING INDUSTRY IN THE USSR

Million Rubles

Year	Total Investments in the National Economy	Investments in the Fishing Industry	%	Investments in the Fishing Fleet	%	Investments in Shore Bases	%
	A	B	B/A	C	C/B	D	D/B
1946-50	47,400	366.0	0.77	218.0	59.6	148.0	40.6
1951-55	89,800	721.0	0.80	386.0	53.5	335.0	46.5
1956-60	168,800	1,187.0	0.71	933.4	78.6	253.7	21.4
1961-65	243,500	1,731.5	0.71	1,346.3	77.8	385.2	22.2
1966-70	347,900	3,543.3	1.01	2,484.0	70.1	1,059.3	29.9
1971-75	493,000	4,068.7	0.83	2,567.1	63.0	1,501.6	37.0

Sources: Column A: Narodnoe Khoziaistvo SSSR v 1980 godu (USSR National Economy in 1980). Statistika. Moscow. 1981. p. 333.

Columns B, C, and D: N. P. Sysoev. Ekonomika Rybnoi Promyshlennosti SSSR (Economics of the USSR Fishing Industry). Pishchevaia Promyshlennost. Moscow. 1977. p. 115.

---

over accounted for 51% of the catch and 41% of the output of fish products (Sysoev, 1980).

It is difficult to judge the efficiency of the Soviet fishing fleet but it certainly does not come out favorably in comparison with the Japanese fleet, which managed to surpass the Soviet catch with a fleet that was 28% smaller in number of ships and had only 25.9% of the Soviet tonnage (Rybnoe Khoziaistvo, 1979, No. 6, 35-36).

It is difficult to attribute to any particular country, or to any given factor, the sudden desire on the part of a number of nations to set up economic zones within their coastal waters, but no doubt the presence of a large number of relatively very large Soviet fishing and processing vessels must have prompted various governments to act before fish resources were permanently depleted. It should be noted that, modelling themselves on the Soviet Union, other communist countries built up their fishing fleets as well, increasing their catches enormously from year to year (see Table IV). Whatever the reason for its introduction, the 200-mile economic zone, now almost universally accepted, was a shock to the Soviet Union, where it was probably generally assumed that, in the event of any international restrictions on fishing, a quota system would be applied, with allocation of quotas commensurate with the existing fishing capacities of the nations. Having initially tried to oppose it, unsuccessfully, the USSR accepted the inevitable and declared her own

200-mile zone in December 1976 (Bekiashev, 1977). She insisted, however, that she was doing so for noble reasons and not out of greed, as did others — meaning the Western nations. There is no doubt, however, that the declaration of the 200-mile zone was a blow to the Soviet fishing industry, having seriously upset the 1975-1980 plan of production (see Table VI).

The Soviet Union's response to the new situation has been: a) to continue with the maximum effort on operations outside her own 200-mile zone by adapting the fleet to operations in open, deep parts of the ocean, and by taking up rights to fish for unutilized resources in other countries' economic zones by negotiating for fishing rights and setting up joint ventures; b) to increase the catch within her own 200-mile economic zone through restricting other nations' entry and undertaking measures to restock the zone's resources; c) to increase the catch from inland seas and fresh waters through artificial stocking and re-stocking. It is recognized, however, that in the last category important factors militate against a successful outcome. The large-scale needs of agriculture for water to irrigate increasingly larger areas has resulted in a shortage of water in southern regions, leading to a drop in the level of the Aral and Caspian Seas, while the regulation of rivers for hydroelectric power production has had an adverse effect on spawning grounds. Since the early sixties, for example, the level of the Aral Sea has dropped 7 meters, its area has contracted by 14,000 sq. km., the volume of water has declined by 380 cubic km. This process is expected to continue. With a further expected decline in area, and an increase in salinity from 10‰ in 1960 to about 35‰ by the year 2000, there can be little hope of bringing the fish productivity of this sea to its former level (Bortnik, 1980). Although a great deal has been written about the possibilities of increasing the output of fish from inland waters by practicing fish breeding, so far the success has been rather modest. Another reason for this state of affairs has been the low priority accorded the fishing industry by the authorities and the planners.

The current Five-Year Plan for Economic Development of the USSR for the period 1981-1985, and for the decade up to 1990, places the main emphasis on better utilization of the catches and does not stress the possibility of expanding them, as has been the case in the past. There is to be a 10-12% increase in the output of edible fish (including canned fish). The fish output from fresh-water bodies is to increase 1.8 to 2.0 times (Osnovnye Napravlenia, 1981), but considering the low level of present catches in these waters, and the fact that similar goals have been repeatedly proclaimed in the past without being attained, would lead one to conclude that operations in distant sea fisheries will remain the mainstay of the Soviet fishing industry.

In May 1982 a new guideline document for economic development was published in the USSR entitled "The Consumer Supply Program in the USSR for the Period until 1990," which stressed the following points: a) output of fish and other marine products is to be increased; however, no indication is given by how much; b) port facilities and services necessary for better handling of fishing vessels are to be provided; c) fish breeding is to be stressed to ensure a three-fold increase in the yield. The output of edible fish is to increase by 1985 to 4.2 mil.T. and by 1990 to 4.3-4.5 mil.T., and of canned fish to 3.0 and 3.2 billion standard cans. The quality and the variety of fish products supplied to consumers is to be improved. Refrigeration capacity of 220-240 th.T.

TABLE IV

FISH CATCHES OF THE EAST EUROPEAN COUNTRIES

Thousands of tons

Excluding marine mammals and plants

Country	1960	1970	1975	1976	1977	1978	1979	1980
Bulgaria	7.9	84.1	151	160	138	150	136	163
E. Germany	114	319	325	279	210	201	227	244
Poland	187	473	679	689	703	594	632	818
Romania	16	62.2	139	124	149	140	182	189
Cuba	28.7	100	138	188	172	205	144	181

Source: Statisticheski Yezhegodnik stran chlenov Soveta Ekonomicheskoi Vzaimopomoshchi 1981 (Statistical Yearbook of the Member Countries of the Council of Economic Cooperation, 1981). Finansy i Statistika. Moscow. 1981. p. 112.

TABLE V

ANNUAL PER CAPITA FISH CONSUMPTION IN THE USSR — Kg.

1913	6.7
1950	7.0
1955	9.1
1960	9.9
1965	12.6
1970	15.4
1975	16.8
1980*	17.6
1985**	18.2
1990*	19.0

Sources: 1913-1975: N. P. Sysoev. Ekonomika Rybnoi Promyshlennosti SSSR (Economics of the USSR Fishing Industry). Pishchevaia Promyshlennost. Moscow. 1977. p. 17.

* 1980 and 1990: L. I. Brezhnev. O Prodovolstvennoi Programme SSSR na period do 1990 goda (About the USSR Consumer Supply Program for the Period up to 1990). Ekonomicheskaia Gazeta. 1982. No. 22. p. 4.

** 1985: V. M. Kamentsev, Minister of the Fishing Industry of the USSR. Zadachi Rybakov v Realizatsii Prodovolstvennoi Programmy Strany (Fishermen's Tasks in Realizing the Country's Consumer Supply Program). Rybnoe Khoziaistvo. 1981. No. 4. p. 3. In his article "Plany Namechennye XXVI S'ezdom KPSS — Vypolnim (We Shall Fulfill the Plans Set by the XXVI Congress of the CPSU). Rybnoe Khoziaistvo. 1982. No. 2. pp. 3-8, he gives the 1985 figure as 18.6 kg.

TABLE VI

ATTAINED AND PLANNED LANDINGS OF THE FISHING INDUSTRY — Mil.M.T.

Year	Attained	Planned	Average annual increase Attained	Average annual increase Planned
1958	2850			
1965	5774[2]	4626[1]	+ 417.71	+ 253.71
1970	7828	8500-9000[3]	+ 410.80	+ 545.20-645.20
1975	10357	10356[4]	+ 505.80	+ 505.60
1980	9526	11 42[5]	- 166.20	+ 157.00

Sources: 1. Khrushchev's 1958-1965 Plan. Kontrolnye tsifry razvitia Narodnogo Khoziaistva SSSR na 1958-1965. Tezisy doklada Tov. Khrushcheva na XXI S'ezde KPSS (Control figures for the Development of the National Economy of the USSR in 1958-1965. Essential points of the report by N. S. Khrushchev at the XXI Congress of the CPSU). Gospolitizdat. Moscow. 1958. p. 44.

2. Narodnoe Khoziaistvo SSSR v 1980 g. (USSR National Economy in 1980). Statistika. Moscow. 1981. p. 194.

3. 1966-1970 Plan. Direktivy XXIII S'ezda KPSS po Piatiletnemu Planu Razvitia Narodnogo Khoziaistva SSSR na 1966-1970 gody (Directives of the XXIII Congress of the CPSU on the Five-Year Plan of Development of the National Economy of the USSR for 1966-1970). Politizdat. Moscow. 1966. p. 19.

4. 1971-1975 Plan. Osnovnye Napravlenia Razvitia Rybnoi Promyshlennosti v Deviatoi Piatiletke (The Main Directions of the Fishing Industry during the IX Five-Year Plan). Rybnoe Khoziaistvo. 1972. No. 2. pp. 3-5.

5. 1976-1980 Plan. Narodnoe Khoziaistvo SSSR za 60 Let (USSR National Economy during 60 Years). Statistika. Moscow. 1977. p. 21.

(one-time storage capacity) is to be built during the current decade (Pravda, 27.V.82).

To meet the obligations imposed, the fishing industry will channel 75% of the fish catch to food production, compared with 72.4% in 1980 and 66.5% in 1975 (Rybnoe Khoziaistvo, 1978.V.3-5). The output of filleted fish is to be increased by 24%; live, chilled and frozen fish by 40%; specially-prepared cooked products by 21%; smoked, dried and cured fillets of high-quality fish by 16%. Fifteen percent of the output is to be packaged in small-sized containers (Kamentsev, 1982). The distribution of the output in 1985, according to place of origin, is expected to be as follows: 35-37% is to come from the open seas beyond the 200-mile zone, 16% from the 200-mile zones of foreign countries, 32-33% from within the USSR's own 200-mile zone, and 15% from inland seas and fresh-water bodies (Guilbadamov, 1981).

The shift of fishing operations to remote regions of the world's oceans has resulted in a considerable increase in labor input in fishing

TABLE VII

USSR's FOREIGN TRADE IN FISHING INDUSTRY COMMODITIES

Million Rubles

Year	A Total Exports	B Fishing Industry Exports	B/A %	C Total Imports	D Fishing Industry Imports	E Net Exports of Fishing Industry Products
1968	9,571	76.1	0.79	6,469	13.0	63.1
1969	10,490	78.4	0.75	9,294	13.2	65.2
1970	11,520	83.8	0.73	10,565	14.9	68.9
1971	12,425	86.1	0.69	11,232	13.6	72.5
1972	12,734	80.4	0.63	13,309	14.1	66.3
1973	15,802	93.0	0.59	15,541	9.6	83.4
1974	20,738	125.0	0.60	18,829	19.7	105.3
1975	24,030	157.4	0.66	26,669	25.0	132.4
1976	28,022	157.8	0.56	28,733	20.3	137.5
1977	33,256	155.3	0.47	30,097	33.5	121.8
1978	33,668	174.6	0.52	34,557	29.9	144.7
1979	42,426	215.9	0.51	37,881	34.1	181.8
1980	49,635	214.4	0.43	44,462	58.9	155.5

Source: Vneshniaia Torgovlia SSSR (USSR Foreign Trade). Statistical Yearbooks. Statistika. Moscow. 1968-1981.

operations in practically all fishing grounds, especially in the Atlantic, where 60% of the catch was taken. In the northwest Atlantic the increase has been 7.3%, in the central and eastern Atlantic it has been nearly four-fold, and in the Indian Ocean between 2.4% and 21.4%. The average increase in labor input for ocean fishing as a whole has been 4.6% (Rybnoe Khoziaistvo, 1981, No. 9, 3-6). The increase in the use of smaller fish for food production and for canning has required an increasingly higher input of labor, varying in places from 1.6 to 2.7%.

Foreign Trade

In accordance with the constitution of the USSR, the realization of functions arising from the state monopoly of foreign trade is entrusted to the All-Union Ministry of Foreign Trade, whose task it is to achieve a positive trade balance for the USSR, accumulate foreign currency reserves, and improve the efficienty of foreign trade operations (Voronov, 1970). Other ministries, the fishing industry among them, are expected to conduct their affairs so as to assist the Ministry of Foreign Trade to meet the obligations assigned to it. Second-priority industries such as forestry and fisheries are expected to contribute foreign exchange currency to the state holdings, and they are more likely to obtain permits to buy equipment or vessels abroad for the use of the given ministry enterprises if they do so.

As can be seen from Table VII, the fishing industry is not an important one so far as the contribution to foreign trade is concerned: its share of exports, having never reached one percent, has in 1980 dropped below

TABLE VIII

USSR EXPORTS OF FISHING INDUSTRY COMMODITIES

	A	B		C		D		E		F		G		H		I	
Year	Total	Fish		Canned Fish		Canned Salmon		Canned Crab		Caviar Fish Eggs		Whale Blubber		Whale Meat		Fish-meal	
		Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V
	Mil.R.	Thous. T	Mil. R.	Mil. S.C.**	Mil. R.	Mil. S.C.	Mil. R.	Mil. S.C.	Mil. R.	T	Mil. R.	Thous T	Mil. R.	Thous T	Mil. R.	Thous T	Mil. R.
1930	33.7	38.0	7.0	100.1	17.3	-	-	17.3	3.7	2721	5.1	-	-	-	-	-	-
1940	0.6	1.2	0.3	1.1	0.1	-	-	0.1	0	166	0.2	-	-	-	-	-	-
1950	8.1	17.1	3.2	9.6	2.6	9.1	1.9	4.5	1.4	112	0.9	-	-	-	-	-	-
1955	13.8	0.7	0.4	15.3	4.6	10.0	2.7	15.1	7.3	211	1.5	0.6	0.1	-	-	-	-
1960	32.6	51.6	8.2	53.5	14.8	7.9	2.4	12.0	7.7	199	1.8	4.9	0.9	-	-	-	-
1965	50.5	184.8	23.5	42.4	12.3	11.5	3.7	16.1	10.5	687	3.4	35.1	6.5	-	-	4.0	0.5
1970	83.8	244	32.3	62.9	19.0	15.2	6.2	12.4	14.6	1.0*	5.6	56.7	9.2	-	-	7.2	1.0
1971	86.1	277	41.4	62.0	19.6	14.7	5.9	11.1	12.1	1.0	5.5	34.1	7.8	13.5	2.7	12.1	1.8
1972	80.4	242	37.4	58.8	18.6	13.8	5.7	8.5	11.1	1.0	5.7	14.2	3.4	11.5	2.6	10.4	1.5
1973	93.0	260	49.1	64.0	21.8	15.9	7.7	6.6	11.9	1.6	5.3	16.0	3.2	10.0	2.1	15.3	2.3
1974	125.0	371	70.1	69.1	24.8	12.0	7.7	5.9	14.3	1.6	6.7	4.3	0.8	11.7	2.7	11.3	1.5
1975	157.4	491	91.5	98.5	35.6	14.2	8.7	7.9	15.0	2.1	6.9	4.2	0.9	17.2	5.0	10.1	3.2
1976	157.8	470	89.0	98.5	35.8	17.3	10.7	6.3	13.3	1.6	7.7	4.0	0.9	15.0	4.1	17.9	3.4
1977	155.3	404	80.7	110.1	39.5	19.4	13.7	4.5	12.2	1.4	8.1	1.9	0.4	18.0	8.1	18.0	3.5
1978	174.6	460	99.2	90.5	34.1	17.8	11.7	3.9	15.0	1.2	10.2	0.9	0.2	13.2	11.5	13.6	3.2
1979	208.4	474	123.8	84.2	35.9	18.7	13.4	4.2	19.0	0.7	13.2	1.1	0.3	9.0	11.5	21.4	4.3
1980	209.8	484	122.6	91.9	38.8	18.0	12.1	5.2	17.0	0.8	10.3	0.5	0.1	8.8	12.0	20.3	4.4

Sources: 1918-1966. Vneshniaia torgovlia SSSR. Statisticheski Sbornik (USSR Foreign Trade. Collection of Statistics) 1918-1966. Mezhdunarodnye Otnoshenia. Moscow. 1967.
1967-1980: Vneshniaia torgovlia SSSR (USSR Foreign Trade). Statistical Yearbooks. Statistika. Moscow. 1968-1981.

* Thousands of tons.
** Millions of standard cans. Standard can = 353.4 g.

TABLE IX

CHANGES IN PRICES OF EXPORTED FISHING INDUSTRY COMMODITIES

Compiled from data given in Table VIII

Year	Fish R. per T	Canned Fish R per S.C	Canned Salmon R per S.C.	Canned Crab R per S.C.	Caviar Fish-eggs R per T
1960	158.91 (100)	0.28 (100)	0.30 (100)	0.64 (100)	9,045 (100)
1970	132.47 (83)	0.30 (107)	0.41 (136)	1.18 (184)	5,600 (62)
1980	253.30 (159)	0.42 (150)	0.67 (233)	3.27 (510)	12,875 (143)

Year	Whale Blubber R per T	Whale Meat R per T	Fish-meal R per T
1960	182 (100)	--- ---	121 (100)
1970	229 (126)	200 ---	149 (123)
1980	300 (165)	1,248 (233)	233 (193)

half of one percent. Nevertheless, during the decade 1971-1980, its trade surplus amounted to 1270.1 rubles, or US$ 1776 million. Only part of this surplus was in highly-desirable convertible currencies of the West, and also some part of the surplus shown had to be used to pay for the purchase of ships and equipment from abroad. Nonetheless, it would appear that the fishing industry did do its share.

In Table VIII are given the Soviet Union's exports of fishing industry products. As can be seen from comparing columns A and B, the share of fish in exports increased from 25.1% in 1960 to 38.5% in 1970 and 58.4% in 1980. Canned fish accounted for 45.4% of the industry's exports in 1960, 22.6% in 1970, and 18.5% in 1980. Canned salmon accounted for 16.2% of canned fish exports in 1960, 32.6% in 1970, and 31.2% in 1980. The importance of canned crab in exports declined from 23.6% in 1960 to 17.4% in 1970 and 8.1% in 1980. Similarly, exports of the famous Russian delicacy, caviar (including fish-eggs of other species) declined from 28.6% in 1925/6 to 5.5% in 1960, 6.7% in 1970, and 4.9% in 1980. Whale blubber accounted for 19.3% of the industry's exports in 1960, which was the peak year. By 1970 its share had dropped to 9.3% and by 1980 to a mere 1.4%. On the other hand, whale meat exports contributed 3.2% of exports in 1970 and 6.1% in 1980.

In Table IX are shown prices for the fishing industry products exported in 1960, 1970, and 1980. The highest price increase noted was for whale meat, which was 624% during the 1971-1980 period alone. Taking 1960 as 100, the price of canned crab increased to 184 during the sixties, and five-fold from 1960 to 1980. During the same period, the price of canned salmon rose to 233.

In Table X are shown the Soviet Union's exports of fishing industry products by country. It is interesting to note that the two most important customers have been Cuba and Egypt, and that Cuba, a staunch ally, has been paying nearly twice as much per ton as Egypt. Surprising also is the position of Sweden, which has become the third most important customer. Curiously, Sweden has been paying less than half the price charged to friendly Cuba. Thus, for example, in 1980 Cuba paid 475.9 rubles (US$ 665.59) per ton of fish, Egypt 292.5 rubles (US$ 409.09), and Sweden 200.0 rubles (US$ 279.72). It would appear from this that being friendly with the USSR does not give one a bargaining advantage in trade.

Equally interesting observations can be made from Table XI, showing exports of canned fish from the USSR. First of all, as with fresh and frozen fish exports, the price has remained fairly constant, on the average 0.36 rubles per standard can (353.4 g.) in 1974 and 0.42 rubles in 1980. Without difficulty importing countries can be grouped by those paying more than the average price — all of them are Western bloc countries — and those paying less than the average price — those being the Eastern bloc countries. The peak year in terms of both the value and the volume of exports was 1977, which was nearly 20% above 1980 in volume and 2% in value.

Perhaps the most interesting table from the point of view of understanding Soviet foreign trade is Table XII, canned crab being a fairly homogeneous commodity. The first thing to note is that the price for canned crab nearly doubled between 1974 and 1979 and then there was a 38% drop in the price in 1980. The volume of sales has varied from year to year, both in total and for individual countries. Impressive is the almost complete absence of Eastern bloc countries. This makes crab exports an industry earning pre-eminently hard currency. France is by far the most important single customer, accounting consistently for close to one-half of the value of exports and paying less than the average price. Belgium, Sweden and the Netherlands come after France, but their combined demand is less that that of France.

Soviet imports of fishing industry products (see Table VII) have risen appreciably since the mid-seventies. Among the main suppliers is the United Kingdom, which in 1980 accounted for 22.6% of the Soviet imports, mainly fillets of fish. Iceland accounted for 42.9%; here the USSR bought fish-meal, chilled and filleted fish, and canned fish. The third steady supplier has been Iran, accounting in 1980 for 11.1% of the Soviet Union's imports. Three-quarters of this was unprocessed black caviar.

It can be seen, therefore, that the Soviet Union has sought every opportunity to obtain foreign currency through trade in fishing industry products. These efforts will continue in the future. Through bilateral and multilateral trade agreements, the Soviet Union has tried to safeguard for herself access to fish resources found in other countries' economic zones. At present, the USSR has 66 bilateral agreements with 39 countries, and 13 multilateral ones (Kamentsev, 1982). Changes and improvements to the existing fishing fleet are intended to increase the Soviet Union's participation in tuna and other open sea fishing operations, as well as making use of new resources such as unutilized small fish and krill. Programs for enhancement of fish resources in inland waters and in the shallow coastal strip are seen as another source of raw materials for the industry which will provide export goods.

The Soviet Union has, in all, 377 thousand square kilometres of shoreline less than 25 metres deep, of which 38 thousand sq. km. are thought to be suitable for aquaculture. It is estimated that between 348 and 800 thousand tons of water-plant vegetation, 290-850 thousand tons of

TABLE X

EXPORT OF FISH FROM THE USSR BY COUNTRY OF DESTINATION

Q in Thousands of Tons, V thousands of Rubles, Price in Rubles per Ton

	1974			1977			1979			1980		
Country	Q	(P)	V	Q	(P)	V	Q	(P)	V	Q	(P)	V
Total	370.8	(189.1)	70.123	403.8	(199.9)	80.716	474.5	(260.9)	123.792	483.5	(253.6)	122.606
Ivory Coast	58.9	(145.8)	8.587	24.3	(187.2)	4.548	17.0	(224.2)	3.812	9.8	(172.2)	1.688
Bulgaria	8.1	(174.1)	1.410	2.0	(173.5)	0.347	4.5	(148.4)	0.668	2.0	(188.0)	0.376
Hungary	2.8	(213.9)	0.599	1.8	(276.7)	0.498	4.8	(321.5)	1.543	2.1	(335.7)	0.705
Guinea	7.1	(183.4)	1.302	9.9	(186.4)	1.845	9.5	(219.6)	2.086	10.4	(244.1)	2.539
East Germany	8.9	(156.1)	1.389	10.0	(146.5)	1.465	10.1	(248.2)	2.507	10.2	(271.3)	2.768
Egypt	18.1	(186.8)	3.381	29.6	(250.8)	7.425	29.2	(350.9)	10.247	40.1	(292.5)	11.730
Cuba	43.6	(375.3)	16.365	32.6	(516.4)	16.836	48.0	(539.5)	25.894	36.9	(475.9)	17.562
Portugal	11.0	(111.6)	1.228	16.3	(121.6)	1.982	13.5	(183.9)	2.482	27.5	(170.7)	4.693
Romania	2.1	(126.2)	0.265	7.2	(184.7)	1.330	8.1	(200.5)	1.624	6.5	(202.0)	1.313
Sierra Leone	3.3	(144.8)	0.478	12.0	(151.5)	1.818	11.1	(154.4)	1.714	23.4	(157.4)	3.683
Togo	10.3	(140.5)	1.447	9.8	(196.9)	1.930	12.3	(294.8)	3.626	9.3	-	-
Czechoslovakia	7.3	(184.7)	1.348	2.5	(213.2)	0.533	3.2	(245.6)	0.786	3.2	(264.3)	0.846
Sweden	22.9	(114.8)	2.630	49.4	(175.6)	8.673	51.1	(202.6)	10.351	27.4	(200.0)	5.481
Japan	36.8	(197.6)	7.270	71.7	(72.7)	5.215	77.6	(162.5)	12.608	64.9	(146.7)	9.522
USA							14.7	(228.4)	3.363	22.1	(308.2)	6.797

Source: Vneshniaia Torgovlia SSSR (USSR Foreign Trade). Statistical Yearbooks. Statistika. Moscow. 1974-1980.

TABLE XI

EXPORTS OF CANNED FISH FROM THE USSR BY COUNTRY OF DESTINATION

Q in Thousands of Standard Cans,* V thousands of Rubles, Price in Rubles per Standard Can

	1974			1977			1979			1980		
Country	Q	(P)	V	Q	(P)	V	Q	(P)	V	Q	(P)	V
Total	69,061	(0.36)	24,837	110,095	(0.36)	39,492	84,256	(0.43)	35,862	91,882	(0.42)	38,839
Australia	1,025	(0.58)	590	1,110	(0.72)	803	1,264	(0.58)	735	1,805	(0.63)	1,139
Belgium	3,772	(0.46)	1,734	3,435	(0.44)	1,503	2,866	(0.44)	1,255	3,433	(0.56)	1,933
United Kingdom	2,549	(0.79)	2,004	6.537	(0.90)	5,869	5,400	(0.92)	4,989	2,458	(0.92)	2,270
Hungary	2,104	(0.28)	591	2,420	(0.33)	807	2,495	(0.34)	856	3,842	(0.38)	1,471
East Germany	4,125	(0.34)	1,395	8.805	(0.31)	2,724	4,264	(0.38)	1,613	2,690	(0.39)	1,036
Greece	1,210	(0.29)	346	3,084	(0.28)	874	2,107	(0.29)	608	2,611	(0.33)	855
Cuba	4,746	(0.28)	1,328	17,835	(0.27)	4,802	8,210	(0.32)	2,613	6,407	(0.40)	2,579
Mongolia	1,691	(0.36)	588	1,950	(0.38)	738	2,549	(0.39)	983	2,398	(0.38)	910
Poland	7,676	(0.33)	2,524	17,269	(0.27)	4,737	12,600	(0.34)	4,294	22,015	(0.35)	7,663
Romania	3,252	(0.23)	750	1,437	(0.27)	385	1,860	(0.34)	631	1,582	(0.35)	560
Finland	2,392	(0.30)	707	1,683	(0.37)	617	2,188	(0.42)	920	980	(0.49)	482
France	6,412	(0.40)	2,577	10,638	(0.70)	7,484	4,653	(0.59)	2,728	8,349	(0.54)	4,504
Czechoslovakia	16,973	(0.31)	5,189	23,870	(0.29)	6,883	18,662	(0.36)	6,646	19,716	(0.36)	7,160

Source: Vneshniaia Torgovlia SSSR (USSR Foreign Trade). Statistical Yearbooka. Statistika. Moscow. 1974-1980.

* Standard can = 353.4 g.

crustaceans and 340-900 thousand tons of fish could be grown within this shallow zone alone (Moiseev, 1980). Over 150 centers breed fish fry and fingerlings, of which approximately eleven billion belonging to 40 species are released in inland waters of the USSR annually. In addition, there is a growing number of enterprises engaged in growing fish in pens, ponds, lakes and reservoirs. It is estimated that the commercial yield from these efforts amounts to some 120 thousand tons of high-quality fish, increasing quantities of which are being supplied live to the consumer (Nikonorov, 1980).

It can be said, however, that, so far as exports are concerned, the Soviet Union is likely to suffer some disadvantages. First of all, it will be difficult and costly to increase the supply of valuable species such as sturgeon and salmon varieties, because of the difficulties caused in inland waters by industrial activities, over which the fishing industry has no control. Second, the new products to be developed from small fish and krill, and to some extent also from fish obtained in other countries' economic zones, will probably find demand on the protein-scarce domestic market; but it will be difficult to market them abroad, where competition in quality is likely to be very keen. Also, unutilized resources in other countries' economic zones will probably tend to shrink as the owner countries develop their own processing industries in response to increased demand for food from the growing populations of the world.

In spite of all these difficulties, the Soviet Union plans to expand the production and consumption of fishing industry products. The per capita consumption of fish is to continue to grow (see Table V), although most of the increase is to come from the better utilization of the level of catches already achieved. The Soviet Union's need for foreign currencies is likely to continue to increase, and therefore the necessity for the fishing industry to continue providing export commodities will persist, in spite of the increase in demand at home. As in the past, the Soviet Union will strive in one way or another to safeguard for herself the necessary marine resources, and, as in the past, she will succeed — at least in part.

TABLE XII

EXPORTS OF CANNED CRAB FROM THE USSR BY COUNTRY OF DESTINATION

Q in Thousands of Standard Cans,* V thousands of Rubles, Price in Rubles per Standard Can

	1974			1977			1979			1980		
	Q	(P)	V	Q	(P)	V	Q	(P)	V	Q	(P)	V
Total	5,971	(2.40)	14,320	4,526	(2.71)	12,255	4,242	(4.49)	19.063	5,241	(3.25)	17,048
Australia	37	(2.54)	94	-	-	-	-	-	-	13	(3.33)	43
Austria	47	(2.74)	129	6	(3.00)	18	-	-	-	4	(4.25)	17
Belgium	1,008	(2.49)	2,508	460	(2.90)	1.336	734	(4.54)	3,333	815	(3.65)	2,978
United Kingdom	60	(2.77)	166	18	(2.83)	51	18	(4.83)	87	9	(4.22)	38
East Germany	62	(0.80)	50	25	(2.08)	52	25	(2.40)	60	25	(2.88)	72
Denmark	125	(2.59)	324	-	-	-	81	(4.77)	386	26	(3.58)	93
West Berlin	18	(2.83)	51	66	(3.03)	200	352	(4.73)	1,665	297	(3.83)	1,005
Italy	53	(2.39)	125	22	(2.86)	63	110	(4.57)	503	52	(3.77)	196
Netherlands	277	(2.55)	705	225	(2.90)	652	269	(4.49)	1,207	120	(3.59)	431
Norway	73	(2.71)	198	21	(3.05)	64	314	(4.58)	1,439	128	(3.16)	405
West Germany	287	(2.61)	750	174	(3.27)	569	51	(4.53)	231	-	-	-
Finland	59	(2.85)	168	109	(2.08)	227	100	(4.79)	479	72	(3.93)	283
France	2,704	(2.30)	6,208	2,845	(2.63)	7,484	1,486	(4.42)	6,572	2,735	(2.92)	7,975
Czechoslovakia	58	(0.82)	31	31	(2.23)	69	5	(2.80)	14	5	(3.40)	17
Switzerland	151	(2.73)	412	33	(2.97)	98	45	(4.80)	216	22	(4.36)	96
Sweden	453	(2.60)	1,173	133	(2.64)	351	220	(4.40)	977	622	(3.87)	2,405

Source: Vneshniaia Torgovlia SSSR (USSR Foreign Trade). Statistical Yearbooks. Statistika. Moscow. 1974-1980.

* Standard Can = 353.4 g.

Bibliography

Anon. Osnovnye napravlenia razvitia nauki i tekhniki v rybnom khoziaistve (Main directions of development of science and technology in fisheries). Rybnoe Khoziaistvo, 1978, No. 5, pp. 3-5.

Anon. Mirovoi ryboobrabatyvaiushchi i transportnyi flot (World fish processing and transportation fleet). Rybnoe Khoziaistvo, 1979, No. 6, pp. 35-36.

Anon. Osnovnye napravlenia ekonomicheskogo i sotsialnogo razvitia SSSR na 1981-1985 gody i na period do 1990 goda (Principal directions of economic and social development of the USSR for 1981-1985 and for the period up to 1990). Ekonomicheskaia Gazeta, No. 11, March 1981.

Anon. Ekonomit materialnye i trudovye resursy na osnove bolee polnogo ispolzovania dostizheni nauki i tekhniki (To economize on material and labor resources through fuller utilization of the achievements of science and technology). Rybnoe Khoziaistvo, 1981, No. 9, pp. 3-6.

Anon. Prodovolstvennaia programma SSSR na period do 1990 goda (USSR consumer supply program for the period up to 1990). Pravda, 27.V.1982.

Afonin, Yu. G. and Silin, A. V. O proportsionalnosti razvitia proizvodstvennoi struktury rybolovstvennykh predpriati (Proportionality in the development of the operational structure of fishing enterprises). Rybnoe Khoziaistvo, 1980, No. 1, pp. 20-22.

Bekiashev, K. A. and Rumiantsev, V. M. Pravovoe regulirovanie rybolovstva v pribrezhnykh vodakh SSSR (Legal regulation of fishing in the coastal waters of the USSR). Rybnoe Khoziaistvo, 1977, No. 9, p. 56.

Bortnik, V. N. Nekotorye gidrologicheskie aspekty vosstanovlenia rybokhoziaistvennogo znachenia Aralskogo moria (Some hydrological aspects of re-establishing the importance of the Aral Sea for the fishing industry). Rybnoe Khoziaistvo, 1980, No. 9, pp. 56-58.

Giulbadamov, S. B., Kadilnikov, Yu. V., and Pavlov, K. L. Razvitie tekhniki morskogo rybolovstva (Development of technology in marine fisheries). Rybnoe Khoziaistvo, 1981, No. 9, pp. 57-60.

Kamentsev, V. M., Deputy Minister of the Fishing Industry of the USSR. Perspektivy razvitia rybnogo khoziaistva vnutrennikh vodoemov (Prospects of developing the fishing industry in inland waters). Planovoe Khoziaistvo, 1978, No. 1, pp. 9-19.

Kamentsev, V. M. Zadachi rybakov v realizatsii prodovolstvennoi programmy SSSR (Fishermen's task in the realization of the USSR consumer supply program). Rybnoe khoziaistvo, 1981, No. 4, p. 3. See also: Osnovnye napravlenia razvitia nauki i tekhniki v rybnom khoziaistve (Main directions in the development of science and technology in the fishing industry). Rybnoe Khoziaistvo, 1978, No. 5, pp. 3-5. On that occasion, Kamentsev

gave slightly different figures. The output of fresh and chilled fish was to have gone up 37.3% as against 40%; smoked, dried and cured fillet production was to increase 15% as against 16%; culinary products 18% as against 21%. These changes in the planned figures indicate that there was a degree of uncertainty about the real possibilities, and that the fishing industry is being pressed to increase its production.

Kamentsev, V. M. Plany namechennye XXVI s'yezdom KPSS — vypolnim (We shall fulfill the plans set by the XXVI Congress of the CPSU). Rybnoe Khoziaistvo, 1982, No. 2, pp. 3-8.

Moiseev, P. A. Osnovye napravlenia razvitia marikultury (The main trends in the development of aquaculture). Rybnoe Khoziaistvo, 1980, No. 2, 21-25.

Nikonorov, I. V. Zabota o prirode i sokhranienie rybnykh zapasov (Care of the environment and the conservation of fish stocks). Rybnoe Khoziaistvo, 1980, No. 6, pp. 3-5.

Sysoev, N. P. Ekonomika rybnoi promyshlennosti SSSR (Economics of the USSR fishing industry). Moscow: Pishchevaia Promyshlennost, 1977. p. 317.

Sysoev, N. P. Tekhnicheski progress i razmeshchenie rybodobyvaiushchei promyshlennosti (Technical progress and the location of fishing industry operations). Rybnoe Khoziaistvo, 1980, No. 1, pp. 17-20.

Sysoev, N. P. and Shcherbaev, T. N. Puti sovershenstvovania transportnogo protsessa v rybnoi promyshlennosti (Ways of perfecting the transportation process in the fishing industry). Rybnoe Khoziaistvo, 1979, No. 9, pp. 67-70.

Voronov, K. G. and Pavlov, K. A. Organizatsia i tekhnika vneshnei torgovli (Organization and methods of foreign trade). Moscow: Mezhdunarodnye Otnoshenia, 1970. p. 52.

For more detailed descriptions of the USSR's fishing industry see: Jan J. Solecki, "A Review of the U.S.S.R. Fishing Industry," Ocean Management, 5 (1979) 97-123.

Abstract

The Soviet Union's fishing industry accounts for less than one percent of the nation's exports, even though the country has the largest fishing fleet in the world. Clearly, the principal function of the industry is to meet domestic requirements for edible fish for inputs to the manufacture of products such as margarine, pharmaceutical preparations, and fish-meal to be used in agriculture. Nevertheless, during the last decade (1971-1980), the USSR has exported net US$ 1.7 billion worth of fishing industry products. Fresh, chilled and frozen fish accounted for 25.1% of the exports in 1960 and [illegible].4% in 1980. Canned fish, on the other hand, accounted for 45.4% in 1960 and 18.5% in 1980. This includes canned salmon, exports of which showed an opposite trend: accounting for 16.2% of canned fish exports in 1960 and 31.2% in 1980. Canned crab exports, mainly going to hard-currency countries, declined relatively from 23.6% of the industry's exports in 1960 to only 8.1% in 1980. Similarly, exports of the famous Russian delicacy, caviar, declined from 28.6% in 1925/6 to 4.9% in 1980.

The greatest price increase noted was for whale meat 6.2[illegible] times over the 1970-1980 period alone. Taking 1960 as 100, the price of canned crab increased to 184 during the sixties, and five-fold between 1960 and 1980. Within the same time interval, the price of canned salmon rose to 233. By comparison, increases in the price of fish were relatively modest, around 50%.

Against the exports of fish products worth US$ 2.04 must be set imports worth US$ 362 million. One can detect here an adverse trend for the USSR. During the first half of the decade 1970-1980, the imports amounted to 15.1% of the exports, while during the second half the figure rose to 19.2%. In 1980, imports reached 27.5% of the exports. The recently introduced ban on whaling is likely to cost the USSR some US$ 15 million per year.

Plans for the future, announced recently in the USSR, envisage some increase in the volume of the catch, and a somewhat greater growth in the output of edible fish products. Because of the Soviet Union's perennial need for foreign exchange, some of the production of the fishing industry will, as in the past, be devoted to exports.

The Contribution of Trade in Fisheries Products to the Fisheries Economies of Northern Ireland and Hong Kong

John A. Butlin
University of Manchester
Manchester, England

Rights of Access and "Trade" in Rights to Fish

It is clear from the simple theory of resource extraction that a social manager, managing a fishery on behalf of the nation, would choose that pattern of extraction which would maximise the discounted present value of the surplus accruing to the fishery. Using conventional neoclassical[1] calculus, this would imply that, for each fishermen participating in the fishery, the supernormal profit from fishing would be just exhausted. If the fishery is a multinational one, and negotiations over access are conducted between social managers, then the final division of rights to fish, and the amount of fishing activity undertaken by each nation, will be such that the net marginal social benefit to fishing will be the same for each participating fishing nation, and the aggregate surplus generated by this idealised Law of the Sea type of activity would be maximised.

This is the idealised, or stylised, approach to the problem. I have cavalierly skipped over a considerably number of conceptual and theoretical problems, and will make no attempt to remedy them here. Rather, I wish to focus on the weaknesses of this approach, and to consider further the extent to which these limitations impinge upon small countries, affecting to a considerable degree internal fisheries and food policy. The cases of Hong Kong and Northern Ireland are cited as examples.

Omissions from the Conventional Approach

There is one category of omissions from the neoclassical approach on which I want to focus: the assumption that there are no significant externalities other than the absence of private property entitlements in the fishery; and the assumption that the prime motivation of the social manager is to maximise the surplus accruing to the nation from the fishery by attracting as efficient a fleet as possible (either national or international) to exploit it.[2]

Bargaining power in fisheries negotiations

Fisheries negotiations between countries on rights of access to each other's (often newly-created) extended economic zones[3] rarely represent negotiations between countries of equal size, or with equal natural resource endowments, or with equal political or economic leverage. The situation is more likely to be one in which the distribution of any of these between negotiating units is unequal, and any solution arrived at can be seen conceptually to be off the Edgeworth Bowley contract curve. The solution, therefore is unlikely to be one in which aggregate welfare of the negotiating parties is maximised, but rather one in which the national interests of individual countries are met in proportion to their ability to press these interests at the bargaining table. The negotiations may be a formality, or may not take place at all: the dominating power in a region may simply set the terms under which other countries participate in a fishery over which they have overlapping interests. This is clearly the situation in which our first case study, Hong Kong, finds herself. The terms and conditions under which she fishes the waters surrounding her territory[4] are determined entirely by the Peoples Republic of China (PRC). In this situation, the contribution of trade in fish to the food supply fulfills an important, and potentially increasingly important, role.

This unequal distribution of bargaining power may also be reflected within, as well as between nations. Different regions may have different sizes of fleet, fleets fishing closer to or further from shore or catching higher valued or lower valued species. In this event, certain regions, representing certain sectors of the national fleet, may have a stronger influence on the national negotiating position, as well as being able to benefit more from whatever agreements are reached. Our second case study, Northern Ireland, finds itself in this position, 'caught' between the stronger national political influence of the Scottish fishing fleet on the one hand, and the special preference given to the Irish Republic's fishing fleet at a European level on the other. Again, this unequal distribution of negotiating influence can affect supplies of fish.

In the case of Northern Ireland, as part of the European Community, the exchanging of rights to fish in third-party waters for the right of third-party countries to export fish to the Community can also have noticeable (in this case adverse) effects upon the indigenous regional industry. Thus, the trade in rights to fish can be as important as the trade in fish and fish products.

The following two sections discuss the fishery economies of Hong Kong and Northern Ireland, with attention being given to the importance of trade in fish and fish products, and in 'rights to fish'. In neither case is the question of trade in fish products a matter of great current political concern, but in both cases it plays an important role.

The Fishing Economy of Hong Kong

Indigenously produced fish

The territorial waters of Hong Kong are extremely small in area, as mentioned above. They are approximately 16,900 hectares (or 65 square miles) in area. This is an extremely small area, and represents only a small part of the grounds exploited by the Hong Kong fleet. The major grounds are to be found off the South China coast, over a 160-kilometre wide section between Hainan Island and Shantou. Most of the better fishing grounds are within Chinese waters[5], and to fish these waters Hong Kong vessels must obtain a licence from the P.R.C. authorities, in addition to fulfilling a number of other restrictive requirements.

In addition to the capture fishery, there are two other sources of indigenously produced fish in Hong Kong. The first of these is mariculture, and the second is culture in freshwater ponds. As a result of these three categories of activity, Hong Kong is approximately 90 per cent self-sufficient in marine fish but only 16 per cent self-sufficient in freshwater fish. The excess demand for fish other than those produced domestically is met by trade in fish and fish products. In addition there is a significant trade in fish fry to stock the mariculture nets.

Estimates of the number of people actively involved in fishing in Hong Kong varies between 28,000 to 35,000.[6] The most common estimate, that fishery employment was 33,500 in 1981 [1], indicates that fishery employment was 0.65 per cent of the population of 5.1 million. The number of fishermen fell on average by 0.86 per cent per annum between 1976 and 1981. Notwithstanding this, the catch taken by the fleet increased by 19 per cent between 1976 and 1980. Between 1976 and 1981 the number of vessels fell by 500 to 5,000, an average decline of 1.8 per cent per annum. [2].

Over this period of decline in the capture fishery the mariculture industry has been expanding rapidly. In 1976 there were 974 mariculturists in Hong Kong, who collectively owned 1,360 rafts from which were suspended 6,681 cages. By December 1980 there were 1,553 mariculturists who between them owned 2,339 rafts from which were suspended 14,049 cages. The scale of operation increased significantly during this period, from almost 7 cages per mariculturist on average to 9 per mariculturist. The aggregate weight of fish produced by the mariculture sector rose from 574 tonnes in 1976 to 760 tonnes in 1980, an aggregate increase of 32.5 per cent.

Information on the freshwater pond fish production sector is not readily available in Hong Kong. There is some anecdotal evidence that the numbers of pond farms are declining, although local production of freshwater fish has increased from 3,627 tonnes in 1976 to 5,550 tonnes in 1980, an increase of 53 per cent. [3].

The consumption of fish in Hong Kong[7]

In 1978, the aggregate consumption of fish in Hong Kong was 2[illegible].8 kgs. per annum, representing almost 14 per cent of aggregate food consumption. Information is not available on expenditure on fish products for

1978, but in 1975, the latest year for which expenditure data is to hand, and when consumption of fish was 31.4 kgs. (15.7 per cent of aggregate food consumption) expenditure on fish was 1.49 per cent of per capita G.D.P. Information concerning consumption of and expenditure on fish in Hong Kong is given in Table 1. It is clear from this that consumption of fish in Hong Kong peaked in 1970, and that consumption of fish exceeded 30 kgs. per capita per annum between 1967 and 1976. The relative constancy of consumption is not reflected in the figures for the proportion of income spent on fish, which fell from 2.27 per cent of per capita GDP (unadjusted) in 1965 to 1.49 in 1975. (Estimates of the own-price elasticity of demand for fish and of the income elasticity of demand for fish have been made in the colony, but the estimating equations and the incomplete specifications of the estimating equations severely limit the usefulness of these estimates. For these reasons they are not reported here.)

The importance of the freshness of fish to the Hong Kong consumer (that is, to the Chinese community) cannot be emphasised too much. The proportion of marine fish consumed in some form other than fresh has remained relatively static at 15 per cent of total marine fish consumption. 7 per cent of total consumption is cured (salted or dried), 6 per cent frozen and 2 per cent canned. More than 80 per cent of the freshwater fish consumed in Hong Kong is consumed in the fresh state, and the balance is sold chilled.

Table 1 : Per Capita Consumption of and Expenditure on Fish in Hong Kong, 1965 - 1978

Year	Marine Fish (kg)	Freshwater Fish (kg)	All Fish/ All Food (%)	Marine Fish (HK$)	Freshwater Fish(HK$)	All Fish Expenditure per Capita G.D.P. (%)
1965	21.2	7.8	15.51	43	23	2.27
1966	20.0	8.8	15.13	37	26	2.06
1967	22.4	8.9	17.00	39	35	2.25
1968	23.5	8.4	16.85	33	32	2.23
1969	23.6	8.2	16.27	33	32	1.75
1970	25.1	6.9	16.29	37	28	1.69
1971	22.9	8.4	15.28	32	32	1.65
1972	23.8	8.5	15.52	38	31	1.69
1973	22.6	8.6	15.86	36	33	1.52
1974	23.7	7.9	16.10	39	29	1.49
1975	22.8	8.6	15.70	38	21	1.49
1976	22.2	8.1	14.70	n.a	n.a	n.a
1977	21.5	7.4	13.78	n.a	n.a	n.a
1978	21.0	7.8	13.99	n.a	n.a	n.a

Source: 4, Appendixes 1 and 2.

Trade in fish and fish products between Hong Kong and the rest of the World

As was mentioned above, Hong Kong is about 90 per cen self-sufficient in marine fish, but only 16 per cent self-sufficient in freshwater fish. Details of exports are given in Table 2, imports in Table 3, and re-exports in Table 4, all for the years 1976-1980. Table 5 summarises the previous three tables, and demonstrates clearly Hong

Table 2 : Exports of Fish and Fish Products from Hong Kong, 1976-1980

Products	Weight (Tonnes)					Value (HK $000s)				
	1976	1977	1978	1979	1980	1976	1977	1978	1979	1980
Marine Fish	5,834	6,168	12,567	11,673	8,998	41,345	65,302	110,460	120,387	98,287
Freshwater Fish	56	158	183	31	102	633	1,460	1,888	413	1,208
Fish Fillets	-	-	121	12	12	-	-	639	107	347
Fish Derivatives	11	3	1	243	361	519	454	140	1,039	1,346
Fish Fry	-	-	-	-	-	242	163	553	930	1,202
Crustaceans	8,710	9,825	7,081	6,599	5,413	264,302	287,916	245,678	267,773	193,576
Molluscs	4,139	3,373	5,369	5,884	6,622	39,408	27,701	40,562	54,366	57,696
Others	2	2	64	72	107	61	14	1,065	1,048	1,215
Total	18,552	21,529	25,386	24,459	21,615	346,510	383,010	400,985	465,718	354,877

Table 3 : Imports of Fish and Fish Products to Hong Kong, 1976-1980

Marine Fish	15,961	14,529	16,404	17,584	19,563	93,147	104,616	127,935	154,085	186,197
Freshwater Fish	31,864	30,624	31,077	36,609	39,200	242,792	263,865	283,664	361,424	441,820
Fish Fillets	-	-	882	1,504	964	-	-	10,693	16,630	13,297
Fish Derivatives	8,395	10,373	10,458	11,010	12,571	78,056	115,420	170,921	154,012	175,400
Fish Fry	-	-	-	-	-	1,499	5,916	12,232	25,049	17,833
Crustaceans	18,412	17,153	18,283	20,628	21,366	245,092	248,799	279,912	438,500	442,763
Molluscs	12,273	11,172	12,220	13,182	13,551	222,731	250,466	296,149	381,168	492,323
Others	995	1,398	1,246	1,364	1,605	11,939	16,418	15,054	19,360	27,487
Total	87,900	85,249	90,550	101,881	108,820	895,256	1,005,500	1,196,560	1,550,228	1,797,120

(Source for Tables 2,3 and 4: 3, pp.31-39).

Table 4 : Re-Exports of Fish and Fish Products from Hong Kong, 1976-1980

Products	Weight(Tonnes)					Value (HK $000s)				
	1976	1977	1978	1979	1980	1976	1977	1978	1979	1980
Marine Fish	4,027	1,884	2,543	3,806	4,276	27,860	22,982	25,491	39,293	47,950
Freshwater Fish	295	343	186	384	783	2,512	2,545	1,570	3,971	9,158
Fish Fillets	-	-	23	8	12	-	-	258	140	179
Fish Derivatives	288	877	432	668	1,456	10,875	16,659	16,110	20,526	24,714
Fish Fry	-	-	-	-	-	2,508	7,046	8,391	25,309	14,923
Crustaceans	4,305	3,641	6,002	7,553	8,022	123,029	105,738	192,788	313,558	285,952
Molluscs	1,965	2,631	2,284	2,743	1,760	45,292	61,071	58,378	69,804	63,828
Others	661	631	852	1,011	1,188	9,995	12,488	16,416	20,602	29,851
Total	11,541	10,007	12,322	16,173	17,479	224,131	228,529	319,402	493,203	476,555

Table 5 : Balance of Trade in Fish and Fish Products* in Hong Kong, 1976-1980

Marine Fish	-6,300	-4,477	-1,294	-2,160	-6,289	-23,[illegible]42	-16,332	8,016	5,593	-39,960
Freshwater Fish	-31,513	-30,123	-30,708	-36,194	-38,315	-239,447	-259,860	-281,626	-357,220	-431,454
Fish Fillets	-	-	-738	-1,484	-940	-	-	-9,796	-16,383	-12,771
Fish Derivatives	-8,096	-9,493	-10,025	-10,099	-10,754	-76,352	-98,307	-154,671	-132,393	-149,340
Fish Fry	-	-	-	-	-	1,251	1,293	-3,288	1,190	-1,708
Crustaceans	-5,397	-3,687	-5,200	-6,476	-7,931	141,939	144,855	744,615	162,831	36,765
Molluscs	-6,169	-5,168	-4,297	-4,555	-5,169	-138,031	-1,161,694	-197,209	-256,998	-370,799
Others	-332	-765	-330	-281	-310	-1,883	-3,916	2,427	2,291	3,579
Total	57,807	53,713	52,592	61,249	-69,708	336,465	1,305,484	98,468	-591,087	-965,688

(Source for Tables 2,3 and 4: 3,pp.31-39).
(Source derived from Tables 2 - 4 (Balance of Trade = Exports + Re-Exports - Imports))

Kong's net dependence on the rest of the world to meet the demand for fish in the colony. This is particularly clear in the case of freshwater fish and molluscs, which accounted for a significant portion of the balance of trade deficit by weight and by value in 1978 (62.38 per cent and 83.08 per cent respectively). It is also clear that for certain products, in particular crustacea, the added value in processing before re-export is particularly significant, and is sufficient to turn a quantity deficit into a value surplus. The small surplus in trade in fish fry is surprising, as the indigenous production of fry is for lower-valued species, and imports are for the higher valued mariculture species. The aggregate trade deficit on fish and fish products is a significant if not a large sum. In 1980 the deficit was equivalent to approximately 1.4 per cent of GDP.

The countries with which Hong Kong trades in fish products are numerous, but a large proportion both of imports and of exports come from or are destined for one or two countries. The principal destination for exports of fish and fish products from Hong Kong is Japan. The proportions of exports destined for that country from 1976 to 1980 by weights were as follows:

1976	1977	1978	1979	1980
69%	74%	77%	69%	63%

The other country for which a significant proportion of fish and fish products exports were destined between 1976 and 1980 is the U.S.A. The proportions of the total weights of fish exported from 1976 to 1980 were:

1976	1977	1978	1979	1980
21%	16%	14%	19%	16%

Thus, these two countries accounted for approximately 90 per cent of all fish and fish products exports from Hong Kong during the period for which data are available. (The figures are very similar in terms of the value of the fish exported.)

Dependence on countries as sources of fishery imports to Hong Kong is not as concentrated as the destinations for exports. Nevertheless five countries (PRC, Thailand, Japan and Macau and Taiwan) providing 75 per cent of the imports on average, with PRC alone providing 50 per cent of the fish or fish products imported into Hong Kong.

Hong Kong dependence on PRC

There is clearly a dependence on the PRC by Hong Kong, both for the right to fish in Chinese waters, and as a source of fish imports, particularly freshwater fish. Although I have not been able to obtain figures on the sources of fish fry imported into Hong Kong for the mariculture industry, it is also clear that, as most of the higher valued fish in the mariculture units (mainly red, green and yellow groupers) are grown from imported fry, it is clear that this important sector of the Hong Kong fish supplying industry would be much more limited in scale in the absence of imported fry (primarily from Taiwan and the Philippines).

It is difficult to anticipate the future development of trade in fish and fish products between Hong Kong and the remainder of the world. Certain features of the development of policy in China may however, have a significant bearing on this. These include:

- The increase in aggregate food consumption as the population of China increases
- The increase in per capita food consumption as the level of economic development in China increases.

Both of these signal an increase in the demand for fish for domestic consumption in the PRC. This clearly has significant implications for Hong Kong, particularly in relation to the supply of freshwater fish, but also in relation to the terms under which Hong Kong vessels are entitled to fish in Chinese waters. There are already restrictions on the number of vessels entitled to fish in Chinese waters (this applies, surprisingly, to smaller vessels); and vessels which are granted access must be licensed. In addition, Hong Kong vessels which are permitted to fish within Chinese waters must land a proportion of the catch (currently 10 per cent) in the PRC.

Whilst the degree of dependence is difficult to quantify, it is clear that Hong Kong is particularly reliant on the PRC for fish and fish products to augment its indigenously produced food supply. In the next section of this paper I will investigate the fishery economy of Northern Ireland, and in the final section I will attempt to draw conclusions from these two 'case studies' on rights of access and the trade in fish and fish products between small and large economies.

The Northern Ireland Fishery Economy[8]

The Northern Ireland sea fishing fleet is a small but socially important one. Full-time and part-time employment in the catching and processing sectors provides employment for approximately 1800 people in the province, in areas where the unemployment rate currently can be between 15-20 per cent, and sometimes exceeds the higher figure. The fleet is based upon two areas: the major part of the fleet is focused on the South Down coast (on the ports of Kilkeel, Ardglass and Portavogie) and there is also a smaller, seasonal fleet which fishes the inshore waters along the north coast of County Antrim and along the coast of County Londonderry. The South Down fleet fishes primarily in the northern section of ICES area VIIa. (This is essentially that part of the Irish Sea between the latitude of Carlingford Lough and the Mull of Kintyre). The main species caught are nephrops, herring, cod and whiting. These four species represent over eighty per cent of the fish caught by the South Down fleet.[9] This fleet, in turn, lands more than 97 per cent of the fish landed either by weight or by value.

In comparison with Hong Kong, the Northern Ireland fleet is parochial. Almost all of the fishing is undertaken on a "day-trip" basis, with the exception of a small sector of the fleet, 5 or so purse-seiners which exploit both the Minch herring and mackerel, and the mackerel stocks of the south-western approaches. These vessels may be away from their home port for several months at a time.

One of the starkest contrasts between the Northern Ireland fishery economy and that of Hong Kong is the much lower demand for fish in Northern Ireland. Aggregate consumption of fish (excluding "indirect" consumption of fish meal and oil used in animal feed or in the preparation of foodstuffs) is currently approximately 4.00 ounces per person per week, or under 6 kgs. per head per year. Hence, fish does not assume the same importance in the food supply of Northern Ireland that it does in the food supply of Hong Kong. We therefore have to consider the problems of access and the question of trade in fish products more from the viewpoint of the supply side than the demand side of the market. It will be convenient first to consider the regulatory regime under which the Northern Ireland fleet operates, and then to consider its contribution to determining this regime when compared with other parties involved.

The regulation of fishing in the Irish Sea

The fishing fleet from Northern Ireland[10] operates under two sets of policy influences: those from the national government in London, and those from the European Commission in Brussels. At the national level the regulation of fishing within 12 miles either of the Northern Ireland coast on of the mainland coast is achieved by rules and orders implemented either by the Department of Agriculture for Northern Ireland (DANI), by the Department of Agriculture and Fisheries for Scotland (DAFS) or by the Ministry of Agriculture, Fisheries and Food for England and Wales (MAFF). Fishing activities outside the 12-mile limit but within the United Kingdom 200-mile limit are administered and policed by the United Kingdom government on behalf of the European Commission under the Hague Agreement of 1976. The Isle of Man, one of the main foci for herring fishing in ICES area VIIa, is neither part of the United Kingdom nor of the European Community. Its own Board of Agriculture and Fisheries administers the waters up to 3 miles from the coast of the Isle of Man. The waters from 3 - 12 miles from the Manx coast are administered jointly by MAFF and the Manx Board in consultation with DANI. Hence, the only area in which the Northern Irish fishermen currently have a preference is within twelve miles of the coast of the Province. This preference, agreed in principle under the Treaty of Accession to the European Community, is likely to be eroded by several factors:

- it is a temporary derogation from the principle of equal access, which remains a basic tenet of fisheries policy in the European Community. Unless otherwise renegotiated, it will cease at the end of 1982.

- Other vessels which have traditionally fished within 12 miles of the Northern Ireland coast (primarily the Irish fleet from the east coast of the Irish Republic) retain their rights to access.

- Conservation measures for stocks deemed to be under threat within the Northern Ireland 12-mile zone must not be discriminatory (i.e. give preference to one fleet rather than another) and must be temporary.[11]

Aggregate catches for species deemed to be "under pressure" are determined by the Council of Ministers of the European Commission acting on advice from the area and species working groups of ICES, and from its

Advisory Council on Fisheries Management. The Council of Ministers decides only on aggregate catches and national quotas (or Total Allowable Catches - TACs), and the allocation of this national quota amongst the fleet of a particular area is the responsibility of the national government. In the Irish Sea, the UK quota for herring has traditionally been allocated by a licensing system (sometimes restricted sometimes not) combined with a closed season. Other white fish species have been controlled by closed seasons.[12]

This, then, is the regulatory structure within which the Northern Ireland fishermen operate. To determine whether or not there is any potential for bargaining strengths to determine the degree of fairness of the resulting fisheries policy, it is necessary to identify points at which bargaining takes place in the decision process. There are, in fact, four points at least where regional interests may (or may not!) be pressed:

1. Within the working groups and Advisory Council on Fisheries Management (ACFM) of ICES.

2. Within the Council of Ministers.

3. Within the national political system.

4. Within the allocation system for rights of access to the national TAC for a particular species.

To suggest that there is overt discrimination against the Northern Ireland fleet at any of these decision points would be incorrect. It would, however, be appropriate to remember that the decision process encapsulated in stages 1 to 4 is essentially a political one, and the extent to which Northern Ireland's interests are represented may depend on the degree of representation that Northern Ireland has at any stage. At stage one, there may be a scientist from the DANI fisheries laboratory within the working group(s) dealing with the VIIa area (amongst other continguous areas) but not - to date - in the ACFM. Within the Council of Ministers the Minister of Agriculture for the U.K. represents all U.K. fishing interests, but is subject to lobbying primarily from Scottish and (to a lesser extent) English fishermen's organisations. Furthermore, the structural fisheries policy of the European Community has specifically encouraged the expansion of the Irish Republic's fleet and thereby increased its bargaining strength. The Manx herring fishery is regulated by a licensing system and, on a week-to-week basis, by a Management Committee. Although theoretically represented on this Committee (together with representatives from the Isle of Man, England and Scotland) attendance has apparently been sporadic. Northern Ireland fishermen often argue that the restrictive licensing system which has been introduced from time to time is also discriminatory, as it limits access to vessels with participation in the fishery for three (or more) of the preceeding years. Clearly the scheme is discriminatory, and intentionally so; it does not discriminate against Northern Ireland fishermen alone, however.

It has been shown above that there is the potential for Northern Ireland's interests to be represented less forcefully than other regions' in the determination of Irish Sea fishery policy. To demonstrate this (or test the hypothesis that there is a lack of equity in Irish Sea fisheries policy) would, however, be extremely difficult.

One indication is the attention explicitly given to the Northern Ireland fishery by official governmental investigations. In the three parliamentary reports on the United Kingdom fishing industry since 1960[13] there is virtually no mention of the Northern Ireland industry. Similarly, in the fishing industry press in the United Kingdom, there is again almost no coverage of activities in Northern Ireland. Although other events in the province have been the subject of extensive investigation by governmental agencies and media commentary, the fishing industry remains one of the least understood aspects of the Northern Ireland economy.

Thus far we have simply established that, on the face of it, there is the possibility of under-representation of Northern Ireland's case in the forums where fisheries policies affecting its fishing industry are discussed. We shall now investigate some of the current problems of the Northern Ireland fishing industry.

The Northern Ireland fishing industry

As has been the case with other regional United Kingdom fisheries, the Northern Ireland industry has expreienced fluctuating fortunes over the past 12 years. There has been a growth in the fleet (to 152 in 1980 from 98 in 1970). Productivity of the vessels rose until 1974, and then showed a secular decline, although there was a brief rise in productivity in 1978/9. Most of the stocks which the fleet exploits have been, since U.K. accession to the European Community, subject to more or less stringent quota controls. The administration of Community waters on a year-to-year basis, in the absence of a Council agreement on a comprehensive Community Fisheries Policy, has proved unsatisfactory.

A report on the Northern Ireland fishing industry (5) discussed the future of the industry under three scenarios. The well-being of the industry was seen to depend crucially on the long-term management regime to be implemented, and the underlying productivity targets to be incorporated into the associated structural policy. In essence, the scenarios represent attempts to assess both the effectiveness of the presentation of Northern Ireland's case in the determination of a policy, and the extent to which the Northern Ireland fleet could be given preference in the negotiations.

The three scenarios were developed to model the outcome of particular vessel productivity objectives and criteria for the allocation of quotas to regional fleets fishing in the area of the Irish Sea. Two productivity targets were included in each scenario: the first assumed that the target productivity would be that achieved in the period 1972/4 by the Northern Ireland fleet. This is clearly the more stringent of the two productivity targets. If it was implemented strictly, it would result in a significant reduction in the fleet. The alternative target was that the fleet should regain the productivity per vessel achieved in the 1978/9 period. This target admits that improved vessel productivity is required in the Northern Ireland fleet as in all other European fleets, but that a rigid requirement to achieve maximum efficiency would produce social effects which would not be acceptable.

The first scenario investigated the effects of achieving these productivity targets on the Northern Ireland fleet if it were simply to retain its historic share of the area's average total catch from 1973-1978. The second scenario replaces this with the assumption that the Northern Ireland fleet receives 90 per cent of the total United Kingdom quotas of the TACs in area VIIa. The final scenario is the most optimistic of the three, by which Northern Ireland vessels are given dominant preference in that section of ICES subdivision VIIa north of latitude 54°N. In terms of representing the interests of Northern Ireland, the first scenario is the least favourable, scenario two intermediate, and scenario three most favourable. The results of this exercise are shown in Table 6. The total quantity of fish available to the fleet varies from 10,290 tonnes under scenario one to 17,750 tonnes under scenario three. To put the case in its most extreme form, the strength with which the interests of the Northern Ireland fleet are pressed in international (and national) negotiations may affect the size of the fleet by up to 100 vessels (150 vessels ± 50) and by 7,500 tonnes. Whilst these figures do not bulk large in a national context, the social implications of the most pessimistic outcome for the South Down would be severe.

Table 6 : Vessel Retirement/Recruitment from 1979 Northern Ireland Fleet under Three Alternative Scenarios

Productivity Target[1]	Scenario 1	Scenario 2	Scenario 3
1972/4 average catch per vessel	-28 to -50	-13	+8
1977/8 average catch per vessel	0 to -26	+1	50

Source: 5, Table 41, p.173.

1. In 5, a number of more sophisticated productivity targets were considered, to account for the increase in vessel catching power in the fleet over time.

Implications of the Hong Kong and Northern Ireland Experience for Other Fisheries Economies

The experience of Hong Kong and Northern Ireland in terms either of access to fishing grounds or in terms of the import of fish to meet demand not filled by domestic production is that there exists a potential for the small country to fare less favourably than the large country if economic and political power is not equitably distributed. In the case of trade in fish and fish products, Hong Kong's reliance on China to supply the major part of demand that cannot be met by domestic production may conceivably result in the terms of trade in fish (and, incidentally agricultural) products to move against Hong Kong as aggregate and per capita consumption of fish increases with economic development in the P.R.C. Similarly, as aggregate demand for fish in the PRC increases, the terms under which other countries (including Hong Kong) are granted access to PRC waters is likely to become less favourable. The experience of Northern Ireland shows that the bargaining strength of an individual country may have a significant influence upon its access to fishing grounds, and therefore the degree to which it enters into trade in fish and fish products. Using a crude calculation, the aggregate demand for fish in Northern Ireland is approximately 6,000[14] tonnes; depending upon the scenario chosen, the export surplus (either to other regions of the British Isles or to other countries) varies from 4.25 to 11.75 tonnes.

The essence of this paper has been to show that there is prima facie evidence for the terms of trade in fish and fish products gradually turning against small countries which are net importers of fish. At the same time, the terms under which these small countries gain access to fishing grounds may become more stringent over time.[15] The extent to which existing international institutions (under UNCLOS III) and other international of inter-regional agreements are equitable in their approach to fishing ground access negotiations deserves attention. Furthermore, the terms under which trade is carried on, and under which small 'fish-deficit' countries are permitted access to large, 'fish-surplus' countries grounds, is worthy of the attention that was paid to commercial and philanthropic international flows of grain in the 1960s and early 1970s. Only as a result of such empirical investigation will it be possible to determine whether the prior hypotheses deduced in this paper hold water. If they do, there is a considerably greater agenda of work to be done.

Notes

1. I use this term in a generic rather than particular sense.

2. In reality the two issues are linked, and they are separated here only to clarify them more precisely.

3. This euphemism for extended fishing limits became current during the Third United Nations Conference on the Law of the Sea (UNCLOS III).

4. With the exception of a small territorial water varying from 3 miles to zero!

5. The definition of Chinese territorial waters in the South China Sea appears to be imprecise.

6. The problems of estimating the number of people actively involved in fishing in Hong Kong arise partly from the social habits of fishermen, and partly from definitions of employment. The Census and Statistics Department (CSD) of the Hong Kong Government, using one definition, counts the labour force as comprising those over 15 years old who have been in employment during the previous 7 days. It thus excludes from this ennumeration both those who have a part-time interest in fish capture and culture, and children under 15 years old. These latter are, however, an integral part of the crew on family-owned vessels (which comprise the large majority of the Hong Kong fleet, the boat also representing the sole dwelling for the family in many cases). The Agriculture and Fisheries Department (AFD) estimate on the other hand, is derived by multiplying the number in each class of vessels found in the Hong Kong fleet by the average crew size for each class of vessel. This overcomes the problems encountered with child crew members and with part-time fishermen if the CSD approach is used.

7. Most of the information in this section comes from or is derived from [4].

8. Much of the information on the Northern Ireland fishery economy is obtained from [5].

9. The proportion of herring in the catch has declined significantly over the years because of persistent overfishing despite attempts to regulate effort.

10. We are concerned from this point on only with the South Down fleet, excluding the activities of the few purse-seiners in more distant United Kingdom waters.

11. The U.K. government was successfully brought before the European Court in 1980 for implementing, via DANI, a ban on herring fishing along the Mourne Coast for all vessels exceeding 35 feet in length. This was deemed by the Court to discriminate in favour of small Northern Ireland vessels; as a result, a total ban on herring fishing in that area was introduced, on an annual, renewable basis.

12. There are, of course, other partial conservation measures, including regulations on the type of gear that may be carried and the mesh

size permitted.

13. These were: the Fleck Committee Report (1961), the House of Commons Select Committee on Expenditure Report on the Fishing Industry (1978), and the House of Lords Committee on the Fishing Industry (1980).

14. This figure is derived by multiplying the annual consumption per head (4 kgs.) by the population (approximately 1.5 million)

15. There is also the problem faced by small countries with long coastlines and extensive areas of sea within their fishing limits. This problem is that of ensuring third country access is only gained under fair terms to the host nation. This problem arises both because of the difficulty of policing any agreement between a small country and a large country's fleet, and because fishing ground access for the larger country may be tied to some form of aid to the smaller country. I have not considered these issues in this paper, however.

Bibliography

1. Hong Kong Government Information Services: Hong Kong: the Facts. The Fishing Industry, Hong Kong, March 1981.

2. Liaison and Training Section, Fisheries Development Division: A Summary of the Results of the Fishing Vessel Count, Conducted in Hong Kong (24-26 January 1979) and a Comparison with the 1978 Count. Occasional Paper No. F.23, AFD, June 1980.

3. Economics and Marketing Division: Statistics on Fishery Production and Trade, 1980. Occasional Paper No. M12, AFD, undated.

4. Fisheries Economics Office, Consumption Pattern of Selected Foodstuffs in Time Series Trends, MRDC/WP7/79,AFD,6/7/1979.

5. Butlin, J. G. Smith and D.R. Colman: The Regional Impact of the EEC: Economic and Social Situation and Perspectives for the Fishing Industry within Certain Regions of the EEC: Northern Ireland, Department of Agricultural Economics, University of Manchester for DG-XIV (Fisheries), Commission of the European Communities, July 1981.

Acknowledgements

Some of the work reported here comes from contracts awarded either by the Hong Kong Government or by the Fisheries Directorate (DG XIV) of the Commission of the European Communities. Whilst this financial support is gratefully acknowledged, the opinions and views reported here, and in fact the entire contents of the paper, are the sole responsibility of the author.

Abstract

Small, open economies, such as Northern Ireland and Hong Kong, find themselves in essentially similar situations from the viewpoint of fish supply. The management policy for the waters in which they fish is determined by some political entity other than their own, with objectives which sometimes differ from their own. Nevertheless, they are dependent on trade in fisheries products to support their fisheries economy. The paper investigates the conditions under which these geographically and culturally dissimilar regions trade in fish products, and attempts to draw lessons for other small economies, both from the perspective of fisheries management and food supply.

Analysis of the EEC Trade in Seafood from 1970 to 1980

Ulrich Sommer
Institut für landwirtschaftliche Marktforschung
Braunschweig, Federal Republic of Germany

Between 1970 and 1980 the volume of world trade in fishery commodities has increased by one fourth while total catch has grown by a tenth only. In particular the great trade expansion was attributable to products for direct human consumption. Their trade volume rose by some 70 % equally much more than the 20 % growth realized by total catch used for food.

Contrary to the expanding trade in food fish commodities there was the decreasing trade in fishmeal and -oil. However, concentrating on sea<u>food</u>, this category will not further be considered.

The strong increase in foreign trade with fish products for human consumption was connected with growing prices and changes in the commodity structure (higher shares of high priced shellfish) which quintupled world trade value within ten years (table 1).

The most important market in the world for fish is Europe. In 1980 three quarters of all traded fishmeal and -oil and nearly half of all food fish products entering foreign trade were sold in European countries. Of this quantity almost 60 % and 70 % respectively have been bought by member countries of the European Community, which equally spent more and more money to buy an ever growing bulk of the highly wanted goods.

The reasons for the expansion of food fish imports of the EEC-9 from 1970 to 1980 (quantity: +60 %, value: +500 %) are discussed in the following paper.

Table 1: **Imports of Fish and Fish Products** 1970 and 1980

Regions	Total Fish				Fishmeal and -oil				Fish for Consumption			
	1 000 tonnes		Mill. US-$		1 000 tonnes		Mill. US-$		1 000 tonnes		Mill. US-$	
	1970	1980	1970	1980	1970	1980	1970	1980	1970	1980	1970	1980
World	7 383	9 199	3 275	15 294	3 711	2 951	599	1 445	3 672	6 248	2 576	13 849
Africa	279	559	99	465	19	31	4	16	260	525	95	447
North-America	1 304	1 269	962	3 111	377	145	69	57	927	1 124	893	3 054
South-America	143	166	58	175	69	43	12	21	96	123	46	154
Asia	844	1 721	472	3 985	246	363	47	183	556	1 358	425	3 802
Japan	353	940	292	3 115	100	144	20	84	253	796	272	3 031
Europe	4 672	5 019	1 609	7 059	2 969	2 219	562	1 074	1 703	2 800	1 046	5 985
EEC-9	3 131	3 361	1 158	5 189	1 902	1 381	374	661	1 229	1 980	784	4 528
Belgium	218	186	86	408	112	66	23	33	106	120	63	375
Germany. FR	971	888	277	1 023	686	483	124	215	285	405	153	808
Denmark	176	260	47	331	36	14	5	5	140	246	39	326
France	354	479	204	1 131	123	77	26	41	231	402	178	1 090
Ireland	29	23	9	41	24	12	4		5	[illegible]	5	34
Italy	319	393	160	832	123	66	24	40	196	[illegible]	136	792
Netherlands	341	348	93	389	255	189	50	89	86	159	43	300
United Kingdom	731	794	294	1 034	555	454	115	[illegible]	176	340	179	903
Oceania	102	123	58	261	31	13	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

<u>Source:</u> FAO, Yearbook of Fishery Statistics, Vol. 39 und 51.

Development of Food Fish Landings in the EEC

Foreign trade in fish is considerably influenced by total landings of the national fleets. Therefore, I shortly point to the development of national landings before discussing the trade flows.

The biggest landings of fish for consumption within the EEC are still brought in by the United Kingdom although with 760 000 tonnes (t, fresh fish landed weight) the account is some 25 % less than in 1973, the year with the largest catch ever got. This decrease is expected further to continue if it were only because the distant water fleet is permanently reduced. In consequence to the almost total prohibition of the herring catch and the loss of the Icelandic fishing grounds it would have been even more distinctive if the pelagic fleet had not had the chance to switch over to mackerel-catching. But the intensified expansion of fishing efforts to the mackerel stocks has meanwhile led to an overfishing already shown up in the dwindling catches, which is all the more alarming since up to now other stocks worth fishing have not yet been found.

The production of crustaceans and molluscs in the UK has doubled since 1960 and since 1973 fluctuates between 65 000t and 80 000 t.

The French catch of fish and shellfish ranges since 1965 - except the landings of 1971 - between 750 000 t and 800 000 t (nominal weight) and contrary to most of the other EEC member countries shows a slowly increasing tendency since 1978. This is due to the broad orientation of the fishing industry and to the strong development of the yield of molluscs which to a high degree are produced in aquaculture. In France total production of mussels, oysters and other molluscs has nearly doubled during the last 15 years. On the other hand the restricting influence of quotas on the total yield of French landings has been insignificant mainly because of little importance of the herring fishery.

The landings of the Italian fishing fleet have increased since 1962. This can be attributed to the growing catch of sardines and anchovies and to higher production of molluscs whereas landings of other species stagnate on a level between 160 000 t and 170 000 t.

Landings of fish for human consumption in Denmark (almost one fifth of the total Danish catch in the average of 1978 to 1980) have reached their culmination in 1980 in spite of catch restrictions in the EEC-fishing zone in force since 1978. Herring landings again have strongly increased since 1974 and with more than 50 000 t reached again the level of 1966 to 1968. Mackerels are not very important for the Danish fishing industry, they add only 5 % to total landings, however, in the course of the time they have extended to tenfold their 1970 bulk. In 1980 growing cod and haddock landings (+33 000 t = +26 % and +6 000 t = +80 % respectively) were main causes for the large total yield.

Primary importance for the Danish processing industry and export trade have the direct landings by Swedish trawlers. Since the herring landings faded away - they decreased from 100 000 t to 13 000 t - mackerel landings took their place. Partly the direct landings of herring were replaced too by processed herring exported by a newly modernized Swedish fish processing industry.

The Danish production of molluscs has importantly grown up to 70 000 t which is the fourfold of the average of the years 1966 to 1968.

The rebuilding of the catching capacity of the Netherlands fishing fleet after intensive scrapping measures in the mid 70ies resulted in increasing landings since 1976. As a consequence of the prohibition of nearly any herring catch the Dutch herring trawlers have successfully diverted to the mackerel. But cod landings have also increased since 1976. Moreover, the catch of new species such as horse mackerel has sensationally widened within a few years (1976 to 1980) from 400 t 30 000 t.

The production of molluscs in the Netherlands has always been important, sometimes it attained 35 % of total catch but normally it shows great fluctuations around a more lower level.

In the Federal Republic of Germany the landings of fish for consumption have strongly declined since the end of the 60ies. For this there are two reasons working together. First the market share of the high sea fleet has been substantially greater than in the other EEC countries and, second the fishing grounds of the high sea trawlers were mainly in national waters of third countries which became inaccessible by the new law of the sea. Thus the extension to 200 miles and catch prohibitions have had greater influence on the German fishing fleet than on any other within the EEC. Furthermore, the production of molluscs and crustaceans is traditionally small. The herring catch decreased from 125 000 t (1968) to nearly 10 000 t (1980) and could not be compensated by mackerel catch like in the UK. The landings of other species have more than halved in the same time.

However, the early reduction of total catch which on grounds of official production statistics should already have been rather significant had in fact not reached that extent. Illegal catches of cod and other species in 1976 to 1979 are not fully known but they must have been very important (Sommer, 1981). On the other hand a reincrease of landings similar to that in the Netherlands, in France or in Denmark can not be expected because the limited catch quotas in the EEC fishing zone and unsuccessful joint ventures will make a further reduction of the high sea fishing fleet inevitable in the near future.

Within the EEC the Irish fishing industry could enjoy an unprecedented boom. Total landings have increased to fivefold since 1960. However, in 1980 an important share of the enormous catch increase has only been attained by direct sales (mackerels mainly) to third country factory ships on the high sea. The Irish fishing grounds contributing 70 % to the total catch seems to be very rich. This can be judged from the high yield in 1980 and from the planned investigations into the fleet which shall help to reach total landings of 300 000 t in 1984. Furthermore, the aquaculture production of molluscs and proper fish species is promoted systematically.

Though Belgium is allowed to catch in Icelandic waters total landings have decreased since the end of the 60ies to the lowest catch (30 000 t) in 1980 which was about 55 % of the yield in 1968. The main reasons for this development are the uncertainty about a prolongation of the catch agreement with Iceland beyond 1985 and a possible quota reduction in British waters. It should be expected that in the near future there will be no increase in landings.

For the EEC member countries in the whole there have been in 1980 as against 1970 only small changes in landings of fish for consumption (without crustaceans and molluscs). Total catch amounted to somewhat below 3 million t (nominal weight) at the beginning of the decade and to somewhat above 3 million t at the end of the decade (table 2).

Table 2: Landings of Fish for Consumption

EEC-9

1 000 tonnes nominal weight 1)

Fish Species	1970	1980
Herring	465	135
Mackerels	300	755
Other Fish species	2 315	2 055
Crustaceans and Molluscs	415	610

1) Partly estimated.

Source: National fishery statistics.

More exact informations cannot be given because of unharmonized weight datas in the statistical material of the individual countries and because of missing catch data as a consequence of illegal catch.

But there are great differences regarding the structure of total landings. Herring catch has sharply decreased to less than one third and landings of other pelagic species (mackerel mainly) have more than doubled. Within the catch of groundfish species which is in 1980 nearly on the same level as in 1970 "new fish species" have attained greater importance.

The production of crustaceans and molluscs has increased from 1970 to 1980 by 50 %.

The main reasons for the explained development of fish and shellfish landings in the EEC countries are

- good success in cultivation of molluscs
- overfishing of some groundfish and herring stocks
- stock growing of other species to a fishable extent and
- the prohibition for the British and German distant water fleet to catch in rich fishing grounds within the 200 seamile zone of third countries.

International Trade

Besides the primary effect of the new general catch conditions resulting in a tendency of shrinking national landings and - consequently - in considerable structural changes in the market supply of the EEC countries there are secondary effects influencing foreign trade resulting in growing imports and changing commodity and country structures.

Another important factor for the international trade of the EEC is the beginning and tightening of the common market order for fish in 1971 and 1977 respectively, in particular the regulations concerning a common customs-frontier and free trade among the member countries. If the intra EEC-trade had not been important the years before, the common market made a strong incentive for diverting traditional trade flows.

A third factor to be mentioned at this place because of its importance as an import stimulating factor is the consumer preference and growing effective demand for some high-value quality products.

Moreover, there is a lot of various factors influencing international trade with fish products, which, however, have effects only in a few markets and are discussed later.

The effects of these factors - the general increase of imports as a consequence of the new ocean regime, the EEC-market regulation, the consumer demand, etc. - have been analysed by a rather extensive study on international fish trade based upon statistical data from 1970 through 1980 and simultaneously 11 commodity groups and the most important countries (Sommer, 1982).

The international trade of the EEC in fishery commodities (its structure is shown in figures 1 and 2 for three years 1970, 1975 and 1980) was - during the 70ies - subject to five major changes:

1) Conspicuous increase of total imports with all commodity groups except herring.

2) Increasing total exports of all commodity groups excluding herring and salted and dried fish.

3) Absolute trade expansion between EEC member countries except for herring.

4) Decreasing intra-trade shares concerning total imports of most commodity groups.

5) Increasing intra-trade shares concerning total exports of the EEC countries.

The relative highest growth in total trade is shown by the pelagic species (mackerel, sprat, pilchard and anchovy without herring). While the export has increased to the seventeenfold the import has quadrupled its value. An increasing part of the imports, however, was supplied by member countries. This is a consequence of both, the catch development and the rising demand in the domestic market of some member countries using these species as substitute for herring in the processing industry.

The sharply rising exports of the EEC are based too on demand expansion of third countries. Eastern Europe countries have been bought mackerel mainly as lower priced substitute because their fleets are not allowed to catch as much fish as they want in third country waters and large quantities (horse mackerel and mackerel) were exported to some African countries unable to buy higher priced fish.

The international trade with groundfish suffered many structural changes and was subject to various factors mutually superimposing each other. So they are not easily to isolate, particularly when they caused countercurrent effects.

The increase of imports of whole fish and fish fillet from third countries can be traced back to the changed catch conditions and to the expansion of the processing industry in countries owning rich fishing grounds. The higher imports are the result of both, the unability of national fleets to meet domestic demand and the unwillingness of domestic consumers to accept the "new fish species" as substitute for cod, redfish, saithe etc. Growth of imports have been accompanied by a substitution of whole fish by fish fillet. This was due to the tendency of many countries economically

Figure 1: Imports of Fish and Fish Products, EEC - 9, 1970, 1975 and 1980

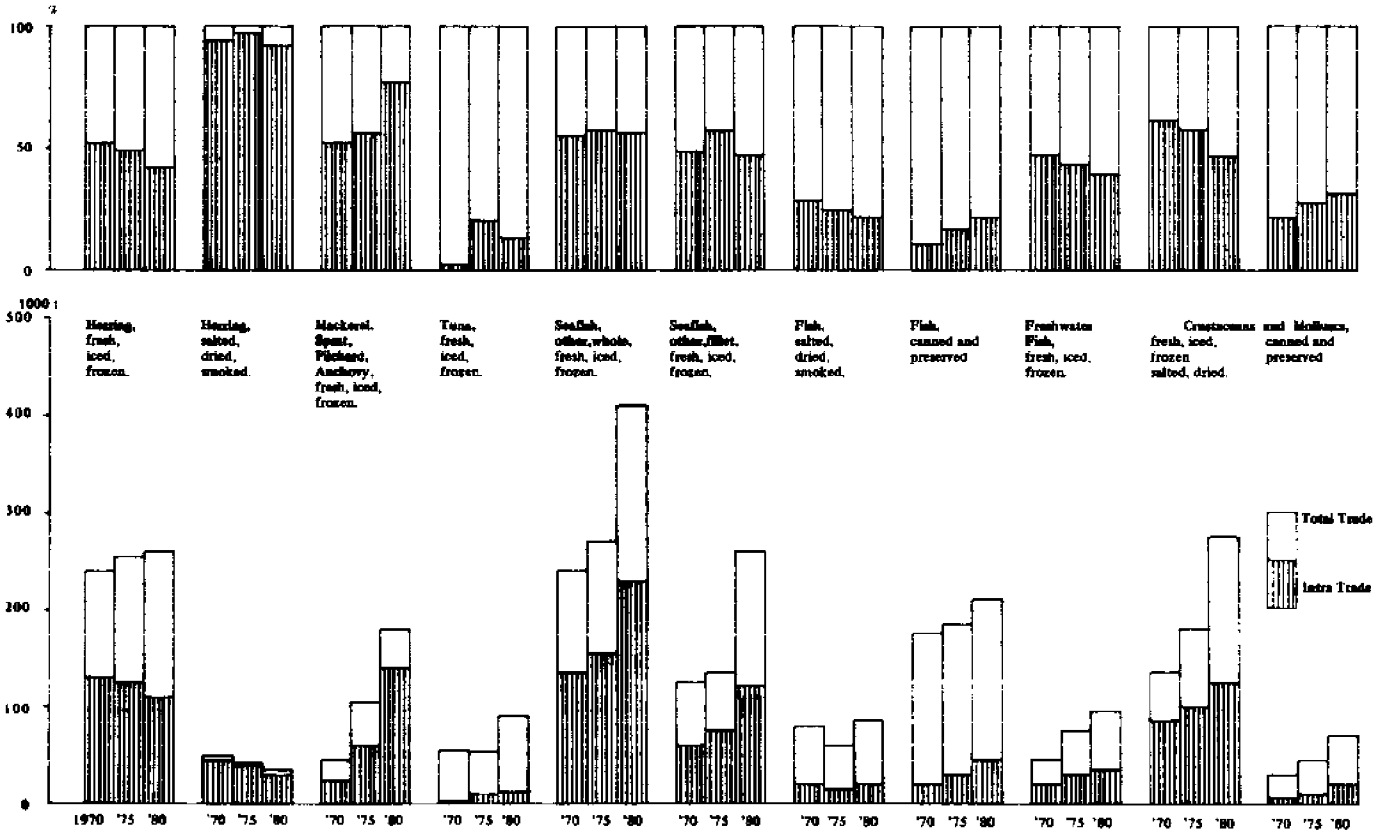
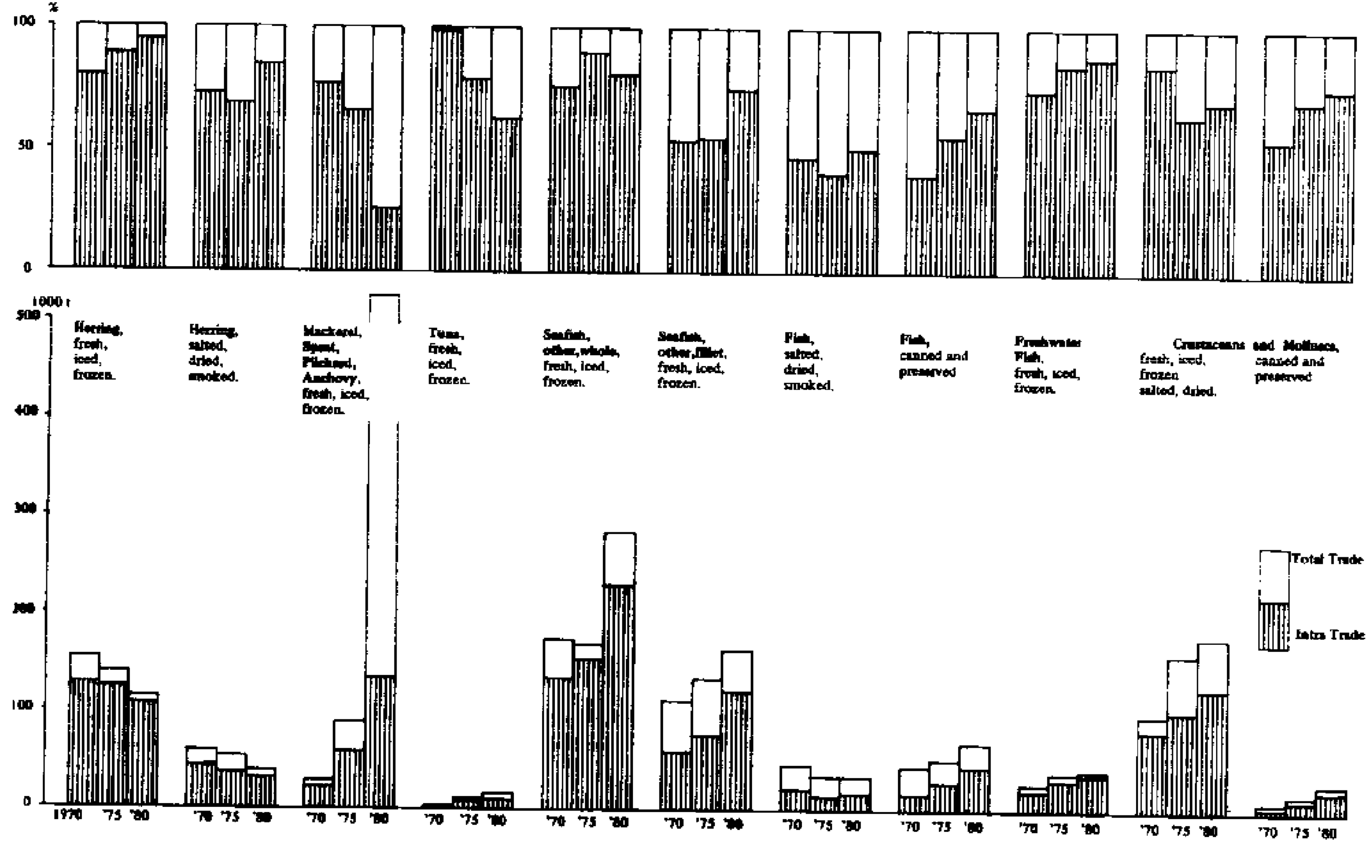


Figure 2: Exports of Fish and Fish Products, EEC - 9, 1970, 1975 and 1980



more or less dependent on prospering fishery sectors to maximize the yield of their fisheries. Thus more and more countries tried to retain the excess value added of fish filleting for their own industry.

The effects of the EEC-market regulation, especially of the common customs-frontier and of the free trade among the member countries produced a nearly constant share of intra-trade in total imports of groundfish (figure 1) in spite of the strongly (75 % since 1970) increased total groundfish import. These market order effects were forced by some changes in the US market. For a long time the US market for groundfish has been supplied by Denmark. The combination of the decline of the US dollar and of higher catches by the US and Canadian fleets - Canada is the most important trade partner of the US - worsened the market conditions for Danish exporters so that they diverted their export efforts to the European markets.

Further deteriorating catch conditions and therewith further declining EEC catches of main food fishes will limit, however, the growth rates in intra-trade with these species. In 1980 there has been only a small quantity of groundfish that could be diverted to the EEC-markets. The lower intra-trade share in total exports of whole groundfish (figure 2) must not mislead to the conclusion that EEC extra exports could be raised much beyond present levels. The reason is that higher exports are often due to "new fish species" not salable in the common market. This has no impact on the fillet market since up to now in the EEC countries fillet is made almost exclusively from main food fishes like cod, saithe, redfish etc."New fish species" are considered to have too small fillet share. The same causes influencing the commodity structure can be recognized also by regarding the receiving countries. While fillet is exported to developed countries like Sweden, Switzerland and Austria increasing quantities of whole fish are exported to Nigeria, Ivory Coast and also to Spain.

The effects of extended jurisdiction and deteriorated catch conditions in still open waters on international trade are clearly to be seen in the herring trade. While total imports of herring are still increasing there is a continous reduction in the intra-EEC-trade both by absolute figures and by relative shares. In 1980 nearly the total landings of herring caught by EEC trawlers have remained in the EEC market. Thus one is led to conclude that if the stocks in the EEC-fishing zone will not grow to an exploitable size future growth of demand can be met only by imports from third countries (USA and Canada mainly).

The increase in trade with preserved and canned fish, freshwater fish, crustaceans, and molluscs has been influenced on a small scale only by the changes in catch conditions and extended national fishery zones. These external factors had effects only on changes in the country structure for imports of canned mackerel and salmon and limited in time on higher imports of canned herring.

In the market for canned mackerel Denmark has improved her position competing with Japan. Economics of scale through higher production and advantages of closer market vicinity may have been the main reasons. On the other hand there were difficulties of delivery which caused Japan to lose the EEC-market for canned salmon. Since Japan was not allowed to fish the same quantity of salmon in the 200 sm zone of the USSR as in previous years supplies ran short of traditional export requirements. The gap was filled by the USA and Canada who were able quickly to expand their salmon catches.

The temporary higher EEC-imports of canned herring from Canada and Iceland were immediately stopped when the EEC disposed of enough raw fish again though from imports.

The intra-trade with canned products and preserved fish, crustaceans and molluscs is not very important relative to total imports, however, during the last 10 years it has increased stronger than total imports (fish products +160 %, crustacean and mollusc products +250 %) resulting in a general growth of intra-trade shares ranging for fish from 10 % to 21 % and for crustaceans and molluscs from 22 % to 30 %. In the same time total EEC-exports have increased with both commodity groups selling at rising shares in EEC countries.

There is of cause quite a lot of factors to be found behind these relations but the following three may have been the most important:

1. The high shares of imports from third countries can be traced back to the efforts of many countries to earn as much foreign currency from fish exports as possible. This tendency has already been noticed in the context of fillet trade developments. With regard to the production of canned food this interpretation applies to the processing of pilchards in Portugal and Morocco, the processing of salmon in the USA and tuna in Ivory-Coast and Senegal even if the tuna has been directly landed by French trawlers.

2. The relatively small intra-trade is among other things a consequence of the tinning industry which seems to be oriented mainly to meet the domestic demand rather than towards exporting. Examples like the tuna processing in Italy and the use of herring in Germany seem to give evidence.

3. The increase in the intra-trade is mainly due to the growing production of canned herring and mackerel in Denmark which is mostly sold within the EEC-market.

Freshwater fish species which can be under the favourable conditions set by intensive cultivation and technical supervision produced independently from international maritime law will gain greater importance in the future.

Since the first research activities proved aquaculture to be efficient some EEC countries (Denmark, Italy and France) have invested into systematic trout production. This growing branch has already led to an expanding intra-trade especially with regard to an increasing import demand of Belgium and the Federal Republic of Germany. In 1980 almost 60 % (13 000 t) of the intra-traded trouts fell to Germany. Roughly the total expansion of Danish trout exports since 1962 was absorbed by the Federal Republic of Germany which in 1980 took nearly 80 % of Danish exports. Belgium having doubled the import since 1970 has mainly been supplied by France.

Besides trouts there are only eels being traded at larger quantities within the EEC. The main exporting countries are Denmark, France and the UK selling their products to Germany and the Netherlands.

Third countries are mainly exporting salmon, eel and carp to EEC countries. While the imports of carp and eel have only increased from 1974 to 1980 by 10 % (to 5 600 t and 17 000 t respectively) the salmon import has grown by 70 % to 35 000 t. The extremely growing salmon imports having gone to France, the main market for carp is Germany, which received 80 % of total EEC-imports from East-European countries (Hungary, Czechoslovakia and Yugoslavia). The limited expansion of carp imports is a consequence of the peculiarities of the EEC carp market which essentially is restricted to the seasonal German demand.

The most important factor for the trade expansion in the above mentioned markets of high quality products (freshwater species, crustaceans, molluscs, and canned products), however, has been growing demand for such high priced commodities. This can be seen very clearly in the trade in freshwater fish and fresh and frozen crustaceans and molluscs. In spite of very strong expansion of the EEC-production and increased intra-trade values there was an even greater upswing in total imports leading to lower intra-trade shares. (The large exports of fresh and frozen crustaceans and molluscs to third countries result from traditional high trade relations between Italy and Spain.)

Summary

The main findings of the analysis are, that EEC-demand for fish and fish products from third countries has clearly increased since 1970 especially as a consequence of stagnating and structural changed landings of the national fleets (influenced by the new ocean regime) and growing demand.

As in the nearest future there will be no fundamental changes in catch conditions it may reasonably be expected, that extra-imports will further increase. This is almost absolutely clear in the markets for tuna, salmon, herring, molluscs and crustaceans because the stocks of these spe-

cies are too small in the regions the EEC-fleets are allowed to fish. In the groundfish market demand has been satisfied until now by trade diversion (smaller exports of EEC member countries into third countries in favour of the intra-trade). But deteriorating catch conditions with these species too will tend to higher imports of groundfish from countries disposing of ample fish supplies because the export capacity of the EEC is still very small. Only the supply of mackerel and some other pelagic species out of EEC waters will be sufficient to satisfy demand at higher degrees. However, this will be true only if measures will be taken in time to prevent overfishing for these species too.

References

Sommer, U.: Analyse des Sofortmaßnahmeprogramms zur Kapazitätsanpassung in der Seefischerei. Landbauforschung Völkenrode 31 (1981), H. 2, S. 93-100.

Sommer, U.: Der Außenhandel der Europäischen Gemeinschaft mit Fischen und Fischerzeugnissen von 1970 bis 1980. IflM-Arbeitsbericht 82/2. Braunschweig, Mai 1982.

Abstract

The EEC is the world most important market for seafood. EEC imports have been increased by 60 % in volume and to the sixfold in value since 1970. In 1980 almost 45 % of total world imports of food fish commodities have been bought by member countries. To find out the reasons for this development the international trade of the EEC in seafood has been divided for each year into 11 nearly homogeneous commodity group trade flows between the 9 member countries and the most important third countries. Doing this division we are able to see five market tendencies of the EEC trade from 1970 to 1980:

1) Conspicuous increase of total imports with all commodity groups except herring.

2) Increasing total exports of all commodity groups excluding herring and salted and dried fish.

3) Absolute trade expansion between EEC member countries except for herring.

4) Decreasing intra-trade shares concerning total imports of most commodity groups.

5) Increasing intra-trade shares concerning total exports of the EEC countries.

This development has been influenced by several biological, political and economical factors being at work during the whole time or for a shorter period. The main effects resulted from the new ocean regime, from the establishment of the common market order for fish and from variations in consumer demand.

Assuming that there will be no basic changes regarding consumption and catch conditions it has to be expected that imports from third countries into the EEC member countries will further increase.

The EEC Common Fisheries Policy: An Irish Perspective

R. O'Connor
Economic and Social Research Institute
Dublin, Ireland

Abstract

When Ireland, along with the UK and Denmark, joined the EEC in January 1973, a common fisheries policy was already in existence. This policy laid down common rules for fishing in the maritime waters of the member states and common rules for trading and competition covering all fish and fish products. The main, and most controversial feature of the common fishing rules was "equal conditions of access by member states to all other members' fishing grounds".

The policy was not acceptable to the three applicant states and, in the event, certain temporary derogations were negotiated and written into the treaty of accession. These applied to all states. In Ireland's case they provided for a restriction of fishing within designated areas extending from six to 12 miles from Irish baselines to home-based vessels and to vessels of other member states enjoying traditional rights to these areas. This concession was granted for a ten-year period to 31 December 1982. The situation was to be examined before that date and new rules introduced. Agreement has, however, not yet been reached on these rules, even though the Commission recommended in March 1981 the extension of the derogations to December 1992.

Ireland's fishing industry has expanded considerably under the CPF and landings have risen from 75,000 tonnes to 1975 to 188,000 tonnes in 1981. Continued expansion will, however, depend on the "Free Access" derogation being continued and on positive steps being taken by the EEC to stimulate fish consumption within the Community by means of market promotion programmes. Also fishing activities throughout the Community continue to be largely uncontrolled and unless something is done in this regard some stocks are in grave danger of being fished almost to extinction.

Introduction

The sea fishing industry in Ireland is of greater significance to the national economy than is the case in most of the EEC Member States. Although small in absolute terms, and relatively underdeveloped, its percentage contribution to the Gross Domestic Product is greater than that of any of the other Member States with the exception of Denmark. Value of fish exports as a percentage of total exports is also second only to Denmark, and the percentage of the total male labour force employed in sea fishing stands highest in the Community. The industry is of special importance socially and economically in the less industrially developed and agriculturally disadvantaged parts of the country.

Since the wellbeing of the industry depends to a considerable extent on the EEC Common Fisheries Policy (CFP), it may be opportune to trace the main developments in that policy affecting Ireland and to consider what changes may be needed in order to secure the further expansion of the industry.

Development of CFP

When in 1973, Ireland, together with Denmark and the United Kingdom, joined the EEC, a Common Fisheries Policy (CFP) was already in existence based on the needs of the original six (mainland European) Member States, Belgium, France, Italy, Luxembourg, The Netherlands and West Germany. The main elements of that policy are to be found in two Community Regulations 2141/70 on the establishment of a common structural policy for the fishing industry and 2142/70 on the common organisation of the market in fishery products.

Regulations 2141/70 (re-enacted as 101/76 of 19 January, 1976) provides inter alia, for the laying down of common rules for fishing in the maritime waters of the Member States which would ensure, in particular, (a) equal conditions of access to and use of the fishing grounds in those waters, (b) bring about the co-ordination of the Member States' structural policies, and permit the adoption by the Council of the EEC of any necessary conservation measures to prevent over-fishing, (c) secure the rational development of the fishing industry within the framework of economic growth and social progress and (d) ensure an equitable standard of living for the population which depends on fishing for its livelihood. In the case of equal access a five-year derogation from this principle was permitted in a three mile zone off coasts where the local fishermen were heavily dependent on fishing for a livelihood. Also in cases where equal access led to over-fishing the Council of Ministers was empowered to adopt the necessary conservation measures.

Regulation 2142/70 (replaced by 3796/81 of 29 December, 1981) comprised a common price and trading system and common rules of competition covering all fish and fish products and provided for the establishment of marketing standards and pricing arrangements aimed at achieving market stability and at giving a fair return to producers. (Regulation 3796/81 came into force on 1 June, 1982). This regulation includes the withdrawal system whereby fish are withdrawn from the market if prices drop below a certain specified level. Fishermen are recompensed for these withdrawals out of Community and national funds.

The two basic Regulations had been accepted by the six original Member States after discussions extending over a period of years, on the very day, 30 June 1970, on which negotiations for the accession of Ireland, Denmark and the United Kingdom to the Community began. The CFP was thus presented in the fishery negotiations as a "fait accompli". This, together with the pressures of accession negotiations in other areas, made it difficult for the applicant States to bring about changes in the regulations in keeping with their own interests. However, certain temporary derogations from the principle of free access were negotiated and written into the Treaty of Accession. These provided for a restriction of fishing within designated areas extending to six and 12 miles from national baselines to home-based vessels and to the vessels of other Member States enjoying traditional fishing rights in these areas. This concession was granted for a 10-year period to all member states, the Accession Treaty (Article 103) stipulating that before 31 December, 1982, the Commission should present a report to the Council on the economic and social development of the coastal areas of the Member States and the state of stocks. On the basis of that report and of the objectives of the CFP, the Council, acting on a proposal from the Commission, should examine the provisions which could follow the derogations in force until 31 December, 1982. In March 1981, the Commission did in fact present to the Council a proposal for measures for the conservation and management of fishing resources which would constitute the arrangements to succeed those in force up to 31 December 1982; it provided, inter alia for the extension of the derogation regime, with slight modifications, to 31 December 1992, the introduction of a licensing system for fishing vessels and the institution of an effective system of supervision of activities in the fishing grounds and on landing. This proposal has not yet been adopted and has met with stiff opposition from some Member States who appear to prefer a "free access" situation after 1982. However agreement must be reached one way or another before the end of this year.

It should be noted that the CFP adopted in 1970 did not provide for Community management of fish stocks; this function was left to the North East Atlantic Fisheries Commission (NEAFC) whose membership comprised East European as well as EEC and other West European countries and whose powers of enforcement of conservation and management measures were limited. As a result there was heavy over-fishing of certain species and stocks in some areas became seriously depleted. Although calls for changes in the CFP had come from the three new Member States as far back as 1973, it was not until 1976, following the declaration of 200-mile fishery limits by a number of countries in the North Atlantic, that a major review of the CFP became possible. Meanwhile, Ireland's sea fishing industry continued to expand, under the protective umbrella (initially effective enough) of the derogations from "free access" negotiated in the Treaty of Accession, and on the basis of a Development Programme introduced by the Irish Government in 1973. This programme envisaged a substantial increase in the number and size of vessels as a result of grant aid, both from the Community and from home funds, harbour improvements and improved training courses. However, the protection afforded by the access derogations were not entirely adequate and as a result of continued heavy over-fishing within and outside the 'protected' zones by foreign vessels, which the NEAFC found itself unable to cope with, some stocks of special importance to the industry in Ireland (herrings) became depleted, posing a serious threat to further profitable expansion of the industry.

In October, 1976, the EEC Member States decided to extend their fishing limits to 200 miles from 1 January 1977 and at the same time the Commission put forward proposals for a revised fishery regime. This, inter alia, led to the Commission assuming overall responsibility for the conservation and management of fish stocks within the 200-mile zones of the Member States, the phasing out of fishing within these zones by a number of, mainly East European, countries, and the conclusion of fishery agreements on a reciprocal basis with others.

Recent Developments

In the course of discussion of the Commission's new proposals Ireland sought to re-negotiate the derogation provisions of the Treaty of Accession, arguing that because of the decline of stocks, the provision of a reserved coastal belt for Irish fishermen, varying in extent from 12 to 50 miles from baselines had become necessary for conservation purposes and for the development of the Irish fishery industry. This view was not accepted by a majority of the Member States or by the Commission. However, at their meeting at the Hague on 30 October 1976, the Council of Ministers did accept that the development of the Irish fishing industry was a special case and that the CFP should be so operated as to secure the continued and progressive development of the industry on the basis of the Irish Government's programme which aimed at a doubling of the 1975 fish landings of 75,000 tonnes by 1979 and further increased landings subsequently leading to a total of 300,000 tonnes by 1985.

The Commission subsequently adopted the position that the Hague commitment could be fulfilled by giving Ireland increased quotas. Ireland continued to maintain that the quotas proposed could not be reached unless complemented by conservation measures aimed at reducing the fishing effort by non-Irish boats operating in Irish waters. In the event, Ireland's total landings in 1979 amounted to only 90,000 tonnes as against the target of 150,000 tonnes.

While the 1979 landings figure was disappointing, a strong recovery took place in 1980 with landings totalling 140,000 tonnes and in 1981 when landings reached a total of 188,000 tonnes. This was seen as the result of the improvement in stocks (particularly, pelagic) following the discontinuance of fishing by East European fleets in Community waters and the sharp rise in the demand for mackerel on world markets. Irish mackerel landings increased from 24,000 tonnes in 1979 to an estimated 100,000 tonnes in 1981; landings of demersal varieties, used mainly for processing, increased over the same period from 21,000 to 38,000 tonnes, while exports rose from 55,000 to 149,000 tonnes.

Current scientific advice on stocks generally allied to a weakening demand for mackerel in some important markets, e.g., Nigeria, would indicate that without special help the attainment of Ireland's landings target of about 300,000 tonnes by 1985 will be far from easy. The depletion of fish stocks in Irish waters because of overfishing by non-Irish fleets may have abated but the shortcomings of the present Community conservation and management programme - based on quotas which some Member States regard as inadequate and which in any case are not adequately monitored - is not encouraging as to future fish supplies. This tends to inhibit financial backing for new fish enterprises. Pending the evolution, therefore, of a more tightly aministered quota system, preferably involving the licensing of boats and catch monitoring on a Community basis, I consider that it will be necessary for Irish fishermen to have a reserved fishing zone around the Irish coast to enable them to take the fish quotas needed to maintain the expansion of the industry. This expansion, together with regularity of supplies, is absolutely essential if a good fish processing industry is to develop in the country. In 1980 over 75 per cent of the catch was marketed as whole unfilleted fish, while a further 8 per cent was reduced to fishmeal, less than one per cent being marketed in a prepared/preserved form. With almost 80 per cent of our fish exported, this lack of processing is a recipe for disaster since exports of raw materials for a food industry are most vulnerable to price fluctuations. The aim, therefore, must be to develop a processing industry probably through multinational corporations or through joint ventures with such groups.

At this point, I would like to refer to a statement made by the late Finn Gundelach, Vice-President of the EEC Commission in the course of an address given by him at a seminar on the future of the Irish Fishing Industry in Ireland in February 1978. Having enumerated the many benefits secured by Ireland from the Common Fisheries Policy up to that time, Commissioner Gundelach went on to say that the prospects for the future were even more attractive and that given strict conservation and control measures, given the preference in favour of Irish coastal fishermen under the quotas and given fishing plans which were intended to be an additional means of ensuring that Irish coastal fishermen would be able to make the catches allocated to them, there was every reason to believe that the Irish catch would increase considerably - well beyond anything experienced in the past. Unfortunately the scenario described by the Commissioner has not materialised although admittedly Irish landings have increased. Effective conservation and control measures are not in operation, the basis of distributing Total Allowable Catches, i.e., quotas, has not been agreed, and a regime of fishing plans on which the Commission set such store, has not even got off the ground. Thus, fishing activities throughout the Community continue to be largely uncontrolled. This, as I have indicated, has given rise to doubts about future fish stocks some of which have become dangerously over-exploited.

In the prevailing circumstances I am convinced that an exclusive fishing zone arrangement is the only sound basis for the furthur speedy and progressive development of Ireland's fishing industry. Indeed it is my opinion that most countries in the EEC would wish to have exclusive zones round their coasts but for various reasons it is proving exceedingly difficult to get agreement on them. I think it would be fair to say, however, that in the long run an open access regime cannot work. Coastal fishermen will object to outsiders fishing in their (the coastal fishermen's) traditional grounds. There will be strife and damage to boats and nets and eventually the members will have to concede coastal bands.

On the marketing side, the recent revision and updating of the basic Regulation 2142/70 should go some way towards achieving market stability and giving a fair return to producers. Much will, however, depend on how effectively the provisions for controlling cheap imports into the EEC are applied. These imports have contributed seriously to the disruption of the Community market for fishery products, and prices for many of the common species are now at a very low level. Both herring and whiting have had to be withdrawn from the Irish market in the last year.

A more serious defect in the revised marketing policy is the absence of special provisions for stimulating demand for fish products within the Community by means of market promotion and development programmes. Rationalisation of marketing through the measures proposed in the recent Regulation cannot be fully effective unless accompanied by comprehensive market promotion and development activities throughout the Community under specially tailored national programmes co-ordinated at Community level. The need for a promotional campaign on these lines was recognised by the Commission as far back as 1977 when putting forward proposals for structural changes in the fishing industry. These proposals envisaged that Member States carrying out consumer education and fish promotion campaigns would be eligible to receive financial aid from Community funds matching their own expenditure. The reactivation of this approach is overdue and is of particular importance to Ireland in view of the projected increase in fish landings over the next 3/4 years which will necessitate the creation of considerable additional market opportunities.

To sum up, there is a special EEC commitment, set out in the Hague Resolution of 1976, to assist the development of Ireland's sea fishing industry. The discharge of this commitment requires that more catching and marketing opportunities be made available to those engaged in the industry. Given the present state of fish stocks in Irish waters only an exclusive coastal band will provide Irish fishermen with the fishing opportunities they need. Such an arrangement could be temporary, and reviewable when Commission-administered stock conservation and management measures are made effective, which is unlikely. The availability of additional marketing opportunities for Irish processors and exporters can come about through the adaptation in Ireland's favour of some of the provisions of the revised basic marketing regulation 3796/81 of 29 December 1981, but this should be complemented by a Community-wide campaign of consumer education and fish promotion.

Given adequate conservation and management of stocks, growth potential in the Irish sea fishing industry is considerable and I have little doubt that with EEC help in the areas indicated, the targets set for landings during the next 3-4 years will be reached. At that stage the real problem will be to market these landings profitably.

Trade Possibilities for New Fish Products

Paul Adam
Organization for Economic
Co-Operation and Development
Paris, France

Since the development of frozen fish products between 20 and 30 years ago no new products of widespread appeal have appeared on the international seafood market. At the time innovations in the production of frozen fish resulted in a significant increase in consumption, which had a noticeable effect on catches; in remote areas, new outlets for the local catches were made possible, and countries not adjacent to the resource could more intensively exploit their distant water fisheries. This rather dramatic increase in production/consumption certainly contributed towards the extension of overfishing. Overfishing in turn was the main reason for the adoption of the new regime for fisheries. But the chain of consequences seems here to have reached an impasse. Now some 5/6 years after its worldwide acceptance, this new regime has only brought a solution to part of the problems with which fisheries are confronted.

If the new jurisdiction rights of the coastal states have contributed to a more efficient management of the fish resources, the market situation remains a source of difficulty and the conditions for the international seafood trade seem to have worsened rather than improved.

It is in that context that the problem of a new approach to fish marketing will be considered.

*
* *

After examining the reason why new products have not been developed, some of the difficulties involved will be reviewed. As the outlook will be of a general fishery economics nature, no proposal leading to precise solutions will be offered. It will nevertheless be stressed that the question of product development cannot be left exclusively to business enterprise but should at the same time be considered by economists and others in the national administrations.

*
* *

The stagnating situation of the international market for frozen fish is a matter of general concern because this market, which deals with preserved products has a stabilising effect on other fish markets: in the case when fresh products for which there is a buoyant demand are in rather short supply the substitution of frozen products (same species) can have a normalising effect on the market; and in case of surpluses of fresh supplies, freezing can be an effective way of providing continuity of supply. The situation of the frozen fish market is therefore of a paramount importance for a much wider range of fish products.

It seems that, since a few years, this market has not been able to pay for the costs of production, at least in a number of areas where bulk catches have to be exported to far distant markets. There are several explanations:

- The markets for fish products have always been multiple i.e. there are many and diverse distribution channels and outlets. They range from the luxury items to the low price products, which are among the lowest of the animal protein food products. But an important change has taken place in the last 20 to 30 years; the relative prices for preserved fish have increased, so much so that frozen fish prices, and salted fish prices (as salting is still an alternative processing for wet fish demersal landings), cannot be subject to further increments if the prices for other staple food products such as chicken, or pork, do not increase beyond their current level. As a consequence, fish markets are no longer isolated as they were in the past; they compete more directly with other food products. Whereas this has led to an expanded distribution it has also made fish products more sensitive to the price movements of other food which are normally domestically produced and for which product costs can be forecasted if not strictly controlled.

- The new regime for fisheries in emphasising the rights for the coastal state to exploit the resources in its economic zone has in fact side tracked the key economic issue. When the concept of maximum sustainable yield is replaced by that of optimum yield, the profitability is not the only issue at stake: social, political and environmental constraints are considered as being as equally important as economic viability. This cannot be practically achieved without costs and it may well be that the new regime, albeit reducing the operational costs of fishing when compared to common property access, will have to bear substantial costs due to the fact that fisheries are an emotionally and politically sensitive sector of many national economies.

- The implementation of coastal state jurisdiction has resulted in a significant reduction in the activity of many distant water fleets. The redistribution of the world catch has therefore been significantly altered and it is not always the case that the "looser" countries (the countries excluded from their traditional fishing grounds) replace their deficit in supplies by corresponding imports from the "winner" countries, which have replaced their foreign competitors and might also have benefited from increased catches due to stock rehabilitation. An obvious and important example is given by the USSR and other Eastern European countries which have not increased their imports of fish in spite of significant cuts in their catches of demersal fish. [Meanwhile these command economies have directed to human consumption many pelagics previously utilised for non-food purposes].

- The increased quantities of fishery products available for external trade, the relatively high costs for production and stagnating markets lead to the necessity of upgrading the products to be sold or, at least, to increasing the revenue of the fishermen, i.e. their actual share in the total price paid by the consumers. This may be contradictory to the numerous claims that the surplus catch can be best utilised by increasing the supplies of animal protein, and as a means of alleviating against hunger and malnutrition in developing countries. However, the reality of the situation is that diversions to down-market utilisations can only further accentuate existing problems. Modifications in fisheries production and marketing are usually made by quality improvements. This is quite logical when it is thought that marketing of food products should have some link with gastronomy. This is especially true for fish, which deteriorates quicker than red meats.

I am, for example, personally inclined to explain the poor success of fish protein concentrates (F.P.C.) made out of fish meal by the difficulty of promoting a food additive, as useful as it can be, when there is no gustative incentive towards its consumption. Furthermore it should be made quite clear that the gastronomic quality of a food product is not necessarily a function of the price at which it is sold: know how and good handling can significantly improve the quality of seafood products without automatically increasing their costs.

In any case the necessity for upgrading the reputation of frozen fish is obvious. If these products are known as perfectly wholesome and have an extensive market it is a market which is based on "fast food", commonly considered as alien to real gastronomic qualities. It is a fact that high quality restaurants or gastronomic journals, as a general rule, exclude frozen materials. Furthermore, as already mentionned, the market does not seem capable of further expansion which might be that it lacks the diversity and quality incentives which would be necessary for attracting additional consumers.

*
* *

In this short presentation precise proposals cannot be put forward regarding new fish products. And, in any case, an economist is not supposed to have the practical down to earth qualities of the successful businessmen. Some direction, at least to start with, can nevertheless be indicated before stressing some of the difficulties to be encountered.

I remember an old advertisement boasting frozen fish as fresher than fresh!... It has long disappeared but after such excessive statements, many consumers remain convinced that frozen fish was a substitute to fresh fish. The marketing policy for frozen fish does not seem to be able or does not try to counteract such a prejudice and it will never succeed in doing so as long as a good quality freezing process and an efficient cold chain are put forth as a sufficient solution to all preservation problems. Because it is false.

One does not need to be an expert cook or a specialist in freezing technology to know that some fish or crustaceans keep very well in cold storage; others don't; the texture of the meat may be somewhat modified by defrosting; fatty fish do not keep all their qualities and for some species there is a drying up effect which may be detrimental from the quality standpoint. Huge differences in costs and in quality might also occur when the temperature is pushed down further than 0° Fahrenheit (in specific cases, freezing is now maintained at around -60° Celsius which corresponds to around -60° Fahrenheit). Finally the apparent absence of any change should not be taken as a final rule: a defrosted cod fillet should not be cooked as a fresh one; if freezing has not altered the flesh texture, it has somewhat transformed it as if it had already been slightly cooked; the time in the court-bouillon will have to be shorter, etc... Many other remarks could be made by the specialists. This kind of information would not add anything to the well accepted mass produced fish sticks and portions, but the preparation and presentation of many other frozen fish products are so poorly documented than their marketing is in fact impossible.

Two main obstacles have certainly played a role in preventing the fishing industry from taking steps in the above-mentionned direction:

- When the raw material which is landed by the fishing boats has to be processed it is as if the individual species are loosing their individuality. Cut, minced, battered, half cooked, the product sold to the consumer may be labelled cod or haddock or hake; it is rarely known whether it is Pacific or Atlantic fish; it is often impossible for the average consumer and difficult for a specialist to taste what kind of "white fish" has been utilised. Fish processing is almost synonymous with mass produced standardised products which can only be utilised in the manner for which they have been prepared. It should be stressed that standardisation is not necessarily such a limiting factor for the user. Tomato, vegetables, meat, etc., can be presented in standardised qualities and sizes but numerous presentations are known to the average consumer. If it was concluded that the consumption of frozen fish could only be significantly expanded by the introduction of more variety giving more choice and initiative to the consumers, it is obvious that it means a rather drastic change in both marketing practices and consumer habits. The tourist going to the seaside invariably eats seafood but when he/she returns home fish looses its appeal; and only the more mundane products are consumed on a regular basis. The potential market for more diversified frozen presentations may be important; the work to create it would certainly not be an easy one.

- The above-mentionned obstacle is in fact made more difficult by a peculiarity which was mentionned at the start of this paper. The fish which is frozen comes from relatively remote areas which must export their production. The relationship between the fish and the product offered to the consumer has been made much looser... which, in fact, is not good advertising. The picture of a fishing boat at sea, of a harbour..., or in a more general manner the existence of a fishing fleet supplying a domestic market, are the best possible assets for promoting the sale of high value fish. When the fish is imported in standardised blocks and processed into standardised portions, it is as if the link with the sea, the best and easiest promotional image for fish, is lost. There seems to be a big gap between on one side the sophisticated preparations that are offered by the "chef" in a good fresh fish restaurant or that are served at home for welcoming friends and on the other side the ready-made fish, fully standardised which is given in snacks, canteens and other fast food outlets. It may be difficult to ask importers to base the promotion of their sales on the peculiarities of their different supplies; it would make their job more difficult and it is in contradiction with the advantage they could derive from choosing between competing standardised supplies coming from different places.

However, the change from the open access regime to one of national fishing zones was a very important one and if the production pattern is, and has already been drastically revised, how would it be possible to maintain old marketing patterns. The value of the fish at the landing stage is rarely more than 1/3 of the price paid by the consumer; with freezing and international trade, the ratio can easily come to 1/6th; 1/10th is not abnormal.

*
* *

One doesn't have to be a gourmet in order to advocate the introduction of some gastronomical divergence into the frozen fish markets. In fact it is an obvious conclusion arrived at after simple economic reasoning. For years and years fishery economists have built up models for demonstrating the necessity of adapting fish production to the reproduction capacity of the fish stocks. Everybody is now convinced, not only of the usefulness, but of the necessity of such studies. But political and social constraints can result in management compromises which do not take into account the research of a bio-economic optimum utilisation of the resources. In such cases, the bio-economic work continues for the benefit and progress of mathematics and econometrics, which might be useful when the political will become sufficient to pursue more systematic management policies.

The achievement of fishery economies should not disguise the fact that in the new regime of the sea the main economic difficulties of fisheries are now located ashore and that the fishery economist cannot remain practically useful if he does not become market-orientated. The question being put is a difficult one. The landed raw material, very perishable indeed, has to be transformed into a standardised well-preserved product for storage and shipment. And this product should allow at the consumer end, either ready made standardised usages for the well established market corresponding to that type of food, but also to more diversified and varied preparations. There is obviously some contradiction in this approach. But there is no other way out: if there is a maximum sustainable yield of fish to be taken out of the sea, the prosperity of fisheries cannot come from an increased production but should come from an increased value on the marketing side.

The author is solely responsible for the ideas and information presented in this paper.

The Development of a Fishery: The Irish Example

Alex Heskin
Bord Iascaigh Mhara
Dublin, Ireland

Abstract

Although for some centuries beforehand the fish-rich waters around Ireland had been attracting the fishing fleets of Holland, Spain France, England and Scotland, it was not until the latter half of the 18th century that Irish fisheries began to be worked with vigour by native fishermen under the stimulus of an ever-increasing home demand for food in a population which in a space of 60 years from 1780 had risen by 170 per cent, to over 8 millions (present population 4 millions). After the Great Famine of the 1840s which led to a drop of 2 millions, or one quarter, in Ireland's population, the industry entered a phase of decline, created temporarily by the 1914-18 World War, which persisted well into the 1930s. Throughout this period the industry was marked by a high degree of instability due largely to the absence of effective planning and development policies on a national scale.

In 1952, a State-sponsored sea fisheries Board, An Bord Iascaigh Mhara (BIM) was set up to promote the interests of Irish fishermen, and in 1962 was charged with the development of the industry as a whole. The introduction by BIM at this time of a comprehensive long-term programme of development covering the entire industry laid the foundations for the rapid progress which had been achieved in the industry, despite persistent economic and supply problems, as evidenced by a ten-fold increase in landings, from 22,000 tonnes in 1963 to close on 200,000 tonnes in 1981.

BIM's current programme envisages a continuing expansion of the industry based on landings rising to a figure of 300,000 tonnes by 1985 and a maximising of the industry's return to the national economy. It aims to achieve these objectives by broadening the resource base through

increased white fishing and heavier landings of non-traditional species, greater catching efficiency, improved product quality, adding to the value of fishery products and more aggressive marketing.

For countries in process of expanding under-developed sea fishing industries, the Irish experience should provide valuable lessons as to the requirements which have to be met. A wide range of training and consultancy services covering the main areas involved are available from BIM.

Introduction

Ireland's sea fishing industry, particularly as it has developed over the past 20 years, is of vital importance to the economic and social welfare of the most disadvantaged parts of the island, situated along the western seaboard. Since 1963 Irish fish landings have increased ten-fold from 22,000 tonnes in that year to close on 200,000 tonnes in 1981.

The basis has been laid for further substantially increased landings and exports in the years ahead. While the full potential of the industry has still to be realised, the steady and substantial progress achieved under difficult conditions, indicated that the industry is moving in the right direction. I believe that there are valuable lessons in the Irish experience for countries in the process of building up their sea fishing industries.

Early Days

The story of the industry goes back a long way in time and is marked for the greater part by alternating periods of prosperity and decline.

It was not until the latter half of the 18th century that Ireland's sea fisheries began, for the first time, to be worked with vigour by native fishermen. Long before this, however, Irish coastal waters had yielded varied and profitable fishing for Dutch, Spanish, English, Scottish and French fleets. Even in those remote times, Dutch fishermen were active off the west coast of Ireland; so much so, in fact, that in the reign of Edward IV (1442 to 1483), they attempted the purchase of the port of Galway. The price said to have been offered was as many coins as, placed side by side, would cover the quays. The King accepted the offer provided the coins were placed on edge. This seems to have terminated the negotiations.

The years between the Great Famine of the 1840s and the establishment of an independent Irish State in 1922 saw many fluctuations in the condition of the industry. By the end of the 19th century, however, thanks to the efforts of dedicated individuals and bodies such as the Royal Dublin Society, a start had been made with the provision of fishery training and the application of scientific research and planning to the industry. The Department of Agriculture had been set up and with this Department in overall control of the industry and a subsidiary body, the Congested Districts Board looking after the developmental needs of the poorest areas of the western coast, Irish sea fisheries began to move towards a modest prosperity.

The advent of the 1914 War sparked off a great surge of activity. The diversion of the British trawling fleets to war duty left open to Ireland's inshore fishermen the valuable English market. Fish prices rose, the demand for motor fishing boats soared and Britain facing serious food shortages willingly lent Irish fishermen money to equip themselves to meet these. Unfortunately, many of those who borrowed heavily lacked both fishing and business skills and, when the British trawling fleet resumed its landings of cheap and plentiful supplies, they found themselves in financial trouble and were forced to abandon their costly motor boats to rot at their moorings. The Irish fishing industry thus lapsed into a period of depression aggravated by the world economic recession which persisted well into the 1930s.

Developments since 1922

When the Irish State was founded in 1922 the reality of the industry was one of

- a few steam trawlers and drifters
- some motor boats
- a variety of sailing craft
- a large number of rowing boats

These vessels landed herring and mackerel mainly with little attention to white fish. The total catch at this time was less than 10,000 tonnes per year.

A Minister and a Department of Fisheries were set up by the first Irish Government in 1922 demonstrating an early commitment to the development of sea fisheries. The Department, however, ceased to function as a separate entity in 1928 when fishery work was transferred to the Department of Agriculture and later the Department of Lands. By 1930, the small industry faced virtual disappearance when the German and Central European markets for cured herring, as well as the American market for cured mackerel, collapsed.

In the early 1930s the Government of the day decided to set up a co-operative association of fishermen with financial assistance from the State, which would provide members with boats and gear, the cost of which would be recouped from fish sales. This was the origin of the Irish Sea Fisheries Association Limited. Funds were provided annually under the Vote for Fisheries. These consisted of grants to cover the cost of administration and for general development work, and also for advances, which were repayable to the Exchequer, for the purchase of boats and gear on hire purchase terms.

In 1952 a number of important events occurred. The 21-year-old Sea Fisheries Association was wound up as a State body charged with assisting the growth of the industry and An Bord Iascaigh Mhara (BIM) - The Irish Sea Fisheries Board - was established by legislation. It was a potentially more flexible organisation, carrying on not only the Association's functions of financing vessels and marketing their catches but also acting as the promotional agency for the industry.

Following recommendations contained in a Government White Paper on the development of Sea Fisheries, BIM was reorganised in 1962 charged with the development of the Irish fishing industry. There are several such Authorities in Ireland, funded either partially or totally by the State and charged with the development of different sectors of the economy. They are not part of the established Civil service and so have a certain commercial freedom, though the Boards of such Authorities, which are generally composed of businessmen and others in the particular industry, are appointed by the Minister concerned with the particular sector.

Following its designation as a development Board, BIM gradually withdrew from direct marketing and processing activities. The new role called for the provision of extension services to the industry and these were introduced by the establishment of three mainline development divisions to cater for market development, fisheries development and shore investment development.

The main objective of the newly-constituted Board was to develop the industry both at sea and on shore in order to maximise its contribution to the Gross National Product. The planning which followed was based on the premise that economic development of fisheries as a profit-making business venture would serve the best interests of the industry and the country. This was consistent with the Government's overall development policy which aimed at increasing national prosperity through economic action. BIM, therefore, drew up detailed development plans covering all aspects of the industry, with specific targets for marketing, production, and investment and these were approved by Government.

The introduction of the programme produced an immediate response from the industry, and the confidence of fishermen in making large scale investments in new vessels was matched by the enterprise and managerial ability of the processing and distributive sectors. The BIM programme benefitted through the solid backing of successive Ministers, who had delegated responsibility for fisheries to BIM and the Fisheries Division of the Department of Agriculture and Fisheries. The result was that a very good balance was achieved between the Government, on the one hand, and private enterprise on the other, with both exerting force in the same direction. In 1965, shortly after the development programme got underway, the Government introduced the 12-mile territorial limit with special concessionary zones for boats of nations which had traditionally fished those areas. This further increased confidence.

Some years later export orders for fish had outstripped the capacity of the Irish fleet, while the home market was steadily growing. What a change this was from the difficult period up to the 1950s.

Fish landings, particularly herring rose steadily during the period reaching 79,000 tonnes in 1970. New boats built in Ireland, France, Holland and Norway were being added to the fleet and the number of fishermen were also increasing.

Hopes of further progress stemmed from Ireland's entry to the EEC in 1972 and the extension of national fishery limits to 200 miles in 1976 but, over-fishing of pelagic stocks, notably, herring, was, meanwhile, beginning to pose problems. By 1973, it had become clear that herring stocks were sharply diminishing in the Celtic Sea south of Ireland and it became necessary to impose temporary bans on herring fishing to combat stock depletion. This, together with pressure on other fish stocks, and uncertainty about the EEC Common Fishery Policy prompted fishermen to put forward a claim for an exclusive 50-mile limit.

By the end of 1978 it was evident that forces had built up which were making it impossible for the Irish Government to hold to this position on the 50-mile limit. A ruling of the European Court, that the exclusion of large foreign trawlers from the 50-mile limit was invalid marked the conclusion of this lengthy battle.

The Industry To-day

Despite the problems experienced during the 1970s, landings increased steadily following agreement by the EEC that Ireland should continue to develop her fisheries. Landings were doubled from 96,000 tonnes in 1976 to close on 200,000 tonnes in 1981.

This represents a record in the history of the fishing industry as does also the export figure of 149,000 tonnes valued at IR£56 million. The most significant development has been the large expansion in mackerel landings from 28,000 tonnes in 1978 to 90,000 tonnes in 1981. There has been a substantial increase in the demersal catch from 18,000 tonnes in 1978 to 36,000 tonnes in 1981. There has also been an increase in the herring catch but this catch at 30,000 tonnes in 1981 is still considerably below the record 1972 catch of 48,000 tonnes.

Between 1977 and the end of 1981 the number of boats over 24 metres increased from 42 to 68. Of these 6 are over 33 metres. These large vessels are fishing mainly for pelagic fish in offshore grounds which were previously out of range of the Irish fleet. They have proved to be very successful. New grounds have been opened up which are giving increased landings of demersal species. There has been a particular upswing in the mackerel catch which has benefitted the new vessels in the range 27 to 40 m. length, but fishing as trawlers rather than purse-seiners. However there is a danger of over-fishing this species, as had occurred with the Atlanto-Scandian herring stock over a decade ago.

The category of vessels in the 12 - 24 metre class are giving cause for concern. The majority of this fleet comprises timber vessels designed primarily for herring fishing. These came into the fleet in the early 1970s when fish prices were high and herring stocks were generally plentiful; this created a state of unreal prosperity. The scarcity of herring, and the high cost of oil in recent years, has brought many of these skippers to their senses. Today these fishermen are beginning to look at their operations in a much more business-like manner. Provided fish catches are geared to demand, prices will achieve more realistic levels and it is then up to the fisherman to increase his profitability by bringing operating costs to this level. Not an easy task perhaps but one which given a correct approach and sustained effort has a good chance of success. Fishermen have to appreciate that it is the market calls the tune, not the producer.

International Trade

Ireland's role in international trade in fishery products is quite small, but it is of interest as a case study of a developing fishery.

Prior to the 1960s

Towards the end of the last century and in the early days of this one, prior to the 1914 war, Ireland was a large exporter of salted herring. This export trade continued right through the Great War together with fresh white fish, going by the train-load from Irish west coast ports to London and the Midland cities of England. Railways had been built to many Irish fishing ports for this trade.

Following the Great War, cured herring was exported to central European markets, including Germany, and cured mackerel to the USA. These markets collapsed with the economic depression of the early 1930s. During the same period there were significant imports of dried and salted white fish mainly from Scotland.

The 1939-45 War gave another fillip to Irish fish exports mainly because of the shortage of fish from the British home fleet, but this was short-lived and exports declined again in the late 1940s and early 1950s. In the latter half of the decade and in the early 1960s, the State through BIM built and operated its own fish factories which produced salted and marinated herring products mainly for the German market, and also white fish, packed in consumer packs, for the Australian market. This venture did not prove commercially successful and also had the effect of inhibiting investment in the industry by private enterprise. With its reorganisation as a development authority in 1963, BIM ceased direct trading and its three factories were sold to private firms.

1963 to 1973

In the decade prior to Ireland joining the EEC in 1973, exports grew from approximately 10,000 tonnes to 50,000 tonnes. This growth was mainly due to the good herring catches at the time. The bulk of the herring was sold in salted form for onward sale by Dutch merchants, with a sizeable marinate trade also developing. There was also a considerable fresh trade in herring.

During this decade, imports remained fairly static at about 4,000 tonnes of which about 3,000 tonnes were prepared fish products such as fish fingers. Several efforts have been made to produce fish fingers and other such breaded products locally, but it is virtually impossible to compete with the multi-nationals, with their large heavily advertised market-share in this sector.

1973 to-date

The mid 1970s saw a change in the pattern of Irish foreign trade of fishery products, but on the export side there was a down-turn, rather than an up-turn, as expected with the entry into the EEC. The volume of exports fell from 50,000 tonnes in 1973 to a low point of 35,000 tonnes in 1976, gradually climbing again to 45,000 tonnes in 1979, before the dramatic increase in 1980 and 1981 (of 135,000 tonnes) due to the large mackerel fishery. The fall from 1973 to 1979 was principally due to the reduction in herring landings, especially the collapse of Celtic Sea herring fishery off the south-Irish coast. Table I shows the trade pattern for both Ireland and for the EEC as a whole for this period.

As a proportion of total EEC trade Irish fish exports fell from being 6% in 1973 to just over 3% in 1979, when large mackerel landings had already commenced by other EEC fleets but before the Irish fleet had equipped itself for this fishery. The proportion rose again to 6% approximately in 1980 when the Irish industry geared itself for mackerel and landings showed a healthy jump. Total EEC figures are not yet available for 1981, but it is expected that the Irish percentage will be in excess of 6%.

Total imports over the decade rose slowly from 5,600 tonnes in 1973 to 8,500 tonnes in 1979, and then increased dramatically in 1980 and 1981 with imports of fresh mackerel from UK for onward export in frozen form. A notable feature of both imports and exports, since we joined the Community has been the relatively static position of trade with countries outside the Community until the advent of the mackerel fishery in 1980/81.

The Irish external trade pattern, broken down by product grouping, is shown on table 11. It will be noted that the largest imports were in the category of prepared and preserved fish - this figure being in the region of 1,500 to 2,500 tonnes prior to 1977 rising to 4,000 tonnes in 1979 and 1980, with the increase in the standard of living, and falling again with the recession in 1981.

On the export side, the influence of the herring fishery is evident in the pattern of the figures for fresh/frozen fish and for salted/ smoked fish. Again the high figure for exports of fresh/frozen fish in 1981 will be noted - this was due to the mackerel trade, mainly with West Africa.

The West African mackerel trade has been prosecuted both by freezing fish on shore and also by "over-the-side" sales mainly to East-European vessels. About 25% of the catch was sold over the side in 1981. Some difficulties have been experienced this year with the Nigerian market in respect of imports and foreign exchange controls, but we are nevertheless hopeful of further expansion to this and other West African markets.

The Way Ahead

Aware of the present difficulties in the catching and market sectors, BIM's primary objective in its development programme is to achieve the maximum return for the industry by

- broadening the resource base
- achieving efficiencies in all aspects of catching
- expansion of mariculture
- improving quality consciousness
- Adding to the value of the product

- aggressively marketing the product.

Broadening the Resource Base. Although our fish landings are now considerable, they are still heavily dependent on pelagic varieties. BIM, therefore, is anxious to promote fisheries based on non-traditional species such as blue whiting, scad, tusk, ling, dogfish, sprat. It will stimulate further activity in whitefishing, in order to give a more balanced catch which is essential to ensure that the gains of the past in terms of increased fish landings are protected. This spread of species is necessry to ensure adequate raw material on a continuing basis for expanded shore processing.

Achieving Efficiency in Catching. Fishing vessels are both expensive to build and to operate and cost reductions in these areas are essential. The cost of fuel for a modern trawler now amounts to a staggering 25% of total revenue each year and consequently greater efficiency in fuel utilisation is vital.

A cost-effective approach to equipping the vessel would also contribute by reducing the amount of equipment which does not directly lead to increased catches. Cost reductions could also be achieved by greater emphasis on new development in fishing gear, and increased use of energy monitoring and saving devices, as well as the use of passive methods of fishing for at least part of the fishing year. Effective training is most important. The courses at the BIM National Fisheries Training Centre are geared to this end.

Expansion of Mariculture. Salmon and sea-trout, oysters and mussels are the principal species cultivated. The total quantity of farmed salmonid produced in 1981 amounted to approximately 250 tonnes, with intensive shellfish cultivation producing about 800 tonnes and extensive mussel production of 4,000 tonnes. Under the National Mariculture Development and Assistance Programme, it is expected that these figures will be quadrupled by the end of the decade.

Improving Quality Consciousness. Emphasis on bulk fishing and a low level of white fish catches has often, in the past, resulted in failure to earn a price premium for well-handled quality fish. This situation can be improved only through joint action by fishermen and buyers. It is imperative that fish is landed in best condition so that the prices paid should reflect the extra effort. BIM is actively pursuing the objective of improving quality standards with the industry by such methods as subventing the cost of ice at fishing ports.

Aggressively Marketing the Product. Aggressive marketing is one of the main planks in BIM's development programme. There is a particular need now for a fresh marketing drive.

The EEC's liberal trade policy has adversely affected fish prices within the Community particularly for herring and some varieties of white fish, this has to be coped with by pursuing more vigorously the available opportunities. Increased emphasis is being laid on market intelligence and research as well as on product development in co-operation with the exporting sector.

An active approach in marketing is essential for success in the development of the industry. All sectors have to become "market" rather than "producer" orientated. We have to adopt the "market to market concept".

Adding to the Value of the Product. It has always been a primary objective of BIM's development programme to encourage shore processing of fish because of its importance in adding to the value of the products and thus creating employment. At present there are in Ireland some 60 fish processors employing 1,500 people. In the national development programme the target for 1985 is an increase in shore employment of 400 with the assistance of State grants.

While an increasing number of firms are engaged in primary processing only a small number have successfully gone ahead into secondary processing in recent years; this trend has to be speeded up.

In the processing sector, the main thrust of activity will centre on -

(a) the provision of freezing and cold storage facilities where such is not already available

(b) the expansion of existing projects and the creation of new facilities to cater for the development of added-value product lines

(c) the modernisation and re-equipment of firms to increase efficiency and competitiveness

(d) the establishment of new firms with strenghts in marketing and technology, including joint-ventures with foreign firms

(e) fishmeal production facilities to provide offal reduction and ancillary industries at major ports.

The potential for further employment in the fish processing sector depends very much on the new market opportunities which will be seized in the context of an expanding catch. The optimisation of our fishery resources means producting more consumer products so as to attain a higher level of added-value and employment with the country.

Opportunities exist not only in development of the home processing industry but, also, for joint-venture co-operation. However, the Irish experience has shown that great care is required in marrying such ventures with the indigenous industry and it is especially important that personnel with local fishery experience are included in management. Government investment grants are available for approved processing and catching facilities.

Lessons from the Irish Experience

The Irish experience has shown that in order to service a sound and balanced development in the sea fishing industry certain requirements must be met, viz,

- forward planning based on the best available information on fish stocks, markets and operational factors

- a high level of training and education for participants in the industry

- a controlled and co-ordinated approach involving the catching and processing sectors

- prudent management procedures and, in particular, the avoidance of over-capitalisation

- insistence on high standards of quality and hygiene in the handling and treatment of catches

- a vigorous market development policy.

The establishment of a central planning and development body, on the lines of Ireland's BIM, with practical experience in all branches of the industry, maintaining close touch with fishermen, processors and distributors, and in a position to give prompt and expert advice on the industry's problems as they arise, is likely to give the best results in the areas indicated. Incidentally, a wide range of training and consultancy services covering these areas are available from BIM to organisations in countries outside Ireland contemplating development work in the sphere of sea fisheries.

Conclusion

In concluding this paper I would like to say that I believe that we are embarking on an exciting period in fisheries development in Ireland. At long last our landings have reached a level where we can say we have an industry. It behoves us now to grasp the opportunity that these landings afford us to maximise the economic return from fishing through efficient catching and aggressive marketing of a quality product.

The past 20 years have been a period of investment and growth in fleet size and we reached out successfully into competitive markets during that period. We did all this at the right time putting us in a good position to seize on the opportunities that lie ahead.

NOTE:

The material used in this paper covering the period prior to the foundation of the Irish State in 1922 has been taken from "Ireland - Industrial and Agricultural" published in 1902 by Browne and Nolan Ltd., Dublin on behalf of the Department of Agriculture and Technical Institution of Ireland and from "Ireland's Sea Fisheries - A History" by John deCourcy Ireland published in 1981 by the Glendale Press, Dublin.

Statistical data may be obtained from the author.

Seafood Markets in the Americas

Export Markets for Seafood: A U.S. Perspective

Robert C. Webster
American Seafood Export, Inc.
Mt. Dora, Florida, USA

The subject I have been asked to discuss is a subject close to my heart and also the subject of intense frustration. The word "perspective," according to Webster, is defined as, "the relation of an object of thought from a particular viewpoint."

My viewpoint can be encapsulated as follows - We, as a nation, sit on top of possibly the largest resource of raw material in the world. The spectrum of species, or product mix, that is available to the harvester, processor/exporter in the Northeast, the Mid-Atlantic, Southeast/Gulf of Mexico, and the Pacific Coast from California to Alaska's outer reaches, is staggering to the exporters imagination. Yet, the export market for seafoods caught by U.S. vessels and processed in the U.S. plants at present, is, unfortunately, limited.

To outline the true perspective of the U.S. export market we must look at the world market and the problems these markets face. It is out of adversity that opportunities spring. There are many negatives that have to be faced, overcome, and converted into positives, to realize the real value of the U.S. position in the export markets of the world.

The currency of yesterday was gold, the currency of today is oil, and the currency of tomorrow is food. Seafood, in all forms, is an important coin of the realm.

The world importers and exporters of seafood are today controlled by a "new regime." The 200 mile economic zone and the Magnuson Fishery Conservation Act (for U.S. exporters) is the base of this new regime. More than 90% of the world's coast lines are controlled by either developed or developing countries.

Those nations that fish off their own coasts have been the big gainers. The developed nations, such as the U.S. and Canada have shown gains. The developing countries initially showed gains, but these gains are slipping. The nation's such as the EEC, that depend on distant water fishing have not fared so well, as shown in Table 1.

Table 1. World ocean catch, millions of tons, 1965-1978

COUNTRY	1965	1970	1975	1976	1978	1981
Japan	6.8	9.2	10.3	10.5	10.5	11.34
U.S.S.R.	4.3	6.4	9.0	9.4	8.2	
Peru	7.6	12.5	3.4	4.3	3.4	
U.S.A.	2.6	2.8	2.8	3.1	3.4	2.68
China	2.1	2.7	2.7	3.3	3.4	
Norway	2.3	3.0	2.5	3.4	2.6	
South Korea	0.6	0.8	2.1	2.4	2.3	2.34
Denmark	0.8	1.2	1.8	1.9	1.7	
India	0.8	1.1	1.5	1.4	1.5	2.64
Thailand	0.5	1.3	1.4	1.5	2.1	1.96
Others-Chile	17.2	21.0	23.7	23.6	25.9	3.34
TOTALS	45.6	62.0	61.2	64.8	65.0	73.7

Source: FAO - Third Fisheries Cooperation Meeting of Non-Aligned and Developing Countries - Havana, Cuba, 1981.

The growth and gradual decline of the world's fish catch over the past 20 years has been much influenced by the fisheries devoted largely to the reduction of landings to meal and oil. An example of this is Chile, where 3.3 million tons of fish were caught in 1981, (4th place in the world), but over 75% of this catch went into meal and oil plants. During the same period, Chile's exports fell to an all time low of 35.7 million dollars in 1981.

The FAO projects, that within developing countries, given a projected population increase of 2%, the 1981 decrease in catch and the figures projected for the 1980s will be inadequate to maintain per capita consumption. Countries such as Chad, Mali and Burwunde, will suffer the most. (1) The FAO forecasts declining rates of growth in production, yet the factors controlling demand are expected to continue at historical rates.

The global demand for seafood-protein by the end of the century will increase 3.35%, a rate comparable to an annual growth in production of 1%. The projected demand by 1990 will increase by 18,000,000 tons, by the year 2000 by over 30,000,000 tons (almost 40% of the total catch in 1981). It is estimated that 75% of this demand will be in the developing countries (1).

It is further estimated that by 1990 only 5-6 million tons will be available for fishmeal, compared to 18,000,000 tons in 1981. There is no question, based on present estimates, that the demand for fish for human consumption by the year 2000 will far exceed the catch.

The projected growth of catch in the EEC will continue on declining scale because of the restrictions of overlapping 200 mile zones and the fact that resources are heavily exploited. Thus, it is obvious that major exporters, such as Holland, will reduce exports in favor of sales to the domestic market.

The net effect of the "new regime" caused by the 200 mile zone EEC's will be the creation of trade and increased world trade in fishery products. The greatest potential for demand will be the developed countries, such as the EEC countries, Japan, Scandinavia and others. By the end of the century, some developing countries with sizeable populations; e.g., India, Bangladesh, Thailand, Chile, Egypt. There will also be countries that experience problems in meeting basic needs for animal protein; e.g., Ghana, Ivory Coast, Nigeria, and India.

The FAO reports point out that exports of seafood declined in the world market for the third straight year, with developing countries suffering the brunt. The value of world exports in 1981 was: (2)

Volume - 9.4 million MT.
Value - $14,000,000,0900.00

The developing countries in 1981 dropped six percent to less than 5 billion dollars.

The world's leaders in exports are shown in Table 2.

Table 2. Major exporters and importers of seafoods for human consumption-1980 (USA $ Millions)

Major Fish Exporters - 1980

Country	1980	Change 79-80
1. Canada	1,028	- 8.3
2. U.S.A.	1,006	- 65.0
3. Norway	974	+ 83.0
4. Denmark	931	+ 72.0
5. So. Korea	760	- 35.0
6. Japan	754	+ 34.0
7. Iceland	696	+101.0
8. Netherlands	530	+ 27.0
9. Mexico	410	-430.0
10. Chile	314	+ 35.0

Major Fish Importers - 1980

Country	1980	Change 79-80
1. Japan	3,218	-800.0
2. U.S.A.	2,709	+ 35.0
3. France	1,158	+160.0
4. U.K.	1,036	+135.0
5. West Germany	1,012	+127.0
6. Italy	756	+ 34.0
7. Spain	545	+135.0
8. Netherlands	394	+ 25.0
9. Hong Kong	350	+ 43.0
10. Sweden	344	+ 52.0

Note: Norway is 3rd largest exporter, Sweden is 10th largest importer.
Note: U.S. is 2nd largest exporter and the 2nd largest importer.
Note: Japan is major importer but imports declined by 800 million dollars and reduced her share of values to just over 20%.
Note: EEC imports exceed Japan's imports by almost 40%.

Source: World Fish Trade in 1980 - Infofish, FAO #1, October, 1981.

The dramatic rise in imports by many nation's has increased protectionism and other related forces inimical to the interest of fish exporters, particularly those of the developing countries.

In researching for this paper, I ran across several quotes which I feel will set the tone for what will follow. I am not picking on this gentlemen, but I think the quotes help point out the problem:

"The U.S. fishing industry is a dominant factor in international trade. Over half the seafood consumed here is imported from over 80 major foreign suppliers." "In 1981 the U.S. exported a record $1.2 billion in seafood - a record. Imports for 1981 were also a record at $4.2 billion." (3)

"Technology in producing fishery products (for export) has always been well in advance of demand." (3)

"There has always been a "hidden" partnership between government and industry which is more meaningful than many would care to admit. With present high interest rates, dull markets, and a maze of regulations, the threads of continuity are strained, but in place. The U.S. seems to be on a course of action to improve its fisheries situation and it certainly has abundant resources to develop, promote and consume. It is reasonable to expect U.S. production will double in the next decade." (3)

Each of the quotes reflect a goal and, frankly, a goal which could be achieved if the American Seafood industry could become marketing oriented. We must look at the following facts in light of the above statements:

1. The U.S. catch of all species fell in 1981 to 2.68 million tons, the lowest since 1977. (4)

2. The U.S. per capita consumption has risen from 12.3 lbs./person in 1972 to 13.0 lbs. per year per person in 1981, an increase annually of less than 0.1%. We are very far down the list in terms of per capita consumption.

3. Four products represent 58.50% of the total catch volume in 1980 and are as follows:

Shrimp	-	463 million lbs.	-	19.29%
Salmon	-	438 million lbs.	-	18.25%
Crabs	-	297 million lbs.	-	12.38%
Tuna	-	206 million lbs.	-	8.58%
TOTAL		1,377 million lbs.	-	58.50%

When you add the estimates for Menhaden, of 710 million lbs., or 26.50% for meal and oil, the total catch of other species is slightly more than 16%.

4. Granted, we are the second leading exporter, but we are rapidly becoming the worlds largest importer of fish. In 1981, we imported $3,034,000,000.00 worth of edible fishery products, plus

$1,140,000,000,00 worth of non-edible imports to make a grand total of $4,173,000,000.00.

5. The estimated export market worldwide is in excess of 14 billion dollars and more than 10 million tons. Exports of more than 1.2 billion dollars is an excellent start as in our net volume of 334,500 metric tons. Let us compare these figures against the world totals. (2)

   Dollars - 8.57% of the total
   Volume - 3.35% of the total

   If we look at item 3, above, four items, all expensive, represent 58.50% of the catch. U.S. fishermen concentrate on a relatively few high value and hopefully high volume species which yield high profits. This is high risk if bad year(s) befall one or more species, as has been seen with King Crab, and the present overabundance of tuna.

6. The U.S.A. has the longest continuous shore line in the world and one of the largest bio-mass of fish in the world, why are we stuck with items 1-5 above.

It has been said by a number of very knowledgeable people that the methods of solution for the worlds shortfall of edible seafood products can be summarized as follows:

1. Increased production for conventional species remaining underexploited or from unconventional, or non-traditional species.

2. Improved utilization of fish caught, with significant reduction in post-harvest losses.

3. Significantly better management of the world's fishery resources.

There is a major market for a high quality, realistically priced, frozen, fresh or canned seafood in virtually every country of the world. The demand will grow steadily in the 80s, and dramatically in the 1990s.

We, the American harvester, processor and exporter, have a major opportunity in the next two decades, but are we capable of handling this challenge. We are not generally looked upon as a sophisticated trading country and exporter of seafoods. We are a production oriented industry, but must become a marketing oriented industry.

The U.S. seafood industry is an anomaly, and as such the harvesting and processing sectors are usually at cross purposes. It is an important industry contributing 12-13 billion to the economy (less than 1/2 of 1 percent to GNP) and creates employment for over 270,000 people. Yet, it cannot be said that it is an industry where all component parts work as one. It is an industry where both the fishing and processing sectors of the seafood industry have maintained separate identities and traditions that value individualistic activities over administrative, corporate approaches to business. (5)

The American seafood industry is production oriented. The philosophy assumes that consumers will favor those products that are available, affordable, and offer the most quality for the price. Given this assumption, the industry is to improve production and distribution efficiency and devote its energy to improving quality.

The seafood industry appears to be slowly going through several stages of development of their orientation, of which the production orientation, is usually the first. As consumers become more sophisticated, the orientation should shift to a selling phase and to a more contemporary marketing phase.

At present, harvesters and processors are single mindedly producing as much as possible when the fish "are running." Fish are caught and packed, usually in a poor quality mode, with little regard to the market for which packed. Later on a distress sale must take place.

There is an important need for market orientation. This need is based on the fact that new resources are needed, bottomfish resources must be developed.

What is market orientation. A concept where management philosophy holds the key to achieving organizational goals which consist of: (5)

1. Determining the needs, wants, and interest to target markets.

2. Adopting itself to delivering consumer satisfaction more effectively than its competitors.

3. Developing means to accomplish this at a reasonable profit in a way that enhances the consumers needs and results in repeat sales.

The American seafood industry through its intense product orientation ultimately concentrates on the needs of the seller. The industry must change its mode to concentrating on the needs of the buyer. Its goals and profits must come through consumer satisfaction.

I have spoken at great length as to what I perceive to be the problems and they are legion. At the back of every problem is a solution, and thus an opportunity. I believe that the U.S., could, and should, become the predominant exporting force in the world. Each of the negatives is in fact a positive, if countered correctly.

The first step, is to decrease significantly our dependence upon imports by moving into the domestic market with quality products which are oriented to the consumer. We should try to make it a buyers market, not a sellers market of necessity.

We must clarify our foreign fleet policies. We must answer, believably, the question, "What place do foreign fisheries have in the long-range fisheries development of the U.S." When the Magnuson Act was passed the intent was to allow foreign fleets to participate until the domestic industry was able to take 100% of the available catch. The ultimate goal would be U.S. vessels supplying U.S. processors.

Foreign dominance of many fishery areas is increasing and the U.S. processing industry is declining. It is true that a limited number of vessels have prospered by hoisting their cod ends on foreign processors, but overall the industry has not grown and the industry will not grow in the posture. We are also starting to decimate a valuable resource. (6)

The decision to allow certain vessels in to catch, particularly on the East Coast, is patently political. The quotas given to Spanish and Italian catchers have wiped out the squid population. Ask the processors who have had no Loligo squid season for two years, and those who did pack. The fact is that they could not compete in normal markets because Spanish marketers dumped huge quantities onto the European market, at a very low price.

The NMFS and the State Department sometimes make decisions that help a few fishermen to work, but do nothing to build the segment of the market that really needs it. The NMFS has announced its goal to have all foreign fishing ended by 1985. This is inconsistent, when they are allowed a foreign entity to basically dictate a link between allocations and U.S. selling rights.

The State Department public position is "The intent of Congress is that U.S. fishery resources be entirely utilized by American fishery industry must be given greater force and effect, hence, the emergence of carefully crafted economic criteria for the allocation of foreign nations of our vast surplus of fishery resources. The emphasis would be laid/improved access to foreign markets for U.S. products and on increased Joint Ventures with U.S. fishermen" (and processors). (7)

I feel that this statement from Mr. Kronmiller leads to one point. The formation of joint ventures. We are very familiar with the at-sea ventures and their apparent success, primarily in Alaska. We fortunately have been involved with overseas processing JV's for many years, in a number of countries.

There is no question of the resource and there really is no question that some of our major buyers, such as Japan, see us in an excellent place for investment. The Japanese see the U.S. seafood industry as a small fragmented industry made up of many privately held small companies with few employees.

Cashflow is generally the greatest problem to growth.

In 1979 the NMFS stated that there were 1,674 processors, including Alaska. The gross revenues of 260 firms surveyed by the NMFS are broken down as follows: (8)

1979 Gross Operating Revenues		Percent
Less than $250,000.00		24
$ 250 - $ 499,999.00		7
$ 500,000 - $ 999,999.00		13
$1,000,000 - $4,999,999.00		27
$5,000,000 - $9,999,999.00		12
over $10,000,000.00		17
	TOTAL	100%

The predominate investors on the West Coast are the Japanese, who have a large number of direct and indirect investments. The reason that Japanese firms invest in U.S. processors is to gain access to fishery products and, secondarily to make profits by:

1. Gaining access and control of fishery products.

2. Foreign owners can profit from the subsequent resale of these products.

3. Foreign owners have an opportunity to expand their marketing of their own products in the U.S.

4. A return on ownership interest.

Foreign ownership can give the investor the potential to influence or control the operation of U.S. seafood processors. In 1980, 37 processors were involved in foreign ownership, which can be broken down as follows: (8)

Country of Ownership		No. of Firms
Japan		32
Canada		2
Netherlands		1
Unknown		2
	TOTAL	37

Percent Ownership		No. of Firms
100		4
90-99.9		3
50-89.9		7
25-49.9		9
Less than 25%		7
	TOTAL	30

A recent article in the Japanese Times by Mr. Ohkuchi, President of Nissui. "Five years ago, fish hauled by Nissui's boats accounted for 70% of the total sales. By 1980, the ratio had dropped to 30%." He stresses that without the Japanese market, the U.S. fishery industry would not be able to continue marketing.

"Nissui's goal is to purchase fish, as much as possible, despite the fierce competition of the giant trading houses." (9)

We have seen a sharp movement away from the trading companies to the cooperative to insure a supply of a wide range of species. This points up one major requirement for the private sector if it is to become marketing oriented rather than solely production oriented, and that is the knowledge, intimate knowledge of its customers.

We have found a recent interest in Japan, and elsewhere, in investment in shore facilities, with the following conditions:

1. A willingness to invest large sums without control of the resulting operation.

2. The facility to be American owned and managed.

3. Japanese to provide technical and equipment assistance and back-up.

4. A willingness to teach and train us in catching, handling, processing and marketing.

5. A willingness to take less than half the catch or finished product with no pre-conditions.

6. Funds to be invested as equity. Co-guarantee if required for working capital.

We also feel that the U.S. Government must take a more active role in assisting the private sector in developing the fisheries industry to meet the export challenge. By this, I do not mean the political force nor the continuation of the Governments place in establishing quotas, but actively assisting the industry in all aspects from catching, to processing, and to financial assistance.

At the present, the Department of Commerce, and its fisheries arm, the National Marine Fisheries Service (NMFS), is the primary federal agency that assists the fishing industry, its activities include: (10)

1. Collecting and disseminating trade leads.
2. Participating in foreign trade missions and fairs.
3. Improving seafood merchandising.
4. Educating U.S. consumers on the health benefit of seafoods.

The NMFS performs many other services too numerous to list here. The net result, unfortunately, is one which to date has not stimulated the move from a production mode to a marketing mode.

The Japanese and other nations have over the years set out to develop, both internally and externally, the fisheries industry as it relates to their country, in the case, importation of high quality products.

If we take a look at the Japanese internal and external cooperation in fishing we see a major series of differences between Japan and the U.S.A.

"Japan is promoting various kinds of international cooperation in fisheries based upon the basic premise is to mutually develop and maintain fisheries for mutual benefit."

The Japanese, both externally and internally cooperate in: (11)

1. Capital Cooperation - Economic funds disbursed as non-repayment capital for consolidation of fishery infrastructure, plants, piers, training, etc. Overseas investments are funded by Overseas Economic Cooperation Fund and the Japanese Export/Import Bank.

2. Technical Cooperation - Program to train personnel from developed and developing countries and to place personnel in those countries to train.

The Japanese are very sophisticated in the market orientation of their catching, processing and distribution. We can learn much from them in the years to come. It is also interesting to note that Germany has set up an almost identical program through their GTZ and BMZ. The EEC is doing the same. "To assure a continuing supply of food in the years to come."

I will use one example, if I may, which points out what the U.S. Government can do if it becomes a willing partner to the building of the fisheries industry. In 1973, U.S.A.I.D. established a program to build the seafood industry in Vietnam. The U.S. Government provided every form of support needed to build the fledgling industry, including financing for raw material, inventory and market development.

The result was an export industry for shrimp, lobster, red snapper and other bottomfish that grew from $300,000.00 in 1972 to over $30,000,000.00 by early 1975.

Today, every developed country is doing basically the same thing through its various agencies. The U.S. is also actively engaged, primarily with developing countries, through U.S.A.I.D. Unfortunately, AID's program related only to those countries politically oriented to the United States.

I will not belabor you with lengthy points on the so-called underutilized or non-traditional species and the necessity for the success of this program. The NMFS states that success of six non-traditional species could produce 38,000 new jobs and add 1 billion to the economy by 1990.

Marketing is the key to the growth of the non-traditional species. The obstacles in the way, at present, appear to be:

1. Low selling price.
2. Inferior product quality.
3. Restrictive trade practices.
4. Lack of consumer acceptance.

Three of the above points are directly related, inferior product quality assures lack of consumer acceptance and a low price. Even more important is knowing exactly how the consumer of exported product wants his or her product packed, displayed, sized, frozen and shipped. Again, the consumer or buyer is not the final judgment factor in most U.S. processing plants, it is the sellers need to move product and create cashflow.

The development of non-traditional species may be inhibited because of the increasing foreign investment and control over processors. The foreign investor may be reluctant to develop the bottomfish industry. By slowing development of a particular resource, the foreign nation can maintain their dominance in harvesting and processing bottom fish in Alaska, for example. To assist in developing the resource would accelerate the time when foreign operators would no longer dominate the United States 200 mile zone.

The perception I have for the future of the export segment of the American fisheries industry is that it can grow to any size we have the capability of building it to in the next ten years. We should not be that elated nor complacent about the fact that we export only 3.5% of the world's volume of exports.

We must look critically at the industry we represent and its good points, (and it has many) as well as its problem features. We must also look critically at how others perceive us, and then and only then can we perceive the opportunities that really exist for the American fishing industry.

Bibliography

1. Third Fisheries Cooperation Meeting of Non-Aligned and Other Developing Countries. Havana, Cuba, January, 1981, 14 pages.

2. World Fish Trade in 1980 - Infofish. Issue No. _, October 1981. 19 pages.

3. United States Fisheries - A Sleeping Giant. Joseph W. Slavin, Seafood America, January/February, 1982, pages 10-11, 32.

4. At Sea Freezing Could Change Shape of U.S. Fishing World. Joseph W. Slavin, Quick Frozen Foods, July, 1982. Pages 52-53.

5. The Shape of the Seafood Industry: A Unique Enterprise Faced With Challenges at Home and Abroad. Pacific Fishing, November, 1981. Pages 109-118.

6. Future is Clouded by Lack of Policy on Foreign Fishing. Tim Sullivan, National Fishermans, January, 1982. Pages 73-74.

7. States Statement on Fisheries. Theodore Kronmiller, Fish Boats, July, 1982.

8. Foreign Investment in U.S. Seafood Processing Industry Difficult to Assess. G.A.O. Report CED 81-65, March 30, 1981. 73 pages.

9. Japanese Fishing Industry Facing New Challenges. The Japan Times, July 5, 1982.

10. Developing Markets for Fish not Traditionally Harvested by the United States: The Problems and the Federal Role. G.A.O. Report CED 80-73.

11. Fisheries of Japan, 1980. Japan Fisheries Association, 1980. 49 pages.

Fisheries Trade: The Trade Establishment

Robert G. Hayes
U.S. Department of Commerce
Washington, D.C., USA

Within the U.S. Government there exists a separate and distinct bureaucracy that deals with fisheries trade. This system is part of the larger trade establishment and is the focal point for the creation of all U.S. fishery trade policy. This paper identifies the system and describes how it interacts to assist the U.S. fishing industry.

Significant changes have occurred since passage of the Magnuson Fishery Conservation and Management Act in 1976. These changes are a result of the shift away from free access to fishery resources and a concomitant shift in the international trade in fishery products. The United States has responded with adjustments to its laws and structure.

The 1976 MFCMA provided the opportunity for U.S. fishermen to take the entire optimum yield in the 200 mile limit; foreign fishermen were allowed only fish that was surplus to U.S. needs. Full utilization in this context did not necessarily promote domestic utilization which could only occur through expanded domestic and export markets. The task was easier to articulate than accomplish. Processors and wholesalers found that many of the species available were unfamiliar to the domestic market and were unable to sell the catch. In some instances cheaper imports, often caught in our waters, made it uneconomical to sell domestically.

It is not surprising then that many in the U.S. turned to foreign markets for answers for developing the industry. After all, the foreign fleets were taking the fish and selling it in their markets, why not have the U.S. catch and process the fish and export it to those same markets? On the surface it is a reasonable plan, but it proved to be too simplistic.

Problems with price, size, packaging, processing methods and quality deterred many sales. Despite these problems, exports of edible fishery products did triple from $329 million in 1976 to $1,020 million in 1979. We must always be aware, however, that most of those exports were of high-value species which foreigners could not catch in our waters, such as salmon, crab and fish roes. In some cases the increase was a result of buying sprees. In 1978 and 1979 the Japanese purchased significant quantities of salmon.

In 1980, despite some gains made by the domestic fleet and some restrictions on the size and type of foreign fishing, it became clear to NMFS and Congress that MFCMA was not achieving the rapid progress many had intended. The U.S. was not using access to its resources as a development tool. The emphasis in making foreign fishing allocations was based largely on historical fishing patterns, while trade and other factors were only marginally considered. The Agency developed a new strategy known as the "fish and chips" policy to use allocations to assist the development of the U.S. industry. Congress then mandated this approach through the American Fisheries Promotion Act of 1980.

The new Act expanded the list of criteria for making allocations to include the extent of seafood trade between the U.S. and the country, with which we have a Governing International Fishery Agreement or GIFAs; the extent to which fish caught in our waters was used in the harvester's domestic market; the extent to which the foreign country assisted in the development of U.S. fisheries; and positive efforts to reduce trade barriers. The application of these criteria has become an important tool in dealing with other countries. The policy is conducted by two agencies, NMFS in the Department of Commerce and the Office of Oceans Environment and Science in the Department of State. Although each of these organizations are involved in fisheries trade, they are not directly involved in the U.S. trade establishment.

The present U.S. trade establishment was created by the Trade Reorganization Act of 1979. Lead responsibility for negotiations of all generic trade agreements was placed in the U.S. Trade Representative's Office and trade promotion and administrative activities formerly split between Commerce and State were transferred almost totally to Commerce. It is within this structure that Fisheries Trade policy is developed, given credibility and executed.

These then are the principal "players" on the export stage as far as the Federal Government is concerned. In addition, the States, universities, and industry organizations all contribute to the information flow, advise on policy, and assist in the actual promotional efforts.

The efforts of each of these components as they pertain to fish center around three basic activities: 1) Trade promotion, 2) Fish and Chips, and 3) Trade policy. Each of these are important elements in U.S. Fishery trade growth and show how the U.S. trade establishment affects international fish trade.

Trade Promotion

The Federal Government has shown a renewed interest in the development of new export markets for U.S. seafood products through trade promotion activities. In earlier efforts dating back to the 1960s, the U.S. Department of Agriculture's Foregin Agricultural Service (FAS) operated numerous food shows overseas which occasionally involved fishery products. This arrangement grew not from the U.S. Government's organization and structure, in which the fisheries agency is part of the Department of Commerce, but from the fact that in most countries fishery agencies are part of the agriculture ministry. As a result, we have had to continue these contacts with FAS because trade opportunities, changes in regulations or market information often occur in FAS dealings with a country's Agriculture Minister and we want to assist in that flow of vital information. In addition, it is USDA that reserves space at large international shows such as SIAL in Paris and ANUGA in Cologne in which NMFS participates as an equal partner.

For many years USDA has operated food shows overseas. NMFS and its predecessor organization occasionally exhibited seafood at these shows. This cooperation has grown in the past three years to culminate in the very large, well-constructed and organized efforts at the SIAL and ANUGA shows in Europe. USDA has contracted for a large exhibit area with NMFS and the Department of Commerce paying for a substantial share. These shows, with hundreds of thousands of visitors, have had a dramatic impact in educating Europeans and others to the vast variety of seafoods available from the U.S.

In the Department of Commerce, both International Trade Administration and NMFS are involved in promoting international trade in seafood. In the newly reorganized International Trade Administration, a new organization, the Foreign Commercial Service, was created. The FCS began with over 100 Foreign Service Officers, many of whom have officially joined FCS since that time. The FCS has assigned commercial officers to 118 posts in 65 countries around the world. State Department personnel operate in economic matters in the remainder. ITA conducts its activities through the FCS, the U.S. Commercial Service in the District offices located in major cities, and in the offices of International Economic Policy and Trade Development. The NMFS conducts its activities through its regional offices and the Regional Development Foundations. Through sales missions and shows the U.S. is attempting to expand its base of exporters while strengthening existing markets and developing new ones.

Fish and Chips

In addition to trade promotion activities, Government-to-Government consultations have been used to improve opportunities for the U.S. fishing industry to grow and develop. When the AFPA amendments to the Magnuson Act were passed in December 1980, the U.S. was suddenly in an excellent position to use allocations as an instrument for developing the industry. The "fish and chips" policy of linking access to our fishery resources to foreign cooperation in the expansion of the U.S. fishing industry, especially by improving trade performance, was implemented and used in a number of meetings with European and Asian foreign officials. NOAA/NMFS succeeded in 1980 and 1981 in forming agreements with several GIFA nations, including Japan, Korea, Spain, and Portugal, in which those countries promised to provide specific trade and development-related benefits in exchange for favorable allocations recommendations. At the same time, we developed and put into effect a monitoring and evaluation system to use in the assessment of foreign performance under the AFPA criteria.

During the last few years, NMFS has worked very closely with ITA and USTR to reduce trade barriers in other countries and to expand exports. Both agencies, plus the Department of State, assisted NOAA in negotiating fishery trade understandings with Spain, Portugal and Japan. In 1980, this cooperative effort resulted in a trade agreement with Japan which changed the structure of several of Japan's import quotas. It also allowed new Japanese companies to receive portions of the quotas, rather than restrict imports to a few traditional companies. The policy of using fish allocations to gain trade and development benefits is an effective tool, and, will help our fishermen increase their share of available harvest in the USFCZ.

Trade Policy

Although fish and chips is an effective tool in our development strategy it is only a lever to gain trade access with GIFA countries. For countries which do not fish in U.S. waters or which fish at reduced levels, a different trade negotiation strategy is required. That strategy involves all of the major components of the trade establishment and entire matrix of the International Trade structure.

NMFS has worked with ITA, USTR, and the Department of State during the last few years to reduce and/or eliminate tariff and non-tariff barriers against the importation of U.S. seafood products. A good example of this cooperation is the agency's support of USTR negotiators in the Geneva Multilateral Trade Negotiations (MTN). During these consultations, we prepared background analyses and sent staff to attend certain negotiating sessions in Geneva to assist USTR officials in emphasizing, among other things, the importance of improved accessibility of U.S. seafood exports to the EC markets. Largely because of EC problems relating to their internal fisheries policies, they were quite unwilling to consider any relaxation in protective import regulations. Nevertheless, when the MTN was completed in 1979, it included some EC concessions in the form of staged reductions of fishery tariff rates.

In addition to coordinating with multilateral trade activities, such as the MTN, we have assisted our negotiators in bilateral trade talks affecting fisheries. This type of activity took place in 1980 and 1981 when the EC Commission proposed a package of new regulations affecting fisheries trade, and we quickly identified elements of that package which would hinder our exports to Europe and alerted USTR and the Department of State. Of particular concern to NMFS was an EC proposal to include such species as Pacific Salmon and American lobster in the list of species whose importation is governed by so-called reference prices, which are minimum import prices. The additional EC trade barriers, if implemented, would have affected U.S. exports valued at more than $100 million annually. A joint NMFS/USTR delegation went to Brussels in April 1981 to explain these concerns to officials at the EC Commission. With the help of strong support from the Department of State, the Congress, and the U.S. fishing industry, the U.S. succeeded in winning the EC's agreement to abandon their reference price proposals for Pacific salmon and American lobster.

The EC subsequently adopted and put into effect most of the originally proposed package of new trade regulations. An analysis of those regulations has lead to proposed talks with the EC on ways of mitigating their trade distorting effects. There is particular concern about the possibility that the EC reference price system could in the future be used to restrict imports of U.S. underutilized species, such as squid, and that EC export rebates could give their exporters an unfair competitive advantage in selling fishery products in certain third country markets.

Fish and Chips and Trade Policy

On some occasions we have been able to effectively combine our primary negotiating tools to achieve positive results. In 1980 increased Japanese auto imports and a general recession in the U.S. auto and parts industry caused the U.S. trade establishment to focus on Japanese imports. Although the Japanese agreed to voluntary restraints on auto imports, other U.S. commodity groups sensed growing frustration with the treatment U.S. imports received in Japan. This concern resulted in a number of reciprocity bills in the Congress which would significantly modify our free trade posture and require foreign imports to be treated in the same manner as U.S. exports were treated by foreign countries. This threat of an eye for an eye bilateral trade relationship cause considerable trade friction with Japan. A sub-cabinet level bilateral trade group was set up to resolve differences and in December of 1981 fisheries was added to the agenda.

In March of this year in Tokyo, the U.S. asked the Japanese to abolish their import quotas on fishery products, renegotiate the 1980 fishery trade agreement, and expand their joint venture purchases target to 400,000 tons. The Japanese agreed to reopen fishery trade discussions but balked at abolishing their import quotas and increasing their joint venture target beyond 200,000 M.T. in five years. Working group meetings in April in Washington resulted in Japanese acknowledgement that their import quota system might violate GATT and a further recognition that the IQ on roe herring was particularly offensive.

In April the U.S. cut the Japanese allocation off Alaska and urged the rethinking of their joint venture position. In May, the Japanese met in Washington D.C. and agreed to substantial changes in their import quota on herring. Prior to 1980, the Hokkaido Federation of Fishermen's Cooperative held 100 percent of this quota and doled it out to trading companies, while meeting daily to set prices on the herring imports. After 1980, Dogyoren, as the Federation is called, still held 90 percent of the total quota. Effective with the new agreement, as of April 1, 1982, there is a fourth processing entity receiving an import quota; Dogyoren's share has dropped below 50 percent.

Following this agreement, the discussions turned to joint ventures and with the assistance of ITA, the Department of State, Congress, the State of Alaska and the U.S. industry, Japan agreed to a meeting. In June, in Seattle, industry from both sides as well as Government officials met to reach agreement on extensive increases in the tonnage of fish to be purchased by Japanese companies. The agreement calls for 120,000 tons to be purchased by May 31, 1983 and an additional 200,000 tons by May 31, 1984. After 1984, experience will dictate the amounts to be purchased.

The Japanese example shows how the entire trade establishment, including the Congress and States can work together to make a significant contribution to the U.S. industry.

Wholesale Price Determination in the Salmon Market

Rebecca J. Lent
Oregon State University
Corvallis, Oregon, USA

Pacific salmon is harvested in several countries of the world. The major producers are the U.S., Canada, the U.S.S.R. and Japan. These salmon are marketed worldwide and in a variety of product forms: fresh, frozen, canned, smoked, etc. This paper examines the wholesale market for U.S. Pacific salmon, both domestic and foreign. Economic theory provides a framework for discussing what factors determine wholesale prices of salmon. Industry supply and demand are considered, as well as decision-making at the firm level by Pacific salmon processors. Finally, the historical patterns of distribution of U.S. salmon products are presented as well as descriptions of the major markets.

Price Theory, Equilibrium and the Wholesale Market for Pacific Salmon

The purpose of market theory, as with all of economic theory, is to simplify and represent. Assume the following simplified marketing chain:

FISHERMAN ⟶ WHOLESALER ⟶ RETAILER ⟶ CONSUMER[1]

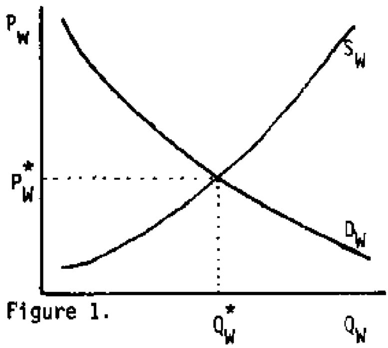


Figure 1.

where retailers include stores, restaurants and institutions. Assume we are examining the wholesale market for one salmon product (e.g., frozen 6/9 troll coho). Economic theory states that under perfectly competitive market conditions the wholesale price of this good as well as the quantity sold will be determined by the intersection of wholesale market demand and supply (see Figure 1). The supply curve (S_W) is that of wholesalers, while wholesale demand (D_w) is that of retailers.

Economic theory postulates that the amount of salmon sold by wholesalers will be positively related to the price offered - i.e. the market supply curve is positively sloped. Under perfectly competitive conditions (with perfectly price-elastic supply curves for inputs) industry supply is the sum of the individual firms' supply curves. Each firm's supply curve is the marginal cost curve above minimum average cost (see Figure 2).

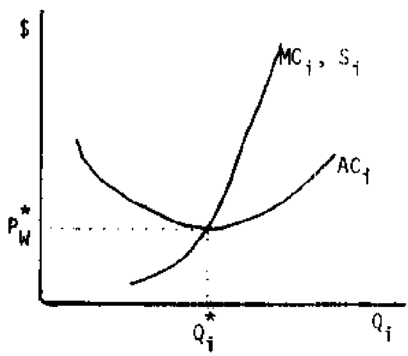


Figure 2.

Costs for salmon producers in the U.S. include expenditures on raw fish at the ex-vessel level, labor and capital (building, equipment, etc.). Individual wholesalers are price takers under these competitive market conditions. The theory of the firm assumes that producers maximize profits. This is assured by equating marginal cost to marginal revenue, which is equal to average revenue and to the market price. In the long run, all firms have zero profits, that is, they are operating at Price = Marginal Cost = Minimum Average Cost (Q_i^* in Figure 2).

Wholesale demand for the coho salmon product, D_w, is actually retailers' demand, and it is derived from consumer demand. As with the supply curve, D_w is the sum of individual retailers' demand curves. Thus, those factors influencing consumer demand play a role in determining wholesale demand. The economic theory of consumer demand hypothesizes that the following variables determine an individual's demand for a good:

1) price of the good in question

2) income level of consumers

3) price of substitute goods for the good in question

4) tastes and preferences

In considering the international market for Pacific salmon, other factors will influence consumer, thus wholesale, demand: exchange rates, tariff and non-tariff barriers to trade, transportation costs and foreign supply (or price) of salmon. In addition to consumer demand, the wholesale demand for salmon will be affected by the retailers' costs of processing salmon into the form purchased by the consumer. Such costs include the expenditures on fish purchased from wholesalers, storage costs, transportation, labor, processing equipment (e.g., refrigeration equipment) and other capital expenditures. Like wholesalers, retailers are assumed to be profit maximizers; they base their salmon purchasing decisions on consumer demand as well as operation costs. They are also "price-takers" under the assumption of perfectly competitive market conditions. Given their own demand curve and the given market price, they can determine the optimal amount of salmon to purchase.

The market theory described above is an equilibrium theory; the positions described, i.e. demand equals supply, all firms operate at price equal to marginal cost, etc., are attained only in the long run, that is, after all adjustments have been made. Any disturbance to the system will result in readjustment, with a move to a new long run equilibrium. For example, an increase in the cost of labor will shift the industry supply curve leftward. Price will increase as demand is greater than supply at the old market price, until a new equilibrium is attained (at a lower quantity). Actual conditions at the firm and industry level of the Pacific salmon market may not often permit the attainment of a long run equilibrium. As long as variables in the system are changing, the market is in a state of adjustment. Nonetheless, while economic theory as described above may appear simplistic and unrepresentative of individual firm activity, it may be a useful predictor of long-run economic behavior in the marketplace.

Before examining individual wholesaler behavior, it may be useful to discuss the assumptions of the perfect competition model. No firm or industry strictly meets all of the conditions for perfect competition, however this does not indicate that the model is useless or even limited. It has been said that the true test of a model is not in the realism of its assumptions but in its ability to predict. Thus, if our model predicts, as we discussed, that increased labor costs will, all other things being equal, result in a higher wholesale price of salmon, and this holds true in reality, then we have a good model. On the other hand, understanding how and why the Pacific salmon wholesale market diverges from perfect competition conditions will provide insight into the working of this market, particularly individual market participants' behavior.

Ferguson and Gould (1975) discuss four conditions characterizing perfect competition; each may be considered individually in terms of the extent to which it is met in the wholesale salmon market.

1) Every market participant is a price taker; the aggregation of individual decisions may lead to market equilibrium. However, as there are many buyers and sellers, no one participant can, in isolation, affect the process. In fact, however, most ex-vessel salmon processing and wholesale firms are large operations. In interviews (Lent, 1980) with Pacific salmon buyers, both domestic and foreign, it was described that some industry members believe that certain large-volume buyers could to some extend affect market price, if only by the size of their purchase.

2) The good in question is assumed to be homogeneous across all producers. It is probably safe to say that no two salmon are exactly alike. There are many dimensions to a salmon product: species, size, gear-type, geographical origin and quality. A frozen 6/9 troll coho salmon may vary considerably between two sellers. Stigler (1964) identifies another dimension of homogeneity: homogeneity of transactions. A seller may differentiate among buyers along four dimensions: (1) ease in making sales; (2) promptness of payment; (3) penchant for returning goods; and (4) likelihood of buying again. Items (3) and (4) appear to be particularly relevant to the salmon market where

supply may vary, as well as quality. Customer loyalty plays a special role in the seafood market.

3) Under perfect competition all resources should be perfectly mobile, with non-monopolized inputs and free entry and exit of the firms. As discussed above, salmon wholesalers tend to be large firms; one explanation for this feature of the market is the presence of high entry costs for seafood processing, such as seaside property, freezing and processing equipment. It may also be hypothesized that the uncertain nature of the seafood processing industry, due to factors such as fluctuating supplies, various management measures and even "Mother Nature," make this a risky business; larger firms may be better suited for survival under such conditions.

4) Finally, perfect competition implies that all market participants have perfect knowledge, including input and output prices and perfect foresight into the future. This statement does not hold true in any industry; however, the seafood business represents a relatively stronger violation of this particular condition. As discussed above, there is significant uncertainty in the seafood business. Information on market conditions, aside from the usual informal channels, is not as readily available in the fish processing industry as in others, such as agriculture.[2] Hindsight and experience may be the best sources of information in the seafood business.

While conditions in the Pacific salmon wholesale market diverge considerably from those of perfect competition, it is not immediately obvious that the industry is monopolistic or oligopolistic. The purpose of this exercise, in any case, is not to classify the salmon industry into a certain category. Indeed, some economists believe that the industry structure should be endogenous, rather than exogenous. Consideration of the appropriateness of various assumptions of the perfect competition model in the salmon market has in fact provided useful guidelines for examining peculiarities of this industry, including individual firm behavior. The following discussion considers how producers/wholesalers make their business decisions as they operate on a daily basis, and examines the relationship between these "micro" decisions and aggregate results.

The individual Pacific salmon wholesaler

Assume for simplicity that each salmon wholesale firm is operated by its owner, rather than by hired managers. Thus, all profits and other benefits to the firm accrue to the decision-maker, the manager/owner. This individual is assumed to have a utility function composed of various variables. Some of the factors in the utility function refer to events or states in the manager's life which are not directly related to his business (e.g., family life, entertainment, friends, health, etc.). All of these factors, which play a role in determining this individual's utility function, will be ignored in this discussion: they may be assumed to be held constant, such that they affect only the absolute value of the utility function, or they may be assumed to be nonexistent. We are also assuming that we may consider the case of the "typical" manager; obviously there will always be peculiarities inherent in each individual.

There has been considerable controversy surrounding the assumption in economic theory that firms maximize profits (regardless of industry structure). Other factors, such as total sales, sales as share of industry sales, longevity of the firm and productivity of the firm have been suggested as other components of "success." In this analysis, it is assumed that the manager maximizes his expected utility, and that profits are but one element in the utility function. Expected utility is used because of uncertainties in the market (e.g., future demand conditions, landings of Pacific salmon, etc.). The manager's expected utility function is hypothesized to have the following general form:

$$EU = f(\pi, TR, TR\%, Y, AP_1)$$

where EU = Expected utility (per unit of time)

π = Profits

TR = Total revenue

TR% = Total revenue as a percent of total industry sales

Y = Firm's years in business

AP_1 = Average product of labor

All of the above components of expected utility are assumed to be positively related to EU, that is, a unit increase in any factor will increase EU. It should be noted that the components of EU are not necessarily independent; e.g., increased TR implies increased π, ceteris paribus. It is assumed, thus, that the manager maximizes expected utility (EU) subject to certain constraints. These include:

1) Market demand;

2) Competition from rival salmon wholesalers;

3) Availability of inputs (fish, labor, etc.);

4) Availability of information;

5) Manager's risk preferences;

6) Total cost functions.

The manager's ability to perform well, that is, his level of profits, sales and other components of expected utility will depend upon at least three factors: his buying strategy for inputs, his production process and his sales strategy. These reflect the manager's entrepreneurial abilities. It will be assumed that the manager has discovered and is using the optimal buying strategy and production process. Thus, the sales strategy will be the focus of the following discussion.

Various factors come into play in the manager's sales strategy. First of all, the manager may either seek out buyers or wait for buyers to contact him. As there are costs involved in seeking out buyers, the firm would be expected to have some optimal level of searching, in addition to buyers contacting the firm. Managers must also decide whether to sell their salmon in large or small transactions. Given a fixed amount of, say, frozen salmon to sell, the manager faces a tradeoff. Smaller transactions may be preferable as they are more numerous, given a fixed total amount to sell, and managers gain information on market conditions with each sale. Conversely, transactions costs are higher with small sales than with larger volume sales. Another factor in sales strategy is customer preference; by "choosing" to sell to certain retailers (and choosing not to sell to others) the manager may be able to increase profits. This relates to Stigler's idea of homogeneous transactions discussed earlier. A manager may also be able to benefit from tie-in sales; there has been some evidence of such sales strategy in the fresh and frozen Pacific salmon wholesale market, where a customer is offered a good price on, for example, troll chinooks if he agrees to purchase a load of small pink salmon. The manager's ability to take advantage of different demand elasticities across regions may enable him to profit from varying "urgencies of purchase" (Stigler, 1964). The marketing strategy used by the manager will influence the level of sales (hence profits) of the firm. However, the level of market demand and the presence of competition from other firms will always be an upper limit to the firm's success.

Using the Theory

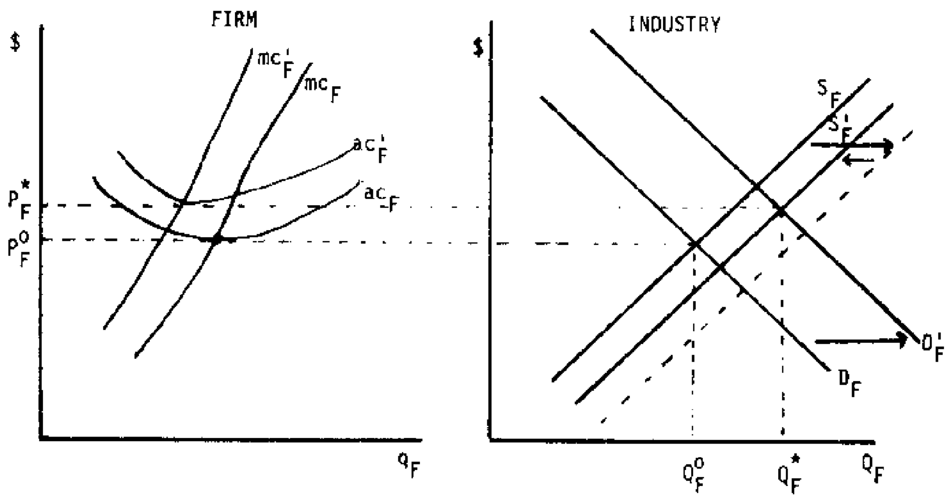
Demand for fresh/frozen sockeye rose dramatically in the late 1970s, primarily due to increased Japanese demand. As a result, prices of both fresh/frozen and canned sockeye shot up, with repercussions in the canned and fresh/frozen markets for other species of salmon. We may use some of the ideas discussed above to trace through the impact of this increased fresh/frozen sockeye demand on the individual firm and the markets.

We begin with an equilibrium position (see Figure 3). The firm is operating at price equal to marginal cost, at zero profits, and demand equals supply in both markets. Now we introduce an exogenous change; demand for fresh/frozen sockeye increases; we will assume that all other market conditions remain constant. At P_0^F, demand exceeds supply, thus the price begins to rise; this causes profits to appear at the firm level, attracting new entrants to the fresh/frozen sockeye industry, and shifting out supply. Given a fixed amount of sockeye to process, the supply of canned sockeye decreases. Pecuniary externalities to the firm will raise the costs in the fresh/frozen industry; increased demand for inputs needed to "produce" fresh/frozen sockeye, including the fish, will raise marginal and average costs, shifting the supply curve leftward and squeezing out profits.[3] In the canned sockeye industry, there will be two opposing pecuniary externalities: an increase in the price of sockeye and a decrease in processing costs (due to reduced demand for canning production inputs). Assuming the net effect is one of increased costs, we reach a new equilibrium at P_c^*, Q_c^*. Meanwhile, higher prices for sockeye salmon products increases the demand for other species of salmon in the fresh/frozen and canned market. The closest substitute for canned sockeye, for example, is another species of canned salmon. These substitutional effects will result in upward pressure on prices of other salmon products.

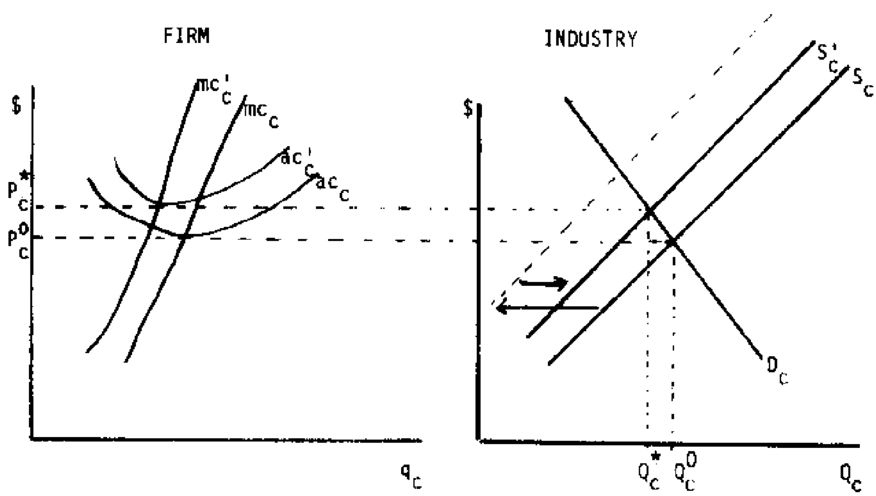
The attainment of a new equilibrium as discussed above will be hampered by less than perfectly competitive conditions in the salmon wholesale market. First of all, it may take some time for all wholesalers to

Figure 3

FRESH/FROZEN



CANNED



become aware of the increased price bids for fresh/frozen sockeye, as information is neither pervasive nor free. Once a wholesaler is aware of the new market conditions, he may not immediately shift into selling frozen sockeye to the new buyers offering higher prices. If customer loyalty or preference is important, a larger price differential may be required to shift to a new buyer. Also, given a fixed supply of sockeye, the shift from canned to fresh/frozen processing will not be instantaneous. Wholesalers need time to sell old equipment and buy the new. The risks involved in this shift (will the price of fresh/frozen sockeye stay at P_F^*?) may also require a larger price increase before undertaking the change in production. In the long run, wholesalers will make those decisions which will lead to maximized expected utility. While this may not result in an equilibrium at precisely P_F^*, Q_F^*, P_C^*, Q_C^*, the <u>direction</u> of change should be as predicted by our model.

The next section presents a general discussion of trends in the international market for Pacific salmon. An attempt is made to interpret reported data by integrating notions from the "equilibrium" and "firm behavior" analyses as outlined above.

Marketing

The U.S. Pacific salmon fishery, one of the highest-valued species produced, is located on the coasts and inland waters of Alaska, Washington, Oregon and Northern California. There are five species harvested in the U.S.: chinook, coho, sockeye, chum and pink. Trolling and seining are used in the ocean for harvesting salmon, while the river fishery relies on gillnetting. Pacific salmon are marketed in many countries of the world and in various product forms. Often the salmon are imported by a non-producing country (or region), processed and re-exported. There may also be some trading between producing countries. Figure 4 demonstrates the marketing channels possible for U.S. salmon. This section examines some of the domestic and overseas markets for U.S. Pacific salmon.

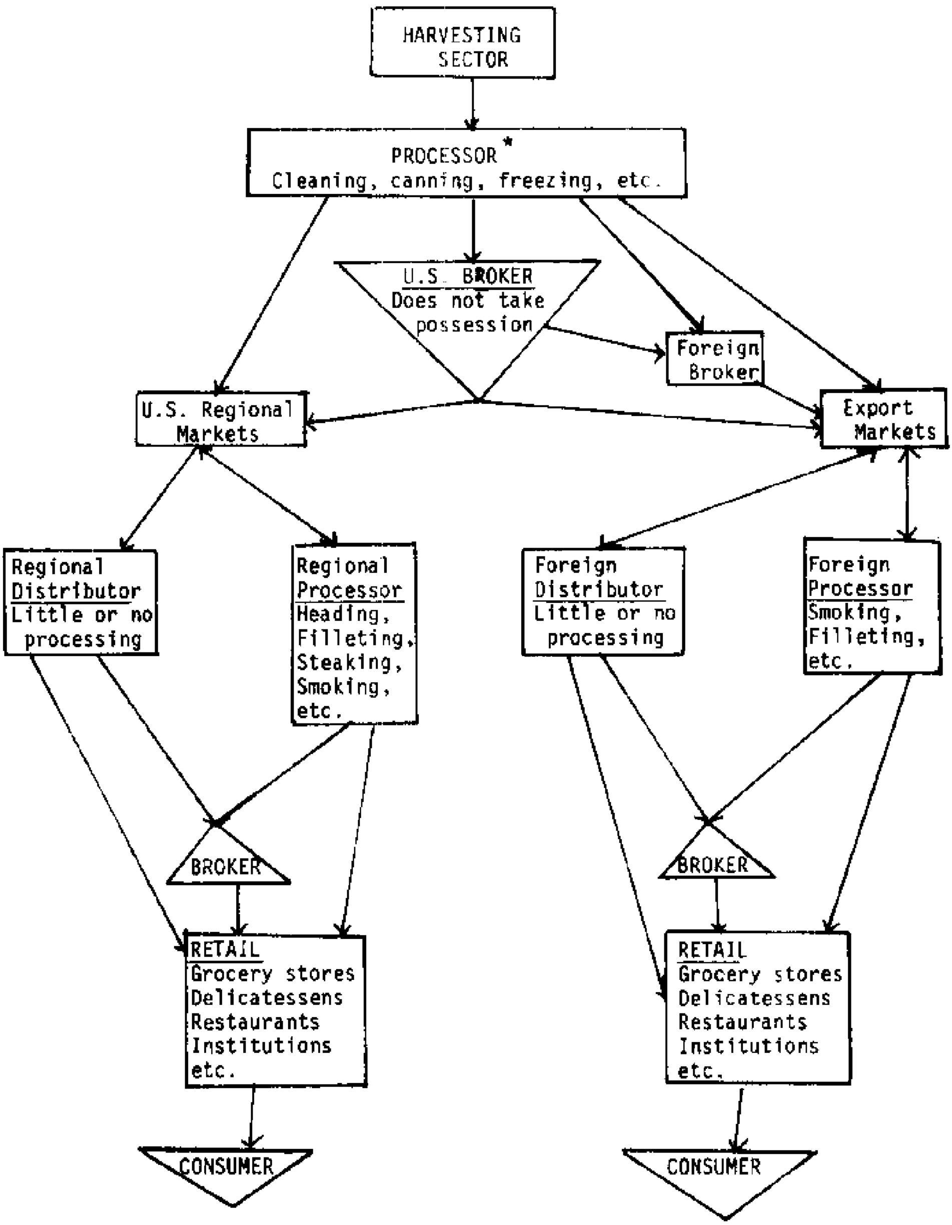
Before undertaking this discussion, it may be useful to consider the importance of the various types of salmon products. Pacific salmon from the U.S. are distinguished along several dimensions in their fresh and frozen form:

1) Species: chinook, coho, sockeye, chum or pink; coloring and oil content vary across species;

2) Size of individual fish: e.g., 2/4 lb. coho vs. 6/9 lb. coho; smaller fish tend to have different markets than larger fish;

3) Gear-type: troll, seine or gillnet; troll-caught fish are considered to be higher quality than gillnet fish because: (i) troll-caught fish are generally in better condition than gillnet as they are harvested on a hook and line, not in a net where bruising and other damage may occur; (ii) troll-caught fish are usually cleaned and/or iced on the fishing boat, (iii) gillnet fish are harvested during the "spawning phase" of the salmon when the meat is of lower quality;

Figure 4. Marketing Channels of U.S. Pacific Salmon



*There is also an undetermined volume of salmon traded between processors

4) Geographical origin of the fish; e.g., "Yakutat chinook" vs. chinook from Oregon;

5) Some processors keep records which enable them to distinguish between salmon from a "day boat" and salmon from a "trip boat", or salmon from a vessel whose operator is known to handle the fish better than other fishermen; the distinction may be profitable inasmuch as the processor or wholesaler may demand a higher price for the higher quality, better-handled fish.

Although these distinctions are important in the salmon wholesale market, the consumer may not realize what type of salmon he is purchasing at a grocery store or at a restaurant. Where in the market chain does the fish lose its identity? Consumers are interested in product quality, at least in terms of freshness and lack of bruises. however, species, gear-type and origin of the salmon may not be important to most consumers. Wholesale buyers, such as buyers for a supermarket chain, may purchase only certain "types" of salmon because in that way they can be assured of relatively consistent quality. Thus, the presence of many varieties of Pacific salmon presents an interesting complication in examining its market.

Domestic markets for Pacific salmon

The bulk of the U.S. canned Pacific salmon pack is sold in domestic markets: 71% of the 1981 pack was consumed or stored domestically (Earley et al., 1982). U.S. consumers capture a much smaller share of the fresh, frozen and cured salmon market, less than 32% of the total production in 1981 (Earley et al., 1982). Over the past decade, per capita consumption of canned salmon in the U.S. has fluctuated, with 1981 levels below those of 1970. The hypothesized reasons for this decline include:

1) Increased consumer preference for fresh and frozen fishery products, thus an increased demand for fresh and frozen Pacific salmon which "bids" the fish away from the canning market;

2) Canned tuna competes with canned salmon and thus limits salmon demand;

3) Canning costs, such as labor and materials have increased considerably;

4) Technological improvements have lowered the costs of storing and transporting frozen seafood products.

In contrast, domestic consumption of fresh, frozen and cured Pacific salmon has been increasing, primarily due to increased supply (hence lower prices). A large share of fresh and frozen salmon sold in the U.S. is consumed in restaurants, and as real per capita income rises in the U.S., more meals are consumed away from home. The species and gear-type of salmon purchased by restaurants is generally related to the the type of establishment. The higher-class, "white tablecloth" restaurants may tend to purchase more troll-caught salmon, chinook or coho, while less expensive, "family-type" establishments may purchase other species and gillnet salmon. There has also been an increase in the U.S. in the availability of fresh and frozen salmon in supermarkets and other retail outlets. Again, the species and gear-type will vary, however, the smaller-sized fish are generally more popular for sales of whole or half fish. Some restaurants or stores may switch from troll to gillnet fish or from, say chinook to sockeye solely because they insist on offering fresh salmon rather than frozen. There are thus a myriad of factors underlying wholesalers' choice of type of Pacific salmon. The smoking markets are important in the U.S., particularly in the Los Angeles, Chicago and New York areas. Large, troll-caught chinooks and cohos are the favored species in the smoking trade; large sizes result in less handling per pound of product, while a troll-caught fish will show fewer bruises when processed. However, in this market as well as others, there has been substitution of lower-priced species and net-caught salmon.

Overseas markets for Pacific salmon

U.S. exports of fresh and frozen salmon have been increasing dramatically over the past two decades (see Table 1). In 1981, 29% of the canned and nearly 70% of the fresh and frozen salmon pack were exported (Earley et al., 1982). Thus, foreign demand for Pacific salmon is of great importance to the U.S. industry. Major importing countries include Japan, various countries of the European Economic Community (EEC) and Canada.

In examining foreign markets for Pacific salmon, it is important to consider what factors affect the demand for salmon overseas. As in domestic markets, income (see Table 2) and prices of substitutes have a direct effect on demand. In the case of foreign demand, however, new variables come into play, such as:

1) Exchange rates; a recent surge in the value of the U.S. dollar has made Pacific salmon more expensive overseas, thus dampening foreign demand (see Table 3);

2) Tariff and non-tariff barriers to trade; Table 4 presents EEC and Japanese import tariffs on fresh and frozen salmon. A reference price on salmon imports was recently proposed by the EEC; U.S. agencies succeeded in blocking the measure, recognizing its potential for harming the U.S. salmon industry; embargoes have also had detrimental effects on the industry;

3) Transportation costs; overseas consumers pay a premium on their Pacific salmon for the cost of shipping it from the U.S.; as energy costs rise, transportation becomes even more expensive;

4) Domestic supply of salmon; Japan has her own Pacific salmon fishery, while Europe has an increasing supply of Atlantic salmon.

The domestic supply of Pacific salmon in Japan was severely curtailed in the 1970's with restrictions placed on Japanese fishing activity in Soviet and U.S. waters. This factor, coupled with rising population and income in Japan led to increased imports of Pacific salmon. Japanese purchases of fresh and frozen U.S. salmon grew dramatically in the late 1970's, peaking in 1981 at over 131 million pounds. By value, these 1981 imports represent over 67% of total U.S. fresh and frozen salmon exports. Sockeye salmon are the favored species in the Japanese market, inthe gutted and head-on "princess-style" fashion; quality

Table 1. U.S. EXPORTS OF SALMON

A. Fresh, Chilled and Frozen

Units: Q = thsd. pounds
V = thsd. $ U.S.

YEAR	TOTAL		FRANCE		SWEDEN		DENMARK		WEST GERMANY		BELGIUM		JAPAN		CANADA		U.K.	
	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V
1960	2849	1677	747	485	14	8	1	1	1	1	210	139	855	457	654	369	243	154
1961	1094	647	329	203	6	4	1	1	25	14	72	51	60	0	390	192	208	141
1962	1508	671	584	359	20	12	0	0	15	13	139	89	0	0	433	197	244	136
1963	4888	2530	1549	803	24	14	52	30	136	83	172	128	4	1	1252	582	1476	771
1964	22560	5371	2298	1290	169	79	65	41	34	21	184	113	16067	1947	1364	542	2139	1178
1965	10559	5330	2612	1449	833	430	73	41	170	83	393	253	1327	567	2466	997	2287	1207
1966	17845	10626	4762	2978	1634	888	408	204	327	225	524	358	2468	920	3779	1428	5136	3168
1967	18911	11846	5216	3724	1621	889	171	105	443	332	667	514	2218	885	2527	1275	4635	3180
1968	16234	10076	4031	3095	1806	931	53	35	196	176	671	511	2902	1130	1255	651	4360	2911
1969	30553	19060	4370	3635	2367	1587	445	177	444	415	780	659	14437	1345	2567	1493	3977	2845
1970	28201	18145	5605	4946	3012	1869	698	[illegible]	401	369	1113	810	[illegible]	3826	4361	1940	4227	3338
1971	32891	21258	6955	5065	3389	2057	456	298	536	450	1152	961	9492	4901	3963	2433	4672	3542
1972	34685	28451	10608	10065	6302	4703	545	445	770	680	1502	1321	3445	1728	2697	1654	6232	5666
1973	60742	59641	9477	9799	4105	4067	511	527	1257	967	2412	2439	27567	26776	4664	4070	6056	7676
1974	28067	34924	7289	10043	4278	4690	600	720	905	1414	1970	2665	4266	4681	3237	3347	3547	4075
1975	48229	66863	15243	22328	5267	6572	1643	2069	1795	2967	2433	3679	10148	14085	2880	3512	6005	7202
1976	41921	75645	15054	29352	4019	6334	1788	2741	1714	3859	2633	5369	5147	8535	2778	4061	3535	8684
1977	69844	125396	14050	30374	4121	5068	1772	2827	1870	4412	1949	4263	33663	60595	5846	5854	3784	5374
1978	125771	276257	12535	31844	4170	6488	976	1754	2244	5610	1770	4340	89806	203989	3948	5035	6106	10226
1979	144365	311594	17686	50989	6151	9670	1443	2909	2985	8595	2841	8404	95276	195545	7231	10544	6602	14050
1980	125465	207071	14640	32976	5162	8269	1294	2448	2265	6192	2591	5935	67626	106513	20151	21730	5927	10325
1981	204130	374326	18689	41700	4062	6051	4690	2855	1183	2719	2587	5941	131332	253330	24780	26275	8973	14446

Source: U.S. Department of Commerce.

Table 1. (Cont.)

B. CANNED

Units: Q = pounds
V = $ U.S.

YEAR	TOTAL		NETHERLANDS		BELGIUM-LUXEMBOURG		JAPAN		FRANCE		U.K.	
	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V
1960	11923969	9829813	545462	397749	133388	104947	1562	706	23561	19400	6294414	7056916
1961	7185705	5580264	718037	518203	59566	48151	600	270	0	0	3967994	3055804
1962	8978323	7292239	498023	349226	84692	58176	0	0	9832	4412	6575571	5621589
1963	10228001	8238970	551178	397371	67130	47073	0	0	86671	50901	6858746	6006268
1964	20923807	14851598	3363444	1242549	1484253	637500	0	0	294937	145220	14794852	11558669
1965	24892169	15916426	2821930	1681237	1384007	751035	0	0	430798	275455	16550962	10842957
1966	20483682	14561041	1320032	922773	640049	406242	0	0	157804	113671	14358037	10471446
1967	20543340	15592579	1611998	1091020	480930	296058	64428	84870	23820	19863	16324914	12700570
1968	5725748	4603823	1121790	803168	66732	37959	0	0	89190	43489	3305063	2636667
1969	15536243	11565262	1808910	1331375	993505	651952	0	0	0	0	8122832	6383665
1970	16811470	13134409	1671380	1334708	769654	466777	15370	19946	158159	146506	[illegible]	[illegible]
1971	18232465	15928687	1964168	1605945	307354	225652	209750	315667	147150	115886	10364033	9513346
1972	21358167	20898479	1387335	1417921	96547	81952	511660	273712	116137	119417	15831708	[illegible]
1973	16941233	26812872	1040971	1137636	516347	438098	[illegible]	[illegible]	15464	21572	13463767	[illegible]
1974	8319707	13257682	412857	662120	463381	627859	44406	155600	0	0	5527896	[illegible]
1975	22504320	34552270	1708804	2607527	1161341	1743955	137211	160989	213143	327196	13894907	22386650
1976	19588270	33865349	2405529	4131727	1344563	1973108	200795	321074	148647	363201	[illegible]	[illegible]
1977	21274644	34031122	2537321	4791550	1189505	1654710	[illegible]	1453015	554965	1135689	[illegible]	[illegible]
1978	32513117	49239691	4997657	7217717	1953644	2681637	1505265	2587669	681597	1092024	9839605	16682130
1979	50718755	91917000	5720109	9702000	3360237	4694000	[illegible]	5512000	570961	1199000	18296070	37573000
1980	74006000	149971000	7354000	14183000	4465000	7448000	527000	1163000	454167	2333000	33012000	72388000
1981	63494000	128616000	4865000	9345000	2972000	5043000	1241000	2673000	656052	1125985	30084000	64192000

Source: U.S. Department of Commerce.

Table 2. National Income, 1946-81

YEAR	U.S. $U.S. bil.	CANADA Can.$ mil.	FRANCE F.Francs bil.	U.K. £ mil.	W. GERMANY D. Marks bil.	JAPAN Yen bil.	DENMARK Kroner mil.	BELGIUM B.Francs bil.	SWEDEN Kroner mil.	ITALY Lire bil.	NETHERLANDS Guilders mil.
1946	180.3	9821	25.96	8662	0	387	13260	190.6	21790	0	9326
1947	198.7	10985	33.03	9250	0	1041	14580	214.5	23536	5178	1250
1948	223.5	12560	54.30	10216	29.9	2124	15809	243.9	26380	5943	12887
1949	216.3	13194	65.39	10926	63.1	2884	16678	249.1	27220	6093	14112
1950	240.6	14550	71.17	11515	71.5	3684	18854	265.0	29210	6619	15624
1951	278.5	16555	91.7	11757	90.3	4348	19517	313.1	32827	7924	16969
1952	291.6	18623	106.7	12707	102.8	4959	20816	320.5	36180	8394	17739
1953	304.5	19267	111.6	13604	110.6	5647	22014	331.9	36453	9410	19146
1954	300.3	19002	119.0	14535	119.7	5984	22733	347.2	38776	9931	21606
1955	328.4	20690	129.2	15361	137.5	6528	23334	367.4	41523	10859	24565
1956	348.6	23118	143.3	16746	152.1	7352	24892	390.8	44895	11614	26510
1957	364.4	23950	159.6	17675	165.8	8201	26412	411.4	48264	12514	29045
1958	364.7	24919	180.0	18413	177.5	8341	27515	413.8	50195	13466	29614
1959	396.5	26628	193.4	19163	192.2	9631	30429	424.2	53006	14338	31700
1960	417.0	27400	231.0	20900	236.0	12816	33100	458.0	60800	17506	35100
1961	430.0	28200	251.0	22400	258.0	15156	36900	481.0	66400	19446	37000
1962	461.0	30600	280.0	23400	277.0	17348	41300	515.0	71200	21958	39600
1963	458.0	30800	312.0	25000	296.0	19900	43200	553.0	77200	25215	43100
1964	522.0	32800	343.0	26900	324.0	22752	49500	622.0	86100	27591	51100
1965	568.0	35300	368.0	28700	355.0	25430	55300	677.0	94600	29665	56900
1966	625.0	38800	399.0	30200	377.0	29181	60100	721.0	102400	32235	61600
1967	658.0	43100	430.0	31800	375.0	34505	66000	763.0	109900	35378	67800
1968	718.0	46100	478.0	32500	415.0	40817	70900	816.0	115600	38254	74600
1969	775.0	50500	549.0	35100	459.0	47459	80100	910.0	138750	41687	83800
1970	879.0	74901	724.4	45963	610.8	61929	107261	1050.0	155118	53270	105257
1971	949.0	82085	804.3	50928	673.2	69059	117547	1168.0	156290	57705	118550
1972	1040.0	91620	895.0	55133	735.2	79286	133668	1280.6	180354	63023	135170
1973	1171.0	108792	999.7	66130	824.4	96930	150281	1630.0	198173	75004	154650
1974	1255.0	128386	1138.8	74397	861.3	114406	165128	1914.0	222885	89322	171090
1975	1332.0	142169	1275.9	92776	917.4	132526	181586	2109.0	257305	100541	184530
1976	1505.0	167474	1482.3	109364	999.2	149303	208501	2415.0	288040	127292	214450
1977	1666.0	185700	1672.0	124700	1064.3	158956	250500	2630.0	339800	153231	237600
1978	1878.0	202400	1900.5	144097	1149.0	172980	283300	2787.0	432490	242700	254980
1979	2112.0	230800	2171.1	169600	1246.0	188438	312000	2966.0	407090	242722	269280
1980	2298.0	255600	2456.8	197900	1316.0	203165	330000	3139.0	462100	305051	299700

Source: International Monetary Fund Montly Bulletin, various issues.

TABLE 3. EXCHANGE RATES

Units: Foreign currency per U.S. $1.00

YEAR	CANADA	FRANCE	NORWAY	W. GERMANY	JAPAN	U.K.	DENMARK	BELGIUM	SWEDEN	ITALY	NETHERLANDS
1960	.9962	4.903	7.150	4.171	359.6	.3567	6.906	49.70	5.180	620.60	[illegible]
1961	1.0431	4.900	7.140	3.996	361.6	.3562	6.880	49.78	5.165	620.60	3.600
1962	1.0778	4.900	7.150	3.998	359.6	.3569	6.902	49.75	5.188	620.60	3.600
1963	1.0809	4.902	7.140	3.975	362.0	.3575	6.911	49.63	5.200	622.36	3.600
1964	1.0741	4.900	7.140	3.977	358.3	.3584	6.921	49.63	5.148	624.80	3.592
1965	1.0750	4.902	7.150	4.006	360.9	.3568	6.891	49.64	5.180	624.70	3.611
1966	1.0836	4.952	7.160	3.977	362.5	.3584	6.916	50.05	5.180	624.45	3.614
1967	1.0809	4.908	7.150	3.999	361.9	.4155	7.462	49.63	5.165	625.86	3.596
1968	1.0728	4.948	7.150	4.000	357.7	.4194	7.501	50.14	5.180	623.50	3.606
1969	1.0731	5.558	7.150	3.690	357.8	.4166	7.492	49.67	5.170	625.50	3.624
1970	1.0103	5.520	7.140	3.648	357.6	.4176	7.486	49.66	5.163	623.00	3.597
1971	1.0022	5.224	6.703	3.268	314.8	.3916	7.061	44.76	4.858	594.00	3.254
1972	.9956	5.125	6.640	3.202	302.0	.4259	6.846	44.06	4.743	582.50	3.226
1973	.9958	4.708	5.728	2.703	280.0	.4304	6.290	41.32	4.588	607.92	2.824
1974	.9912	4.445	5.205	2.410	301.0	.4258	5.650	36.12	4.081	649.43	2.507
1975	1.0164	4.486	5.585	2.622	305.2	.4942	6.178	39.53	4.365	683.55	2.688
1976	1.0092	4.570	5.785	2.362	292.8	.5674	5.788	35.98	4.126	875.00	2.457
1977	1.0944	4.705	5.339	2.105	240.0	.5247	5.777	32.94	4.669	871.50	2.280
1978	1.1860	4.180	5.022	1.828	194.6	.4915	5.090	28.80	4.295	829.70	1.969
1979	1.1680	4.020	4.926	1.731	239.7	.4496	5.365	28.05	4.146	804.00	1.905
1980	1.1950	4.516	5.180	1.959	203.0	.4193	6.015	31.52	4.373	930.50	2.129
1981	1.1860	5.748	5.807	2.255	219.9	.5241	7.325	38.46	5.571	1200.00	2.468

Source: International Monetary Fund Monthly Bulletin, various issues.

Table 4. IMPORT TARIFFS ON FRESH, CHILLED AND FROZEN SALMON

European Economic Community

Date	Advalorem Duty 1/ Autonomous	Conventional
1 January 1971	16	8.4
1 January 1972	16	8
1 January 1973	16	8
1 January 1974	16	8
24 November 1975	16	4
15 November 1976	16	4
14 Nobember 1977	16	4
1 December 1978	16	4
31 December 1979	16	3.8
24 November 1980	16	3.5

1/ This tariff has been suspended until early 1981 for several years.

Source: Official Journal of the European Communities, various issues.

JAPAN

Date	Advalorem Duty General	GATT	Preferential	Temporary 1/
April 1, 1966	10			
April 1, 1969	10			8
December 31, 1969	10	8		7
March 31, 1970	10	8		7
December 31, 1970	10	7		
April 1, 1974	10	5		5
March, 1979	10	5		5

1/ "For the purpose of assessment of duty, a 'GATT' rate shall be applied before a 'Temporary' rate and a 'Temporary' rate shall be applied before a 'General' rate. If, however, a 'GATT' rate is higher than the other rates, the rate applicable shall be the 'Temporary' rate, or if not 'Temporary' rate is specified, the 'General' rate.

Source: International Customs Journal, No. 28, various editions; International Customs Tariff Bureau, Brussels, Belgium.

conscious Japanese consumers prefer head-on fish so that freshness may be better assessed. In 1981, chinook and chum salmon were also important species in U.S. exports to Japan. Also in this year, as in previous years, the U.S. continued to be Japan's major supplier of salmon, accounting for over 88% of total imports of fresh and frozen salmon, by value (Earley et al., 1982). Canned salmon is not imported in significant quantities by Japan from the U.S., however, imports have been increasing since the late 1970's. Salmon roe continue to be an important U.S. seafood export to Japan; in 1981, nearly 98% by value of U.S. salmon roe exports went to Japan (over U.S. $92 thousand; Earley et al., 1982).

Several countries of the EEC are significant importers of Pacific salmon, particularly France, West Germany and the United Kingdom. The U.S. and Canada are major suppliers, while fresh salmor imports come primarily from Norway.

France is the most important market for fresh and frozen Pacific salmon in Europe, the U.S. being the primary supplier. U.S. and Canadian exports of salmon to France have been rising steadily over the past few decades. An important source of demand is the smoking market. Much of the larger-sized troll chinook and coho salmon purchased by French importers are destined for the smoking trade. Some of these are re-exported to other countries (primarily European) after processing. Some gillnet fish are also entering the smoking market as pre-slicing and packaging of the product allows bruises and other flaws to be cut out of the fish. Smaller-sized gillnet salmon, such as chums and pinks, are also imported for sale in the growing super/hypermarket retail outlets. The demand for canned salmon in France, on the other hand, has always been low relative to fresh and frozen. The growth in demand for Pacific salmon in France may be attributable to the same factors as in Japan. French per capita income and population are rising, and domestic supplies of Atlantic salmon have long dwindled. Expansion in the smoking industry, particularly the pre-slicing and packaging production, as well as in the supermarket infrastructure have also been significant factors.

While Canada has been the primary supplier of frozen salmon to West Germany, the U.S. and, increasingly, Norway are also providing a significant share of imports. An estimated 75% of the Pacific salmon imported is destined for the smoking trade (Lent, 1980); these are usually troll chinook and coho salmon, as in France. A smaller percentage of the final, smoked fish product is re-exported than in France. Gillnet pinks and silverbrite chums are imported for retail marketing. As in France and Japan, rising per capita income is an important factor behind Germany's demand for Pacific salmon.

The United Kingdom has long been an important market for canned Pacific salmon. Japanese canned salmon, generally lower-priced, had dominated the U.K. market over the past two decades; since the late 1970's, however, the U.S. and Canada have captured the largest share. Sockeye salmon is acclaimed by the British as the favorite species for canned salmon due to its red color and oil content. Increases in the prices of sockeye over the past decade, however, have resulted in switching to the less expensive canned pink and chum salmon. Nevertheless, 1981 U.S. exports of canned salmon to the U.K. were dominated by sockeye.

Indeed, U.K. purchases of canned sockeye accounted for 60% by weight of total U.S. sales of canned sockeye (Earley et al., 1982). Canned salmon is popular in the U.K. for use in salads and in sandwiches, particularly at afternoon teas. The fresh and frozen market for Pacific salmon in the U.K. is but a fraction of that for canned salmon. The value of U.K. imports of fresh and frozen salmon from the U.S. in 1981 was 22% that of the canned salmon imports. Small coho salmon are preferred for the fresh and frozen trade, however, as in the canned market, other species (chums and sockeyes) have been imported as coho salmon prices rise.

As for other markets for Pacific salmon, Denmark's imports of fresh and frozen Pacific salmon from the U.S. surpassed West Germany's in 1981. Some of these imports are processed (e.g. smoked) and then re-exported. The Danish smoking process is popular throughout Europe. Sweden, which is not an EEC country, has its own Baltic Sea Atlantic salmon fishery, supplying approximately 10% of her domestic salmon consumption. U.S. exports of fresh and frozen salmon to Sweden have increased since the late 1960's, reaching over 5 million pounds in 1980. The growth of supermarket chains in Sweden has fueled the sales of frozen foods, including Pacific salmon. Silverbrite chum and pink salmon are imported for sale in these retail outlets, in smaller sizes for sale whole or cut into roasts. There is also some processing of Pacific salmon imported into Sweden, such as "gravad lax" (pickled salmon) and smoked salmon.

Examination of the world market for Pacific salmon is not complete without considering the role of Atlantic salmon, particularly in the European market. Atlantic salmon (salmo salar) is pink-meated and oily like Pacific salmon, and was once abundant in the rivers and seas of Europe. Pollution, dams and overfishing had devastated the Atlantic salmon stocks by the late 1800's, many runs irreversibly destroyed. A small commercial Atlantic salmon fishery now exists in Scotland, perhaps due to private property rights, and in the Baltic Sea due to Swedish enhancement efforts. There is also a wild Atlantic salmon fishery off the West coast of Norway, although landings have been declining. The supply of Atlantic salmon is increasing, however, primarily due to the development and expansion of salmon farming in Norway. Since the early 1970's, Atlantic salmon (as well as pink-meated trout) have been raised in pens along the West coast of Norway. Production reached 4 thousand metric tons in 1979, of which 90% was exported fresh to countries in the EEC (see Table 5). Production is expected to continue increasing significantly in the 1980's. There is some evidence that the increased supply of farmed salmon may affect the European market for Pacific salmon. Pacific salmon have been imported by European countries to some extent as a substitute for Atlantic salmon. Indeed, many firms and processors importing Pacific salmon also purchase Norwegian farmed fish. These salmon are valued for their freshness, quality and uniformity. Many importers feel that because of the divergence in quality, Atlantic salmon are "in a market of their own" and do not compete directly with Pacific salmon (Lent, 1980). For example, Pacific salmon may be sold in a supermarket while farmed Norwegian salmon tends to be consumed in finer restaurants. On the average, farmed Norwegian salmon is more expensive than Pacific. However, as production increases in Norway, with a possible drop in price, the two fish prices may converge. Previous empirical studies

Table 5. EEC Fresh Salmon Imports from Norway

Units: Q = thsd. kg.
V - thsd. ECU

		W. GERMANY	FRANCE	BEL-LUX	U.K.	DENMARK	TOTAL
1981	V	7,347	10,405	1,963	(NA*)	6,705	26,421*
	Q	1,102	1,705	305		1,090	4,202
1980	V	6,572	6,110	1,353	840	4,799	19,674
	Q	774	784	165	106	625	2,454
1979	V	5,318	4,982	1,005	2,274	5,001	18,676
	Q	788	808	159	355	807	2,835
1978	V	2,484	1,870	1,040	1,145	1,156	7,718
	Q	454	272	158	207	214	1.309
1977	V	2,440	2,093	1,296	433	1,287	7,623
	Q	372	213	183	58	188	1,022
1976	V	1,119	1,120	88	66	690	3,223
	Q	190	224	15	14	127	599

Source: EEC Trade volumes, various issues
*Note U.K. trade data are not available for 1981.

have shown that the quantity of Pacific salmon demanded decreases as supplies of Atlantic salmon rise (or as Atlantic salmon prices fall). Increases in farmed salmon production thus appears to be important for the Pacific salmon market.

Conclusions

Pacific salmon landed in the U.S. thus are ultimately consumed in a variety of product forms (fresh, frozen, canned, smoked, etc.) in many different regions of the world. Factors underlying the final distribution of salmon products include consumer tastes, income, prices (of salmon and its substitutes), barriers to trade, exchange rates and transportation costs. Our discussion of the world market for Pacific salmon has revealed many complexities which warrant further study. The issues raised in examination of this market stem from attempts to understand what factors determine the wholesale price(s) of Pacific salmon and the distribution of sales. Economic theory provides a framework for studying the salmon market, first by explaining individual firm behavior and secondly by helping to understand how the aggregation of individual decisions leads to industry behavior and market equilibrium.

FOOTNOTES

1) With this simplification we're ignoring: sales between wholesalers or processors, brokers, distributors, etc.

2) Consider market news available from government agencies, futures markets, etc.

3) Ex-vessel demand and price of sockeye increase, given our assumptions.

BIBLIOGRAPHY

Buccola, Steven T. Risk Preferences and Determinants of Short Run Market Efficiency. Unpublished paper, Agricultural and Resource Economics Department, Oregon State University, Corvallis, Oregon, 1982.

Earley, J., Gerald Whittaker and Richard S. Johnston. An Analysis of International Trade in Salmon. Forthcoming report, Agricultural and Resource Economics Department, Oregon State University, Corvallis, Oregon, 1982.

Ferguson, C.E. and J.P. Gould. Microeconomic Theory. Homewood, Illinois, Richard D. Irwin, Inc., 1975.

Lent, Rebecca J., Gerald Whittaker and Richard S. Johnston, The Economic Response of Increased Salmon Landings. Paper presented at Salmonid Enhancement Symposium, Arcata, California, October 14-16, 1981.

Lent, Rebecca J. Interviews conducted with European firms importing Pacific salmon, Sea Grant sponsored research, 1980.

Stigler, George. "A Theory of Oligopoly", Journal of Political Economy, Vol. LXXII, No. 1, 1964.

This work is a result of research sponsored, in part, by the Oregon State University Sea Grant College Program supported by NOAA Office of Sea Grant, U.S. Department of Commerce, under grant number NA81AA-D-00086.

The author gratefully acknowledges the assistance of Richard S. Johnston and Mary Brock.

Market Aspects of the Joint Fishing Ventures in the Northeast Pacific and Alaska Waters

Vlad Kaczynski
University of Washington
Seattle, Washington, USA

Introduction

International joint fishing ventures expanded quickly in the Northeast Pacific and Alaska waters after implementation of the Magunson Fishery Conservation and Management Act in 1977.

These operations resulted in changes in harvesting costs and ex-vessel price of raw fish, as well as in foreign quota allocation and international trade of groundfish products originated from the U.S. fishery conservation zone.

The principal target species are Alaska pollock, Pacific hake, flatfish and other lower market value species, traditionally underutilized by the U.S. fishermen.

Joint ventures have been identified as contributing to the growth of the export opportunities for the U.S. harvesting sector and an unprecedented increase of the U.S. groundfish fishing potential and volume of catch. If properly managed, joint fishery ventures with foreign long-range fleet operators could lead to the overall development of the U.S. fishing industry. This in turn can accelerate the U.S. capability to use the entire biological surplus from the groundfish resources in the Pacific Northeast and Alaska.

The nature and extent of this development will be influenced by events in the Northeast Pacific and Alaska waters as well as on the national and international scenes. The purpose of this study is to discuss the current trends and future potential of the joint venture operations in the world and in the waters off the U.S. western coasts, to better ensure that development of this type of U.S. fishery resource use meets the national goals and expectations of the U.S. fishing industry.

I. World Trends and Main Participants of International Fishery Ventures

Although international cooperation in developing marine living resources was initiated many years ago, its growth and economic importance became particularly evident after worldwide implementation of the 200 mile economic zone. Among different forms of this cooperation, commercial joint fishery ventures can be considered of highest direct economic significance.

The initial impetus to the joint venture expansion in commercial fisheries was given by Japan soon after World War II. Presently about 220 joint equity fishing companies and a large number of contractual arrangements have been established by Japan (Joint Venture Computer File, 1981) and this country can be considered an undisputed world leader in international cooperation in the marine resource use.

Thus, the Japanese joint venture activities not only reflect internal fishery policy of this country, but also significantly influence the world tendencies in this field. Figure 1 shows the changes that took place in number and type of equity joint ventures run by Japan during 1965-1980. It can be seen that a major surge in the Japanese joint venture effort occurred in the beginning of the 1970's in anticipation of the 200 mile economic zone.

From the U.S. fishing industry view point, trends in trawling (mostly groundfish) and processing ventures are of highest importance. In both these activities Japan is increasingly active. Most important groundfish operations with Japanese partnership are reported in Australian and New Zealandese waters, in Latin America (Argentian, Chile, Peru, Mexico) and Africa (Mauritania, Morocco) (Joint Venture Computer File, 1981).

Involvement in foreign fish processing operations is considered by the Japanese sources as a processing venture (Suisan Nenkan, 1980) but some authors classify this activity as a Japanese capital investment rather than the typical fishery joint venture (Sullivan and Heggelund, 1980). Equity partnership in foreign land processing industry constitutes the most spectacular change in the Japanese international fishery policy during the decade of the 1970's.

Globally there are over 600 joint commercial fishing arrangements operating in nearly all of the most important fishing areas of the world ocean. These ventures specialize in harvesting, fish processing, cold storage, international and local marketing of fishery products, running land support bases for long-range fishing fleets as well as in other fish business operations in the world market (Joint Venture Computer File, 1981).

One of the most important impacts of these ventures is their contribution in developing fishery resources usually underutilized by the host country's fishermen and in expanding market opportunities for the fishery products based on joint venture's target species.

The developing nations of Southeast Asia, Africa and Latin America host the largest number of these ventures (Joint Venture Computer File, 1981).

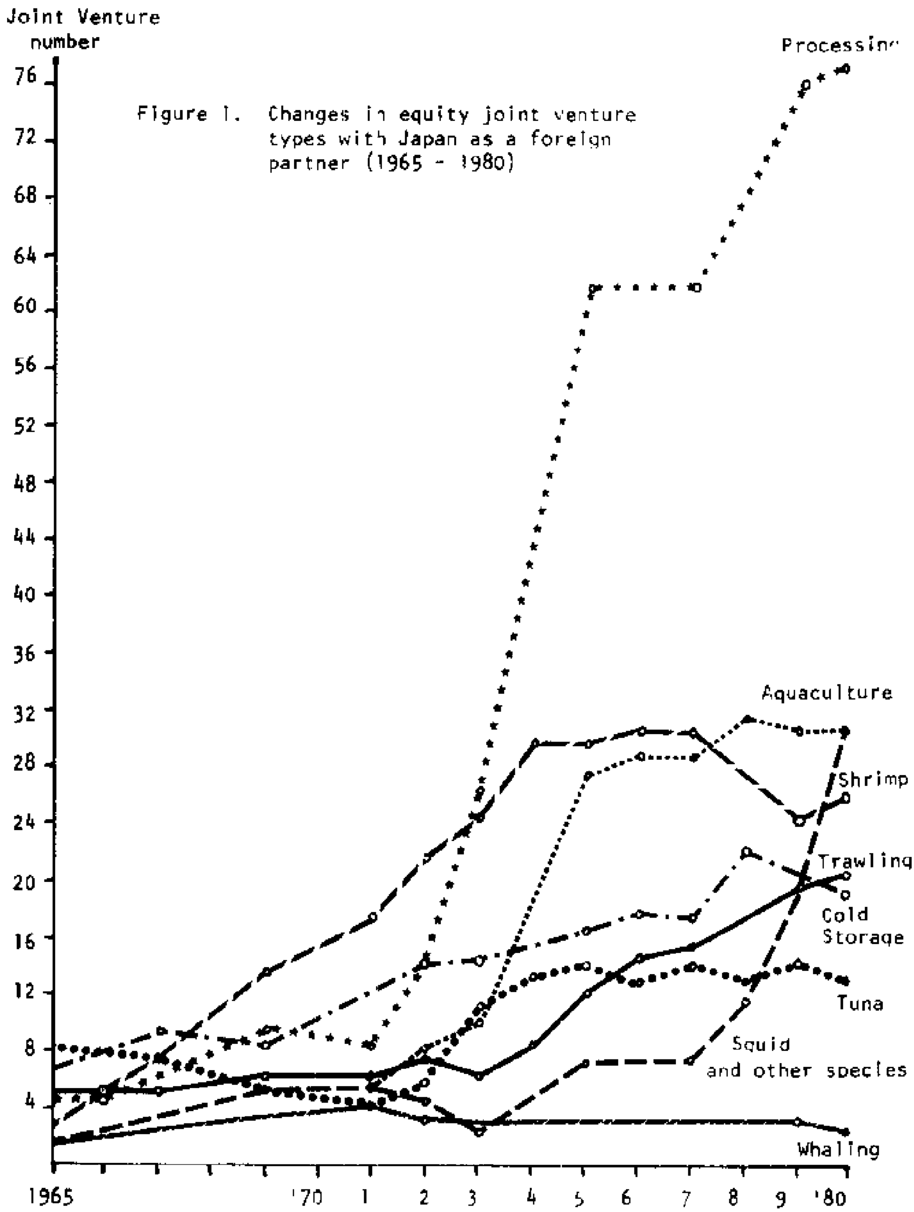


Figure 1. Changes in equity joint venture types with Japan as a foreign partner (1965 - 1980)

Source: Morio Okatsu (1982)

In the North Pacific basin, joint fishing ventures expanded quickly after extension of national jurisdiction in 1977 by the U.S., Canada, U.S.S.R., and Japan. As elsewhere in the world, restrictions imposed by the North Pacific states on foreign distant-water fishing fleets have particularly affected all major long-range fleet operators including Japan, the Soviet Union, South Korea as well as several other non-Pacific nations involved in fishing operations in this area (Poland, East Germany, Bulgaria). For all these countries, one important alternative solution allowing them to continue fishing activities in their traditional areas of operation has been the concept of the joint use of the resource with local fishery interests.

Foreign motivations to enter into this type of cooperation differ according to the economic status, technological advancement or political situation of each of the overseas participants.

The Soviet distant-water fishing fleet was especially vulnerable to limitations imposed by the coastal states in whose waters Russian vessels traditionally fished. Thus, new solutions to this problem were urgently needed. Departing from a strictly closed economic model (autarchy) and self-reliance approach in almost all ocean activities, the Soviets have built in recent years a network of international bilateral fishery agreements, commercial fishing ventures and jointly operated land support bases for Russian long-distant fleets. This effort resulted in better access to some overseas coastal and open ocean fishery resources, in additional seafood supply sources for Soviet fish consumption market and exports and in lower operation costs of the Russian distant-water fishing fleet (Black, 1982, Miller, 1982).

Also in the Northeast Pacific, soon after implementation of the Magnuson Fishery Conservation and Management Act in 1977, the Soviet Union established, as a first nation, the international joint venture company with U.S. partners. After a short period of experimental operations (1978), this venture in terms of the yearly volume of catch, number of U.S. catcher boats and Soviet processors employed, became the leading fishing venture in the whole Northeast Pacific and Alaska waters. For the Soviets, this joint enterprise generates seafood commodities for their own consumption market, hard currency for fish exported to third countries and employment of several large processing ships on U.S. waters even after withdrawal of direct quota allocation in consequence of Soviet military intervention in Afganistan.

For South Korea the 200 mile economic zone in the North Pacific meant the immediate loss of at least 0.5 mln. m. tons of fish per year particularly from the traditionally harvested coastal waters of the neighboring states of U.S.S.R., North Korea and the People's Republic of China. In order to make up this tremendous loss, South Korea looked for increased direct quota allocation in the U.S. zone. An active search for joint venture arrangements with the U.S. fishermen was initiated in 1978, when the quota received proved to be insufficient in comparison to that country's domestic market demand, export projections and harvesting/processing capacities of the South Korean fleet and land installations (Korea Deep Sea Fisheries Association, 1982).

The main effort of the Japanese in establishing joint resource use ventures in the North Pacific has been developing in quite a different direction. As a U.S. ally, Japan traditionally enjoyed large harvesting opportunities in the U.S. coastal waters. Even after extension of national jurisdiction, the Japanese fleet as a historical user of groundfish and other species in Alaska, has received quota allocations equal to over one million metric tons per year, i.e., ten percent of the total Japanese marine catch and about forty percent of this country's catch in the foreign 200 mile economic zone. However, the demand for highly valuable seafood products such as salmon, salmon and herring roe and crab meat could not be met by the Japanese harvesting sector. The supply opportunities of these species shrank quickly even before 1977 and this deficit has triggered a new era in the Japanese fishery industry's history, the era of Japanese firms participating in the U.S. processing industry as an equity owner. This involvement has occurred because it also fit into a larger national interest area of Japan: an awareness of the growing nationalistic approach by the U.S. in controlling these resources and the need to gain a "presence" in the U.S. domestic seafood processing industry rather than risk being shut out of the resource supply or being entirely dependent on the decreasing annual quota allocations (Dowd, 1980).

With relatively easy access to the groundfish resources in the U.S. waters and a strong position as an equity partner in the U.S. processing industry, Japan had little incentive to enter into joint venture arrangements with the U.S. harvesting sector. This attitude began to slowly change recently in 1982, when growing activities of other joint ventures and pressures resulting from the U.S. joint venture policy began to threaten Japanese fishery interests in the U.S. zone.

For other nations such as West Germany, Poland, Bulgaria and East Germany the joint venture operations with U.S. fishermen became the only way of getting access to aboundant fishery resources in the U.S. fishery conservation zone. All these countries have experienced substantial catch reductions in consequence of extenstion of national jurisdiction and are greatly interested in utilizing their surplus harvesting/processing capacities in all economically feasible ways, including joint fishing ventures.

2. Contractual Ventures - foreign experience and achievements

During the years following widespread extention of national jurisdiction, many long-range fishing fleet operators have entered into a seasonal, joint venture arrangements, known in the world literature as a contractual joint venture (F.A.O. 1977) or joint venture operation. Such venture does not stipulate joint ownership of the company's assets, nor capital investment by the partners. Final production of the venture is usually owned by one, mostly foreign partner. Contractual ventures are usually short time arrangments, established to carry out the joint research or exploratory operatións preceeding the joint equity venture. They may also be established to open a quick access to the fishery resources of foreign coastal state, if other methods of fishery cooperation are less favorable or more difficult to implement within the short period of time.

This type of venture became particularly important in joint fishing operations between countries where natural, economic and technology resources are available but coastal state's legal limitations prevent unrestricted access for the foreign distant-water fishing vessels.

A typical example of such activities are joint fishing operations carried out between Japanese and Russian fishing companies in the U.S.S.R. coastal waters. Table 1 demonstrates that in 1979 and 1980 the number of these ventures expanded as well as total catch volume and vessels involved were growing quickly.

Table 1. Japan-Soviet joint fishing operations in the USSR coastal waters (1979 and 1980)

Species	Area	No. of Operations	No. of Japanese Processors	Catch in m. tons
1979				
Shrimp	Tatar Strait	1	7	630
Shrimp	North of Sakhalin	2	3	500
Kegam crab	Southwest of Sakhalin	1	1	120
Tanner crab	Olyutor & Navarin	3	7	4,030
Total		7	18	5,280
1980				
Shrimp	Tatar Strait	1	8	500
Tanner crab	Tatar Strait	1	2	1,000
Shrimp	Olyutor & Navarin	1	5	3,000
Aburagani crab	Olyutor & Navarin	1	2	586
Tanner crab	Olyutor & Navarin	4	14	7,635
Total		8	31	12,712

Source: Tanaka, 1981

The general concept of Soviet- Japanese contractual ventures is to allow both sides to use their resources (fish stocks, vessels, fishermen and other available production factors) to jointly and profitably utilize fishery resources on the basis of the division of labor between involved partners.

In Japanese-Soviet joint venture case economic benefits are based on the agreed ex-vessel prices paid by Japanese companies to the Russian partners. Table 2 provides information about these prices, known as "Fishing Cooperation Fee" paid to the Soviet Union for crab and shrimp harvested in the Okhotsk Sea and Northern Sakhalin areas. It is interesting to note, that only in very few cases Russian fishing vessels were cooperating with Japanese processors. Usually, Japan has been allowed to harvest an agreed quota by Japanese catcher boats, although "fishing cooperation fee" remained unchanged.

Table 2. Ex-vessel Prices ('Fishing Cooperation Fees") paid by Japan in joint venture operations with Soviet partners in 1979 (in $ USA per m. ton)

Species	$ USA
Tanner crab	908.25
Shrimp (Tartar Straits)	3,200.--
Shrimp (Northern Sakhalin)	1,600.--
Hair crab	1,210.--

Source: Memorandum of the U.S. Embassy in Tokyo, December 6, 1979.

Applying these prices to reported catch volumes and species harvested jointly in 1979 and 1980, it can be seen that the ex-vessel value of Japanese joint venture catch in the Soviet waters increased from 6.6 mln. dollars in 1974 to $ USA 14 mln. in 1980. Also the number of Japanese processors employed grew from 18 to 31 during these years.

It is also important to observe that "fishing cooperation fees" are frequently paid in kind rather than in cash. For example, Japan has been forced to pay a certain amount of "fishing cooperation fee" to the Soviet Union for salmon fishing outside of the Soviet 200-mile zone. This fee has been paid in the following commodities delivered during 1979 by Japan to the Soviet Union:

Feed (pellet) plant capable of producing 35.000 m.t./year for salmon fingerlings,

Feed plant (2,000 m.t./year) for salmon fry,

Pilot plant for productior of formula feed,

Adult fish rearing tank (20 m.t./year) with water circulation system.

Adult fish rearing pen (50 m.t./year),

Other equipment.

The total value of Japanese deliveries amounted to Yen 3,250 million. This sum is 7 percent of the average landed value of 1,100 yen/kilo of salmon for the 42.500 m.t. of quota for 1979 (U.S. Embassy Memorandum, 1979).

In contractual joint fishing ventures, the utilization of the raw material remains within the responsibility and risk of the foreign partner, who would provide his floating processors and crews to operate them. The target resources are usually the species underutilized by the host country's fishing industry. In Western European waters Communist bloc motherships have been employed in joint fishing operations with English-fishing vessels targetting on mackerel and blue whiting (Table 3). The yearly deliveries reached the level of 180.000 m.t. In 1977, only the total value of these purchases was about two million U.S. dollars.

A principal benefit which joint fishing operations are bringing to the economies of Japanese, Soviet, and other foreign participants, is the additional production and supply of fish food for their domestic consumption markets.

Table 3. Soviet-bloc-U.K. Joint fishing ventures in 1976 and 1977

Year	Species	Area of Operation	No. of Foreign Processors	Catch in m. tons
1976	Mackerel, Blue whiting	Celtic Sea/ Waters off Scotland	2 motherships (USSR)	87,000
1977	Mackerel, Blue whiting	As above	9 motherships (USSR, Poland, Bulgaria, East Germany)	186,000

Source: Joint Venture Computer File, 1981.

3. Economic Impacts on the U.S. Fishing Sector

After a short period of reluctance and uncertainties, the U.S. fishermen have found that international joint fishing ventures may be the right answer for the long term and apparently unsolvable difficulties in groundfish resource development. One of these problems is the lack of processing capacity and little economic incentive to process and market the lower market value species, mainly groundfish, abundant in the coastal waters and underutilized by the U.S. fishing industry.

Joint fishing ventures are filling this gap, at least temporarily. Foreign fleet operators with their processing ships and their markets offer immediate opportunities for the U.S. harvesting sector to expand the groundfish fisheries which until recently have been monopolized by the overseas long-range fleets.

The following statistical summary of the joint venture catch during 1977-81 and participating nations (Table 4) supports the general opinion that international joint fishing operations constitute one of the most striking development trends in the U.S. fishery industry during recent years.

Table 4. Joint fishing ventures in the U.S. Pacific fishery conservation zone, by year, nation and area of operation

Year/Foreign Participating Nation		Catch by Area in Metric Tons: Northeast Pacific (Washington, Oregon and California Coasts)	Gulf of Alaska	Northeast Bering Sea and Aleutians	Total
1977			-	-	-
1978	USSR	900	-	-	900
	Total	900			900
1979					
	USSR	9,054	138	-	9,192
	S. Korea	-	1,384	-	1,384
	Total	9,054	1,522	-	10,576
1980					
	USSR	26,906	94	24,815	51,815
	S. Korea	-	1,822	7,810	9,632
	Poland	1,017	-	-	1,017
	Total	27,923	1,916	32,625	62,464
1981[1]					
	USSR	34,365	-	47,588	81,953
	S. Korea	-	16,855	13,750	30,605
	Japan	-	21	11,425	11,446
	Bulgaria	7,453	-	-	7,453
	Poland	2,919	-	2,250	5,169
	West Germany	-	-	3,497	3,497
	Greece	145	-	-	145
	Total	44,882	16,876	78,510	140,268

[1] Preliminary data

Source: 1979, 1980, 1981 Reports National Marine Fisheries Service.

It can be seen that in 1978 the Soviet-U.S. joint fishing operations in the Northeast Pacific waters took only 900 m. tons of Pacific hake. It was the only joint fishing operation in the U.S. coastal waters at that time. In 1981 the total deliveries of groundfish (Alaska pollock, flatfish, Pacific hake and others) within international joint ventures was already over 140,000 m. tons. In 1980 the major part of fish taken by the joint venture operations was in Alaska waters although Pacific hake ventures along the Washington, Oregon and California coasts were rapidly increasing their harvest levels as well. Foreign participating nations (U.S.S.R., South Korea, , Japan, Poland, Bulgaria, West Germany, Greece) took most of the production to their domestic markets, but in 1980 and 1981 some quantities of fillets and frozen groundfish blocks have come back to the U.S. For example, Polish and South Korean exports of blocks to the U.S. was largely supported by the joint venture operations in the U.S. waters. Some quantities of Soviet groundfish fillets have been placed in the U.S. market as well.

During 1982 joint fishing operations are expected to take over 330,000 m. tons of groundfish, roughly one quarter of the total allowable catch level for all groundfish species in the Northeast Pacific and Alaska waters. Table 5. provides more particulars of current joint fishing operations in the U.S. waters. There are seven foreign nations involved in joint fishing operations in the U.S. Pacific waters during 1982. The U.S.-U.S.S.R. ventures are aiming to achieve the 100,000 m. tons level of catch and four Japanese companies are to purchase about 70,000 m. tons from the U.S. catcher boats. South Koreans are planning to take only 46,500 m. tons as yet and joint venture operations are supported by two Korean fishery organizations specializing in joint venture business overseas.

It is interesting that the Communist bloc fleets of the U.S.S.R., Poland, Bulgaria and East Germany are increasingly involved in joint fisheries with the U.S. fishermen, at the time when all of them are deprived of direct quota allocations in this area. If 1982 plans are realized, Eastern operators will purchase over 200,000 m. tons of groundfish, i.e., sixty percent of the total joint venture harvest allocation in this year.

This significant share of Soviet bloc fleets underlies the importance of the Communist fish consumption markets for the Northeast Pacific and Alaska groundfish exports, thus when analyzing the future marketing opportunities for the U.S. groundfish, this market should be considered with similar attention as the Asian and West European markets.

Table 5 Catch quotas requested for 1982 by international fishery ventures in the Northeast Pacific and Alaska waters

Foreign Country/Company	U.S. Partner	Catch Quota requested for 1982 (m. tons)	Target Species
Japan			
Hoko Fishing Company	Jeff Hendricks	10,000	Alaska Pollock
Ohtori Suisan Company	Whitney-Fidalgo Seafoods	10,000	Alaska Pollock
Suisan Kaisha Ltd.	Universal Seafoods	20,000	Alaska Pollock
Taiyo Fish Company	Westward Trawlers	20,000	Alaska Pollock
USSR			
Sovrybflot	Bellingham Cold Storage Inc.	96,000	Yellowfin sole, Alaska Pollock, Pacific Cod, Pacific Hake, Alka. Mackerel
South Korea			
Korea Wonyang Fisheries Co.	Fish Producers Associates	30,000	Alaska Pollock
North Pacific Joint Fishing Venture Committee	Joint Venture Fisheries	16,500	Alaska Pollock
Poland			
B.H.Z. Rybex	Ms. Paul's Kitchens	24,300	Alaska Pollock
European Economic Community (West Germany)			
Hochseefischerei Nordstern	-	15,420	Pacific Cod Alaska Pollock
Bulgaria			
Joint Trawlers	-	20,000	Pacific Hake
East Germany			
Joint Trawlers	-	60,000	Alaska Pollock
	Total	331,220 m. tons	

Source: a) Memorandum of the North Pacific Fishery Management Council Meeting, Agenda B-5, July, 1982.

b) Author's file

4. Conditions for joint venture growth during the decade of 1980's.

Although there are different view points as to the value of joint ventures in the future development of the U.S. groundfish resources, the general perception is, that with appropriate management decisions they they can largely contribute to the expansion of the U.S. fishing industry and its export market opportunities.

One can therefore ask, which are the future prospects for these venture in the U.S. waters? The future growth of the joint venture catches will be strongly influenced by the following factors:

a. The Japanese position toward joint fishing operations with the U.S. harvesting sector

b. The catching capacity of the West Coast and Alaska fleets in joint venture fisheries

c. Economic efficiency of the joint ventures both for the U.S. fishermen and foreign participants

d. Expansion of the joint venture operations from over-the-side purchases of fish to more integrated arrangements with foreign nations.

During a recent U.S./Japan meeting on Joint Venture Fisheries[1] and under pressures exerted by the U.S. fishing industry, the Japanese representatives have increased substantially Japan's commitment to purchase bottomfish from the U.S. fishermen. Japanese future plans in these activities are summarized in Table 6.

Table 6 Japanese commitment to purchase of bottomfish from the U.S. fishermen during 1982/82 and 1983/84

Year	Volume of catch to be purchased (m. tons)	Target Species
June 1, 1982 - May 31, 1983	120,000	Alaska Pollock
June 1, 1983 - May 31, 1984	200,000	Alaska Pollock

Source: Natural Resource Consultants, Background Pap er No. , 1982.

It can be expected that the Japanese share in joint venture catch will increase substantially in 1982 and 1984, as compared to the 1982 purchase levels, equal to about 70.000 m.t.

If other nations will maintain their share in joint venture operations during forthcoming years, the Japanese participation can increase the purchase power of foreign fleets from 330 th. m.t. currently to 460 - 500.000 m.t. in the mid of 1980's.

U.S./Japan meeting on Joint Venture Fisheries, was held in Seattle, Wa. June 6-8, 1982.

As a result of such a joint venture catch growth, direct foreign quota allocations would decrease and opportunities to use Northeast Pacific and Alaska fishery resources will be strongly related to the willingness of the overseas operators to combine their direct fisheries with purchase of fish from the U.S. fishermen.

Figure 2 shows present trends and expected development of the joint venture catch as compared to overall groundfish catch in Alaska waters.

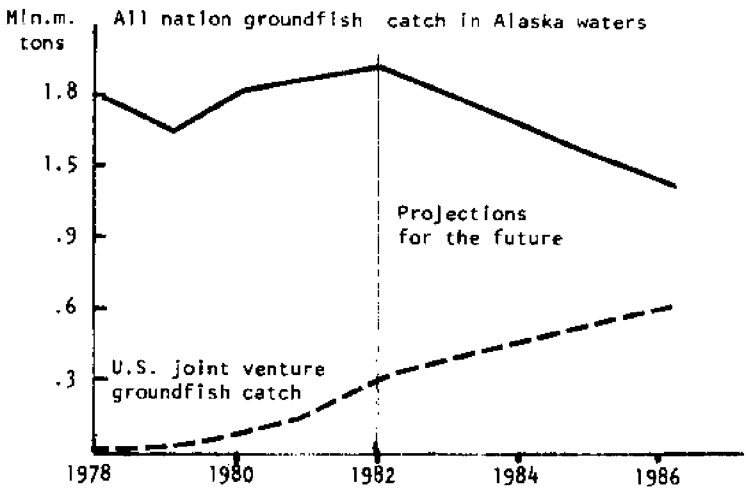


Figure 2. Present and future total groundfish catch as compared to the growth of the joint venture harvest in Alaska waters.

According to most recent estimates (NRC 1982) the current catching capacity of the west coast and Alaska fleets is estimated to be 500.000 metric tons. With declining fishing opportunities of highly valuable species such as crab, halibut and shrimp, this potential will increasingly be seeking joint venture fishing opportunities. It is also possible that this capacity will grow up to 1 mln. m.t. in the following years as joint ventures will become more economically attractive than other declining fisheries.

The economic efficiency of the joint venture operation should be seen as a decisive factor of the future development of this form of fisheries.

It has already been proved that joint fishing operations may be much more cost efficient for the U.S. fishing boats than when delivering groundfish to the U.S. ports. At any given catch rate for the typical combination crabber/trawler of 108 feet and 80-92 feet combination shrimp and groundfish trawler the break-even ex-vessel price when delivering fish to a floating processor is at least 30% lower than when fishing autonomously (Lynde, 1981).

Figures 3 and 4 show the break-even price of fish versus catch rates for the above mentioned types of vessels operating within joint venture regime and autonomously.

Foreign processors save substantial percentage of fuel (up to 25 percent - Kaczynski, Lynde, 1981), their crews are small and fishing gear costs are non-existent. Fish delivered by the U.S. catcher boats is free of poundage fee. Part of the final production is sold in some cases to third markets, thus generating hard currency for foreign partner.

With growing experience, joint venture participants are lowering their costs of operation per unit of fish caught. In 1979, the price of Alaska Pollock delivered at sea to foreign processors was about 6¢/lb., while at the present time some ventures pay only 4.5¢/lb. for this species and the price is still attractive for the U.S. vessel owners.

Although joint ventures are presently expanding toward direct over-the-side purchases of fish from the U.S. fishing boats, we should be acutely aware of the growing dependence of the U.S. harvesting sector from the foreign processing capacity and willingness to continue this type of operations.

There are important questions which should be raised in relation to the future joint venture policy of the U.S.

When selling groundfish to foreign processors, our isolation from foreign consumption markets remain unchanged.

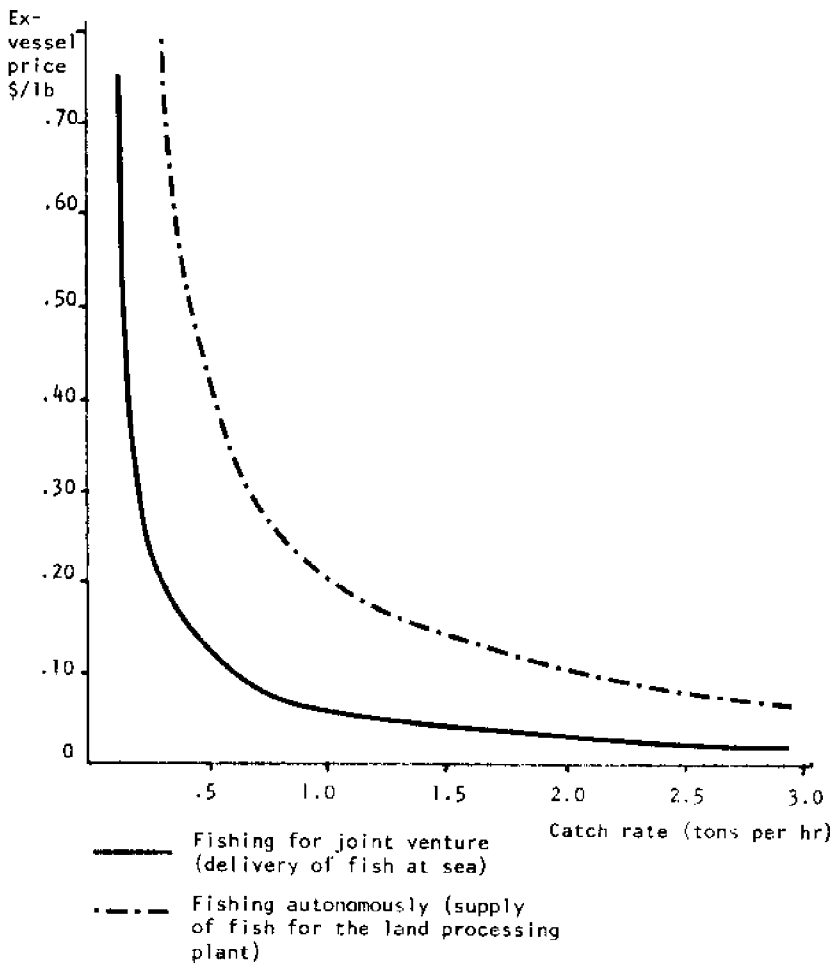
The U.S. processing sector enjoys little benefits of the present joint ventures. In certain cases joint ventures became competitive in offering groundfish to the U.S. market because of subsidization received from foreign participants. Certainly, this competition does not help U.S. processors in expanding their groundfish processing business.

One of the important remedies to this unhealthy situation is departure from the over-the-side exports of fish to more integrated joint venture arrangements with foreign companies.

International experience in joint venture fish business indicates many alternative and profitable arrangements, which may be taken into consideration by the U.S. partners.

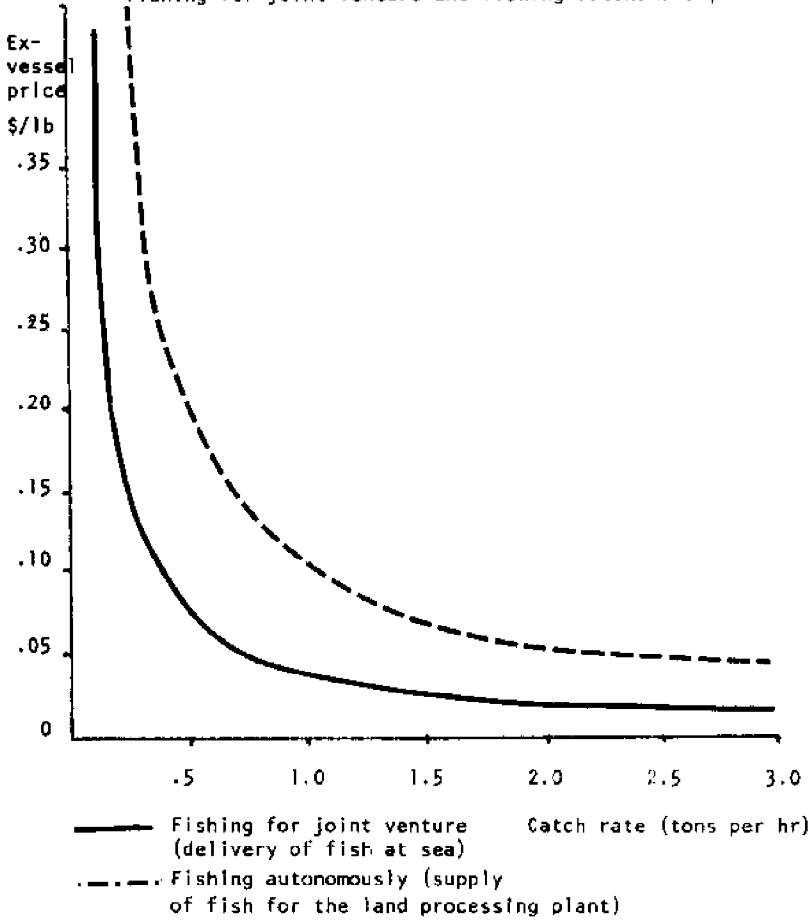
Joint ownership and marketing of the final production, purchase of one part of the fishery products by the U.S. partner for further reprocessing and marketing in the U.S., leasing or chartering of the floating processor and finally purchase of second-hand factory ships, are some of the examples for alternative joint venture arrangements in the future. Another direction is to promote joint venture strategies for both the harvesting and processing sector. Without active involvement of the U.S. fish processing industry in the joint ventures, the U.S. groundfish will hardly be fully utilized by the U.S. fishermen and processors over the next decade.

Figure 3. Break-even price versus catch rate for Crabber/Trawler fishing for joint venture and fishing autonomously.



Source: Lynde, 1979.

Figure 4. Break-even price versus catch rate for Shrimper/Trawler fishing for joint venture and fishing autonomously.



Source: Lynde, 1979.

ACKNOWLEDGEMENT

The research for this paper has been financed by the National Marine Fisheries Service, within the Cooperational Agreement between the Institute for Marine Studies, University of Washington and the National Marine Fishery Service, Northwest and Alaska Fishery Center, Seattle.

References

Black, William L. III. "Soviet Fishery Policy in Developing Countries as a Result of the New Regime of the Oceans", term paper submitted at the Institute for Marine Studies, University of Washington, Seattle, Washington, Winter, 1982.

Dowd, Thomas. "An Overview of the Japanese Investment in the Washington and Alaska Seafood Processing Industry", study submitted jointly at the Institute for Marine Studies and Business School of Administration, University of Washington, Seattle, Washington, December 1980.

F.A.O. "The Role of Joint Ventures In Fishery Development", COFI/77/9 Eleventh Session, Rome, Italy, April, 1977.

Joint Venture Computer File, Institute for Marine Studies, University of Washington, Seattle, Washington, 1981.

Kaczynski, Vlad and C. M. Lynde. "Fleet Operation Regimes and Fuel Efficiency In the U.S. Groundfish Fisheries", discussion paper for the Fishing Industry Energy Conservation Conference, Seattle, Washington, October, 1981.

Korea Deep Sea Fisheries Association, Statement by the Mission of the Korea Deep Sea Association Visiting the United States in March, 1982

Lynde, C.M., "Economic Feasibility of Domestic Groundfish Harvest from Western Alaska Waters: A Comparison of Vessel Types, Fishing Strategies and Processor Location," Fisheries Bulletin, Vol. 79, No. 2, 1981.

Lynde, C.M., "International Joint Ventures off the Western Alaska Coast: Costs and Benefits to U.S. Fishermen," (typescript) NORFISH, College of Fisheries, University of Washington, 1979.

Miller, Ronald, "Evolution of Soviet Fishing Polity: From Autarchy to Cooperation," (typescript - term paper), Institute for Marine Studies, University of Washington, Winter 1982.

Natural Resource Consultants, Seattle, U.S. Bakcground Documents, prepared for U.S./Japan Meetings on Joint Venture Fisheries, Seattle, Wa., June, 1982.

North Pacific Fishery Management Council, Council Policy on Allocations and Joint Ventures, 49th Plenary Session, July 21-22, 1982.

Tanaka, Syoiti, "Japan's Fisheries and International Relations Surrounding Them Under the Regime of 200-Mile Exclusive Fisheries Zone, paper submitted in the 15th Annual Conference of the Law of the Sea Institute, Honolulu, October 1981.

U.S. Embassy Fisheries Attache, Japan-Soviet Joint Fishing Operations, 1979, Tokyo, July 19, 1979.

Sullivan, J.J. and Heggelund, P.D., Foreign investment in the U.S. Fishing Industry, Pacific Rim Research, Series, No.3, 1979.

Suisan Nenkan (Yearbook of Japanese Fisheries) 1965 - 1981).

An Overview of Brazilian Foreign Trade in Seafood Products

Maria Lucia D'Apice Paez
Ministry of Agriculture
Brasilia, D.F., Brazil

Introduction

Brazilian economic policies have been strongly directed toward the expansion of exports in order to attenuate the deficit on its commercial trade balance, a problem of concern especially after 1974 with the advent of the oil crisis. In this context, commercial fishing is viewed as one additional component for increased exports, not only because it is still an under-exploited resource, but also because the export price uptrend for major Brazilian seafood products has not been affected by the generalized price decline for traditional Brazilian export commodities.

Although Brazil is among the twenty major fish-producing countries, fishing activities have developed slowly due to the extractive characteristics whose principal aim has been to supply urban centers close to the catching areas. In an attempt to change this activity into a more productive and competitive one on the international market, several specific government policies and incentives were implemented. In this overview, there will be described the more relevant interrelationships among production, consumption and trade flows, taking into consideration the effects of the intervention of the government in Brazilian fishing sector.

Role of the Government

Before the 1960's, the government role in fishing activities was small and not well coordinated, being incapable of satisfying the needs of emerging industrial fishing. In 1938, the first set of governmental incentives was implemented when tariffs were imposed on imports of seafood products and credit loans were for the first time granted to these activities. After 1940, new legislation instituted organizations destined to give technical assistance to fishermen and to organize the marketing activities of the fishery sector.

In the 1960's, it was agreed that developing a commercial fishing industry in Brazil was essential, given the potential for exploiting this resource along more than eight thousand kilometers of coastline and in the vast inland waters, including river basins, reservoirs and lakes. The coordination of the strategies directed toward the overall development of the fisheries in Brazil was concentrated in a federal agency, founded in 1962, under the name of "SUDEPE - Superintendência do Desenvolvimento da Pesca," attached to the Ministry of Agriculture. Thus, the fishing activities and fishery-related industry became autonomous within the agricultural sector and federal support for consolidation of this industry was established. The responsibilities of SUDEPE included not only the planning, coordination and execution of programs for fishing activities in Brazil, but also the supervision, inspection and control of exploitation of the fish resources.

In 1967, an agreement for technical assistance between F.A.O. (Food and Agriculture Organization of the United Nations) and the federal government of Brazil was signed and there was created the "Fish Research and Development Program." To attain the objectives proposed by this program for increasing the supply of seafood through modernizing the fishing fleet and the fishery industry, massive financial support was allocated to the sector to stimulate private investment in commercial fisheries at the earliest possible time. This financial support, known as the "fiscal incentives policy," was in effect from 1967 to 1977 and included the following measures: (a) exemption from import and other federal taxes on vessels, gear and any equipment used in fishing-related activities; (b) exemption from federal sales tax on any fish products, processed or not; (c) 25 percent deduction on income tax owed by any firm if this amount were to be invested in fishery-related projects, approved by SUDEPE; (d) exemption from income tax due on any fishery-related projects, approved by SUDEPE.

As a consequence of these incentives, an effective growth and modernization of the fleet and the processing plants was achieved. An expansion in the volume supplied of frozen and canned products and a consequent increase in the demand for raw material and on the exports of seafood commodities, processed or not, also followed. Still these government subsidies were unable to result in the expected increase in production, so as to attain the goal of two million metric tons of landings for 1977. Also, the small-scale fishermen and their cooperatives did not benefit from this policy in the same way as the processing plants. In addition, a major part of these new plants were not always located near the traditional fishing grounds or the areas of greater potential availability of fishing resources, resulting, therefore, in an idle-capacity industry.

The implementation of the 200 nautical-mile jurisdiction over the Brazilian coastal waters in 1970 is another fact to be mentioned. This extended jurisdiction more directly affected the foreign shrimp trawlers fishing along the northern coast, and presently the tuna exploitation.

By 1979, following the pattern of government intervention in the fishery sector, eight common fish species of popular consumption in the southern and southeastern regions of Brazil were included within the agricultural products price-support program.[1] This kind of intervention was first designed to protect the small-scale fishermen from excessive price speculation and to provide a more regular flow of raw material to the processing plants, together with provisions for accumulating stocks of frozen and canned seafood products.

Considering the idle capacity of the processing plants and the under-exploited fish species, a three-year joint program was implemented in 1980 between the Ministry of Agriculture of Brazil and the Interamerican Development Bank (IDB). This program was under SUDEPE's supervision and the investment totaled 131.2 million US dollars. This amount was distributed among three subprograms: (a) Subprogram A, in which 101.3 million dollars were destined to offer loans for shipbuilding, for purchasing fishing equipment, for setting up fish farms and hatcheries and for equipping the processing plants; (b) Subprogram B, in which 5.2 million dollars were destined for the construction of a fish terminal in the State of Maranhão (northern region), with the capacity to handle 100 thousand metric tons of products per year, aiming to support small-scale fishermen. This subprogram also included 3.75 million dollars to be applied in the support of cooperatives of fishermen in that region; (c) Subprogram C was designed to allocate funds to buy two fish exploratory and research vessels, to set up freshwater aquaculture centers, to contract technical advisory services for the design of exploratory fishing vessels and to establish fish farms, hatcheries and cooperatives [Nakayama, 1980].

Production and Consumption

Potential production.

Brazilian northeastern coastal waters are characterized by a narrow continental shelf with rocky barriers, a hard and irregular seabottom (that does not allow trawling operations) and by the appearance of stocks of crustaceans and other high unit valued fish species, such as the southern red snapper. Along the remaining coastal regions (northern, southeastern and southern) with a sandy and muddy continental shelf that reaches up to 120 miles from the coast are located the fishing grounds of shrimp, white catfish and other less valuable species such as sardine, croaker, weakfish, etc. In Figure 1, the geographical distribution of the major marine species by landing areas is shown.

The sustainable yield of the edible demersal fish species is estimated at 550 to 800 thousand metric tons for the territorial Brazilian waters up to a depth of 200 meters. About 45 percent of the tonnage is concentrated on the northern region, 5 percent in the northeastern region, 14 percent in the southeastern region and 36 percent in the southern region [Timm, 1981]. For the pelagic fish species, the expected catch potential is about 900 thousand metric tons [SUDEPE-MA, 1979].

---

[1] The ex-vessel support prices were established for the following fish species: bluefish (*Pomatomus saltatrix*), croaker (*Umbrina canosai*), Brazilian croaker (*Micropogon furnieri*), weakfish (*Cynoscion spp.*), king weakfish (*Macrodon ancylodon*), sardine (*Sardinella brasiliensis*), ocean catfish (*Tachysurus barbus*), and mullets (*Mugil spp.*).

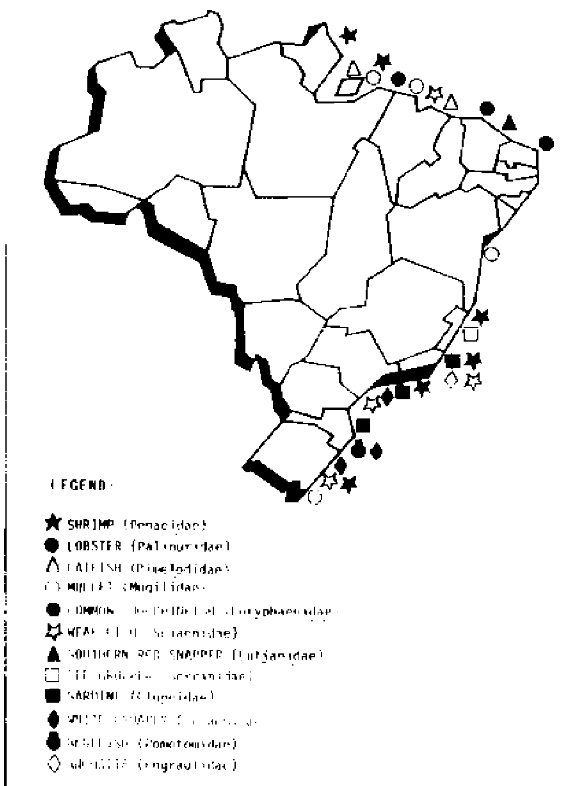


Figure 1 - Brazil. Identification of the Major Marine Species by Landing Area.
SOURCE: SUDEPE-MA (1982)

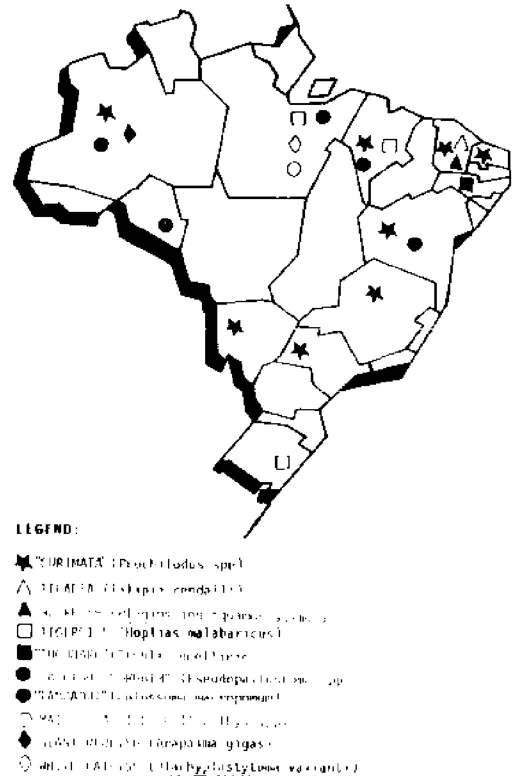


Figure 2 - Brazil. Identification of the Major Freshwater Species by Landing Area.
SOURCE: SUDEPE-MA (1982)

Most of the inland waters are distributed among three main river basins--the Amazon, Plata and São Francisco Rivers--and numerous reservoirs and lakes. The Amazon River basin, in which is concentrated by far the greatest potential of freshwater fish resources, includes a large number of species. A rough estimate of its sustainable catch is approximately 100 thousand metric tons [SUDEPE-MA, 1979]. The Plata River basin is the second in size, comprises the Paraguay, Paraná and Uruguay rivers and has fewer species varieties than the Amazon basin. No estimates have been completed on the total biomass of the Plata basin. It is known, however, that the productivity of catches in that basin have been reduced over time due to the construction of large dams for hydroelectric power generation.[2] The third basin in importance is that of the São Francisco River that also registers a decreasing productivity. Additionally, 379 dams, covering three-million hectares of reservoir area, small reservoirs in the northeastern region and other lakes have a great potential for extractive small-scale exploitation. The geographical distribution of Brazil freshwater fishing resources are summarized on Figure 2.

Besides these potentialities, aquaculture stands out as a growing activity, especially for the production of shrimp rear. In estuarine waters of the State of Rio Grande do Norte, some 200 thousand hectares have been determined suitable for shrimp culture. There is also enormous potential for freshwater shrimp (Macrobrachium) culture. In response to these circumstances, the shrimp culture sector is flourishing and many project proposals for this activity have been submitted to SUDEPE for technical approval. So far the area covered in these shrimp culture projects totals 2,900 hectares to be developed through the financial support of the joint program of the Brazilian Ministry of Agriculture and the Interamerican Development Bank.

Landings, fleet and fishery-related industry.

Brazilian total landings of fish have been increasing mainly assisted by government technical support programs and subsidies. The data available indicate that the landed volume of fish, crustaceans, cetaceans, molluscs and chelonians doubled between 1962 and 1979, i.e., from 414.6 to 858.2 thousand metric tons, or at the annual rate of growth of 4.4 percent (Table 1).

The major portion of these volumes was from marine catches that usually represented about 80 percent of the total tonnage in this period span. Fish species were the main component of the marine landings and also of total landings (marine and freshwater origin).

Although there is no satisfactory global information on the composition of the fish landings by species,[3] it is known that sardines

---

[2] The more important dam in this basin is the Itaipu Dam, which reservoir covers 1,460 square kilometers.

[3] The information on the landings by fish species has been contradictory. This may happen by the difficulty of gathering data and classifying the species caught by numerous fishermen along all coastal areas. SUDEPE itself has only partial control over the landings for some major species caught.

Table 1 - Brazil. Total Landings of Fish Species, Crustaceans, Cetaceans, Molluscs and Chelonian, 1962-1979.

Year	Landings (Thousand metric tons)																
	All Fish			Crustaceans			Cetaceans			Molluscs	Chelonian			Total			
	Marine	Fresh Water	Total	Marine	Fresh Water	Total	Marine	Fresh Water	Total		Marine	Fresh Water	Total	Not Identified	Marine	Fresh Water	Total
1962	265.7	63.8	329.5	46.6	2.1	48.7	22.8	0.1	22.9	2.5	0.0	0.6	0.7	10.2	337.8	66.6	414.5
1963	290.2	74.3	364.6	40.6	3.9	44.5	7.2	0.1	7.3	1.8	0.0	0.5	0.5	2.7	339.8	78.8	421.4
1964	195.4	88.5	283.9	39.3	4.0	43.3	2.2	0.0	2.2	2.7	0.0	0.3	0.4	0.5	240.1	92.9	333.1
1965	266.4	91.1	357.6	54.3	2.8	57.1	3.4	0.1	3.5	2.7	0.0	0.5	0.6	0.6	326.9	94.6	422.3
1966	286.9	8.5	368.4	55.4	2.2	57.6	6.8	0.0	6.8	2.2	0.0	0.4	0.4	0.4	351.3	83.1	435.8
1967	277.1	84.6	361.7	52.1	3.5	55.6	6.8	0.0	6.8	4.7	0.0	0.2	0.3	0.3	340.7	88.4	429.4
1968	316.8	97.7	414.5	61.4	9.4	70.8	8.4	0.0	8.5	4.8	0.0	0.2	0.2	1.6	391.5	107.3	500.4
1969	314.9	103.7	418.6	62.1	8.3	70.4	7.5	0.0	7.6	3.0	0.0	0.2	0.2	1.4	387.6	112.3	501.2
1970	355.8	93.5	449.3	54.6	9.4	64.0	8.0	0.0	8.1	3.5	0.0	0.4	0.5	0.8	422.0	103.3	562.3
1971	411.4	87.9	499.3	67.5	9.2	76.7	9.8	0.0	9.8	4.5	0.0	0.2	0.3	1.0	493.1	97.4	591.5
1972	431.7	77.8	509.5	82.3	4.9	87.3	3.1	0.0	3.1	4.6	0.0	0.2	0.2	0.0	521.7	83.0	604.7
1973	518.5	81.9	600.4	77.3	[illegible]	83.5	7.3	0.0	7.4	7.4	0.0	0.0	0.0	-	610.6	85.2	695.8
1974	494.3	156.7	650.5	59.3	11.8	71.1	5.4	-	5.4	4.0	0.0	0.0	0.0	[illegible]	563.2	165.1	731.4
1975	525.7	154.3	680.0	59.9	9.1	69.0	6.6	-	6.6	3.9	0.0	0.0	0.0	0.2	586.2	173.4	759.8
1976	449.3	135.8	585.1	51.8	8.9	63.8	5.8	-	5.8	4.0	0.0	0.0	0.0	-	514.0	144.8	658.8
1977	504.7	155.5	663.2	60.5	9.9	[illegible]	4.1	-	4.1	5.7	0.0	0.0	0.0		[illegible]	168.1	[illegible]
1978	543.3	159.7	703.0	73.7	10.5	84.2	3.7	-	3.7	12.9	0.0	0.0	0.0	2.4	633.6	170.3	806.3
1979	627.9	119.8	747.4	97.6	6.9	104.5	3.1	-	3.1	7.9	0.0	0.0	0.0	0.0	731.5	126.7	858.2

SOURCE: IBGE (1962-1970); SUDEPE-MA (1971-79).

species caught along the southeastern and southern coasts were by far the leading group of the marine fish landings. Other species of importance in terms of landings in this region were weakfish (Cynoscion spp.), croaker (Micropogon spp.) and anchovy (Engraulis spp.). In addition, on the northern-northeastern coast, the major marine species have been weakfish, ocean catfish (Ariidae) and southern red snapper (Lutjanus purpureus), these in terms of volume landed. Among the freshwater fish species, the white catfish (Brachyplatystoma vaillanti), "tambaqui" (Colossoma macropomum) and mailed catfish (Callichtys spp.) have constituted a significant portion of the annual landings of this group [SUDEPE-MA, 1982].

The crustaceans, the second major group in volume landed, presented a significant growth rate of 4.6 and reached 104.5 thousand metric tons in 1979 (Table 1). Of this latter figure, about 82 percent were represented by shrimp landings, 7 percent by lobster and the remaining percentages were distributed mainly among ocean crabs and freshwater crabs [SUDEPE-MA, 1982].

The third main group was the molluscs and included mainly the landings of mussels and, in decreasing order of importance, squid, octopus and oyster [SUDEPE-MA, 1982]. Chelonians and cetaceans were of small significance in the total landings during this period.

These fish resources in Brazil were exploited under two basic systems identified by the characteristics of the existent fishing fleet. First, there is the artisanal fleet as represented by the small-scale and extrative type of fishing operations, using a rudimentary kind of gear and being composed by approximately 48,155 vessels of less than 20 GT [Nakayama, 1979]. These are distributed and operate along Brazilian inshore coastal waters. Of the total number of vessels, only 6,305 units are motorized. Next, there is the industrial fleet, operating on a larger scale, located especially on the southern-southeastern coast and being composed of 818 boats which are mainly over 20 GT and with greater autonomy, but which are aged vessels for the most part [Nakayama, 1979]. Landings from the industrial fleet have been rising more rapidly than those of the artisanal fleet, mainly as a consequence of large-scale investment whose objective is the development of industrial fishing. Therefore, the share of industrial fleet landings in total catch increased from 43 percent to 60 percent between 1970 and 1979.

In addition, aquaculture production was estimated at 23 thousand tons in 1978, of which about 80 percent was composed of "tucunaré" (Cichla ocellaris) and 20 percent of shrimp, tigerfish (Hoplias malabaricus), characins (Prochilodus spp.), tilapia (Tilapia rendalli), and freshwater weakfish (Plagioscion squamosissimus) [SUDEPE-MA, 1979].

The fishery-related industry in Brazil is estimated in 346 processing plants from which 198 units have refrigerated-frozen lines, 77 units with salting and smoking production facilities, 36 units for canning production and the remaining 35 units are producing fish-meal. These plants are located usually along the coastal line and are mainly concentrated in the southeastern and southern regions [Mencia-Morales, 1976].

Domestic consumption.

Despite Brazil being among the twenty major fish producing countries of the world, according to FAO (1979), its level of fish consumption per capita of seven kilograms is comparatively low when compared to the eight kilograms consumed in other developing countries and the world's average per capita level of 13 kilograms.

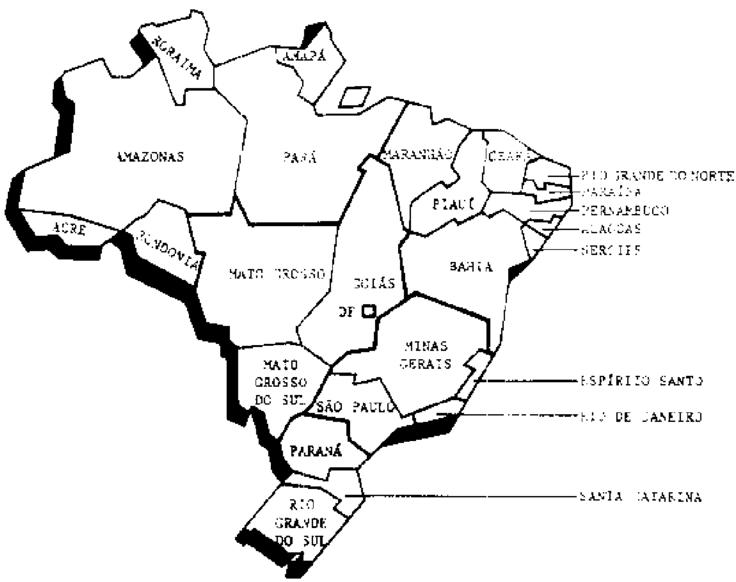
Seven kilograms when converted into fish final product for consumption are equal to four kilograms. This consumption is based on the following product forms: fresh-chilled, frozen, salted, canned and other miscellaneous product forms. In Brazil, varying levels of fish final product consumption can be observed by geographical regions (Table 2; Figure 3). The highest level of 11 kilograms is found in the northern region; the lowest, less than one kilogram, is registered in the middle-western region. The intermediary levels of consumption of four and five kilograms are in the southeastern and northeastern regions, respectively. The southern region has an average consumption of two kilograms. In addition, there exists an unequal distribution of the regional per capita consumption among the product forms. Regions, such as the south, southeast and north indicate higher predominance of fresh-chilled fishery products, while in the northeast and middle-west regions this is not the case.

Table 2 - Brazil. Per Capita Consumption of Final Fish Products: Distribution by Product Form and by Region. 1976.

Product Form	Percentage of the Fish Consumption Per Capita (%)				
	South	Southeast	Northeast	North	Middle-West
Fresh-chilled	48	69	40	65	28
Frozen	19	7	13	3	31
Salted	17	10	41	26	13
Canned	16	14	6	6	28
Consumption per capita (kg/capita/yr)	1.779	4.306	5.241	10.740	0.545

SOURCE: Mencia-Morales (1976).

Although there is no empirical evidence, one must take into consideration at least three interrelated factors other than income and prices that can help to explain the low levels of Brazil's fish consumption and unequal distribution of regional consumption by product form. First, the more valuable species landing areas are located in regions of lower per capita income (north-northeast) whereas a reverse situation occurs in relation to the south-southeast, contributing to the increase on transportation cost. Second, the inadequate storage and distribution systems for seafood products tend to contribute to restrict the growth of this market. Third, the social and cultural consumption patterns appear to signify consumers' preferences for other sources of animal protein.



LEGEND:

SOUTH: Rio Grande do Sul, Santa Catarina, Paraná.

SOUTHEAST: Minas Gerais, São Paulo, Rio de Janeiro, Espírito Santo

NORTHEAST: Bahia, Sergipe, Alagoas, Pernambuco, Paraíba, Rio Grande do Norte, Ceará, Piauí, Maranhão.

NORTH: Pará, Amazonas, Amapá, Roraima, Acre, Rondonia

MIDDLE-WEST: Mato Grosso, Mato Grosso do Sul, Goiás, Distrito Federal.

Figure 3 - Brazilian Geographical Regions.

International Trade Flows

Exports.

Brazilian exports of fishery products are composed on four major commodity groups: (a) fish; (b) crustaceans and molluscs; (c) other products and by-products; (d) canned products and preparations. During the period of 1970-1981, their volumes and respective FOB-values exported are shown in Table 3.

The data reveal that fresh, chilled or frozen lobster has been the single most important export item, representing about 39 percent of the yearly average of total value, or 73,380.3 thousand US dollars (Table 4). The rate of growth was 15.7 percent a year for this item. However, the percentage of the total value of exports, accounted for by lobster has decreased gradually over the period 1970-1981 from 52 percent to 32 percent, losing its leading position to shrimp after 1978. Fresh, chilled or frozen shrimp, the second major export product, retained about 30 percent of the yearly average of total export value with an average rate of growth of 21 percent between 1970 and 1981 (Table 4). The fresh, chilled and frozen fish species group was the next in importance with a relative proportion of 22 percent. Except for a short interval from 1975 to 1977, the share of this group on total value of exports was inferior to that of the corresponding shrimp values. Information on the composition of fish exports by species is not available, but the major fish species traded internationally by Brazil have been white catfish, southern red snapper, tuna species in more recent years (beginning in 1976), and sardines. The remaining fishery commodities exported by Brazil have been at considerable lower levels, accounting for no more than 13 percent of the total exports, like in 1973, and averaged about 9 percent in the period under examination (Table 4). Among these products, canned sardine exports were of interest, especially when considering that their export values jumped from 14.2 thousand US dollars in 1970 to 4,668.0 thousand US dollars in 1981 (Table 3).

The yearly weighted average FOB-prices from 1970 to 1981 for the three most important fishery commodities exported by Brazil are plotted on Figure 4. Upon examining this figure, one can observe an upward trend for lobster and shrimp export prices, especially after 1976, and that lobster prices rose more rapidly than shrimp prices. This was not the case for fish species export prices, since they remained practically stable in that period span. In turn, looking at the behavior of the volumes exported of these three fishery commodities, it can be seen that the volume of fish species experienced the fastest growth in the period. Lobster export volumes were stable while shrimp varied more erratically (Figure 5).

For the period 1970-1981, Brazil's exports were mainly destined for US markets. The US purchased approximately 96 percent of the total value of fresh, chilled or frozen lobster exports--an average of 28,657.8 thousand US dollars. Similarly, the US was the major consuming country for fresh, chilled or frozen fish species, sharing 70 percent of the yearly average export value of this item, or 16,174.0 thousand US dollars. Among the fish species exported to the US, southern red snapper and white catfish have been the ones most commonly forwarded to that country, although there are no data on the distribution of exports by species. Among Brazil's shrimp customers, the US has been losing its leading position to the Japanese market after 1975. For the 1970-1981 period, the former country absorbed 44 percent of the total shrimp sales (22,089.8 thousand US dollars), while Japan reached 48 percent. Besides the US and Japan, Argentina showed some relevance, especially concerning the Brazilian fish species exports, taking about 7 percent of this group on the yearly average value. Among the fish species, sardine is usually the major component of Argentina's fish imports from Brazil.

Table 3 - Brazil. Summary of Volume (in metric tons) and FOB-value (thousand US dollars) of Exports of Major Fishery Commodities, 1970-1981.

Fishery Commodities	1970		1971		1972		1973		1974		1975	
	Volume	FOB Value	Volume	FOB Value	Volume	FOB Value	Volume	FOB Value	Volume	FOB Value	Volume	FOB Value
TOTAL	10408.8	19384.0	12145.0	27179.5	18836.6	39491.7	18747.4	35602.2	17117.0	48156.9	16976.6	43487.6
FISH	4422.7	2827.1	4386.7	2674.2	8030.3	4106.8	7206.7	5341.8	7642.9	7738.4	9954.9	10928.4
Ornamental Fish	197.4	582.0	245.0	595.4	238.3	584.3	246.8	512.3	203.9	499.8	271.2	613.8
Fresh,Chilled or Frozen Fish	4213.5	2232.0	4142.7	2076.3	7792.0	3522.5	6959.4	4825.5	7438.7	7233.2	9733.5	10310.8
Salted,Dried and Smoked Fish	9.3	4.6	0.2	0.2	-	-	0.1	1.4	0.3	5.4	0.0	0.1
Fresh,Chilled and Salted Roe	2.5	8.5	0.8	2.3	-	-	0.4	2.6	-	-	0.2	3.7
CRUSTACEANS AND MOLLUSCS:	5883.2	16393.3	7003.2	23989.6	9391.4	34333.2	5345.5	26477.9	6089.6	38061.0	4902.3	30425.9
Fresh,Chilled and Frozen Shrimp	3057.9	6338.8	4356.9	11048.3	6702.2	17954.8	2621.5	8000.1	2436.7	8621.0	1683.2	6243.3
Fresh,Chilled and Frozen Lobster	2794.0	10042.7	2513.6	12836.2	2629.9	16354.1	2549.2	18032.6	3068.8	27858.3	2498.7	21534.3
Other Fresh,Chilled,Frozen and Salted Crustaceans and Molluscs	31.3	11.8	132.7	105.1	59.3	24.3	174.8	445.2	584.1	1581.7	720.4	2648.3
OTHER PRODUCTS AND BYPRODUCTS(1)	77.0	143.5	199.5	204.2	312.2	274.9	4903.7	2371.5	2829.3	1796.4	1004.2	870.8
CANNED PRODUCTS AND PREPARATIONS	25.9	20.1	553.6	311.5	1102.7	776.3	1291.5	1411.0	555.2	561.1	1115.2	1262.5
Sardine	22.3	14.2	509.4	210.3	[illegible]	[illegible]	1217.2	1186.2	544.6	544.5	926.7	[illegible]
Shrimp	3.6	5.9	44.2	101.2	86.5	205.0	65.9	197.1	0.3	1.3	103.4	381.6
Tuna, Lobster and Other				-	4.3	[illegible]	8.4	27.7	10.1	15.3	85.1	99.9

(continued)

Table 3 - continued.

Fishery Commodities	1976		1977		1978		1979		1980		1981	
	Volume	FOB Value	Volume	FOB Value	Volume	FOB Value	Volume	FOB Value	Volume	FOB Value	Volume	FOB Value
TOTAL	15296.6	54760.7	26622.8	74894.7	33130.5	98663.2	30293.1	147228.2	37513.0	134626.7	53398.2	157088.8
FISH	9350.0	13827.8	18249.1	24457.2	18265.9	26642.8	15769.9	27182.5	23143.1	36698.4	32979.4	43221.2
Ornamental Fish	187.9	624.5	193.5	664.6	236.1	884.2	270.6	1035.2	233.9	843.4	210.6	743.2
Fresh,Chilled or Frozen Fish	9157.9	13200.6	17994.3	23047.9	17940.7	24514.9	15419.7	25018.5	22834.6	35761.9	32730.4	42344.2
Salted,Dried and Smoked Fish	4.2	2.7	61.3	744.7	84.0	1208.9	0.1	0.5	54.2	97.2	6.9	68.0
Fresh.Chilled and Salted Roe	-	-	-	-	5.1	34.8	79.5	1128.3	20.4	195.9	37.5	65.8
CRUSTACEANS AND MOLLUSCS :	4417.5	39211.8	5955.8	48175.5	8151.5	64704.4	11727.2	113794.0	11225.4	89577.8	12033.1	104048.0
Fresh,Chilled and Frozen Shrimp	1784.7	11408.6	3109.6	17484.9	4925.4	26000.8	7169.2	55376.0	7497.8	44956.9	8836.4	51644.4
Fresh,Chilled and Frozen Lobster	2352.9	26876.5	2796.5	30563.5	3181.0	38359.2	3744.5	53791.0	2540.7	37575.0	2763.2	50070.1
Other Fresh,Chilled, Frozen and Salted Crustaceans and Molluscs	279.9	926.7	49.7	127.1	45.1	344.4	813.5	4627.0	1186.9	[illegible]	433.5	2333.5
OTHER PRODUCTS AND BYPRODUCTS(1)	807.4	943.4	1430.8	958.9	2920.9	2246.1	600.3	1799.6	836.5	3549.8	5540.6	4836.9
CANNED PRODUCTS AND PREPARATIONS	721.7	777.7	987.1	1303.1	3792.2	5069.9	2195.7	4452.1	2308.0	4600.7	2839.1	4972.7
Sardine	721.6	777.1	842.7	1093.4	3072.4	3896.2	1756.2	3030.1	2059.0	3998.5	2646.1	4668.0
Shrimp	0.1	0.6	1.7	9.4	-	-	24.5	158.0	25.2	172.6	0.5	3.7
Tuna, Lobster and Other	-	-	142.7	200.3	719.8	1173.7	415.0	1264.0	223.8	429.6	192.5	301.0

(1) Includes: Agar-agar, Algae, Fish Meals, Shells, Fins, Fish Oils, and Fish Liver Oil

SOURCE: BANCO DO BRASIL-CACEX (1970-1981).

Table 4 - Brazil. Total FOB-value of Exports of Fishery Commodities: Percentual Distribution by Major Item, 1970-1981.

Year	Percentage (%)				Total Export FOB-Value (thousand US dollars)
	Fresh,Chilled or Frozen Lobster	Fresh,Chilled or Frozen Shrimp	Fresh,Chilled or Frozen Fish	Other Items	
1970	51.81	32.70	11.52	3.97	19384.2
1971	47.23	40.65	7.64	4.48	27179.5
1972	41.41	45.46	8.92	4.21	39491.2
1973	50.65	22.47	13.54	13.34	35602.2
1974	57.85	17.90	15.02	9.23	48156.9
1975	49.52	14.35	23.71	12.42	43487.6
1976	49.08	20.85	24.10	5.97	54760.7
1977	40.81	23.34	30.77	5.08	74894.7
1978	38.88	26.36	24.85	9.91	98663.2
1979	36.54	37.61	16.99	8.86	147228.2
1980	27.91	33.39	26.56	12.14	134626.7
1981	31.87	32.87	26.95	8.31	157088.8
Average	39.05	30.10	22.04	8.81	73380.3

SOURCE: Table 3.

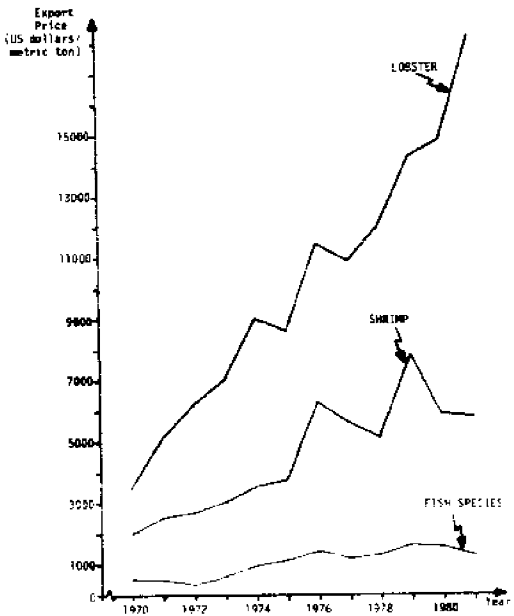


Figure 4 - Brazil. Weighted Export FOB-prices by Year: Fresh, Chilled and Frozen Lobster, Shrimp and Fish Species, 1970-1981.
SOURCE: Table 3.

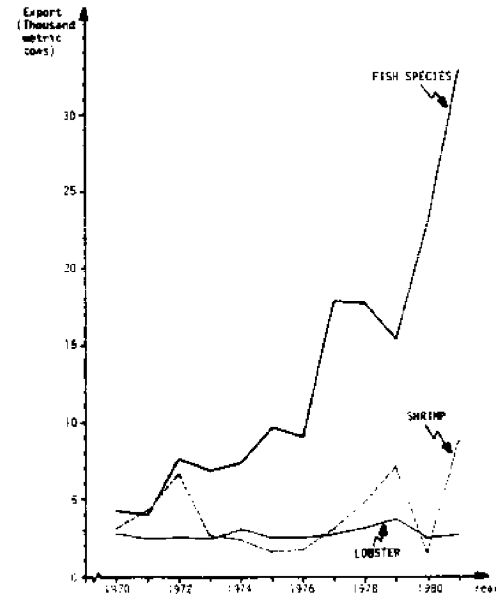


Figure 5 - Brazil. Export Volumes by Year: Fresh, Chilled and Frozen Lobster Shrimp and Fish Species, 1970-1981.
SOURCE: Table 3.

Table 5 - Brazil. Summary of Volume (in metric tons) and CIF-value (in thousand US dollars) of Imports of Major Fishery Commodities, 1970-1981.

Fishery Commodities	1970		1971		1972		1973		1974		1975	
	Volume	CIF Value	Volume	CIF Value	Volume	CIF Value	Volume	CIF Value	Volume	CIF Value	Volume	CIF Value
TOTAL	62564.8	34989.5	52328.6	34113.3	39924.0	33299.6	57645.0	54286.6	49591.9	59068.4	110021.8	60716.1
FISH												
Fresh,Chilled or Frozen Fish	5826.1	593.6	6365.3	708.0	2493.6	402.9	15754.0	3010.3	21313.0	5678.3	24153.3	8250.0
Dried and Salted Fish:	47415.6	31182.6	32299.8	28402.7	31578.6	30086.5	38397.0	46986.9	24469.9	48174.3	25018.5	44557.5
Herrings	30.6	20.2	12.2	5.2	8.9	2.8	38.0	76.9	51.6	42.7	9.3	8.6
Anchovies	109.3	67.5	41.1	28.5	123.5	92.9	252.5	768.2	97.1	111.1	158.4	135.7
Cods	47221.6	31080.6	32243.0	28367.0	31443.8	29988.0	38090.7	46664.6	24251.6	47960.4	24817.7	44336.1
Other fish	54.1	14.3	3.4	2.0	2.4	2.8	15.8	37.2	79.6	60.6	53.1	77.2
OTHER FISH PRODUCTS (1)	8.2	22.1	98.5	114.7	157.6	261.9	147.3	230.6	165.6	396.0	113.4	293.8
CRUSTACEANS AND MOLLUSCS:	479.4	224.9	740.4	453.1	562.0	332.8	594.1	476.9	310.1	385.4	199.7	597.2
Fresh,Chilled or Frozen	479.1	224.4	739.0	451.0	560.6	330.9	581.2	464.1	305.6	369.7	197.5	590.8
Dried, and Salted	0.3	0.5	1.4	2.1	1.4	1.9	12.9	12.8	4.5	15.7	2.2	6.4
OTHER PRODUCTS AND BYPRODUCTS(2):	1029.6	604.1	1572.8	957.2	1922.8	683.7	2136.6	1021.2	1147.3	1536.3	652.0	1014.4
CANNED PRODUCTS AND PREPARATIONS:	746.2	887.3	1094.4	1338.7	712.8	1050.3	1616.0	2560.5	1318.2	2565.0	1664.8	3328.[illegible]
Tuna	430.3	495.7	393.6	505.1	177.0	269.4	304.1	480.2	152.7	315.5	732.9	1596.1
Bonito	190.1	191.7	610.3	656.9	344.0	399.5	1066.5	1480.9	956.0	1715.3	819.5	[illegible]
Salmon	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	25.6	[illegible]	[illegible]	[illegible]	[illegible]	3.2	25.6
Sardine	47.1	60.6	30.9	36.5	97.0	122.5	112.8	169.1	127.2	188.4	33.2	75.4
Other fish,crustaceans, molluscs and caviar	76.4	133.6	51.4	127.8	85.1	[illegible]	124.5	393.6	96.6	[illegible]	[illegible]	261.9
FISH MEALS AND OTHER PRODUCTS NOT FOR HUMAN CONSUMPTION(3)	7039.7	1474.9	10157.4	2138.9	2496.4	481.3	0.0	0.1	867.8	335.1	8219.5	2474.9

(continued)

Table 5 - continued.

Fishery Commodities	1976		1977		1978		1979		1980		1981	
	Volume	CIF Value	Volume	CIF Value	Volume	CIF Value	Volume	CIF Value	Volume	CIF Value	Volume	CIF Value
TOTAL	79517.3	53103.9	64855.0	54691.0	66662.1	72221.1	95845.0	107363.4	70858.3	91836.6	49196.7	69643.3
FISH												
Fresh, Chilled or Frozen Fish	57322.1	15556.8	47070.6	16819.5	45112.7	22532.3	68779.8	46503.1	48471.2	30147.7	31787.0	19454.4
Dried and Salted Fish:	19284.7	32663.0	14387.9	30843.6	16563.8	40731.9	18610.1	49237.7	18003.1	51848.5	13314.1	40329.3
Herrings	-	-	13.2	12.8	8.8	12.4	6.2	11.5	22.1	39.0	13.5	23.4
Anchovies	208.1	198.2	149.5	159.5	223.9	267.4	186.8	264.7	179.6	316.9	130.4	22.6
Cods	18956.9	32356.4	14173.2	30588.3	16300.0	40411.9	18078.8	48357.6	17723.4	51380.9	13033.2	39886.5
Other fish	119.7	108.4	52.0	83.0	31.0	40.2	338.3	603.9	78.0	111.7	157.0	396.8
OTHER FISH PRODUCTS (1)	105.9	221.6	98.1	330.8	110.0	440.7	121.2	596.8	45.9	264.6	54.8	179.1
CRUSTACEANS AND MOLLUSCS:	217.1	229.1	294.9	642.2	249.9	302.1	2046.7	1717.0	201.0	398.6	255.3	324.4
Fresh, Chilled or Frozen	216.8	227.6	291.6	632.4	248.0	294.0	2041.8	1693.5	201.0	398.6	254.8	318.0
Dried, and Salted	0.3	1.5	2.8	9.8	1.9	8.1	4.9	23.5	-	-	0.5	6.4
OTHER PRODUCTS AND BYPRODUCTS (2):	839.9	1230.4	340.6	744.8	915.1	991.6	1410.6	1286.8	502.0	1115.8	282.7	746.1
CANNED PRODUCTS AND PREPARATIONS:	1497.4	3125.3	2663.3	5309.3	3590.1	7152.4	3839.2	7387.6	3443.4	6328.6	3335.1	7151.4
Tuna	764.2	1548.9	312.0	788.7	418.1	1233.1	394.1	1166.2	297.4	987.1	293.4	1088.5
Bonito	611.8	1217.1	2148.8	3852.2	3055.7	5401.7	3303.4	5614.6	2970.2	4722.0	2975.9	5848.6
Salmon	4.4	9.5	5.8	28.4	1.7	20.0	2.1	37.5	3.0	30.9	10.2	10.2
Sardine	44.6	73.2	79.7	147.7	36.1	82.3	15.8	42.5	44.3	79.1	28.3	60.5
Other fish, crustaceans, molluscs and caviar	72.4	276.6	117.0	492.3	78.5	415.3	123.8	526.8	128.5	509.5	27.3	143.6
FISH MEALS AND OTHER PRODUCTS NOT FOR HUMAN CONSUMPTION (3)	250.2	77.7	0.1	0.8	120.5	70.1	1037.4	634.4	191.7	1732.8	167.7	1458.6

(1) Including: Smoked Fish, Roes and Fish Meals

(2) Including: Oils and Fats (Crude or Refined), Fish Liver Oil, algae and agar-agar

(3) Including: Coral and Sponges

SOURCE: Ministerio da Fazenda (1970-1981).

Imports.

Brazilian imports of fishery commodities can be summarized into six major items: (a) fish; (b) other fish products; (c) crustaceans and molluscs; (d) other products and by-products; (e) canned products and preparations; and (f) fish meal and other products. Their CIF-values for the 1970-1981 period, together with their respective volumes are shown on Table 5.

From these groups, the imports of salted fish, especially cod species, represented the single most important item, that is, 65 percent of the yearly average of total value of imports for the period, or 60,444.4 thousand US dollars (Table 6). However, the data reveal that the share of this product imports decreased over time from 89 percent in 1970 to 57 percent in 1981. On the other hand, the relative portion of fresh, chilled or frozen fish species on the total import values rose from 2 percent in 1970 to 28 percent in 1981 (Table 6).

Table 6 - Brazil. Total CIF-value of Imports of Fishery Commodities: Percentual Distribution by Major Item, 1970-1981.

Year	Percentage (%)			Total Import CIF-Value (thousand US dollars)
	Salted Cod	Fresh, Chilled or Frozen Fish	Other Items	
1970	88.83	1.70	9.47	34989.5
1971	83.16	2.08	14.76	34113.3
1972	90.06	1.21	8.73	33299.6
1973	85.96	5.54	8.50	54286.6
1974	81.19	9.62	9.19	59068.4
1975	73.02	13.59	13.39	60716.1
1976	60.93	29.21	9.86	53103.9
1977	55.92	30.75	13.38	54691.0
1978	55.96	31.20	12.84	72221.1
1979	45.04	43.31	11.65	107363.4
1980	55.95	32.83	11.22	91836.6
1981	57.27	27.93	14.80	69643.3
Average	64.99	23.38	11.63	60444.4

SOURCE: Table 5.

Actually, the decline on salted cod imports may be a consequence of the steady upward price trend of this product. The fresh, chilled or frozen fish species item presented only a slight increase if compared to salted cod import prices (Figure 6). In turn, the volumes imported of fish species were increasing, and situated at higher levels than salted cod after 1975, while the respective volumes of the latter were decreasing over time (Figure 7).

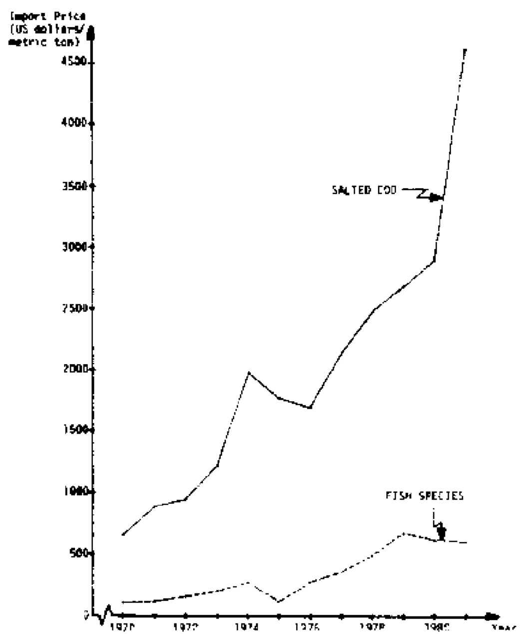


Figure 6 - Brazil. Weighted Import CIF-prices by Year: Salted Cod and Fresh, Chilled and Frozen Fish Species, 1970-1981.
SOURCE: Table 5.

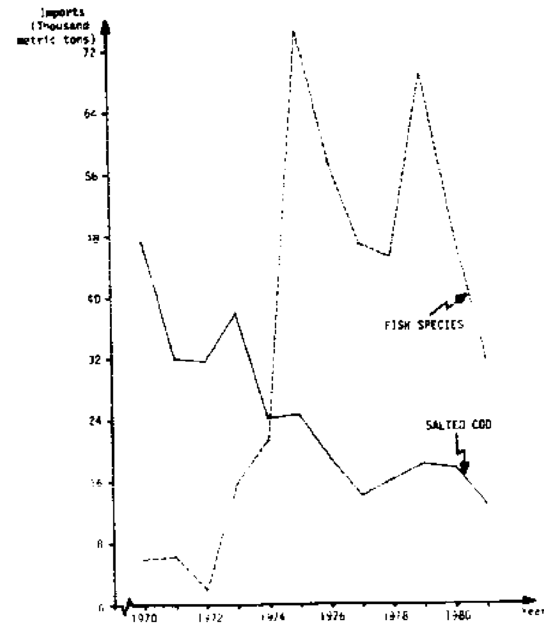


Figure 7 - Brazil. Import Volumes by Year: Salted Cod, and Fresh, Chilled and Frozen Fish Species, 1970-1981.
SOURCE: Table 5.

Salted cod was almost exclusively imported from Norway, that is, 80 percent of the average total import value of 39,281.5 thousand US dollars for the period. Other countries that have been sources of Brazilian imports of salted cod include Spain, Iceland and Canada in order of decreasing importance. The imports of fresh, chilled or frozen fish species originated in Argentina (70 percent) and Uruguay (28 percent). These imports mostly composed by hake were especially destined to the processing plants located in southern Brazil for the production of fillets, steaks and salted products for both domestic consumption and exports.

The current Brazilian import duties for fishery commodities are usually 155 percent ad valorem. Exceptions include: (a) duty-free entry on salted cod, fry and live shrimp for reproduction; (b) a 185 percent duty on ornamental fish; (c) a 55 percent duty on roe and a few other less important items; and (d) duty-free entry on imports from ALADI's (Latin-American Free Trade Association) member-countries.

Trade balance.

Looking at the historical pattern of trade for the fishery commodities from 1970 to 1981, it is noted that since 1976 Brazil became a net exporter of these products (Table 7). As a matter of fact, the trade balance changed from a deficit of 15,605.5 thousand US dollars in 1970 to a surplus of 87,445.5 thousand US dollars in 1981. For this period span, while the rate of growth of the export values achieved 21 percent the corresponding increase of imports was only 6 percent a year. It is believed that this surplus situation may continue if the government current emphasis on exports, vis-à-vis imports, is continued and the domestic consumption is maintained at the same pace.

Many factors might have simultaneously contributed to a faster rate of growth for fishery commodity export values as compared to import values. The first is related to a set of subsidies granted to the fishing sector by the Brazilian government between 1967 and 1977 when there was in effect the "fiscal incentives policy," as mentioned earlier. Despite the shortcomings of this policy, massive financial support provided the conditions for growth and modernization of the fishing fleet and the fishery-related industry. As a result an increase in export volumes was achieved. This fact is more evident in relation to the fish species group which export volumes experienced a significant upward trend, especially after 1976 when these volumes increased even more rapidly than before (Figure 5).

Second, the steady increase in lobster FOB-export prices during the 1970-1981 period might be viewed as a relevant factor responsible for the increase in the total value of Brazilian exports on fishery commodities. This uptrend in lobster prices could be a result of the stabilization of Brazilian lobster export volumes (Figures 4 and 5). The rationale for this is the relative importance of Brazilian exports to the US market. Brazil, together with Australia and Canada, are the major lobster suppliers to this consuming market. Therefore, any of them may individually act as a price-maker country, especially when the production of this crustacean cannot be largely expanded.

The third factor is related to the contribution of shrimp to the total value of exports. In this case, the shrimp export volumes have been

Table 7 - Brazil. Imports, Exports and Trade Balance of Fishery Commodities, 1970-1981.

Year	Imports		Exports		Trade Balance
	Volume (metric tons)	CIF Value (thousand US dollars)	Volume (metric tons)	FOB Value (thousand US dollars)	(Exports less Imports) (thousand US dollars)
1970	62564.8	34989.5	10408.8	19384.0	-15605.5
1971	52328.6	34113.3	12145.0	27179.5	- 6933.8
1972	39924.0	33299.6	18836.6	39491.2	+ 6191.6
1973	57645.0	54286.6	18737.4	35602.2	-18684.4
1974	49591.9	59068.4	17117.0	48156.9	-10911.5
1975	110021.8	60716.1	16976.6	43487.6	-17228.5
1976	79517.3	53103.9	15296.6	54760.7	+ 1656.8
1977	64855.0	54691.0	26622.8	74894.7	+20203.7
1978	66662.1	72221.1	33130.5	98663.2	+26442.1
1979	95845.0	107363.4	30293.1	147228.2	+39864.8
1980	70885.3	91836.6	37513.0	134626.7	+42790.[illegible]
1981	49196.7	69643.3	53398.2	157088.8	+87445.5
Average Value	-	60444.4	-	73380.3	+12935.9

SOURCE: Banco do Brazil-CACEX (1970-1981); Ministerio da Fazenda (1970-1981).

varying widely in the past 11 years while the respective FOB-export prices have followed a more stable upward pattern (Figures 4 and 5). After 1976, the shrimp volumes exported showed increases and by 1979 the proportion of shrimp on total exports exceeded that of lobster. Besides the expansion of shrimp landings in Brazil, the growth of export volumes can be also associated with government-incentive policy for shrimp exports designed to make this sector more dynamic and competitive, since Brazil is a minor shrimp supplier to both the US and Japan (larger buyers of Brazilian exports). The set of incentives granted were the following: (a) processing plants for shrimp export products were allowed to reduce a percentage of the value of federal sales taxes owed (15 percent in 1981, 9 percent in 1982 and 3 percent in 1983); (b) SUDEPE-IDB program was able to finance the construction of 100 shrimp trawlers for the northern coast to substitute foreign vessels at a subsidized interest rate and with a 10-year period for repayment of loans; (c) loans were given for the processing plants of shrimp export products, that corresponded to 30 percent of the anticipated value of exports; and (d) fuel subsidy of 30 percent over the market price for shrimp trawlers whose catches were to be exported.

Major export items: perspectives.

Relating the aspects of production for the major Brazilian export fishery items to future export trends of trade flows, shrimp stock caught along the northern Brazilian coast is one which has not yet been overexploited. As a consequence, an expansion of the catch and in exports can be expected without disturbing the biological equilibrium of this crustacean.

On the other hand, lobster stocks in the fishing grounds already identified are being in or near the overfishing stage, implying that any attempt to increase production, via expansion in total effort, may contribute to deplete these stocks. Besides the various regulations imposed on lobster fishing in Brazil, an annual quota of 9,000 metric tons (live weight) was established for the 1982-1983 period. If this amount is attained, the maximum available supply of lobster for international market is pre-determined for the next season, after a small portion for domestic consumption is deducted (usually around 5 percent).

Current white catfish and southern red snapper catches may not be largely expanded if one considers that the respective estimates for the maximum sustainable yield are near the present levels of catches. Thus, in terms of fish species, the expansion of exports may be sustained by an eventual increase in the tuna catch (through leased vessels in Brazilian waters) and by the fish species imports from Argentina and Uruguay, utilized as raw material in the idle processing plants located the southern region of Brazil.

Also, the changes emerging from recent Brazilian jurisdiction over fish resources have generated conditions for increasing the Brazilian shrimp catches on northern coast by reducing the over-exploitation of these fishing grounds, once dominated by foreign fleets. As a consequence, after 1976 the shrimp exports increased significantly, due to the expansion of Brazilian fleet production in that region.

Final Remarks

Taking into account the historical pattern in which the Brazilian fishing sector had developed, this activity has achieved a greater relative economic importance. The reasons for this performance are several: (a) the demand for an increasing supply of food; (b) the potential presented by Brazil's vast coastal and inland waters; and (c) the technical and economic support for the fishing sector as provided by the government through specific development programs and official policies. It is believed that the government-support program backing fishing activities has been a basic factor in promoting the changes observed in the past twenty years.

At present, it seems that Brazilian fishing activities have reached a stage in which new decisions are to be taken concerning the global policies to the sector. For most species of economic importance in the international markets, catches are very near to the maximum sustainable yield in the traditional fishing grounds. However, for Brazilian territorial waters as a whole the estimated sustainable yield is approximately 1,700 thousand metric tons of which only half (858 thousand metric tons in 1979) was exploited. On the other hand, there is an idle capacity in the fish-related products processing industries due to the misallocation of plants in the past.

If Brazil wishes to perform a more important role in the international trade, the reasonable possibilities seem to be the direction of substituting artisanal fishing with a better-equipped industrial vessel to operate in the already exploited fishing grounds. Also, Brazil's extended jurisdiction over fish resources is another source of possible increase in production, that would require a costly industrial fleet with long-range operating capacity on the high sea and corresponding vessel processing and storage facilities. Aquaculture is pointed out as another source of increased supply, taking into consideration existing adequate ecological conditions and developments thus far made.

However, it is evident that there is a need for economic studies aimed at orientating the search for greater efficiency in fish production management, especially when considering the present situation on the demand side. In the domestic market, the demand for fish-related products is low and does not seem to be prepared to increase substantially in the near future. In the international market, Brazil is a minor supplier of fish products and faces heavy competition. Consequently, any increase in production must necessarily consider the economic aspects of exploitation.

Bibliography

Brasil. Banco do Brasil. Carteira de Comércio Exterior (CACEX), 1970-1981. Comércio Exterior. Exports. Mercadoria por País e Portos. Rio de Janeiro: Carteira do Comércio Exterior, Banco do Brasil.

Brasil. Instituto Brasileiro de Geografia e Estatistica (IBGE), 1962-1970. Estatística Brasileira da Pesca. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística.

Brasil. Ministério da Agricultura. Superintendência do Desenvolvimento da Pesca (SUDEPE). 1971-1969. Produção. Brasilia: Superintendência do Desenvolvimento da Pesca (SUDEPE), Ministério da Agricultura.

______. 1979. IV Plano Nacional de Desenvolvimento da Pesca, 1980/1985. Brasília: Superintendência do Desenvolvimento da Pesca (SUDEPE), Ministério da Agricultura.

______. 1981. Relatório do Segundo Encontro do Grupo de Trabalho e Treinamento (G.T.T.) Sobre Avaliação dos Estoques. Brasília: Superintendência do Desenvolvimento da Pesca (SUDEPE), Ministério da Agricultura.

______. 1982. Guia de Exportadores Brasileiros de Produtos Pesqueiros/Brazilian Exporters Guide for Fishery Products. Brasília: Superintendência do Desenvolvimento da Pesca (SUDEPE), Ministério da Agricultura.

Brasil. Ministério da Fazenda, 1970-1981. Comércio Exterior do Brasil: Importacão. Brasília: Secretaria da Receita Federal, Ministério de Fazenda.

Food and Agricultural Organization (F.A.O.) of the United Nations. 1979. Yearbook of Fishery Statistics. Rome: Food and Agricultural Organization of the United Nations.

Mencia-Morales, F. 1976. Avaliação da Indústria Pesqueira Brasileira (Capacidade, Produção e Mercado). Brasília: Superintendência do Desenvolvimento da Pesca (SUDEPE), Ministério da Agricultura.

Nakayama, M. 1980. Retrospectiva Econômica Pesqueira Brasileira (1978-79). Brasília: Superintendência do Desenvolvimento da Pesca (SUDEPE), Ministério da Agricultura.

Timm, J. V. 1981. A Pesca no Brasil. Brasília: Superintendência do Desenvolvimento da Pesca (SUDEPE), Ministério de Agricultura.

Reassessment of National Policy Regarding Fisheries

Ronald Jensen
National Fisheries Institute
Washington, D.C., USA

If we didn't know anything about international trade before this conference started, we sure should by the time it's complete. The range of topics is extremely broad and fascinating. Tonight, I'd like to take a few minutes to address still another angle, and that is the need for reassessment of national policy as it relates to specific situations in the fisheries.

My objective is to suggest a few areas which should be considered by government and industry. I don't have any answer but, as you will see, do have a lot of questions.

As we all know, the fisheries do not operate in a vacuum. Trade and trade policy decisions affecting the fisheries are made in the context of overall national trade policy, other political considerations, in addition to consideration of the merits of individual cases themselves.

The United States is heavily involved in trade of all items of commerce. Exports in the merchandise classification amount to $220 billion. Imports are $240 billion, producing a deficit of about $20 billion.

The major cause of a negative balance of accounts is benefited by a $30 billion surplus in investment income. We are also ahead in sale of services.

It's been widely quoted that fishery products show a negative trade balance and, indeed they do. In 1981, this deficit was almost $2 billion. Some reports would show a deficit in fishery products of $3 billion. However, this includes the almost $1 billion imported of non-edible fishery products such as coral jewelry. I consider this a quirk of the accounting system and do not include it in my analysis of our fish products trade since it is not affected by fishery policy to any extent nor does it have any real bearing on the operation of the fleet and the processing and distribution industry.

The deficit of $2 billion incurred in fishery products is a substantial amount of money. However, it is not, as has been reported from time to time, one of the very large deficit trade items. But others that also exceed the fisheries negative balance of payment include: motor vehicles and parts, which show a deficit in excess of $8 billion as of 1979; steel products, with more than $4.5 billion; textiles with about $4 billion. In the food classification, coffee is a major import item, exceeding fish levels by a wide margin. Overall in food, we have, however, a $23 billion favorable balance of trade.

Earlier in this talk, I mentioned that, of necessity fishery trade policy must be taken in context with overall United States trade positions. In recent times, there has been strong emphasis on increasing exports, especially since the advent of the very heavy bill for imported petroleum products. Overall, approximately 17 percent of all goods produced in the U.S. are exported, while the agricultural produce of one out of every three acres of U.S. farmlands is shipped abroad. It has been estimated that one out of every eight manufacturing jobs is either directly or indirectly related to U.S. exports.

The broad scenario then shows a market dependent on or desirous of many items of overseas origin. A semblance of trade balance is achieved by overseas investments, sales of services, and an extremely favorable position in the export of food items.

If we overlay fisheries on this, a series of specific fishery issues emerge. Some affect fully developed fisheries such as shrimp, salmon, and crab. Others affect fully developing fisheries. Still others impact fisheries but have been established to seek other goals, such as protection of marine mammals, and to perpetuate our distant water migratory fishery.

An example of an issue affecting a fully developed fishery is the question of tariff on shrimp. In this case, the U.S. resources are fully developed but the market absorbs twice as much product as is available from domestic sources. The ratio of imports to domestic production has remained relatively constant at about 50 percent over the past ten years. Shrimp moves into the U.S. freely, with neither tariff nor quota restrictions.

Some contend that imports are depressing the industry by holding down the value of the product; they say imports should be reduced substantially from current levels and that a high protective tariff should be affixed. The purpose would be to raise the cost of the imported items which in turn would increase ex vessel prices.

Opponents of such measures believe that since restricting imports would not increase domestic production, but rather only increase cost, the scheme would reflect itself in higher consumer prices, resulting in reduced demand. The feeling is particularly felt by the processing and distribution section of the industry which has been built up to handle the combined volume of domestic and imported products. Restricting supply would result in considerable overcapacity in that industry and loss of jobs and investment.

Variations of this scenario exist in several other fisheries, especially fresh groundfish. Many believe that imports from abroad, especially Canada, at times depress the price available for fresh fillets.

The difference between the fresh groundfish industry and the shrimp industry is that there is continuing growth in the production of fresh groundfish in both U.S. coasts whereas shrimp production is static or declining.

Other trade issues relate to the development of fisheries presently being harvested by foreign fleets. The bulk of the resources presently allocated to foreign fleets are in groundfish categories. Yet frozen groundfish products are one of our major imports, exceeding $700 million in value. Some have raised the contention that frozen groundfish products from elsewhere in the world should be restricted either in form of quotas or tariffs in order to expedite the development of the groundfish presently being harvested by foreign fleets.

Some of this latter resource is directly interchangeable with the product being imported. Specifically, Alaska pollock is being imported in substantial quantity for use by U.S. secondary processors to manufacture fish sticks and portions. The Pacific cod resource exhibits many of the same characteristics as cod product now being imported from Canada and European nations. Some of the hake resources presently harvested by foreign fleets are similar to whiting products being imported from various parts of the world.

Vast quantities of the resource, however, are not immediately interchangeable with ground fish now being imported. Further consideration must be given to those product classifications which are being harvested by foreign fleets in which overseas barriers exist to the export of such product by the United States. In addition to groundfish being used in Asian markets, such products include the squid resources of the Atlantic, herring and such less prolific species as butterfish.

The use of tariffs and quotas to restrict imports of groundfish in order to expedite the development of the U.S. groundfish harvesting industry carries with it similar disadvantages to use of such measures on the fully developed fisheries such as shrimp. In case of frozen groundfish products from various places in the world, a major secondary processing and distributing industry is in existence whose volume and employment is dependent upon the ability to move product to the consumer in sizeable quantities. Increasing the cost of the product through tariffs or reducing its flow by quota would impact on volume, and, as mentioned, since fisheries trade does not operate in a vacuum, restrictions on important product movement from such places as Canada, Japan, and Europe include the risk of retaliatory measures in movement of other products from the U.S., or other political retaliations.

We must recognize the growth in high value fish exports makes the risk of retaliation very pertinent to our industry as well as to other parts of the economy.

Still another aspect concerns resource allocations. Allocations of surplus resources may be used to enhance the exports of fish specifically sought by foreign nations. For example, the nations that purchase squid from the U.S. can be rewarded with allocations of the surplus squid. The allocations can be used to promote other fisheries. Again an example, the purchaser of U.S. squid may be rewarded with an allocation of Alaskan pollock or the purchasers of fully developed fishery products may be rewarded with major allocations of Alaska pollock or other surplus resources. Some believe the allocation should be used to promote the good of the U.S. consumer in that allocations should be given to those nations which agree to sell the product at favorable terms to U.S. processors who in turn will pass the savings on to the consumer. The allocations may also be used to gain reciprocal access to fisheries of foreign shores such as the exchange of squid or pollock allocation to Mexico for the rights of the U.S. fisherman engaged in a tuna fishery off Mexico. Finally, the allocations may be used for political purposes completely divorced from the fisheries.

Sorting out the appropriate use of the allocations is a gargantuan puzzle. Do we provide allocations to European nations in exchange for their not restricting the movement of the salmon and crab into those markets? Should the allocations be restricted to gains in the development of the very fishery itself? A further question to be raised in considering the use of allocation is whether it is in the best interest of the nation to spread the allocations over many recipients or to make them more meaningful to a favored few. On one hand, the existence of many nations in a particular fishing ground could be viewed as a negative, whereas spreading allocations over many makes the economics of the fishery less attractive and thereby less likely for the allocation to be used.

Still other areas of trade issues are only indirectly related to the fisheries themselves. Examples are the stated policies of restricting imports of seafood items from those nations which do not conform to U.S. standards on protection of marine mammals and endangered species; or those which do not agree with our tuna policy. This latter policy has generated embargoes of tuna products from Canada and Mexico, and threats of embargoes on other seafood products. Likewise, threats have been raised against nations which do not conform to international whaling commission rules and against tuna from those nations which do not protect porpoises in the manner prescribed by the U.S. The question logically can be raised whether the trade in general and/or in fishery products is a weapon that should be used to achieve conformance in non-trade areas.

The subject is indeed complicated and I'll summarize now with a series of questions for you to ponder:

1. Are trade restrictions in the form of tariffs and/or quotas justifiable in the case of fisheries which are fully developed and which have no potential for further expansion? Would such be useful or counterproductive?

2. In light of national policy, possible retaliation and trade surplus in food products, are trade restrictions justifiable on products that could be replaced with domestically produced items?

3. Are trade restrictions justifiable for the purpose of achieving other goals, such as adherence to U.S. standards on marine mammals protection and to maintain the philosophy of international control over one migratory species? In the latter case, are restrictions justifiable on products other than those directly impacted?

4. What order of preference should be given to allocations of surplus resources? Shall allocations in one fishery be used to enhance exports in another or should the priority be given to allocations that would directly benefit the development of the fishery concerned?

5. Finally, where does the consumer fit in, especially since a major increase in consumer acceptance of fish is essential to industry growth?

These are hardly all inclusive. For example, we've not even touched on the trade issues related to over the side sales. However, the five questions may serve to stimulate discussion and formulation of a consistent trade policy of benefit to the nation generally and to the fish industry specifically.

Theoretical/Technical Papers

The Uses and Abuses of Econometric Models in Seafood Industry: A Case Study of the B.C. Roe Herring Industry

D. DeVoretz
Simon Fraser University
Burnaby, British Columbia, Canada

I. Introduction:

The oracle of Delphi retains its vigor as a myth since it continues to denote a power which has eluded us to today namely the ability to predict the future with little effort and a great deal of confidence. In the face of massive and unexpected shocks on both the demand and supply side of the seafood industry, we would of course like to be able to predict the consequences of these uncontrolled events on industry prices and revenue. In addition, contemplated government policy changes in the form of taxes or royalties and the reorganization of industry structure also lead to largely unpredictable economic consequences.

In order to find remedies for these exogenous shocks to the system analytical econometric models of the seafood industry have been developed. If properly estimated they seem to provide a mechanism to predict the economic effects of diyerse changes in the seafood industry.

However, like the oracle at Delphi there exist limiatations on our econometric models' predictive abilities. What is often forgotten is that the mythical powers of Delphi were a function of the ambiguity of the prediction. The more ambiguous, the more times your predictions were seemingly proved correct. In short, the less precise you were, the more often you were correct. With econometric models the converse holds: the more precise the models, the less often are you able to give accurate predictions or at least the confidence intervals of your predictions grow as the models' precision increases.

To amplify this theme this essay reviews the recent work of this author on the British Columbia roe-herring industry. The format of the paper is as follows. First, a summary of the model and findings for the British Columbia roe-herring industry are presented. Next, the implications of these findings for both predicting future prices and industry revenue are outlined. Further, under a host of exogenous changes simulation experiments are carried out and the effects on industry prices are reported. Finally, some cautionary remarks and a discriminating technique is offered to reduce the ambiguity of modern Delphian predictions.

II. A Roe-Herring Model for British Columbia:

It is beyond the scope of this paper to present the formal system of equations used to estimate the demand and price relationships for British Columbia's roe-herring industry.[1] In general however, we felt that due to the simultaneous nature of price determination in the roe-herring markets for British Columbia a just-identified 2SLS technique would prove most fruitful. The best results are reported in Table 1, for the reduced form price and quantity equations for each level of each industry.

The British Columbia Roe-Herring industry is essentially divided into three market segments; the procurment level, the processing level and the Japanese auction market. Moreover, each sub-market contains various degrees of competition which change over time. This is an important point to emphasize when we later use this model as a predictive tool. For example, a non-competitive segment of this industry may not alter its prices to clear a changing market while a competitive portion of the industry will have fluctuating prices in response to excess demand.

At the procurment level the traditional market (pre-1977) structure featured a few larger processors who "booked" the herring of quasi-independent fishermen.[2] After, 1977 cash buying by independent buyers initiated a period of competitive price bidding at the landings level. In addition, Co-operatives with a smaller percent of the catch (circa 20%) have merged the procurment and processing functions. Thus, it appears that at least after 1977 a competitive model based upon the primacy of the cash market would best explain the price determination mechanism at the procurment level. We turn to our results to support this view.

---

[1] See DeVoretz 1982 for a complete exposition.

[2] A booked transactions is a credit given to fishermen at the time of catch. Actual payment with or without a bonus is later in the calendar year.

Table 1

Summary of Regression Results: Procurment, Processing and Japanese Auction Market for B.C. Processed Roe-Herring

Markets						
A. Procurment Level (1981)	Constant	Cash Price Landings	Japanese Auction Price Lagged	Time	Distance	$\bar{R}^2$
(Cash Transactions)						
1. Price Eq.	2.4 (4.1)*	N.A.	.04 (3.1)*	-.17 (2.8)*	.61 (4.1)*	.81
2. Quantity Demanded Eq.	-127.3 (-1.6)	-1.41 (-3.9)*	7.1 (2.1)*	N.A.	N.A.	.77
B. Processing Level: 1978-80	Constant	Cash Price Landings	Japan Percent Inventory Charge	Price Salmon Roe	Quantity Landed	$\bar{R}^2$
1. Price Eq.	9.0 (8.0)*	.01 (.6)	.83 (2.1)*	.006 (.54)	-.69 (-6.2)*	.32
2. Quantity Demanded Eq.	Constant	Cash Price Landings	Japan Percent Inventory Charge	Price Salmon Roe	Quantity Landed	$\bar{R}^2$
	12.9 (4.1)*	-5.1 (-3.7)*	1.9 (1.7)**	-.005 (-.34)	.05 (2.3)	.39

Continued

Table 1 Continued

C. Japanese Auction Market	Constant	Inverse of Inventory	Change in Japanese Inventory	Inverse Salmon Roe Price	First Difference in Auction Price	Inverse of Seasonal Dummy	$\bar{R}^2$
1. Price Eq. 1980-81	2.1 (.6)	1.7 (3.1)*	-2.1 (-3.2)*	.41 (.81)	.31 (.86)	.61 (.91)	.41
2. Price Eq. 1977-80	1.1 .5	-.07 (-.22)	.12 (.8)	.34 (.69)	.18 (2.4)*	.31 (4.1)*	.34

Our cursory review of Table 1 is predicated upon answering two questions. What can we deduce about industry market structure and the validity of price predictions and what will future price trends be under alternative policy options? In sum, the results of Table 1 (Rows A-1, A-2) support our stylized view of this market. The price at the procurment level is a derived one; that is, in the previous period's (last October-December) the Japanese auction price positively influenced the contemporary period's procurment price. In addition, increasing the fishing distance from port raised the cash purchased price while length of time opened reduced an area's cash price. The significance of all these conditioners is that there exists strong evidence for a competitive landings market.

But how much will be purchased by any one company at this price? As would be expected in a competitive market the sole determinant in the first instance is price (See row A-2). In this case it is the previous period's Japanese auction level price as well as the contemporary period's auction price. These prices however worked in opposite directions: as the contemporary cash price falls then, any firm will increase its quantity demanded while if the previous periods Japanese auction price rises then the quantity demanded rises _ceteris paribus_.

We also attempted to estimate the empirical relationships for price and quantity in the procurment "booked" market but failed. The price data showed virtually no variation in any one year between booking firms or plants and hence regression analysis failed. Two possible conclusions can be drawn: either large companies do not respond to the competitive pressures of the cash based market or the reported booked price is an understatement of the true price paid. It is the latter interpretation which seems more plausible. Finally, we defer our discussion of the Co-operative based fishermen's price to the processing level section which follows below.

The roe-herring processing sector in British Columbia is an extremely complicated market structure given the limited number of members. First, British Columbia law prohibits exporting unprocessed roe-herring, giving domestic processes some market power _vis à vis_ the downstream Japanese buyer. Next, contractual arrangements varied over the recent history: prior to 1977 a "dirty auction" set prices between British Columbia processors and the Japanese buyers. This period was followed by the rise of smaller B.C. processors who processed the cash bought roe-herring and finally in 1980 a strike occurred which virtually shut-down all firms but the co-operatives.

Given these pre-conditions it was recognized that aggregation over time or across firms was bound to fail. Hence we disaggregated by time and firm size and report only the best results in Table 1 (Rows B-1 and B-2). First, it should be noted that the price and quantity equations for the co-operative firms failed and are not reported. However, the quantity equation for the processors is aggregate proved significant and revealing (Row B-2). The own-price variable had a strong negative impact on the quantity of processed roe purchased by the Japanese. The independent variables which would induce a shift in the demand curve; namely non-Canadian roe-prices and absolute inventory levels in the Japanese auction market were significantly and negatively related to the quantity demanded.

The price determination mechanism at the processing level is more ambiguous (Row B-4). In a competitive market structure we would expect that two variables would dominate price determination; the quantity of roe-herring caught and cash prices at the procurment level. Only the quantity landed variable proved significant and correct in sign (negative). However, a more refined measure of quantity i.e. the percentage change in the Japanese held inventories proved significant but, in a perverse manner. Unlike the posited relationship: a rise in inventories should lead to a fall in procurment prices, growing Japanese inventories led to price increases for B.C. processors. How can this basic proposition in economics (i.e. a declining price with growing supplies, *ceteris paribus*) be rationalized? In short, no ready rationale exists if one holds that a competitive market must persist. In this case, members of the Japanese auction markets, mainly the large trading companies, did not necessarily read growing inventories as a sign of excess supply. Since the Japanese market is seasonal there exists an incentive to withhold supply or allow inventories to grow on the expectation that the year-end price will rise.

In sum, the processing level did not perform with the full force of a competitive market. Price determination was not related to derived prices downstream or upstream in the market and the processor's price reacted perversely to the expectations of competitive theory *vis à vis* inventory changes. However, some elements of the competitive argument are maintained. In the quantity equation the standard criteria of a competitive market are met; the demand for roe shifted to the right in response to a rise in competitor's prices and a fall in inventory. Moreover, a fall in the processor's price increased the quantity demanded by Japanese traders.

British Columbia's interaction with the world market is dominated by one major fact. Japanese trading houses until recently purchased 90 percent of B.C. processed frozen roe-herring. Thus, this historical fact tends to strongly suggest that no matter what the details of the mundane day to day structure of the Japanese auction market appear to be, the invisible hand at operation in this market for B.C. processors was not the ephemeral one of Adam Smith. However, the collapse of Toshuku Ltd. in 1980 and the advent of smaller Japanese cash buyers (Hokkaido Roe Reprocessors) who attempted to circumvent the traditional monopsanistic buying power of the trading companies suggest that the post-1980 period was more competitive. Thus, our initial attempt to model the pre-1980 Japanese auction market used a mark-up pricing model. Our alternative model more appropriate for the 1980-81 period is more traditional and introduces the competitive arguments of alternative products (Salmon-roe), inventories and the previous period's auction price to explain the variation in the observed Japanese price for B.C. roe-herring (See Row C-1).

These two alternative models were tested and the results are perplexing. First, for the entire period (1977-1981) there is some evidence to suggest that the mark-up pricing model proved superior to the competitive model. The mark-up model results were as follows:

$$\text{Log } \Delta P_t^{\text{Auction}} = \text{Log } B_1 + B_3' \text{Log } \frac{1}{(\eta p)},\ P_{\text{cash Lendings}} \qquad \bar{R}^2 = .64$$

$$\begin{array}{lll} 3.6 & 4.1 & \\ (.8) & (3.2)^* & N = 15 \end{array}$$

indicating that a one per cent rise in the landings price led to a 4.1 per cent mark-up in the auction level price.

An inspection of row C-2 Table 1 indicates that over the entire period under the competitive model only the dummy seasonal variable and the previous period's price level proved significant. These two variables do not make a cogent argument for a competitive model: the dummy variable is just a seasonal shift variable and the lagged auction price variable is a measure of our ignorance.[3]

The Japanese auction market becomes ever more perplexing when we disaggregate by years. For the 1980-81 period, after a panic price collapse, an inventory adjustment model appears (Row C-1) to dominate price determination. To wit, the Japanese auction price responds to inventory adjustments (both positively and negatively) not previous levels of roe-herring or salmon roe prices.[4]

Thus, for the earlier period a non-competitive mark-up pricing model best explains the variation in B.C.'s auction level prices in Japan. For 1980-81, an excess demand model with competitive overtones is the preferred explanatory model.

III. Degrees of Competition and Prediction

The first question which prompted this review of our earlier econometric results was to what degree would our results shed light on B.C.'s Roe-herring market structure? At this point we require some criteria to judge the degree of competition in the various markets. We propose that if the own price and associated substitute prices tend to move in a direction to clear excess demand then that market is competitive. Given this litmus test we conclude that only a portion of the procurment market (cash sector) and the aggregate B.C. processoring market act in a competitive manner. The substantial "booked" transactions that occur at the procurment level, the co-operative segment of the processing level and the pre-1981 Japanese auction market either do not react as expected to price changes or show evidence of price setting.

---

[3] If we cannot explain last period's price, then using it to explain this period's price is not very revealing.

[4] For this latter period (1980-81) increased absolute levels of inventories led to a decline in auction prices for B.C. roe-herring. However, the B.C. price rose slightly in response to a change $(I_t - I_{t-1})$ in inventories. On Balance, the negative impact of the absolute variable on B.C. roe-herring prices dominated.

Given the relative number of participants in each market, their respective sizes and the many legal restraints this absence of perfect competition is to be expected. Our point now is not to offer the economists' typical menu of corrective measures to increase efficiency in these non-competitive sectors. What we ask at this point is: Given these various degress of competition, are these markets stable? In other words, is it valid to make predictions with our model? Will these predictions make any economic sense? To wit, if we place a tax on B.C, roe-herring landings as recently proposed will this in fact reduce the quantity demanded (and supplied) and eventually raise the price in the Japanese auction market as standard theory would suggest?

An inspection of the cash portion of the landings market suggest that this standard result would prevail. However, since all of the markets are interconnected and the landing's price appears directly in the processor's price equation as well as in the Japanese auction market (under a mark-up model) then the traditional results of a tax imposed on the landings level are less easily deduced in this general equilibrium framework. Perhaps a tax will not raise all prices but, reduce quantity demanded in the Japanese auction market to eventually lead to an increase in quantity demanded and a further price rise in the landings market. This latter scenario is bizarre, but conceivable, given our reported results. However, should we believe it? In fact are we abusing the predicitve powers of our model by attempting to simulate the results of a policy change under imperfect competition? Our tentative answer is positive. However, before we pre-judge our particular model in this speculative and casual manner we will report some recent simulation experiments and some associated tests.

Figure 1 contains scaled pairs of price variables under successive simulation experiments for the roe-herring marketing system estimated and reported in Table 1. Each price mapping reflects a simulation under one altered variable and the ultimate price effect traced out over the historical time in a general equilibrium framework. Our three experiments include: (1) restraining Japanese inventories to 1500 metric tons (2) placing a $50 per ton tax on B.C. roe-herring fishermen and (3) restricing the B.C. supply of roe herring to its 1972-74 average. Each of these experiments has relevence to current government policy objectives. For example, the landings tax is a proposed instrument to reduce the roe-herring (and salmon) fleet (and fishing effort) to raise (ultimately) fishermen's income.[5]

---

[5] In a similar fashion, the 1500 ton year-end inventory level in the Japanese auction market could be seen as the objective of a hypothetical Japanese quota policy which clears the market at the end of each holiday season. The reduced B.C. harvest would reflect a combined policy of conserving a fish stock of unknown biological character as well as reducing entry to the roe herring fishery after the initial licensing policy (i.e. reducing rent dissipation).

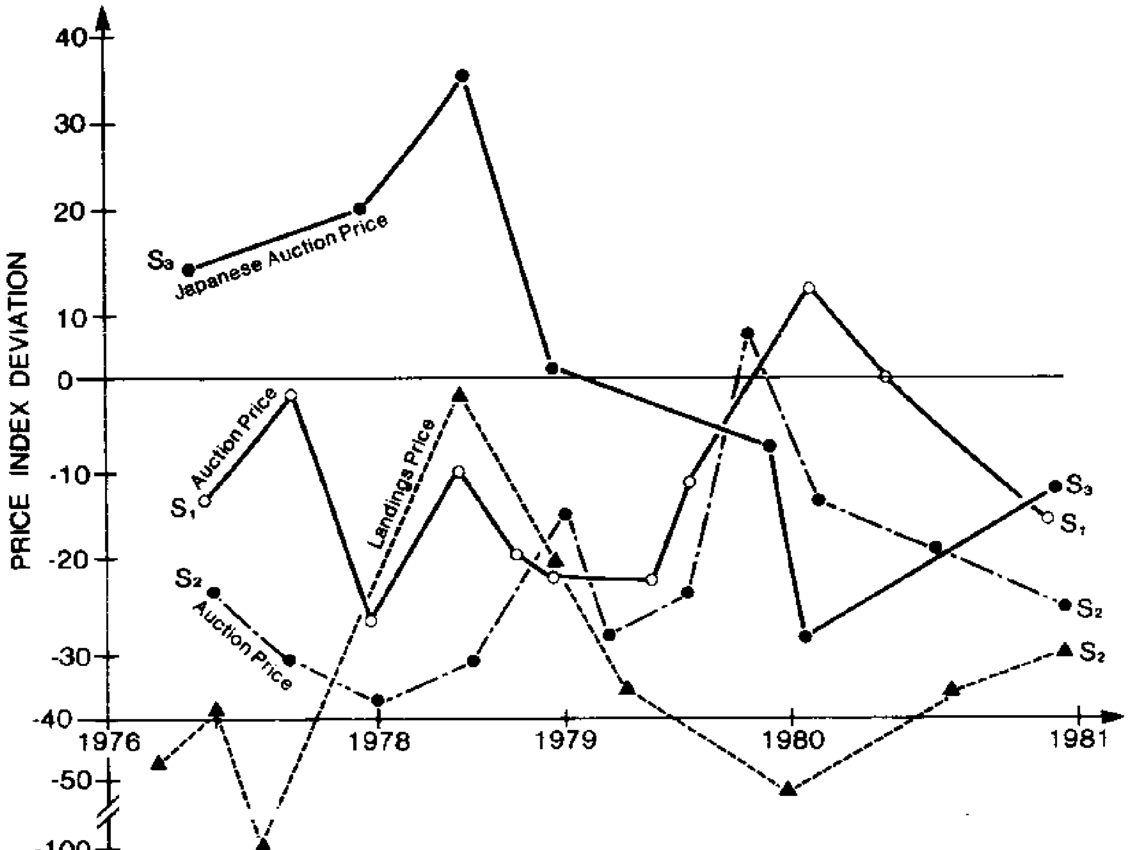


Fig.1: PRICE PERFORMANCE UNDER ALTERNATIVE POLICY SIMULATIONS

Note: All prices are reported relative to percent deviation from actual historical prices.

It would be clearly beneficial to know the outcomes of these various policy measures in advance and hence a simulation experiment to predict the results seems appropriate. But what do the results tell us? Do they stretch our credulity? . Turning to Figure 1 answers this query. The time pattern of the relevant price variable under simulation is reported relative to its historical value over the years of this study. The superscripts (S) refer to the three simulations outlined. The patterns we search for are twofold. First, is the simulated price pattern significantly far from the historical base and secondly, do the simulated price patterns have frequent turning points and wide amplitudes?

Our first simulation required that the Japanese held inventories decay from their 1977 levels to 1500 metric tons in a linear fashion. The policy action being produced here is to moderate speculative inventory fluctuations by persumed quota adjustments of the Japanese Ministry of Trade. The results are as theoretically expected; the Japanese auction price declines on average throughout the period with relatively minor fluctuations and five turning points.

This simulation is in sharp contrast to our second experiment of placing a $50 per ton landings tax. For this experiment we report both the ultimate effect on the Japanese auction price and the more crucialeffect on the landings price in B.C. Tracing these two simulation lines out (S_2-S_2) indicates that if a royalty tax had been imposed in mid-1976 and all other conditions remained constant the effects on both these prices would have been wide-ranging. Both sets of prices, but especially the B.C. landings price fluctuate widely, and in the negative range.[6]

But, would we trust these predictions based upon our model specification and these price series? <u>I would not</u>. My source of distrust is not due to the substantial decline (up to 100%) in the landings or auction price. Rather, it is the wide amplitude of these negative price fluctuations which arouses my suspicion.

Our third simulation (reducing the B.C. herring harvest to its 1972-74 average) illustrates a third property. Although this simulation seems suspect on the criterion that the amplitude of the simulated Japanese auction prices is large, there is a mitigating circumstance. To wit, there are only two turning points in the series, indicating that the model is stable under this simulation.

---

[6]The fact that both price series move in the negative range indicates that a royalty tax cannot be passed on to auction market, but, can be passed back to the fishermen.

These few simulations and associated price series were obviously pre-selected from many we conducted for heuristic reasons.[7] Each simulation and associated price series has markedly different turning points, amplitudes or average distances from the historical price pattern. We pre-selected these results to define simulation with abuse. Our proposition is simple:

> If the model produces under simulation a variable series with a large variance or covariance, then use of this particular series and simulation would constitute abuse.

In all other cases even though the sources of error may be substantial, you would not be abusing the model's predictive prowess by tentatively accepting the results.

But how do you know in precise fashion if you are straining the credulity of your reader or the model? Fortunately, there exists a coefficient owing to H. Thiel (1966) which provides such precision. Thiel defines this measure as an inequality coefficient. This descriptive statistic partitions the deviation from the historical series into three parts: bias, variance and co-variance terms?[8] Thus I argue that whenever either the variance or co-variance terms are the dominant source of error under simulation the models predictive power is being abused.

---

[7]Each simulation yields time patterns for all three price and quantity series. These are available for the interested reader.

[8]The inequality coefficient is defined as follows:

$$1 = \underbrace{\frac{(\bar{P} - \bar{A})^2}{1/N\ (P_i - A_i)^2}}_{\text{Bias}} + \underbrace{\frac{(S_P - S_A)^2}{1/N\ (P_i - A_i)^2}}_{\text{Variance}} + \underbrace{\frac{2\ (1-r)\ S_P \cdot S_A}{1/N\ (P_i - A_i)^2}}_{\text{Co-Variance}}$$

where $(\bar{P})$ and $(\bar{A})$ are the projected and historical price series respectively and (S_P) and (S_A) are the standard deviations around the two series. The term (r), is the correlation coefficient between the changes in the two price series. The three terms on the R.H.S. of the inequality proportion are in order; the bias proportion, the variance proportion and the covariance proportion.

Table 2

Thiel's Test for Measuring the Accuracy of B.C. Roe-Herring Simulations

	SIMULATION SERIES			
Thiel's Statistics	1500 M. Tons Inventory (Auction Price)	$50 Ton Tax (Auction Price)	$50 Ton Tax (Landings Price)	1972-74 B.C. Herring Catch Quota (Auction Price)
	(1)	(2)	(3)	(4)
1. Root Mean Sq. Error	2.1	2.1	2.7	1.7
a) Bias Proportion	.52	.17	.26	.08
b) Variance Proportion	.37	.55	.62	.85
c) Co-variance Proportion	.11	.28	.12	.07

Note: a) $R.M.S.E. = 1/N \sum^{N} (Pi - Ai)^2$ where Pi and Ai are respectively the (ith) projected and historical price series. Note null hypotheses in R.M.S.E. = 0.

Table 2 produces the inequality measures for our previously simulated price series. These descriptive statistics confirm the earlier impressions deduced from Figure 1. In sum, we should be extremely suspect of the last three price series produced by either a $50 tax or a B.C. herring catch quota. The first simulation limiting inventories is acceptable; both the bias and co-variance terms are low - they account for less than fifty percent of the deviation from the historical trend and the direction of the decline (i.e. due to the bias term) is theoretically correct.

The remaining question is: Why would a model produce a simulated series whose main error term is due to variation from the historical trends? The predominant reason is that a portion of the model which generated this simulated time series is unstable.[9] In our model of the B.C. herring industry the instability is generated by the Japanese auction market which sends ever increasing fluctuations throughout the system (e.g. landing's price series under tax simulation). The source of this instability within the Japanese auction market is its non-competitive nature for the time period covered. For example, our earlier results (Table 1) illustrated that auction prices and inventories (excess demand) moved in a perverse fashion. For the B.C. roe-herring model we have traced the ultimate source of the problem which could lead us to accept unwarranted simulations, namely the non-competitive nature of the auction market.

In sum, it is clear that contemporary consumers of modern predictions can be more skeptical. If you live in an unstable economic world, as indicated by imperfect competition with theoretically perverse price reactions, then the variance of your projections will be large relative to other sources of error. Thus, the cautious listeners of contemporary oracles should neither believe these forecasts nor honor them with tribute.

---

[9]A classic example of this type of behavior is the corn-hog cycle, in which changes in the supply of corn produce price changes in hogs which widely fluctuate and may or may not settle down to an equilibrium value.

References

DeVoretz, D., "An Econometric Model of the B.C. Roe Herring Industry," 1982, ms.

Thiel, H., Applied Economic Forecasting, Chicago, Rand McNally, 1966.

Theoretical and Empirical Considerations of Worldwide Ocean Resource Zone Extensions and the Effects on Export Market Shares of Seafood

James R. Wilson
Oregon State University
Corvallis, Oregon, USA

Introduction

Ever since the Fisheries Conservation and Management Act (FCMA) of 1976 was passed in the Untied States, and even before that time, there was considerable discussion among members of government and the private sector regarding the usefulness this new law would have in helping the U.S. trade position in seafood at home and abroad.

It is probably true enough that for some fish commodities, and strictly from an industry perspective, the FCMA in the short-term might have helped sales by U.S. firms on domestic markets by removing availability of raw product to foreign processors. However, there seems to be little evidence to suggest that the U.S. necessarily bettered their export position as a result of extended jurisdiction; nor are the world-wide effects of extended jurisdiction entirely unambiguous in their effects on export performance of other countries. These outcomes depend on which fishery is prominent (or under discussion), the extent of foreign fishing within 200 mile boundaries prior to extended jurisdiction, the nature of consumer preferences in a country, how rich the fishing grounds in question are, how well defended these grounds are, and how mobile a country might be in the trade of fish versus the trade of effort. Besides these issues, there still remains the question of what might happen to world trade in fisheries if all countries claiming a 200 mile limit suddenly decide to rationalize their fisheries, either domestically or internationally.

If one wishes to attribute changes in export markets to changes in extended jurisdiction, then a number of these factors must be controlled a priori either by explicitly incorporating them in a model, or implicitly by choosing commodities and conditions for which there is little interference from other factors not controlled for in a simpler model. For example, how sure can one be that a country will necessarily trade other goods for fish if their effort is displaced from a fishery? Might they as easily "trade" this effort away for fish or even form a joint venture in a way that no trade is explicitly carried on yet the net effect being an "export" of the resource from the host country? Would not one expect that as the regulation of an extended jurisdiction becomes "tighter" that a number of new institutions, and innovations on old ones will result? If the last two questions can be answered in the affirmative, then standard treatments of trade data may yield ambiguous results if one tries to address the issue of the effects of extended jurisdiction on export market shares of fish commodities. This could, in turn, lead to erroneous policy prescriptions and a subsequent misreading of trade opportunities arising from extended jurisdiction.

This paper will attempt to formalize some of the theoretical considerations that must be addressed when market shares models are used to measure the effects of extended jurisdiction on export markets. An empirical example of changes in Japan's export market shares of shrimp, prawns, and lobsters to the U.S. and Canada is given to show how market shares models can properly be used to measure the effects of extended jurisdiction on Japan's trade in these commodities.

Theoretical Issues Regarding Trade of Open Access Resources

For this exposition, we deal with only two countries, X and Y. It should be added here that generalization to n countries would be exceedingly complex with no obvious graphical or mathematical solutions. These two countries share in the exploitation of a common resource of fish, and have established production possibilities curves for effort. Here, effort is spoken of as though the units were homogeneous and infinitely divisible. This is obviously not the case in real life, but the abstraction, in general, is reasonable from the standpoint that factors directed towards fisheries resource exploitation can be considered in a broad sense a measure of effort expended to catch fish. However, as Scott (1955) and later Gould (1972) and Anderson (1977) have pointed out, the common property nature of the resource, both within each country and between countries cause the effort expended in the fishery to be undervalued, relative to how that same composite might be valued if it were combined with a resource endowment with strong property rights. This leads to the well known solution depicted in figure 1, where fish is not assumed to be constant in price, with average cost and marginal cost shown and the open access (F^{OA}, P^{OA}), competitive (F^{C}, P^{C}), and monopoly ($F^{PR}P^{PR}$) solutions are shown.

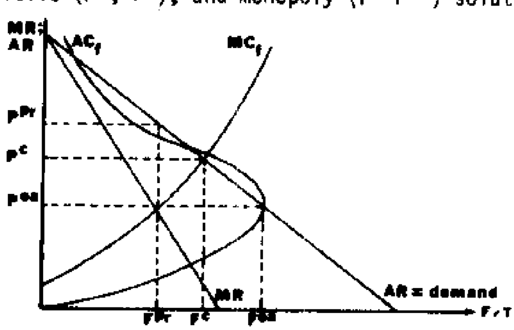


Figure 1. Price and Output Under Three Assumptions.

We turn now to briefly explain Anderson's principal results in a partial equilibrium framework within the context of the results above. Anderson shows that for any economy producing goods and effort where effort is used in the procurement of fish that the following conditions hold:

$$\frac{dF}{dg} = \frac{dF}{dE} \cdot \frac{dE}{dG}$$

or, the slope of the production possibilities curve for fish is the product of the slope of the yield-effort relationship and the production possibilities curve for effort and goods, respectively.

$$TR = P_g \cdot g + P_F(f(E)) \tag{2}$$

$$dTR = P_g \cdot \frac{dg}{dE} + P_F \cdot \left(\frac{d(f(E))}{dE}\right) = 0 \tag{3}$$

$$\frac{dE}{dg} = - \frac{P_g}{P_F} \cdot \left(\frac{d(f(E))}{dE}\right) \tag{4}$$

Equations 2 - 4 show the derivation of the well-known marginal condition of a producer who pays the marginal product of his inputs $\frac{d(f(E)}{DE}$. This is shown in figure 2 (frame A) and simply shows that a producer under these assumptions will produce at the tangency of the production possibilities curve and the prevailing price line. However, as suggested by figure 2 (frame B) the open access solution is not as shown in (4), but rather

$$\frac{dE}{dg} = - \frac{P_g}{P_F} \cdot (F/_E) \tag{5}$$

where F/E is the average product of application of effort. It then follows that the right-hand quantity (the slope) of (5) will be greater in absolute value than the same quantity in (4) at the same point (figure 2). What this amounts to, then, is a price line in open access that is steeper than the normal solution obtained, but anologous in that as one decreases the price of g (increases the price of f), that the slope of the open access price line continues to decrease but will always be greater than the price line corresponding to property rights at that point.

For any point on the production possibilities curve, then the price line corresponding to a production equilibrium (which maximizes total revenue subject to production possibilities) is less steep relative to the g axis in the open access case than is the price line in the non-open access case. Furthermore, since the marginal physical product of effort in the production of fish declines more rapidly than does the average physical product it follows that the equilibrium price line corresponding to (4) declines less rapidly than that corresponding to (5) throughout the range of production possibilities.

If we pursue this topic in more depth, we find that previous authors have been somewhat arbitrary in their explanation of this phenomenon. Consider effort as a homogeneous single input into the production of goods or fish. It is perhaps best to think of this within the succeeding frameworks as a production function in g and E, with the input E actually being allocated to production of g instead of fish. This is a long-run concept to be sure; and the notion of a "product" that is actually an input might sound foreign but this is mathematically an immaterial topic. Consider now the total revenue derived from the production of goods and fish and the equilibrium solutions of (4) and (5). In dealing with goods-effort relationship as an example of production possibilities, it is clear that:

$$\frac{\left(\frac{d(f(E))}{dE}\right)}{\left(\frac{dg}{dE}\right)} = \frac{MPP_E^F}{MPP_E^g} = -\frac{P_g}{P_F}^{\ C} < \frac{F/_E}{\frac{dg}{dE}} = \frac{APP_E^F}{MPP_E^g} = -\frac{P_g}{P_F}^{\ OA} \tag{6}$$

From this relation, it is now possible (with some visual help from figure 2) to establish the precise difference in the slopes at any one point on the production possibilities curve. It is merely the difference between the slope of the ratio $\frac{APP_E^F}{MPP_E^g}$ and the second derivation of the production possibilities curve for fish and other goods:

$$D = \frac{d\left(\frac{F/_E}{dg/dE}\right)}{dg} - \frac{d^2f(g)}{dg^2} \tag{7}$$

$$D = \frac{\left(\frac{d(F/_E)}{DG}\right)\cdot\left(\frac{dg}{dE}\right) - \left(\frac{d(dg/_{dE})}{dg}\right)\cdot(F/_E)}{\frac{dg}{dE}^2} - \frac{d^2f(g)}{dg^2} \tag{8}$$

$$- \quad > 0 \qquad < 0 \qquad > 0 \qquad < 0$$

$$D = \frac{\left(\frac{d(F/_E)}{dg}\right)}{\frac{dg}{dE}} - \frac{\left(\frac{d(dg/_{dE})}{dg}\right)\cdot(F/_E)}{\frac{dg}{dE}^2} - \frac{d^2f(g)}{dg^2} \tag{9}$$

Equations 8 and 9 suggest that for combinations of effort and g in the positive region of marginal productivity of E in g, the size will be absolutely positive, indicating an increase in slope for the open access price line. The second derivative of the production possibilities for fish and other goods is negative and constant: the middle term in equation 9 is always positive. As APP_E^F falls with an increase in effort to fishing (decrease in g), the slope of the productin possibilities curve steepens and, consequently the square of this slope becomes very large making the middle term smaller. As APP_E^F increases, the slope of the production possibilities curve for g and E decreases. Thus, even at high levels of g production there is still a substantial difference in the slopes of each pair of price lines, even though both price lines are very steep.

This information is very useful in reference to the construction of graphical expositions in this paper, and would certainly be useful in a more rigorous mathematical treatment with specific functional forms.

Trade solutions for independent fishing nations. Notice from the previous discussion that no mention has yet been made of consumer preferences, yet they are necessary to provide for the possibility of a unique trade solution. The price ratio to producers will also be the budget set for the consumers of an economy. Yet, there is no reason to believe that in a trading economy that production and consumption points must be the same. In fact, they may be quite different. The multitude of price lines at which producers are willing to supply determines the feasible set of production points. These imply a set of budgets which in equilibrium with preferences form a set of feasible consumption decisions in the closed economy. This is depicted in figure 3 for one country. Assuming homothetic preferences, the function ϕ^* is the locus of all tangencies between the price line (budget set) and the community indifference curves. In figure 3, at price ratio P_1P_1' producers are in open access equilibrium at θ' and consumers at ϕ^1. At P_2P_2' both producers and consumers desire and produce the same bundle of commodities. The price line P_4P_4' shows a relatively high price of fish, compared to the others, and also suggests that consumers would be indifferent between consuming ϕ^4 at P_4P_4' of ϕ^1 at P_1P_1', although producers would want to produce at θ_1 or θ_4. Note particularly that price lines determining the production points do not necessarily emanate from a given point, but rather take their slopes from the slope of the production possibilities curve for fish and other goods (PPC_F^g) plus the difference in slope which changes for each production point for all second order and higher functions (see equation 9).

When trade is opened up between these two countries with independent fisheries, a process of tatonnement occurs between both countries that establishes a world price which allows a trade of commodities. However, notice that trade does not appear to be a necessary result and that it is possible that no trade could occur, depending on the relation between the prices at which producers are willing to produce and the prices at which the consumers are willing to consume. As we have constructed it in figure 4, trade will occur, with country X producing at B and consuming at A (trading $\overline{BC}$ of g for $(\overline{CA}$ of fish) and country Y producing at B and consuming at α with $\overline{\beta\gamma}$ of fish given up and $\gamma\delta$ of g obtained. Quantities of goods and fish exchanged between the countries are equal. It is important to note, however, that such a happy solution does not seem to be at all guaranteed and ultimately depends on the relation between prices and preference structure (exemplified by ϕ^*) which is, in turn, related to the production possibilities curves of the producers. By definition, the world price line in country Y will be flatter than the domestic price but whether or not trade will ensue depends on where, on the production possibilities curve, the producers will want to be at that price. They may, in fact, want to produce at P, and if this is the case then no trade may be forthcoming, or consumers may be indifferent to trade versus the no-trade point, depending on the shape and curvature of the indifference curve tangent to P_Y at R.

Notwithstanding these cautions it seems that trade may occur in open access goods, although it does not appear to be necessary, for any price change. That trade does not appear to be necessary for all

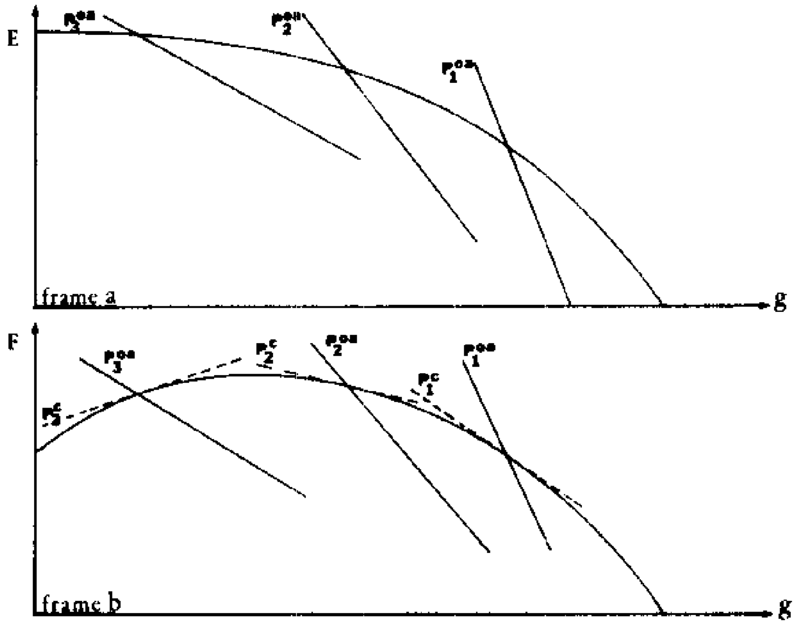


Figure 2. Open Access (oa) and Competitive (c) Price Ratios.

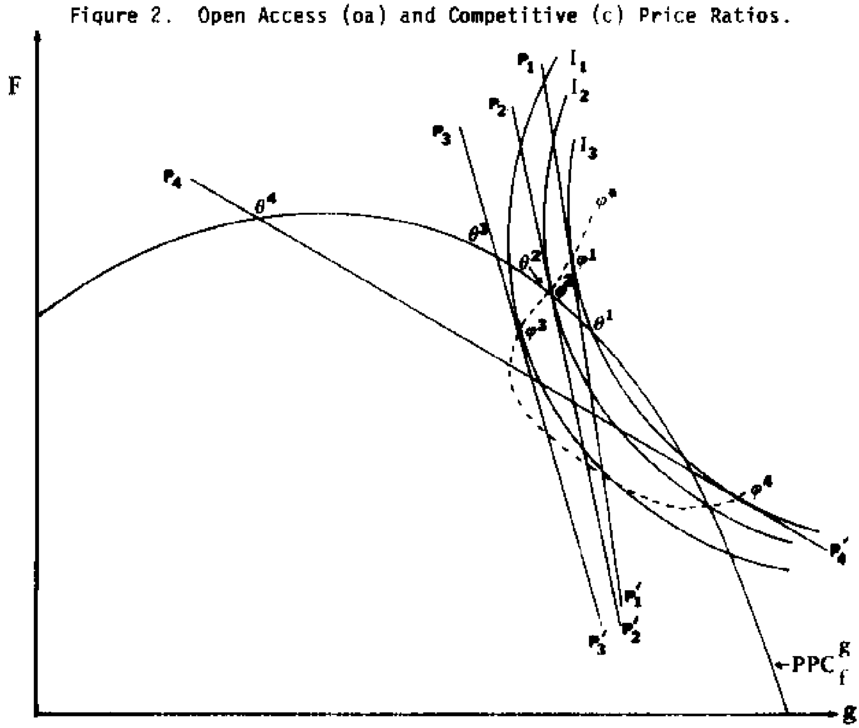


Figure 3. Construction of Locus of Feasible Consumption Points (ϕ*).

changes in price seems at first to be counter-intuitive, especially since the competitive solution so obviously results in potential gains from trade regardless of the direction of world price change. This result deserves a more careful treatment than we can give to it here.

Trade Induced by Changes in Production of Other Goods with Interdependence

Suppose that for now we focus on the country X, and what happens to it when, after giving up effort to increase production of other goods, this sends signals to producers in country Y. Assume for this example, that there is a negatively related one-to-one correspondence between effort expended in fishing in country Y or X; as country X gives up one unit, country Y fills that void in the fishery by increasing effort by the same amount, because of an increase in the productivity of effort caused by the removal of effort from fishing into goods by X. This is suggested by figure 5. Country X (top diagram) decreases its effort to EX_2. Country Y's productivity of effort increases through the yield curve, from $SYY(EY_1)$ to $SYY(EY_2)$. Country Y's effort increases from EY_1 to EY_2 through the equation of $SYY(EY_2)$ with TC_{EY}, the open access solution. This, in turn, effects a downward shift in the sustainable yield curve for X from $SYX(EY_1)$ to $SYX(EY_2)$. Further, this activity shifts down the production possibilities curve from $PPX_g^F(EY_1)$ to $PPX_g^F(EY_2)$.

Since we are concerned with the nature of the trading changes as a result of these and other shifts, it would be interesting to know how such changes affect the prices of the commodities at which each producer would be willing to trade. This will change the condition under which consumers would be willing to buy also, and as such this topic is important. First, consider figure 2b and $PPX_g^F(EY_1)$ in figure 4. There corresponds a unique set of prices for each point on each curve. However, what is the change that can be expected for the slope of this price line through R, as opposed to that going through Q? Are they the same slope through both points or different?

It is known that the open access solution is:

$$\frac{APP_E^F}{MPP_E^g} = -\frac{P_g}{P_F} \tag{10}$$

However, the change in this value is needed with respect to a change in the effort level in country Y where other goods (g) are held constant in country X.

$$\left.\frac{\partial\left(\dfrac{APP_E^{FX}}{MPP_E^{gX}}\right)}{\partial \quad E^Y}\right|_{g^\circ} = \frac{\left(\dfrac{\partial \; APP_E^{FX}}{\partial \quad E^Y}\right) \cdot \; MPP_E^{gX} - \left(\dfrac{\partial \; MPP_E^{gX}}{\partial \; E^Y}\right) APP_E^{FX}}{(MPP_E^{gX})^2} \tag{11}$$

Since $\frac{\partial\, APP_E^{FX}}{\partial\, E^Y} < 0$ and $MPP_E^{gX} > 0$ this first term is negative. Also, since by assumption g is held constant the second term goes to 0 and $(MPP_E^{gX})^2$ remains positive. Therefore, the sign on the change in this slope with respect to effort expended in Y for any constant g is negative. This corresponds to an increase in the expected price of fish, which leads to a decrease in the slope of the price line at any fixed level of g. An increase in the price of fish in country X will tend to increase the producer price of effort in X if the fish price has risen higher than the decrease in average productivity of effort. That is:

$$APP_{E_1}^F\ P_{F_1} < APP_{E_2}^F\ P_{F_2};\quad \frac{APP_{E_1}^{FX}}{APP_{E_2}^{FX}} < \frac{P_{F_2}}{P_{F_1}} \tag{12}$$

Similarily for country X, if the APP^X falls by a greater amount than can be compensated for by the price rise of fish, then the price of effort can fall. It is also possible for the price to remain constant. Similar reasoning can be used to show that if prices of fish falls in country Y the price of effort can fall, remain constant, or increase. In figure 5, country X's price of effort has risen; country Y's cost of effort has remained the same. An inset for country X shows the condition that could hold for a decrease in the cost of effort. This decrease would be accompanied by a drastic reduction in the sustainable yield curve of country X after having given up $EX_1 - EX_2$ units of effort. This result is quite similar in fact to what some large fishing nations might be experiencing in specific fisheries in the post 200 mile regime; which might partially explain the relatively recent attention given to joint ventures and foreign direct investment.

However, now that production possibilities curves are allowed to shift along the fish axis in response to the allocation of effort in one or the other countries, then the trading solution becomes fairly complex. Consider, for instance, a case where country X has decided to enforce a 200 mile economic resource zone, and that this will mean, for country Y, an exclusion of all or part of their effort in that zone. That is, there will be an autonomous increase in the productivity of effort in country X and consequently an increase in the price of effort, if effort is held at constant levels, even though it has been shown (equation 11) that the price of fish for country X will tend to fall at fixed levels of g (and consequently, E). This phenomenon opens up the opportunity for country X and Y to trade, not only in fish but also (possibly) in effort.

First, however, consider an initial situation where trade of goods for fish by country X is attempted in an open access situation. Keep the assumption that countries competing for a fish resource increase their effort in response to productivity gains in the fishery caused by another country removing effort from the fishery. Also assume, as is actually the case that there is never a total ocean-wide expulsion of

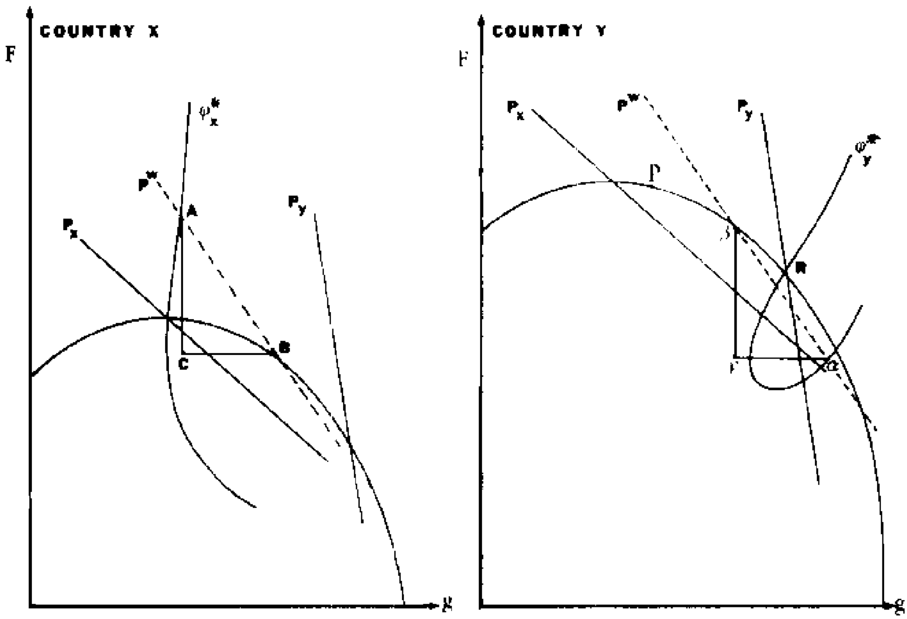


Figure 4. The Open Access Trade Solution.

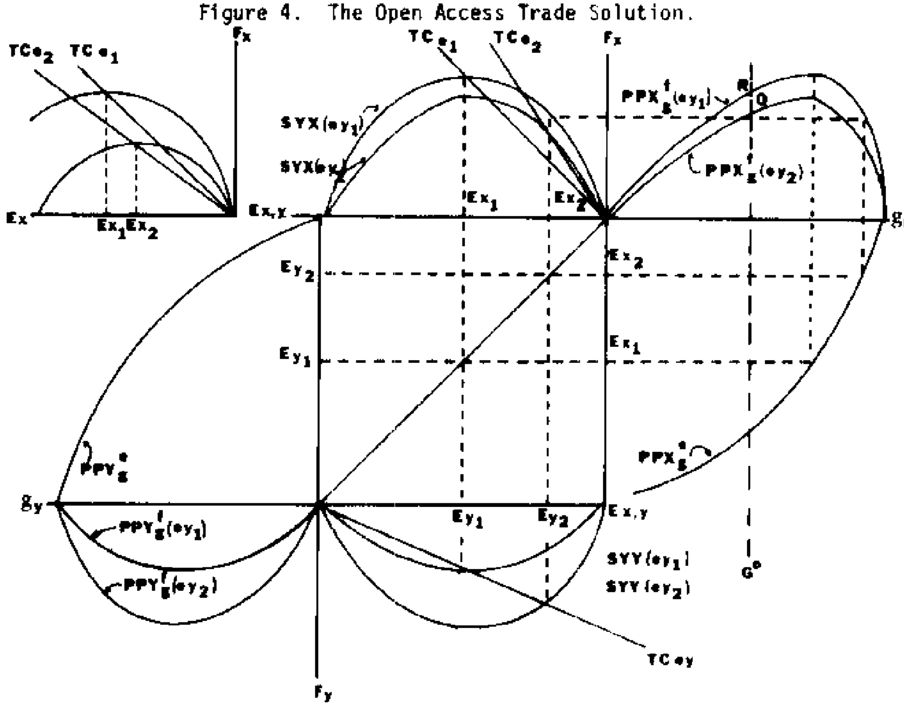


Figure 5. Effects of Changing Effort Levels in the World Fishery.

all competing effort in a fishery through extended jurisdiction. That is, the fishery resource is shared, but an extension of jurisdiction does not necessarily force the foreign fishing nation out of the whole ocean fishery. Also, giving up some effort by one country does not <u>necessarily</u> cause an increase in effort by the other country by the same amount as was shown for simplicity in Figure 5. Given these and previous assumptions, it appears that, through a very complex adjustment process, that an entirely different trade solution from the initial standing position will ensue between fish and other goods, if a world price of fish can emerge which places consumers in a better position than the initial position. It becomes readily apparent that such a solution depends in large part on the path of adjustment along the shifting production possibilities curves. The final position of the PPX_g^F of the country X depends on the responsiveness of country Y's movement of effort into the fishery. Figure 6 shows some paths of adjustment for X under three assumptions about the nature of the productivity shifts in country Y. Under each of the three assumptions the method of adjustment is as follows:

1) Both country X and Y perceive an opportunity to trade in fish;

2) A production and consumption point at world price P_w is established;

3) However, as producers give up effort to produce goods to trade their production possibilities curve shifts down which results in:

   (i) a general increase in the price of fish at which producers are willing to produce in country X;

   (ii) a general decrease in the price of fish at which producers are willing to produce in country Y;

   (iii) a rightward shift in the ϕ line in country X, a leftward shift for country Y (not necessarily at the same price ratio);

   (iv) a new established world price with production and consumption points;

   (v) the discovery that as effort is moved out of the fishery that the production possibilities curves shift yet again;

   (vi) a repeat of the above process until:

      a) the outward shift in price of fish in country Y converges to P_Y^*;

      b) the downward shift in the production possibilities curve converges to PPX_g^{F*} and attendent price of equilibrium of consumption and production converges to P_X^*.

If a world price can be established after this adjustment then trade will ensue without any further decreases in the production possibilities curve (increases in country Y's productivity of effort). Note that a controlling mechanism is the declining rate of downward shifts of the production possibilities curves for fish and other goods in country X. This occurs because even though an upward shift in productivity of effort may occur for country Y, the successive increases in effort in Y become ever smaller, which shifts the PPX_g^F down, which in turn converges with each successively smaller increment of effort released. So, instead of trading along a single production possibilities curve, country X trades along a whole set of these curves. Figure 6 shows three possible paths of adjustment each with different results. Each have started from the initial position at ϕ^1, P_{w1}, $PPX_g^F(1)$. The first adjustment path (to ϕ^2, P_{w2}, $PPX_g^F(2)$) leads to a solution which is absolutely better than the first position, since the no-trade and the trade solution lies to the northeast of the community indifference curve I_I. The second adjustment path (to ϕ^3, P_{w3}, $PPX_g F$ (3) yields an inferior no-trade solution but a trade at previously world prices that makes country X better off. The third adjustment path (to ϕ^4, P_{w4}, PPX_g^F (4)) yields both an inferior no-trade solution and trade solution. If producers have prior knowledge of this outcome, there will be no attempt to trade goods for fish in the first place.

One final consideration for the theoretical part of this paper is what happens when extended jurisdiction is imposed by both countries. Suppose country Y has autonomously ordered all effort input by country X out of its 200 mile zone (Figure 7). Country X has also done the same thing to Y, but the net effects are a downward shift of PPX_g^F and an upward shift of PPY_g^F. This will cause, in country X, an increase in the price of fish at which firms are willing to produce, according to our previous results. The decrease in marginal productivity of effort is shown here to be greater than the price increase of fish; thus the price firms are willing to pay to effort in country X falls for each point on PPX_g^F (2). However the ϕ locus for fish and goods tends to be moved down and right to ϕ_x^2. The equilibrium price of fish thus has two forces working on it; the general increase in prices at which firms are willing to produce and the attempts by consumers to maximize community preferences given these price increases.

In country Y an opposite process has taken place. An increase in the marginal productivity of effort reflected in the move from PPY_g^F (1) to PPY_g^F (2) takes place with a subsequent fall in the price of fish at which firms would be willing to produce each quantity along the new curve. This raises the price of effort in country Y. In the goods-fish sector, these changes are accompanied by a movement of the ϕ locus left and up to ϕ_y^2.

To look at alternative trade movements, it is important to note that the price of effort in Y under the new regime $P_y^E 2$ would not necessarily coincide with the goods and fish bundles at which firms in X would be willing to produce given the corresponding price of fish in Y. For

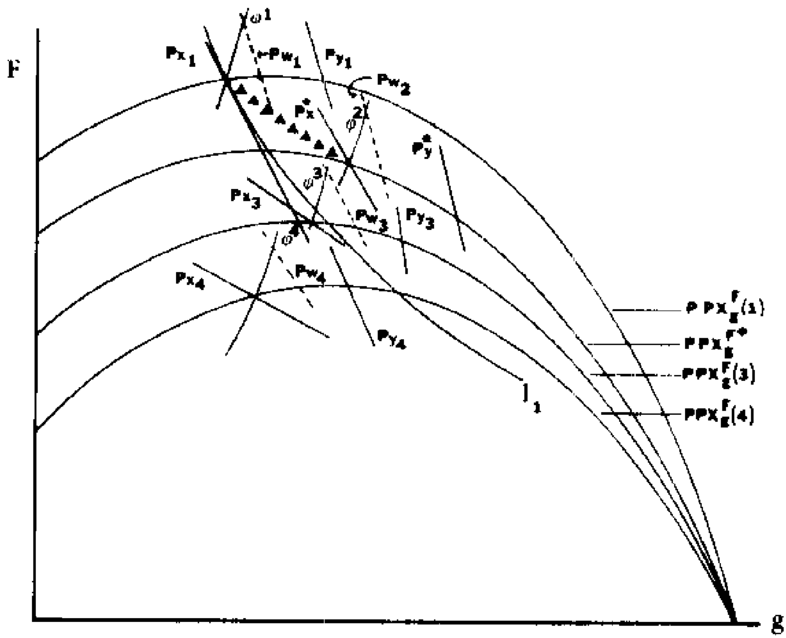


Figure 6. Three Trade Solutions in an Interdependent World Fishery.

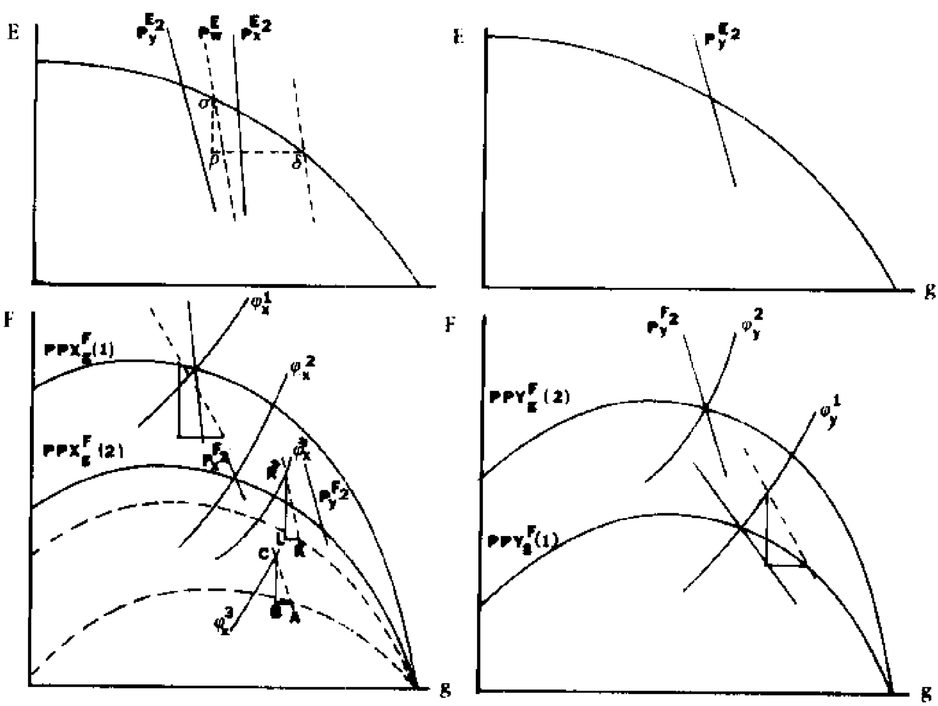


Figure 7. Comparative Trade Positions for X; Trading Effort Vs. Goods.

this reason Figure 7 shows P_y^{E2} at a different effort and good location than P_y^{F2} in the fish-goods sector. This distinction is of great importance in the analysis. However, there is a corresponding price of effort for P_y^{F2} on the effort-goods production possibilities P_x^{E2} where the world price is established at P_w in the country X, the producing point is at A, and $\overline{AB}$ goods are traded for $\overline{BC}$ fish. Similarly, in country Y $\overline{\alpha\beta}$ fish are traded for $\overline{\beta\gamma}$ goods, as before (not shown).

However, the above trade solution need not be the only one. Consider the process by which the world price was established, say, for country X. Given the pre-trade scenario it would be reasonable to expect that fish and other goods were traded until product prices equalized and subsequently factor prices are equalized. But one could just as easily conclude that $\overline{\sigma\rho}$ units of effort were given up for $\overline{\rho\delta}$ units of goods; with $\overline{KL}$ subsequently traded for $\overline{LR^*}$ based on a world price of effort obtained at P_w^E. The adjustment process would be roughly similar to that shown in Figure 6, except that, in this case, some of the effort produced at the world price would never reach the fishery in country X, but would rather be "traded" to country Y for goods. However, country Y no longer experiences their sustained yield curve shifting up, but rather their total cost of effort shifting down. This movement involving a use of effort occurs along the existing yield curve in country Y. The increase in effort, however, still shifts production possibilities curves in country X down, shifts the relevant ϕ locus down and raises the producer price of fish in country X. However, the world price of effort obtaining suggests a lower price at which firms would be willing to produce fish. This translates again to a new lower price for fish for which firms in X would be willing to produce. The end result of this adjustment process may well be one where the trading point would be R*, greater than either the old equilibrium or the one obtaining without trade in effort. This solution is tantamount to saying that a major loser due to extended jurisdiction, country X in this case, may find it advantageous to trade off its effort produced at a higher price. In the process, however, less fish is lost in its own fishery, and goods may still be given up for fish. Thus, an effective trade in fish can be initiated by a trade in effort for goods. This opens up the possibility of trade of product bundles. That is, if both sectors are open to international trade, perhaps neither R* nor C will obtain, but some intermediate point will, and again, if R* and C are both superior points to n, then so much the better. This solution in Figure 7 has its analogue in country Y, though these are not shown here to keep graphics simple.

Empirical Considerations

It is apparent from the discussion above that if one wishes to see the results of extended jurisdiction on trade of fish, then one must be very cautious about the conditions under which that movement takes place. The considerations previously discussed can either be explicitly modeled or implicitly controlled for by a careful choosing of cases and analyzed by very simple models. The latter approach was chosen in a study shown below on changes in Japanese export market shares to the U.S. and Canada in the commodity group of shrimp, prawn and lobster (SPL). This case was specifically chosen for the following reasons.

(1) Japan has undoubtedly been the hardest hit by the trend of worldwide extended jurisdiction both from the standpoint of size of gains and magnitude of the loss of access to fishing grounds.

(2) Shrimp, prawn and lobster products are generally considered luxury commodities by Japan, Canada and the United States, with a wide consumer appeal.

(3) The fisheries dealing with the commodities in question are, relatively speaking, inshore; well within the 200 mile limit. Also, practically all shrimp species are designated for domestic fleets in the U.S. The inshore nature of these fisheries is generally a worldwide trait that is related to the biology of the species.

(4) U.S. and Canadian trawling vessels and other methods of capture are well-developed and may even be in oversupply. Therefore, there is little incentive for a trade in the various forms of effort between Japan, Canada and the U.S.

(5) The U.S. is a major importer of this commodity group as is Japan. Canada is less so, but this is probably related to their population level rather than differences in preference.

Therefore, it would be expected that Japan's share in the import markets of Canada and the U.S. would fall between the years of 1959 to 1981 largely as a result of the worldwide trend in extended jurisdiction; even though markets for these commodities remained very strong during this time period.

Little has been done do elucidate the role of extended jurisdiction on the international trade of seafood, although Lin et al. (1981) raise issues on the ramifications of extended management zones in the world community. However, a number of studies have been done using market shares analysis, in general. To study trade flows, one needs to measure directly or by proxy variables the import demand, and the price elasticities of that import demand. Market shares approaches have been used to estimate the effects of price competition, and their use avoids the more difficult empirical problems that develop when actually specifying import demand functions. Studies by Hickman (1973, 1977) looked at changing trade patterns in the Pacific Basin countries between 1955 and 1975. Hickman's unaltered log-linear model is specified in the following manner:

$$\mathrm{Ln}\alpha_{ijt} = a_{oij} + a_{1ij}\mathrm{Ln}\,(P^{x}_{it}/P^{m}_{jt}) + a_{2ij}T + a_{3ij}\mathrm{Ln}\alpha_{ijt-1} + v_{ijt} \quad (13)$$

where: α_{ijt} = the share of the exporting country i in the import market of a country j in year t, for all imports defined as:

$$X_{ijt}/\sum_{i}^{h} x_{ijt}$$

or, the ratio of the country i's exports to country j in year t (X_{ijt}) and the total exports to country j

a_{oij} = the intercept term

a_{1ij} = the short term elasticity of the market share with respect to price (expected sign is negative)

P^x_{it}/P^m_{jt} = the ratio of the export price for all goods of country i, based on F.O.B. price quotas, to an import price index in market j, defined as:

$$P^m_{jt} = \sum_{i=1}^{n} \alpha_{ijo} P^x_{it}$$

where α_{ijo} = share of the exporting country to input market j in year 0

a_{2ij} = estimated trend growth rate (expected sign is positive or negative, depending on trade relations)

T = an index of time

a_{3ij} = estimated rate of response in market shares in year t to market shares in t-1 (expected sign is positive)

α_{ijt-1} = market shares of the previous period

v_{ijt} = error term

Hickman's model, which was used on 26 countries or country aggregates, yielded results which have considerable theoretical and empirical appeal. For example, signs on the elasticity measures regardless of significance, were consistently negative, and the significance of the parameter estimates at 5 percent and 10 percent levels were common. Hickman included in his model the variable time, which, in our model specifications is not included. Hickman includes a time index to capture secular shifts in demand but, ignores determinants of supply.

It is felt that theoretically, a supply determinant should be included in the export model for Japan, especially in the case of the fisheries for shrimp, prawn and lobster (SPL), so the variable time has been removed, and the variable AREA (the percentage of 1981 world jurisdictional claims in square nautical miles, by year) has been added to the model. In addition, the metric tons of shrimp, prawn and lobster (SPL) caught by Japan was included to account for short term supply fluctuations.

In addition, the export-import price ratios are not strictly comparable between Hickman and the model specified in this study. Hickman weights the import market price by the share of the exporting country in year 0. This study computes the price ratio in the following manner:

$$P^x_{it}/P^m_{jt} = ((\Sigma V_{it}/\Sigma Q_{it})\ E_{ijt})/((\Sigma V_{jt} - V_{ijt})/(\Sigma Q_{jt} - Q_{ijt})) \quad (14)$$

where: V_i = the total value of exports of Japan of SPL, year t (1959-1980)

Q_i = the total quantity of exports of Japan of SPL, year t, (1959-1980)

$(EV_{jt} - V_{ijt})$ = the total value of imports of SPL by Canada (U.S.) less the value of Japanese export to Canada (U.S.), year t (1959-1980)

E_{ijt} = the exchange rate between Japan and the U.S. (1959-1980)

For this model specification of Japan's export market shares to the U.S. and Canada, the shares are developed in value terms (FOB), the catch is in metric tons, the variable AREA is in terms of percent (decimal fraction x 100), and the price ratio has been developed using cents U.S. currency in year t. All product forms of SPL were included in this analysis.

Model tests. The specification of the export market shares model was log-linear, with the following independent variables for each country regressed against the log of Japan's export share to the U.S. (Canada), LJSHRUS (CAN):

LJSHRUS (CAN): Log of the lagged (one year) Japanese export market share of shrimp, prawn, and lobster (SPL) in U.S. (Canada).

LRATIOJUSA (CAN): Log of Japanese export price of shrimp, prawn, and lobster (SPL) divided by the import price of SPL without Japan's share included in the U.S. (Canada) (in cents, U.S.).

AREA: The percentage of 1981 200 mile area claims of ocean held by countries as territorial or fisheries zones (times 100).

LCATCH: Log of the Japanese catch of SPL, in metric tons.

A Farrar-Glauber test for multicollinearity between these variables within the Canadian and U.S. model was performed. Multicollinearity was detected in the Canadian model with a X^2 test at the 99% level. It is clear that the multicollinearity was caused by correlation between the lagged endogenous variable LSHRCAN (-1) and the variable AREA. Similar tendencies between the same variables for the U.S. model were observed, although multicollinearity was rejected.

Tests for autocorrelation in both models yielded ambiguous results, since the Durbin-Watson test of models using lagged endogenous variables was inflated. Attempts to use the Durbin h-test yielded equally ambiguous results. A large sample alternative test to the h-test shows no autocorrelation, but the prescription is suspect because of the small sample size (21 observations). For this reason, both uncorrected and corrected models are shown for each country (Table 1). We will discuss the uncorrected models, but the reader should compare the results. The Cochrane-Orcutt iterative technique was used to

Table 1. Models of Japan's export market share response in Canada and the United States

PART I. CANADA

a) Uncorrected: R^2 = .671563; F(4, 16) = 8.17890*; Observations = 21; Durbin-Watson = 2.1632

LJSHRCAN =	-10.5693	+	.493387 LJSHRCAN (-1)	+	.515426 LRATJCAN	-	.023888 AREA	+	.741705 LCATCH
	(-1.63262)*		(2.05313)**		(.249001)		(-1.62560)*		(1.23704)

b) Corrected: Cochrane-Orcutt: R^2 = .844170; F(4, 15)** = 16.257; Observations = 20; Durbin-Watson = 2.4542

LJSHRCAN =	-10.8345	+	.789934 LJSHRCAN (-1)	-	.605240 LRATJCAN	-	.00992166 AREA	+	.868377 LCATCH
	(-1.78851)**		(4.16112)***		(-.349065)		(-.856120)		(1.55955)*

PART II. THE UNITED STATES

a) Uncorrected: R^2 = .644252; F(4, 16) = 7.24392*; Observations = 21; Durbin-Watson = 2.1988

LJSHRUS =	-2.85520	+	.218960 LJSHRUS (-1)	+	.589918 LRATJUSA	-	.0107262 AREA	-	.0490185 LCATCH
	(-1.34448)*		(1.14530)		(1.09882)		(-2.90727)***		(-.297777)

b) Corrected: Cochrane Orcutt: R^2 = .686966; F(4, 15)** = 6.58362; Observations = 20; Durbin-Watson = 2.0665

LJSHRUS =	-2.89354	+	.274813 LJSHRUS (-1)	+	.585315 LRATJUSA	-	.00996342 AREA	-	.0248259 LCATCH
	(-1.12723)		(1.10463)		(1.09665)		(-2.72540)***		(-.140892)

*Reject H_o: that $\beta_i = 0$ at $t_\alpha = .20$

**Reject H_o: that $\beta_i = 0$ at $t_\alpha = .10$

***Reject H_o: that $\beta_i = 0$ at $t_\alpha = .05$

*Reject H_o: that $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$ @ F(4, 16) (α = .01) = 4.77

**Reject H_o: that $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$ @ F(4, 15) (α = .01) = 4.89

correct for autocorrelation. No heteroscedastic disturbances were detected at the 95% level, using testing methods outlined by Park (1966) and later refined by Glejser (1969).

In the specifications shown below, AREA is treated in the same way as the time variable was treated by Hickman; as the linear part of a log-linear relationship. This is justified for two reasons: 1) the variable AREA is roughly collinear with time. The quantity of ocean that has come under extended jurisdiction has increased in a stepwise fashion throughout the observations; 2) the variable AREA can be regarded as a supply shifter, not as a variable that periodically affects a quantity supplied. Thus, the AREA variable accounts for secular shifts in supply over the long term, while the catch variable (LCATCH, in this specification) corresponds to a short run conception of supply. The market shares models presented here are therefore hybrids of supply and demand models that might perhaps be better specified as a system of simultaneous equations reflecting supply, demand and inventory conditions in Japan and other countries. However, work by Lin et al. (1981), also on shrimp in Pacific Rim countries, suggest that data problems encountered in making models such as these operable were very large, and were not completely overcome in their work either. In fact, Lin et al. suggest the incorporation of an inventory function and less aggregated data over longer periods of time. This, unfortunately is a tall order for analysts living in the U.S.

For the uncorrected Canadian model (Table 1) model, the F statistic is considerably larger than the critical value of F (4.67) for (4, 16) degrees of freedom. As regards the t-statistics, only the lagged share value LJSHRCAN (-1) shows up as significant at the 90 percent level in a two tailed t-test. The constant and the area variable show up as significant at the 80 percent level for the same test. If one could a priori hypothesize, or if one has prior information, that a parameter is a certain sign, then the one tailed test can be performed. However, for the variable LRATJCAN, for example, its sign is dependent on relative price movements and could vary from country to country. But in view of the fact that the parameter for the variable AREA, for instance has been a priori hypothesized to be negative for Japan, then it would be possible to perform a one tailed t-test.

U.S. models are considerably more stable: in practically every test performed they have shown an absence of autocorrelated disturbances. The F test is again rejected at the 99 percent level. However, as far as significance of the parameters are concerned, the only strong test is for the AREA variable; it is significant in the two tailed t-test at above the 97 percent level at 16 degrees of freedom. However, the lagged shares of Japan in the U.S. market (LJSHRUS (-1)) can at best be claimed significant in a one tailed t-test at the 80 percent level. It can, in fact, be tested in this manner, since we have a priori postulated that sign and repeated model specifications for both countries have substantiated this claim. So, at least the sign is persistent, regardless of different model specifications.

Summary Statements and Conclusion

Many of the results of the empirical analysis are what one would expect to find, especially since a specific case was chosen in order to isolate the trade effects of extended jurisdiction. The lagged share response is important from the standpoint of modeling the constancy and stability of export markets; in general, markets do not change overnight. That the price ratio is insignificant is not inconsistent with other work in this field: "In most cases, the price of shrimp was found to be statistically insignificant in both import demand and world supply function... Joint ventures and shipment contracts may be among the factors that hinder, to some degree, the movements of supply in response to changes in price. The failure of including an inventory function due to data insufficiency might be another major cause of this result." (Lin et al. 1981).

It is important to note that there is a strong negative relationship between the AREA variable and Japan's export market share of SPL to the United States and Canada. It is not likely, however, that an application of this simple model to another major loser due to extended jurisdiction, would yield similar results. In fact, one could probably find a fish commodity(ies), which has as a major source of raw material the U.S. fishery zone, but where Japanese presence in one form or another, world-wide, allows them to maintain their trade position. If one were to use the market shares model presented here to look at that trade pattern, results may be somewhat ambiguous.

If one is willing to accept the foregoing analysis, the unlogged market shares model would look like:

$$LJSHR = e^{-(c + \beta_1 \text{ AREA})} A^{\beta_2} B^{\beta_3} C^{\pm\beta_4}$$

where β_1 can be regarded as a component of the "intercept" for no changes in the area under extended jurisdiction. However, as an area changes, the schedule of Japanese market shares response will shift downward, as the area under jurisdiction becomes larger. The function is increasing in lagged Japanese shares in the U.S. and Canada, and the parameter β_2 corresponds to the elasticity of market share response to lagged market shares. A similar interpretation can be given to β_3 and β_4, except that, for the U.S., the export share is inversely related to the magnitude of the Japanese catch of SPL. An explanation of this might be that Japanese market penetration of the seafood market began about the time that their catches were declining, but reaches a peak prior to major jurisdictional changes in the oceans.

In conclusion, this analysis did succeed in showing that a significant and robust negative relationship exists between extended jurisdiction trends and the export market shares of Japan, in Canada and the U.S. However, based upon the theoretical treatment presented in the first half of this paper, it is not necessarily true that major gainers will end up exporting fish to major losers. Attempts to investigate the effects of extended jurisdiction exclusively using trade data could yield frustrating and ambiguous results, if factors such as effort exchange cannot be modelled or controlled for.

Literature Cited and Data Sources

Anderson, Lee G. 1977. The Economics of Fisheries Management. Johns-Hopkins Press, Baltimore, MD. 214 pp.

Canada. Annual Exports and Imports of Commodity by Country, Annual: Department of Statistics, Canada.

Glejser, H. 1969. "A New Test for Heteroscedasticity." Journal of the American Statistical Association Vol. 64, No. 325, pp. 316-323.

Gould, J.R. 1972. "Externalities, Factor Proportions, and the Level of Exploitation of Free Access Resources." Economica Vol. 39 (November), pp. 383-402.

Hickman, B.G. and L.J. Lau. 1973. "Elasticities of Substitution and Export Demands in a World Trade Model." European Economic Review 4, pp. 347-380.

Hickman, B.G., Yoshimi Kuroda and L.J. Lau. 1977. "The Pacific Basin in World Trade, Part III An Analysis of Changing Trade Patterns, 1955-1975." National Bureau of Economic Research, Inc., 36 p. + Appendix.

Japan. Annual Fisheries Statistics of Japan. Japanese Ministry of Agriculture and Fisheries.

Japan. Monthly, Annually. Exports of Commodity By Country. Japanese Ministry of Finance and Japan Tariff Association.

Lin, Biing-Hwan, Rebecca J. Lent and Richard S. Johnston. 1981. "Trade and Investment in Fish Products Among Pacific Area Countries." Unpublished Manuscript. 58 pp.

Park, R.E. 1966. "Estimation With Heteroskedastic Error Terms." Econometrica Vol. 34, No. 4, p. 888.

Scott, Anthony. 1955. "The Fishery: The Objectives of Sole Ownership." The Journal of Political Economy 63 (April), pp. 116-124.

United States. 1981. Limits in the Seas; National Claims to Maritime Jurisdictions. Department of State, Washington, D.C. 117 pp.

United States. Annual. Imports (General and Consumption) Commodity By Country. U.S. Bureau of the Census.

This work is a result of research sponsored, in part, by the Oregon State University Sea Grant College Program supported by NOAA Office of Sea Grant, U.S. Department of Commerce, under grant number NA81AA-D-00086.

Disequilibrium and Seafood Trade Modelling

Nancy E. Bockstael
University of Maryland
College Park, Maryland, USA

Fishery Trade Models and Disequilibrium

There are a number of reasons why we might wish econometrically to model seafood trade relationships, many of which involve public policy issues. Despite their limited numbers, the few existing seafood trade studies testify to the variety of issues at stake. Some of these past studies are straightfoward econometric models of the working of a particular fishery market and include an import/export sector for the sake of completeness (see, for example, Altobello, Storey and Conrad, 1977; Bockstael, 1978; Wang, Dirlam and Norton, 1977). These studies attempt to provide a basis of information for fishery managers, a means of anticipating the effects of exogenous factors or of policy changes on the returns to fishermen and processors and the welfare of consumers. A trade sector is included in these models simply because foreign demand or supply plays a large part in the market mechanism.

Other fishery studies have had more specific motives for including a trade sector. As early as 1970, the National Marine Fisheries Service was interested in the extent to which imports depressed domestic prices for New England groundfish (Houtsma, 1970). More recently, a few studies have set about trying to prove injury to domestic fishermen from imports (see the analysis of groundfish prices by Corey and Dirlam, 1981, and Corey, 1982; the study of Canadian lobster exports by Hasselback, 1979; and the report on the Gulf Shrimp industry by Sage Associates, 1981). Attention to these issues has been provoked by Congressional concern over the health of the domestic industry, demonstrated by the Saltonstall-Kennedy Act and Breaux's proposed legislation.

Econometric models of trade have been employed to assess other issues of potential inter-nation conflict. Edwards (1981) included a trade sector in his model of the Atlantic sea scallop industry in an attempt to assess the effects of alternative resolutions of the Canadian-US boundary dispute. Similar trans-boundary management issues on the west coast prompted Capalbo (1982) to investigate the effects of alternative unilateral and bilateral management schemes for the North Pacific Halibut fishery. Earlier, Vidaeus (1977) evaluated the foreign fees which could reasonably be charged for foreign access to US herring stocks.

Rarely is the work of economists so directly applicable to important policy decisions as the econometric modelling of fishery market models has been. In some cases, the estimation results have been used to further legislation. Considering the political significance of the issues involved, accurate econometric modelling assumes a particular importance here. It becomes critical that our model specifications are careful and do not depend on blatantly unrealistic assumptions.

All models are, of course, simplifications of reality, but the consequences of simplicity must be well understood. Among the many simplifying assumptions made in most market models, and in all of the above seafood trade models, is that market transactions take place at equilibrium. This paper challenges the reasonableness of this assumption in certain fishery trade situations and investigates the consequences of mis-specifying the model as an equilibrium market when transactions take place in disequilibrium.

Disequilibrium markets

In the past decade an interest in disequilibrium markets has migrated from macro- to micro-economics and with it a challenge to the Walrasian view of the world. Economists have been forced to admit that there are many situations in which the market clearing assumption is unrealistic, i.e. that desired quantities demanded and supplied may not be equal.

Perhaps the classic micro-economics example of disequilibrium is the cob-web cycle. Here, supply is determined by past prices and price expectations, as in agriculture where harvest is related to plantings in a previous time period. Current price is determined by demand for the harvested output, but this harvest may not be the quantity farmers would have wished to supply at new prices. Such markets are characterized by disequilibrium if inventory adjustment is precluded because the commodity is perishable. A detailed model of such a market has been formulated for watermelons (Goldfeld and Quandt, 1975). Inelastic short-run supply response and frequent supply disruptions motivated a similar disequilibrium specification for the US fed beef sector (Ziemer and White, 1982).

Institutional constraints can also cause a market to be out of equilibrium. Market interventions through price ceilings or floors, quotas, etc. are polar examples of disequilibrium, since they intentionally prevent the adjustment mechanism. However, any barriers which inhibit the adjustment of price may result in disequilibrium and consequent rationing or surpluses. The housing and credit markets exhibit these characteristics and have attracted the attention of economists interested in disequilibrium (see Fair and Jaffee, 1974; Laffont and Garcia, 1977).

From these examples, it is clear that certain criteria are necessary for the Walrasian mechanism to work effectively. First, supply (including supply from inventories, if such exist) and demand must be responsive to current price, and price must be free to adjust quickly. If price in a given market is sticky - either because of institutional constraints, transactions costs, or search costs, then the likelihood of observing the market in equilibrium is diminished. The same is true if demand or, more often, supply cannot respond to current price.

These characteristics present no particular problem in stable markets where, once attained, equilibrium is infrequently disturbed except marginally. However, in "unstable" markets, where significant shifts in supply or demand are frequent, disequilibrium may be chronic. In fact the market may never be observed in the neighborhood of equilibrium. Thus disequilibrium economics must play an important role when the market mechanism adjusts slowly and when there are significant random fluctuations in either demand or supply.

Since, by definition, inventories cannot exist for fresh seafood products and since supplies tend to be greatly variable depending as they do on biological stocks, weather, etc., these markets are likely candidates for the disequilibrium roster. When the above conditions are coupled with forward contracting, as is frequently the case in international markets, then persistent disequilibrium is especially likely.

As if this were not enough, institutional factors affecting seafood trade offer further potential sources of disequilibrium. Trade barriers are direct means of preventing adjustment to equilibrium and to some extent have been employed in fisheries trade. Perhaps of greater interest is the role domestic fisheries management may play in affecting market clearing in trade relationships. Management policies such as quotas may either increase or decrease the potential for disequilibrium. Disequilibrium will be more likely if the quotas artificially restrict landings and thus potential export supply. (Interestingly, if the quotas are fixed over time, they may instead serve to stabilize supply in the long run and reduce supply fluctuations.) With all these potential sources of disequilibrium in fishery trade markets, an investigation of their importance and impact seem warranted.

Unfortunately, once we abandon the market clearing assumption, a crucial aspect of our econometric market model is altered. The price-quantity combinations observed in market data can no longer be assumed to satisfy both the supply and demand equations. The resulting estimation problems are addressed in the growing literature on disequilibrium econometrics (see, for example, Fair and Jaffee, 1972; Amemiya, 1974; Gourieroux, Laffont, Monfort, 1980; Maddala and Nelson, 1974; and Quandt, 1978). Unfortunately the empirical literature has not grown as quickly, and in the area of fisheries - furtile ground for disequilibrium modelling - it has yet to surface.

The purpose of the remainder of this paper is to investigate a few of the implications of disequilibrium for econometric modelling of seafood trade. An international fishery market is identified which exhibits characteristics consistent with our notion of persistent disequilibrium and model of this market is estimated under disequilibrium assumptions. The same market is then used in a Monte Carlo experiment. Data generated in a disequilibrium market model are used to estimate demand and supply functions under the naive assumption that the market is in equilibrium. The sampling experiments shed some light on the kinds of estimation errors which are likely if we incorrectly specify the model as one of equilibrium when the market in question is actually observed in disequilibrium.

Disequilibrium in Seafood Markets: A Sampling Experiment

The US import market for Canadian live lobsters was chosen as the example for empirical study. This market was identified as a good candidate for disequilibrium for a number of reasons. Live lobsters can not be effectively stored so inventory adjustment is not possible. Additionally, because the market is one of international trade, prices are likely to be agreed upon prior to delivery thus preventing the rapid price adjustment necessary to equate desired supply and demand. Since landings of lobsters are subject to radical random and seasonal fluctuations, the market is unlikely to converge to equilibrium with time. Consequently observations are more likely to occur at disequilibrium.

Econometric estimation of a disequilibrium market

Before undertaking the sampling experiment, a model of the lobster import market incorporating the assumption of disequilibrium is specified and estimated using observed monthly data from January 1972 to December 1980. The model is a simple one but representative of the type of trade models likely to be estimated given current data limitations. US excess demand for live lobsters, i.e. the difference between domestic demand and supply, is specified as a function of import price, US domestic supply of live lobsters and US disposable income. Canadian excess supply is modelled as a function of export price, Canadian landings of lobsters, and the US-Canadian exchange rate. The latter variable is included directly to allow for the possible differential response to price and exchange rate movements. Recent theoretical and empirical work suggest the value of this approach (see Chambers and Just, 1979; Chambers, Just, Moffitt, and Schmitz, 1981).

The structural demand and supply equations are, respectively,

$$QD_t = f(IP_t, NEL_t, INC_t) \tag{1}$$

$$QS_t = g(EP_t, CNL_t, EXR_t) \tag{2}$$

where
QD = desired quantity demanded
QS = desired quantity supplied
IP = US import price of live lobsters from Canada
NEL = New England landings of lobsters
INC = US disposable income
EP = Canadian export price of live lobsters to the US
CNL = Canadian landings of lobsters
EXR = US/Canadian exchange rate.

In equilibrium models, equations (1) and (2) are typically combined with a market clearing identity

$$QT = QD = QS \tag{3}$$

where QT represents the quantity transacted. This additional condition is sufficient to define how price is determined as well.

If disequilibrium is allowed, a new condition for determining transacted (and thus, observed) quantities must be defined. Generally it is assumed that

$$QT = \min(QD, QS), \tag{4}$$

but now typically QD $\neq$ QS and price is not determined from the system. The structural model can be altered in a number of ways to describe the price determination mechanism. For the purposes of this model we assume that the price observed in time t affects both the quantity of live lobsters which US wholesalers wish to purchase from Canada in time t and the portion of predetermined domestic landings which Canadians choose to export in time t. At this price, QD_t and QS_t may not be equal however. Prices may have been agreed upon earlier or may be sticky due to transaction costs and cannot adjust to equate desired supply and demand. Excess demand will put upward pressure on prices so that next period's price can be expected to be higher; excess supply will depress price. The price adjustment mechanism can be modelled as

$$P_{t+1} - P_t = \lambda(QD_t - QS_t). \tag{5}$$

There are a number of ways to estimate the system described in equations (1), (2), (4), and (5). For demonstration purposes, a fairly simple method is employed here and is based on the following substitution of expressions (4) and (5) into (1) and (2) suggested by Fair and Jaffee (1974):

$$\begin{aligned} QT_t &= f(IP_t, NEL_t, INC_t) - \tfrac{1}{\lambda}DZ_t \\ QT_t &= g(EP_t, CNL_t, EXR_t) + \tfrac{1}{\lambda}SZ_t \end{aligned} \tag{6}$$

where $DZ_t = \begin{cases} P_{t+1} - P_t & \text{if } P_{t+1} - P_t > 0 \\ 0 & \text{otherwise} \end{cases}$

and $SZ_t = \begin{cases} P_{t+1} - P_t & \text{if } P_{t+1} - P_t < 0 \\ 0 & \text{otherwise} \end{cases}$

Amemiya (1974) has shown that two stage least squares estimates of the model in (6), where all the variables in parentheses are treated as exogenous, is consistent although not asymptotically efficient.

Results of the estimation are reported in Table 1. Both equations are estimated in linear form and the coefficients on DZ and SZ are constrained to be equal in absolute value across equations. All coefficients are of the expected sign and significant at the 1% confidence level.

Table 1. Results of Disequilibrium Estimation of US-Canadian Trade in Live Lobsters, January 1972 - November 1980.

Variable	Estimated Coefficients
Demand equation	
Constant	4077.100 (912.340)
Import price, IP_t (in US$/thousands lbs)	-2.441 (.561)
New England landings of lobsters, NEL_t (in thousands of lbs live weight)	-.518 (.112)
US personal disposable income, INC_t (in million of dollars)	3.377 (.954)
Supply equation	
Constant	-10240.000 (2749.200)
Export price, EP_t (in Canadian$/thousands lbs)	1.107 (.350)
Canadian landings of lobsters, CNL_t (in thousands of lbs live weight)	.667 (.079)
US/Canadian exchange rate in percents, EXR_t (US$/Canadian$ + 100%)	77.129 (22.284)
Price adjustment	
Coefficient of -DZ and SZ, $(1/\lambda)$	41.53 (14.40)
Price adjustment parameter (λ)	.024

Dependent variable - US import of live lobsters from Canada in thousands of lbs.

Design of the sampling experiment

The actual values of the exogenous variables in the above model were used in the Monte Carlo study. The values of the parameters estimated above were chosen as the "true" values so as to reproduce approximately the levels of the dependent variables observed in the actual data. The endogenous variables were generated from the following system where the actual value of import price in January 1972 was used as an initial condition for IP

$$\tilde{QD} = 4077.1 - 2.441\ \tilde{IP}_t - .518\ NEL_t + 3.377\ INC_t + \varepsilon_{1t}$$

$$\tilde{QS}_t = -1024.0 + 1.107\ \tilde{EP}_t + .667\ CNL_t + 77.129\ EXR_t + \varepsilon_{2t}$$

$$\tilde{QT}_t = \min(\tilde{QD}_t, \tilde{QS}_t)$$

$$\tilde{P}_{t+1} = \tilde{P}_t + .024\ (\tilde{QD}_t - \tilde{QS}_t)$$

where tildas imply generated values and the ε's are disturbance terms drawn randomly from a normally distributed population with mean of 0, variance of 10.

The experiment included 160 replications of a sample of 107 observations. Each sample was estimated for two specifications of the market model. Specification 1 was identical to the model presented in equations (1), (2), (4), and (5) and allowed for desired quantities demanded and supplied to diverge as would occur in disequilibrium. Specification 2 incorporated the equilibrium assumption, i.e. the model as expressed in equations (1), (2) and (3). Observed quantities were assumed to be desired quantities in this specification. Specification 1 was transformed and estimated similarly to equation system (6), using two stage least squares with restrictions across equations. Specification 2 was estimated in two ways a) using ordinary least squares and b) using two stage least squares, treating both price and quantity as endogenous.

Results of the experiment

Statistics reflecting the results of a preliminary sampling experiment are reported in Tables 2 and 3. Mean absolute deviations and root mean square errors are reported for each specification. These statistics were calculated for each parameter and averaged over parameters. Averages are reported for the model as a whole (six coefficients) as well as by equation (three coefficients each). The root mean square error, a measure of dispersion around the true value of the parameters, is consistently larger for specification 2 (equilibrium) than for specification 1 (disequilibrium). In all cases the misspecification is most serious when 2SLS is used.

The mean absolute deviation is a measure of dispersion around the mean of the estimate and thus, for specification 2, reflects accuracy around a biased estimate. The results are not so definitive here. There is little difference among the MAD's over specification and estimating technique. However in five of six comparisons, specification 1 exhibited the smaller MAD.

Table 2. Comparison of Parameter Estimates with "True" Values in Monte Carlo Experiment

Variable	True Value of Coefficient	Mean Value of Coefficient over 160 Samples		
		Specification 1		Specification 2
Demand Equation		2SLS	OLS	2SLS
Import price, IP	-2.441	-2.406	3.221	14.615
New England landings, NEL	- .518	- .513	- .073	.180
Disposable income, INC	3.377	3.330	-2.857	-14.777
Supply Equation				
Export price, EP	1.107	1.108	1.073	1.153
Canadian landings, CNL	.667	.664	.285	.282
Exchange rate, EXR	77.129	77.548	75.938	81.542

Table 3. Summary Statistics Comparing Specifications

Specification	Mean Absolute Deviation $\sum_j(\hat{\theta}_j-\bar{\bar{\theta}})/N$	Root Mean Square Error $(\sum_j(\hat{\theta}_j-\theta)/N)^{\frac{1}{2}}$	Relative Accuracy MAD_{DIS}/MAD_{EQ}	Relative Efficiency $RMSE_{DIS}/RMSE_{EQ}$
Statistics averaged over 6 parameters of model				
Specification 1 Disequilibrium	.569	.717	---	---
Specification 2 Equilibrium-OLS	.627	2.828	.907	.254
Specification 2 Equilibrium-2SLS	.663	6.997	.858	.102
Statistics averaged over 3 parameters of demand equation				
Specification 1 Disequilibrium	.120	.153	---	---
Specification 2 Equilibrium-OLS	.128	4.117	.937	.037
Specification 2 Equilibrium-2SLS	.339	11.976	.359	.013
Statistics averaged over 3 parameters of supply equation				
Specification 1 Disequilibrium	1.018	1.281	---	---
Specification 2 Equilibrium-OLS	1.126	1.540	.904	.832
Specification 2 Equilibrium-2SLS	.992	2.018	1.026	.635

Perhaps the most striking aspect of the results is that neither OLS nor 2SLS for specification 2 reliably estimates coefficients with correct signs in the demand equation. The most striking problem is the positive sign on the price coefficient in both OLS and 2SLS estimating of the equilibrium model. The root mean square errors for specification 2 relative to specification 1 are far superior in the supply equation compared to the demand equation. Thus while the disequilibrium model always performs better than the equilibrium model, it is relatively more superior for the demand equation than the supply equation.

At first blush, this is curious. However the explanation is really quite simple. If the market in question is in disequilibrium (according to our formulation of disequilibrium), then observed price-quantity combinations will lie either on the supply curve or on the demand curve but not on both. Inspecting the data, we discover that on average some 70% of the observations generated are categorized by the model specification as conditions of excess demand and thus are points on the supply curve but <u>not</u> on the demand curve. Only 30% are points on the demand curve. It therefore is not surprising that specification 1 is not very successful in estimating the demand curve since it tries to fit all observations to a demand curve when many of them are totally unrelated to this function.

<u>Implications for Estimation of Seafood Trade Models</u>

From Tables 2 and 3, it is clear that misspecification can cause serious errors if the true state of the market is disequilibrium and we estimate the model as though the data were generated by a market in equilibrium. These results are consistent with Quandt (1978) who compared two types of misspecifications a) estimation under the assumption of disequilibrium when equilibrium was the truth and b) estimation under the assumption of equilibrium when disequilibrium was the truth. His results indicate that the consequences of misspecification are far more serious when the data is generated by a market in disequilibrium and we attempt to model it assuming market clearing than when we estimate a disequilibrium model using "equilibrium-generated" data.

All of this suggests that we had better take seriously the possibility of disequilibrium in the markets we estimate. Unfortunately few reliable tests of the equilibrium vs. disequilibrium hypothesis exist and most are complicated to employ (Quandt, 1978). Consequently we must, at least to some extent, trust our intuitive assessment of the market in question and its potential for being out of equilibrium.

The results of the sampling experiment reported here demonstrate one of the most serious consequences of estimating an equilibrium model when disequilibrium is the true state of the market. In this case we could not get reasonable estimates of the parameters in the demand function because most of the observations occured under conditions of excess demand. Clearly the converse holds as well. If most of our observations are made when excess supply exists, trying to estimate the supply curve from the entire set of data will be disastrous.

The implications are important. If the state of the market is disequilibrium and we estimate our model assuming market clearing, we may be tempted to attribute our poor results to a classic identification problem. This may lead us to search for more exogenous variables to help identify the equations in the system, but of course if disequilibrium is causing the problem exogenous variables will not help. Alternatively we may argue that our results prove demand or supply is not very responsive to price. However this conclusion will be unfounded. Finally, we may just give up, claiming that there is obviously too much unmeasurable variation in the system to fit both functions. Yet we may in fact have enough information if only we realize none of the observations are points on <u>both</u> supply and demand curves.

Of course accepting the disequilibrium hypothesis has its own problems. Techniques which yield estimates with better properties than the simple one employed here can be complex. Additionally, misspecification errors are still possible since once market clearing assumptions are abandoned, substitute formulations for how price and quantity transacted are determined must be arbitrarily devised. Yet the results here suggest that assuming away disequilibrium when it really exists will yield results which are not even qualitatively correct for at least one side of the market and possibly both.

References

Amemiya, T., 1974, A note on the Fair and Jaffee model. Econometrica 42:759-762.

Bockstael, N.E., 1977, A market model for New England groundfish industry. University of Rhode Island, Dept. of Resource Econ., Ag. Exp. Sta. Bulletin No. 422, p. 56.

Bowden, R.J., 1978, Specifications, estimation and inference for model of markets in disequilibrium. Int. Econ. Rev. 19:711-726.

Chambers, R.G. and R.E. Just, 1974, A critique of exchange rate treatment in agricultural trade models. Am. J. of Ag. Econ. 61:249-257.

Chambers, R.G., R.E. Just, L.J. Moffitt and A. Schmitz, 1981, Estimating the impact of beef import restrictions in the U.S. import market. Aust. J. of Ag. Econ. 25:123-133.

Corey, R.L., 1982, U.S.-Canadian trade in frozen groundfish products, 1970-1981. NOAA, University of Rhode Island Sea Grant, memo No. 70.

Corey, R.L. and J.B. Dirlam, 1981, Current developments in ex-vessel groundfish prices. NOAA, Univ. of Rhode Island Sea Grant, memos No. 65, p. 7.

Edwards, S.F., 1981, Econometric and welfare analysis of the Atlantic sea scallop markets. M.Sc., Univ. of Rhode Island, p. 87.

Fair, R.C. and D.M. Jaffee, 1972, Methods of estimation for markets in disequilibrium. Econometrica 40:497-514.

Goldfeld, S.M., and R.E. Quandt, 1975, Estimation in a disequilibrium model and the value of information. J. of Econometrics 3:325-348.

Gourieroux, C. and J.J. Laffont and A. Monfort, 1980, Disequilibrium econometrics in simultaneous equations systems. Econometrica 48:75-96.

Hasselback, N.L., 1979, Canadian Lobsters: Subsidies and impact on U.S. ex-vessel price. MIT and Rhode Island Sea Grant.

Houtsma, J.J., 1970, The effects of imports on United States groundfish prices. NMFS, Econ. Res. Dir. File manuscript No. 172, p. 127.

Laffont, J.J. and R. Garcia, 1977, Disequilibrium econometrics for business loans. Econometrica 45:1187-1204.

Maddala, G.S. and F.D. Nelson, 1974, Maximum likelihood methods for models of markets in disequilibrium. Econometrica 42:1013-1030.

Quandt, R.E., 1978, Tests of the equilibrium vs. disequilibrium hypothesis. Int. Econ. Rev. 19:435-452.

Sage Associates, 1981, An economic assessment of the United States shrimp industry with associated public policy recommendations. Washington, D.C., p. 77.

Wang, D.H., J.B. Dirlam, and J.J. Norton, 1977, An Econometric study of Atlantic herring industry. Dept. of Res. Econ., University of Rhode Island (preliminary report) p. 79.

Ziemer, R.F. and F.C. White, 1982, Disequilibrium market analysis: An application to the U.S. fed beef sector. Am. J. Ag. Econ. Feb. pp. 56-62.

Abstract

Applied econometricians typically estimate supply and demand relationships implicity assuming that the market in question is always in approximate equilibrium. However in reality prices may not always adjust to clear the market. This is particularly true when supply or demand exhibits radical disturbances and prices are forward contracted or subject to other institutional impediments to adjustment. When inventories are not available to buffer the erratic fluctuations in supply or demand, the market will infrequently be observed in equilibrium.

Such conditions would seem to be typical of trade in fresh seafood products. Supply is particularly erratic, dependent as it is on the vagaries of biological stocks, weather, and management policies. Additionally, inventories are non-existent because of the nature of the product, and there may be high costs to frequent price changes.

This paper reports the results of some interesting experiments on equilibrium and disequilibrium modelling of seafood trade. The experiments attempt to determine what sorts of misleading inforamtion we obtain if we model such markets assuming equilibrium when in fact the observed data is generated by a market in disequilibrium. The U.S.-Canadian trade in live lobsters is used as an empirical example.

Welfare Considerations in the Development of a Joint Venture Policy

Tzy-Ning Chen and Darrell L. Hueth
Oregon State University
Corvallis, Oregon, USA

A number of authors have recognized the increasing importance of economic considerations in foreign allocations of U.S. fisheries stocks. Crutchfield (1982), for example, in an excellent paper has provided estimates of Japanese willingness-to-pay for Alaska pollock allocations and has found that current U.S. fees are far less than estimated willingness-to-pay. Similarly, Stokes (1981a) has discussed a number of factors affecting foreign demand for U.S. fisheries stocks and the effects of alternative market structures on potential economic benefits to the U.S. from foreign allocations. Stokes has also recognized that imposing tonnage fees to extract rents from foreign allocations is generally inferior in terms of its impact on potential U.S. revenues to the use of lump sum bids. Neither of these papers, however, has considered the impact of joint venture (JV) activity on the willingness-to-pay for foreign allocations or the welfare effects of alternative government policies regarding foreign allocations and participants in joint ventures.

In an earlier paper Stokes (1981b) discussed the possible conflicts between U.S. fishermen and U.S. processors in policies with regard to joint ventures, but he did not extend the analysis to consider the effects of policies concerning joint ventures on the willingness-to-pay for foreign allocations by foreign firms involved in unilateral operations in U.S. waters, as well as joint ventures. This paper attempts to provide an integrated welfare analysis of policies regarding foreign allocations in a joint venture environment. No empirical analysis is presented but some discussion of data needs is included. An emphasis is on the determination of the optimal economic policies. That is, while previous works have been concerned with the estimating of the willingness-to-pay of foreign nations for given U.S. fisheries allocations, this paper is concerned with determining an allocation which maximizes the potential economic benefits to the U.S. The point of view taken here is that foreign allocations based on subtracting U.S. "capacity" from some exogenously determined optimal yield will only by chance maximize the economic benefits to the U.S. If allocations below or above this optimal level are made, for perhaps non-fisheries considerations such as navigation rights, decision makers should be provided with an estimate of the price they are paying for these considerations.

Though the discussion is entirely in terms of demands for U.S. fisheries stocks by foreign nations, the analysis is generally applicable to any nation which has yields in excess of its domestic capacity and is involved in joint venture activities.

A number of restrictive assumptions should be listed at the onset. First, unlike Crutchfield, who assumes that a foreign nation's willingness-to-pay can be considered as the sum of factor rents, processors' profits, and final consumers' surplus; the analysis below is in terms of willingness-to-pay by the foreign fishing industry which is viewed as vertically integrated in the harvesting and processing sectors. Thus, total willingness-to-pay for foreign allocation is identical with the quasi-rents of the vertically integrated industry. Payment of the nominal fees now charged for U.S. allocations by the firms receiving these allocations lends some credence to this view. Second, foreign firms who receive allocations and buy landings from U.S. harvesting vessels are assumed to sell in competitive markets in their home countries. The possibilities of decreases in processed fish prices induced by purchases of joint venture landings are not anticipated by the foreign fishing industry and hence are not considered in calculating the willingness-to-pay for foreign allocations. The framework of analysis below, however, can be easily used to investigate the impact of policies on foreign willingness-to-pay where it is possible to extract consumer gains. Third, domestic demand for fish harvested by U.S. harvesting vessels is assumed to be unrelated to demand for the products sold by foreign ventures. This is perhaps a tenable assumption where the domestic demand is for the fresh fish market and foreign demand is for processed fish, but it is admittedly less defensible when the domestic demand includes a domestic processing sector.

Finally, it is assumed in all the following analyses that some optimal yield (OY) is given, and that the domestic capacity is less than OY. Optimal yield is only optimal in a maximum sense. If it is not economically efficient to land the OY, the residual left unharvested imposes no cost on the U.S. That is, a free disposal activity is introduced.

With these caveats in mind, the analysis begins in section one by first analyzing the welfare effects of quotas and fees on the foreign landings, where there are no JV opportunities. Section two extends the analysis to explicitly include a U.S. fishering sector with JV activities and a U.S. demand for landed fish. Foreign firms are considered to be competitive buyers and sellers. Section three discusses the empirical possibilities for the application of the models presented and anticipates some problems which can arise. The final section summarizes the paper and offers some concluding remarks on fisheries management policy.

The Demand for Foreign Allocations and the Optimal Quota

As previously stated, we assume a foreign fishing industry consisting of vertically integrated harvesting and processing firms selling in competitive foreign markets. The industry demand curve for yield or landings is given in figure 1 by D(p) where p is the price of processed fish. This demand curve is generated by incrementally varying the prices of yield (r) allowing complete adjustments in the vertically related processed fish market. It could be viewed as allowing for adjustments in horizontally related processed fish markets as well, but this complication is not introduced. It is thus a general equilibrium demand curve and the changes in the areas below this curve represent changes in quasi-rents to foreign firms as processors, plus changes in approximate willingness-to-pay by consumers in the sense of Willig (1976) assuming for simplification that processors sell directly to consumers. The vertically integrated industry is assumed to have a production function which exhibits diminishing returns to effort for landings and faces a fixed price of effort. This results in an increasing marginal cost function C_{Y_F} in figure 1.

Suppose that foreign allocations are initially set at Y_0 where the marginal cost of yield C_{Y_F} equals industry demand. This implies a processed fish price p_0 and an implicit price of landed fish r_0. For welfare analysis it is useful to construct the ordinary demand curve $D(p_0)$ which indicates the quantities of landings demanded by the

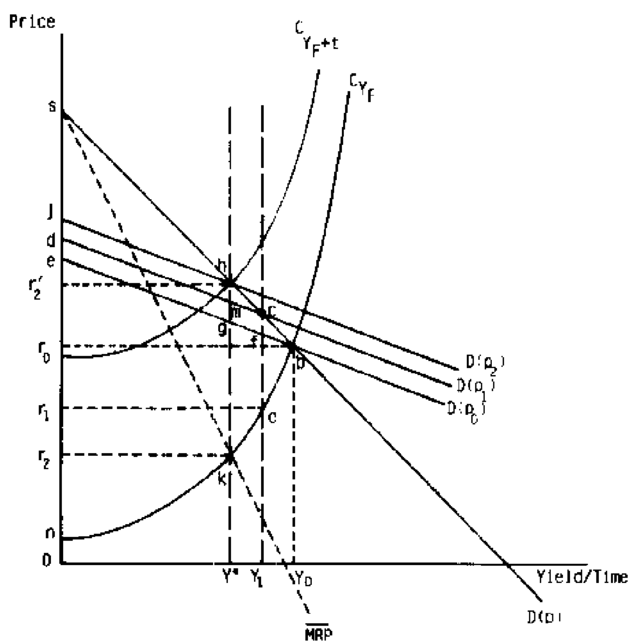


Figure 1. Foreign Allocation of U.S. Fisheries

industry under the assumption of a fixed price for processed fish. The allocation Y_0 is efficient in the sense of maximizing the joint benefits of all participants in the market, in this case foreign consumers and producers. Following Stokes (1981a, page 572) we assume this allocation is suballocated among foreign firms to eliminate the incentive to overcapitalize. At Y_0 quasi-rents to the foreign processing sector are given by ebr_0, and quasi-rents earned by the foreign fishing industry as a harvester are nbr_0. Thus, total quasi-rents to the foreign fishing industry are given by nbe. Approximate consumer willingness-to-pay is measured by the area behind the general equilibrium demand curve but above the ordinary demand curve and is hence given by ebs.[1/]

Now consider the effects of imposing a quota of Y_1 less than Y_0. The price of processed fish rises to p_1 as supply of fresh fish is restricted to Y_1. This generates a new ordinary demand curve $D(p_1)$. As long as the marginal revenue product curve $\overline{MRP}$ is less than the marginal costs of landings C_{Y_F}, total quasi-rents in the fishing industry increase. Consumer surplus in the processed fish market, however, decreases as the area between the ordinary demand and general equilibrium demand curve diminishes. Thus, willingness-to-pay for foreign allocations interpreted as the maximum amount the fishing industry is willing to pay to obtain these allocations increases as the allocation is reduced from Y_0 to Y_1. This is in contrast with the results of Crutchfield (1982) where willingness-to-pay continually decreases as allocations decrease since willingness-to-pay is measured as the area behind the general equilibrium demand curve. Willingness-to-pay in figure 1 continues to increase as allocations are reduced up to Y* where the marginal revenue product equals the marginal cost of landings.[2/] The maximum economic benefits from the U.S. fisheries resources can then be obtained by requesting a lump sum bid on the allocation Y* and the foreign fishing industry when faced with the possibility of a zero allocation or $\overline{Y}$ will be willing to bid nkhj. This policy, an allocation of Y* with a bidding mechanism, creates a monopoly of an otherwise competitive foreign fishing industry and extracts the monopoly rents through bidding policy. It is obvious from figure 1 that the foreign fishing industry is willing to pay less for any allocation which is more or less than Y*.

Landing fees rather than lump sum bids may be used to raise revenue and allocate fisheries stocks. For example, in figure 1 a tax or fee on landings of $r_2'-r_2$ would result in foreign landings of Y*, the same level

---

1/ For a more detailed discussion of the relationship between general equilibrium and ordinary demand curves, the reader is referred to Just, Hueth, Schmitz (1982).

2/ Under the assumptions stated above, not all producers gain as foreign allocations are reduced from Y_0 to Y*. Inefficient high cost producers may be forced out of the industry as allocations are reduced. Still total quasi-rents of the industry will increase when the industry is given an allocation of Y* without being charged fees and the firms remaining could compensate all of those firms forced out of that industry and still be better off than they were at Y_0.

of landings as those under the optimal quota. Note however that U.S. revenues under this policy would be $nkhr_0$, an amount less than the total willingness-to-pay of the foreign fishing industry for Y*. The bidding instrument is clearly preferable to fees if one is concerned about maximizing the economic benefits to the U.S. from foreign fisheries allocations.

The above model is highly aggregative and simplified for the analytical purpose of focusing on the issue of an optimal allocation. Operationally, of course the determination of revenue maximizing quotas is complicated by the existence of potential bidders from firms and industries of many foreign countries and alternative sources of fish for the foreign fishing industry.

Quotas, Fees and Willingness-to-Pay in a Joint Venture Environment

Figure 2 extends the analysis of the preceding sections to include a U.S. fishing sector with a marginal cost curve C_{US} and a U.S. demand D_{US} for landing fish. U.S. demand may be interpreted as either a demand for the fresh fish market or for fish for processing. The demand curve D(p) again represents the general equilibrium demand of the foreign industry for fish landings. Given the foreign internal marginal costs

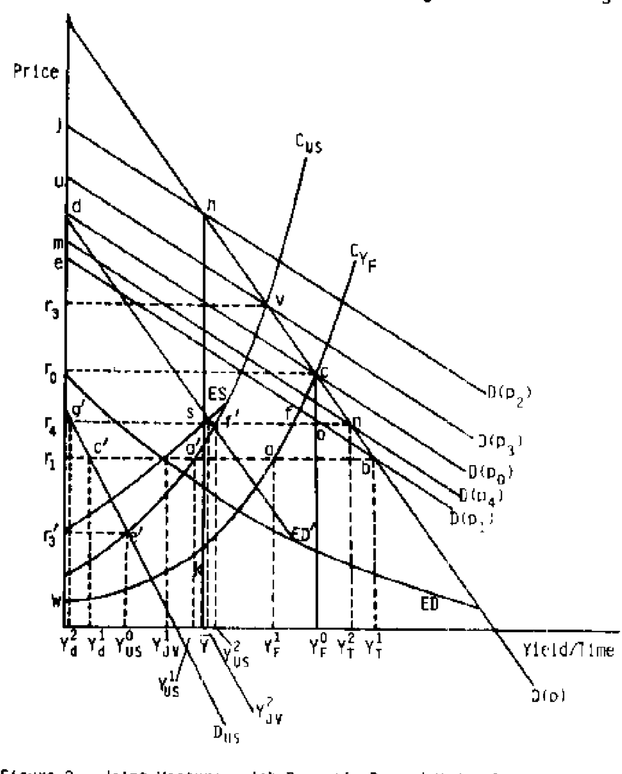


Figure 2. Joint Ventures with Domestic Demand Under Competition

of landings, C_{Y_F}, the excess demand curve, ED is deriveo by subtracting the amount internally supplied from that demanded by the industry at each price level, i.e., $D(p)-C_{Y_F}$. In a like manner, the U.S. excess supply curve, ES, is derived by subtracting U.S. demand from the U.S. supply. Under the assumptions of an initial allocation of Y_F^0, unrestricted joint venture activity, and freely available foreign allocations, equilibrium is determined by the intersection of excess demand and excess supply. This results in the joint venture landings of Y_{JV}^1, total U.S. landings of Y_{US}^1 of which Y_d^1 is sold in the domestic market, and foreign landings by the foreign firms Y_F^1. Total landings supplied to the foreign market are given by $Y_T^1 = Y_F^1+Y_{JV}^1$. The price r_1 is both the implicit price of landings by the foreign fishing industry and the price paid to the U.S. harvesting firms. Clearly, in figure 2 the introduction of a joint venture activity results in an economic welfare gain to the domestic harvesting sector and welfare losses to the domestic consuming sector since without the joint venture, domestic price of landed fish would be r_3' and domestic landings Y_{US}^0. Also, it is clear in figure 2 that the joint venture option yields net economic gains to the processors and fishermen (of e'a'c') combined even though U.S. processors lose U.S. fishermen would compensate processors and still be better off with JV operations.

Joint ventures benefit foreign consumers by ebcd as processed fish price falls from p_0 to p_1. Foreign fishing firms may or may not gain. Quasi-rents prior to participation in joint ventures are given by wcd but with joint ventures quasi-rents are represented by wabe. Thus, the change in quasi-rents or profits is given by wabe-wcd = abf-efcd which, as is usually the case when one gets downward shifts in supply curves, is indeterminate in sign. Note that under the assumptions of this model the foreign fishing industry does not find it profitable to take their entire allocation of Y_F^0. The increasing supplies of fish available from joint ventures reduce the demand for foreign allocations.

Now consider the impact of imposing a quota or foreign allocation on the foreign fishing industry of $\overline{Y}$ which is necessarily less the Y_F^1 in order to affect behavior of the foreign fishing industry. This results in a new excess demand curve for joint venture activity given by ED'. Equilibrium joint venture output increases to Y_{JV}^2. Total landings by the U.S. also increase to Y_{US}^2, but less Y_d^2, is sold in the domestic sector. Total landings available to the foreign industry Y_T^2 consisting of the foreign allocation $\overline{Y}$ plus the joint venture landings Y_{JV}^2 also fall.

The domestic or U.S. welfare effects in figure 2 of a foreign allocation of $\bar{Y}$ in comparison with an allocation of Y_F^0 are to benefit the domestic fishermen by $r_1a'f'r_4$, and reduce domestic consumers gains by a $r_1c'g'r_4$. The net gain over the two sectors is, however, positive by the c'a'f'g'; thus, the domestic fishing sector prefers reducing foreign allocations and again can compensate the domestic consumers for their losses and still be better off.

If one considers Y_F^1 an initial allocation and $\bar{Y}$ a subsequent allocation one can investigate the effect of reducing foreign allocations on the willingness-to-pay for allocations by the foreign fishing industry by comparing quasi-rents of $\bar{Y}$ with those of Y_F^1. Quasi-rents at $\bar{Y}$ are wksnm, and are wabe at Y_F^1. Hence the welfare effect on the foreign fishing industry is wksnm-wabe = eonm-kabos, which again is indeterminate in sign. Thus, in the joint venture environment reductions in allocation may not increase the net potential economic benefits from U.S. fisheries. There is a net gain in the domestic sector (processors and fishermen), but willingness-to-pay for access to fisheries stocks may decline. Finally, if one adopts the view of Crutchfield and includes the willingness-to-pay of foreign consumers, however, willingness-to-pay is decreased with reduced allocations, and foreign consumers lose ebnm and net foreign losses are kabns. Reducing foreign allocations in a joint venture environment may involve tradeoffs among U.S. participants. That is, potential benefits from bids for foreign allocation may decrease as foreign allocations decrease but U.S. fishermen may gain.

Again, as in the previous section fees on foreign landings of U.S. fish could be used to reduce foreign landings. This would effectively shift the excess demand curve rightward and would benefit U.S. fishermen and result in losses again to the domestic consuming sector. The maximum rents in the foreign fishing sector, however, cannot be extracted through fees. It is also easy to see in figure 2 that if fees are charged on joint venture landings, the effect would be to shift the excess demand curve ED leftward, which then benefits the domestic consumers but result in losses to the U.S. harvesting sector.

A perhaps more interesting analysis is to compare the willingness-to-pay for the allocation $\bar{Y}$ in a joint venture environment with one where joint venture opportunities are not available. That is, to consider an effect of joint venture possibilities on willingness-to-pay for a given foreign allocation. Without joint ventures the foreign fishing industry willingness-to-pay for $\bar{Y}$ is given by wkhj. The calculation of willingness-to-pay for $\bar{Y}$ given joint venture opportunities requires comparisons of quasi-rents of $\bar{Y}$ with those of a zero allocation where both allocations (zero and $\bar{Y}$) allow joint venture possibilities. Quasi-rents of a zero allocation are $r_3$vu while quasi-rents of $\bar{Y}$ are wksnm = $r_4$nm+wksr_4. Thus, willingness-to-pay for $\bar{Y}$ is given by wksr_4+$r_4$nm-$r_3$vu. The willingness-to-pay for an allocation given joint venture possibilities clearly depends upon the supply conditions in the

U.S. harvesting sectors. Highly elastic supply conditions would result in $r_4 \approx r_3$ which would imply that $r_4 nm = r_3 vu$ and hence a foreign willingness-to-pay of approximately $wksr_4$ which are the rents the foreign industry earns on its own harvesting operations. Comparing willingness-to-pay without JV possibilities one finds JV willingness-to-pay for $\overline{Y}$ may be significantly less, the difference being $wkhj - wksr_4 = r_4 shj$.

Still, one observes that as long as the foreign fishing industry has a harvesting capability there exists a WTP for an allocation. The maximum economic benefits to the U.S. can be determined by increasing allocations to the point where the marginal gain in WTP is equal to the marginal losses in benefits to the domestic sector from increased foreign allocations.

Some Empirical Considerations

This section discusses some of the empirical considerations which arise in applying the model developed in the previous sections. First, the data which are required to estimate the ordinary and general equilibrium demand curves presented in figure 2 are not easily available. But the works by Vidaeus (1977) and Crutchfield (1982) are evidence that estimates can be obtained for some nations for some species. In estimating the general equilibrium demand curve for a particular species care must be taken not to include the price of processed fish or other fishery and nonfishery food products whose prices and quantities are simultaneously determined with the price and quantity of the species in question. The only variables to be included in the general equilibrium demand equation are own price and other variables which are truly exogenous to the market in question and are further along the market chain in the direction of the consumer. Examples of such variables would include consumer income and government policy instruments. Crutchfield's use of predetermined quantities of related fish species is novel and this assumption may be appropriate for many fisheries, particularly in the present environment of extended jurisdiction and foreign allocations. For some nations, however, effort and hence supply of one species may shift in response to changes in prices in related markets which would invalidate the use of quantity variables. Also, if government policy is viewed as endogenously determined and affected by market forces, as has recently been suggested by Rausser (1982), foreign allocations or quotas may not serve their desired purpose.

The data for the estimation of domestic demand curves are more readily available. Care must be taken, however, if one is working in the multi-species environment to insure that the demand curves estimated are consistent with the utility theory to avoid the now "well known" integrability problem in calculating welfare effects over markets. As discussed by Bockstael (1976) this problem may not arise since multicollinearity problems may necessitate aggregation over species.

As joint venture activity continues to expand, it may be possible to estimate the excess demand curves in figure 2. But, one must be careful in the interpretation of the area under the excess demand curve. The area under this curve cannot be interpreted as the total quasi-rents to the foreign fishing sector as can often be done in an input market.

This is because joint venture landings are not necessary inputs in the production of processed fish. At prices above the intersection of their marginal harvesting costs with general equilibrium demand the foreign fishing sector simply abandons the joint venture activity and catches its own fish. These welfare effects are not transmitted to the joint venture market.

More formidable problems are encountered on the supply side of the market than on the demand side. To begin with a thus far unstated assumption that the cost functions in foreign and U.S. fisheries are independent is expected to encounter strong criticism from fishery economists. If data were available to estimate these cost functions, one perhaps could test this assumption. To our knowledge, the econometric studies on those foreign fishing costs or supply functions have not been done. Initially, one may have to apply synthesized cost studies such as those used by Meuriot and Gates (1982) in welfare analysis.

Data to estimate production functions which can be used to derive the cost curves and supply curves of the U.S. sector are more readily available and many studies have been done. The time horizon for the analysis previously conducted is generally longer than the seasonal or yearly period envisioned here. Given the current popularity of dual techniques, one is inclined toward the use of ex vessel prices and landings to estimate an industry indirect profit function and derive the supply function of the industry via the Hotelling lemma. In the application of this methodology to the fishery however, one encounters a problem in that the use of an indirect profit function assumes profit maximization and hence cost minimization which without the suballocation of quotas among firms, as is common in the foreign industries, is not tenable. Thus, one may be forced to adopt a primal approach to obtain the supply curves for the U.S. sector. That is, the dual methods cannot be used to make inferences about industries which are not operating rationally which is frequently the case with fisheries.

Concluding Remarks

This paper has shown that in a non-joint venture environment reducing foreign allocations can increase the willingness-to-pay of foreign fishing industries and that an "optimal" quota which maximizes the willingness-to-pay for foreign allocations exists. The emergence of joint venture opportunities was shown theoretically to benefit U.S. fishermen but result in economic losses to domestic processors; however, total net gains over processors and fishermen were shown to be positive. The willingness-to-pay for allocations by a foreign country, and possibly by the foreign fishing industry as well, was shown to decrease with the emergence of joint ventures. Thus, foreign allocations given the existence of joint ventures can involve economic trade-offs among sectors of the U.S. fishing industries and U.S. government.

The question of whether or not the U.S. should pursue a policy of extracting maximum economic rents from its fishery resources is of course a normative question and thus one on which economists have little to offer. One cannot help but to observe however, that international trade in many natural resource industries is characterized by state trading on the part of foreign countries and private trading by the U.S. In wheat, for example, Canada, Australia, New Zealand, and The Union of South Africa trade through their own state marketing boards while the U.S. trades through private trading companies. As for oil, Mexico and Saudi Arabia deal directly with U.S. private firms in negotiations. In copper, Kennecot and Anaconda companies compete with those of Chile. Undoubtedly, many U.S. firms are of sufficient size to compete effectively in world markets but this is not necessarily the case in fisheries. Extended jurisdiction has created an economic environment for fisheries which puts the U.S. government in a position as a possible seller of natural resources. In this environment one must question the wisdom of the FCMA which requires "full utilization" of our fisheries resources in the biological sense. Perhaps the objective should not be to maximize the economic gains from U.S. fisheries but certain studies such as the one suggested here should be conducted to indicate what the potential gains from these resources are and what the economic impact of alternative policies is likely to be on the domestic and foreign sectors involved.

Finally, a number of issues are beyond the scope of this paper but deserve attention. The existence of monopsony power on the part of buyers of the access rights to fishery resources has obvious welfare implications for U.S. parties and suggests a need to consider alternative policy instruments. Perhaps U.S. fishermen should form bargaining associations to negotiate contracts with foreign processing vessels, or marketing orders should be established. Initially, however, the possible existence of monopsony power on the part of the foreign buyers must be an empirical one which deserves testing by future research.

References

Bockstael, Nancy E. 1976. Analysis of Investment Behavior and Price Determination: Analytical Input for the Formation of Policy in the Fisheries. Ph.D. dissertation, University of Rhode Island.

Crutchfield, Stephen R. 1982. "Estimation of Foreign Willingness-to-Pay for United States Fishery Resources: Japanese Demand for Alaska Pollock." Land Economics (Forthcoming).

Just, Richard E., Darrell L. Hueth, and Andrew Schmitz. 1982. Applied Welfare Economics and Public Policy. Prentice-Hall, Inc. Englewood Cliffs, NJ.

Meuriot, Eric and John M. Gates. 1982. "An Economic Evaluation of Foreign Fishing Allocations." Marine Technical Report No. 84, University of Rhode Island.

Rausser, Gordon C. 1982. "Political Economic Markets: Pests and Perts in Food and Agriculture." Paper presented AAEA/WAEA Meetings, Logan, UT, August 1-4, 1982.

Stokes, Robert L. 1981a. "The New Approach to Foreign Fishing Allocations: An Economic Appraisal." Land Economics, 57 (Nov): 568-482.

________________. 1981b. "Economics of Development and Management: The Alaska Groundfish Case." Economic Analysis for Fisheries Management Plan, ed. Lee G. Anderson, Ann Arbor Science Publishers, Ann Arbor, MI.

Vidaeus, Lars O. 1977. Analysis of Foreign Demand for United States Fish Stock Under Extended Jurisdiction with an Application to the New England Herring Resources. Ph.D. dissertation, University of Rhode Island.

Willig, Robert D. 1976. "Consumers' Surplus Without Apology." Am Econ Review, 66(Sept):469-474.

Testable Hypotheses About Supply Responses by Multinationals

David P. Rutenberg
Queen's University
Kingston, Ontario, Canada

Introduction

In general sales of fish have been supply driven. What was landed got sold, even if the price dropped. No forward market developed, so the price cited is a spot price. According to economic theory, this price drop is supposed to induce fishing skippers to redirect their efforts to more profitable species; radio improvements have certainly made for faster feedback. Nevertheless, the old market structures and decision rules remain. We seem to be in transition from being supply driven to being market driven.

As the fishing industry becomes market driven, we can expect to see supply adaptations. The purpose of this paper is to antiticpate possible supply adaptations, and consider what evidence might be relevant to demonstrate the extent of transition.

My prior research, published as Multinational Management, analyses the network adaptation mechanisms of multinational manufacturing corporations. Ground fish appear to represent something far from multinational corporate management, yet the underlying logic is similar. Just as a collection of markets function like an organization, so - in reverse - insights from a multinational organization can yield insight into the supply adaptations of the different trawler fleets. My fishing experience is limited to the North Atlantic, so I am more familiar with illustrations from Atlantic Canada, Iceland and Norway, but believe that the logic has wider applicability. The following sections are divided into a statement of theory, an illustration from the North Atlantic, and finally some thoughts as to a possible vigorous investigation.

1. Sell to Several Markets

Theory

First, marketing risk can be reduced by selling simultaneously in several national markets. Though some nations will preserve their market for domestic fishermen, most nations cannot afford that indulgence. In the face of supply fluctuations, it will be helpful to distinguish three categories of national markets (by market share) and orchestrate supply to the markets in an adaptive manner.

Category (1). Medium market share and high aspirations: supply these markets with whatever fish the marketing manager request. Their task of gaining market share by establishing a brand is so elusive that they need to be spared the frustration of supply interruptions.

Category (2). High market share and weak competitors: interestingly, these markets may be able to tolerate short-term supply interruptions when competitors are hurting too. This conclusion offends marketing managers who have nurtured their market through Category 1.

Category (3). Low market share and no aspirations: supply these markets as erratically as is necessary, because good quality fish have priority for Categories 1 and 2. Use different brand names, for the reputation of the product will be low due to erratic cuality and supply.

Illustration

Canadian ground fish is exported to the U.S.A. Norwegian ground fish is sold mostly in Europe, with some exports to the U.S. although its market share is low (perhaps Category 3). Iceland has traditionally exported to the U.S., but now is steadily building market share in Britain (Category 1). In certain U.S. markets Iceland has a substantial market share. For instance, the Long John Silver chain obtains about 85% of its purchases from Iceland. Iceland's volume to Long John Silver alone constitutes almost 60% of Icelandic cod fillet exports to the U.S. (Category 2). Iceland also exports salt fish to many nations and dried stock fish to Nigeria (Category 3).

Possible Statistical Tests

Run a regression between total catch in a nation and its exports to each market. Sequence the nations by their R^2 correlation coefficients. This ranking should accord with the Categories 1, 2, and 3.

2. Multiple Sources

Theory

The second adaptive response is to develop multiple sources of supply. For each species the variance of total supply can be low if the co-variances of fish availability in the various catching grounds are sufficiently low (some may even be zero). The time period for analysis of variances and covariances is probably two months, the time period in which the corporation can redeploy its trawlers and factory ships.

Illustration

Five Japanese fishing companies operate internationally. Ranked by size, these are Taiyo, Nippon Suisan, Nichiro, Kyokuyo and Hoko. These companies maintain trawlers in the North Pacific, off New Zealand, off South Africa, off South America (Chile, Argentina) and in the North Atlantic.

The companies use 200-foot factory trawlers which stay in their assigned fishing ground year round. A crew occupies the trawler for 10 months, is flown to Japan for a two-month home leave, and then is flown to another trawler. On board, fish are dressed within 5 hours of being caught, and the fillets are plate frozen (a quick 3-hour process). The trawlers have on-board fish meal plants to utilize the heads and guts.

The trawlers are provisioned locally. Each trawler can hold 1,000 tons of frozen fish. Every two months the fish is transferred at sea to a carrier ship, which steams to market. Usually the carrier ships go to Japan. As profitable opportunities arise, the companies service other markets. For example, they sell some North Atlantic squid in Spain and Portugal, and some South American cod in Australia.

Possible Statistical Test

Calculate the covariance between imports from one ocean and total imports, and thereby sequence the nations. Rank the supply sources by their cost (delivered in the home market). Compare the two rankings using a Spearman rank order correlation.

3. Blended Brands

Theory

The third adaptive response is to develop some products that can accommodate multiple inputs, and some brands that are general enough to accommodate such blended products.

Illustration

Fish balls can have a mongrel heritage, one that changes from month to month.

Test

Study the specification sheet of each product, and count products whose specifications do not mention any species, but rather deal with physical size and objective taste characteristics.

4. Inventory Frozen Fish

Theory

The fourth adaptive response is to inventory frozen fish. Because of the mismatch between seasonal catch and consumption patterns, someone has to inventory frozen fish. Large food retailers are becoming even more conscious of their cost structures, and are eliminating shelf availability from suppliers who fail to replenish their product "just in time".

Illustration

The Bank of America loans up to 50 percent of the cost for frozen fish up to six months old. Several Boston banks will loan a greater percentage of the fish cost, but require more of an investigation into the company.

Test

If there is any consistent seasonal pattern to the price of frozen fish, the ascending slope of that pattern should not exceed the cost of carrying inventory.

5. Inventory Live Fish

Theory

The idea is to refrain from catching easily catchable fish. The ocean is precisely divided into sectors; those closed to fishing so as to replinish stocks are often the sectors closest to fleet home ports. The theoretical solution would be for the regulatory body to permit fishing in the closed sectors, whenever the fisherman desired, so long as a government observer be on board and that a levy be charged per ton of fish taken.

Illustration

Lobster is a traditional meal in the Boston area on July 4. Live lobster commands a premium price, so causht lobsters are inventoried for the holiday. Fish farms provide another illustration.

Test

If there are ocean sectors which can be accessed for a price per ton, study the correlation between weekly price and tons taken. It is hypothesized that accesses will be made even when seemingly uneconomical.

6. Move the Processing Plants

Theory

The fifth response is to move trawlers and fish-processing plants between nations as the markets dictate particular species of catch. However, in many nations foreign vessels are penalized. The crucial ingredient is to have some flexibility in some relationships so that fish delivery can adapt to forecast market requirements. Similarly, if some factory trawlers or some barge mounted processing plants are used, their mobility reduces the extremes faced by the fixed facilities.

Illustration

Factory ships have cheaper sewage systems than do shore based plants (fixed or barged). The second attraction of factory ships is that the workers can be paid cheaply.

Test

Data on the location of factory ships is partially available from Lloyds. There are few enough such ships that a mail survey of owners would verify their locations.

General Discussion

Since the advent of the 200 mile limit in 1977 most nations have developed procudures and controls to curb over fishing. By 1987, those fish stocks will have matured; commercial harvests will increase about 2% per year till 1987. There is a world market in blocks whose price elasticity has been investigated in the doctoral dissertation of Backstael, by Paez, by Gillen and Oum (1981) and others. If the supply increase goes into blocks, the price will drop (though it is difficult to estimate long run elasticities from short run observations). If block prices tend to rise, fish farming of catfish will assure that they don't rise much. Seeing these facts, it makes sense to develop fish products that yield higher returns than does block.

Quality specifications for block have been rather sloppy. Quality specifications for brand name products are exceptionally tight, so that only the best of fish meet these specifications. Unfortunately this means that the availability of specification product is a varying portion of a varying catch.

A brand name demands not only consistent quality, but also availability whenever customers demand fish. The more prominent the brand name, the greater the opportunity cost of stockouts. Relevant opportunity costs include customer dissatisfaction, and also the greater cost of having undermined a training program of having the channel of distribution be responsive.

Price within the fishing industry has usually meant today's spot price. Yet brand names take years to build up, and cannot be maneuvered in response to daily prices. There does not exist a three year forward market in fish, because fish is perishable and no scientific quality standards have been developed. Yet investment decisions are being made now in anticipation of what the returns might be, come the post 1987 harvests.

The marketing approach is that supply shall respond to the market. Such responsiveness costs money. The purpose of this paper has been to outline several mechanisms of responsive adaptability. They work best if orchestrated together.

References

O.E.C.D. Study of the Changes in International Trade in Fish and Fish Products, Committee of Fisheries, FI/204, Paris, November 3, 1981.

Rutenberg, David P., Multinational Management, Boston: Little-Brown, 1982.

Rutenberg, David P., "Multinational Food and Fish Corporations", pp. 217-239 of Alan Rugman's New Perspectives on the Multinational Enterprise, New York: St. Martin's, 1982.

Gillen, David W., and Tae H. Oum, "A Study of the Demands for Ground Fish", Working Paper 81-11, School of Business, Queen's University at Kingston, Canada.

Abstract

The long run price decline in fish blocks increases the potential gain from selling differentiated fish products, under brand names. But brand naming demands consistently available product, which requires supply adaptation. The global network of supply can adapt in six ways:

1. Sell to Several Markets
2. Multiple Sources
3. Blended Brands
4. Inventory Frozen Fish
5. Inventory Live Fish
6. Move the Processing Plants

Each is briefly explained and illustrated. Data requirements to test the extent to which the system is adapting in this way are sketched.

The Role of Exchange Rates in the Capital Allocation of the Multinational Corporation

Biing-Hwan Lin
Oregon State University
Corvallis, Oregon, USA

Introduction

It is widely recognized that two of the most spectacular developments in the world economy during the last two decades have been in the areas of foreign direct investment (FDI) and multinational corporations (MNCs). As entrepreneurs went abroad, the academic curiosity in these developments was initiated with the pioneering work by Stephen Hymer (1960). Since then, the literature on these subjects has increased substantially and taken different directions, placing the MNC at the crossroads of many disciplines and of many debates as well (Calvet, 1981).

Despite the vast development in this controversial and multidisciplinary literature, little attention has been placed on the role of exchange rates as a determinant of capital allocation of the MNC.[1/] As a result, the role of exchange rates is still in a mist and, sometimes, misunderstood. The "crosspenetration" phenomenon best examplifies this issue. During the 1960s American firms began investing in Europe while during the 1970s European countries and Japan increased their investment in the U.S. Realizing the striking correlation between the "cross-penetration" and the currency realignment which occurred during the early 1970s. Bergsten, Horst, and Moran (1978) speculate that the change in relative currency values was the main cause of the crosspenetration.

Baldwin and Richardson (1981) elaborate further on the issue and argue that there is only an indirect linkage between exchange rates and FDI through the channel of changes in relative prices of tradable goods. They claim that

"...It is tempting to jump to the conclusion that the overvalued dollar made foreign corporations relatively cheap for Americans in the 1960s, and the depreciated dollar made U.S. corporations relatively cheap for the rest of the world in the 1970s. Yet such simple reasoning is false. It fails to recognize that when Japanese investments in the U.S. yields dollar returns, then Japan is not only paying fewer yen for dollar assets but is earning fewer yen on their dollar profits. Neither their rate of return nor the relative attractiveness of real investment at home and abroad need be affected by exchange rates." (p. 265)

Baldwin and Richardson's argument may sound correct intuitively, but there is no a priori theoretical objection to the direct role played by exchange rates in the capital allocation of the MNC. On the contrary, the main purpose of the paper is to demonstrate that there is a direct linkage between exchange rates and FDI. To achieve this objective, a general equilibrium model characterized by the presence of a MNC is discussed in the second section of this paper. The first order conditions for profit maximization are derived in the third section to facilitate comparative static analyses. The comparative static results are then confirmed by graphical demonstrations. The last section summarizes the analytical results of the paper and draws implications of this theoretical study on the research pertaining to the international seafood trade.

Assumptions and the Model

Batra and Ramachadran (1980) postulate a general equilibrium model consisting of two sectors in each of two countries in which a multinational corporation is involved. The purpose of their paper is to examine the effects of changes in various parameters, such as tax rates, tariffs, and terms of trade, on investment decisions. Their model is modified to include an exchange rate variable and also with the objective function reinterpretated. The assumptions made in the Batra and Ramachadran's model are retained. They are briefly described as follows:

Assumption 1: There are two countries, a home country and a host country of the multinational corporation; and two sectors, one (X) wherein the parent firm competes with its foreign affiliate and the other (Y) in which a good produced by local firms is marketed.

Assumption 2: Labor is the only nonspecific factor and capital is specific to both sectors, but the capital of the MNC is mobile between the parent firm and foreign affiliate. The production function of the MNC also contains another specific factor representing patents, technical and managerial know-how, etc.

Assumption 3: All other assumptions of the Heckscher-Ohlin model are retained. Thus perfect competition, linearly homogeneous and concave production functions, full employment, and price-inelastic factor supplies are also assumed.

Assumption 4: Both the countries are small and take as given the relative prices that are determined in the rest of the world. Within a country the price of X relative to that of Y is invariant with respect to changes in exchange rates.[2/]

Based upon the above assumptions, the aggregate production functions are

$$(1) \qquad X = X(L_x, K_x, S) \qquad X^* = X^*(L_x^*, K_x^*, S^*)$$

$$(2) \qquad Y = Y(L_y, K_y) \qquad Y^* = Y^*(L_y^*, K_y^*)$$

where L stands for labor, K for capital, S for a specific factor, and the asterisk denotes the variables in the host country. The production functiond, which are assumed to be linearly homogeneous and concave, possess the following properties: In X

$$(3a) \qquad X_j > 0, X_{jj} < 0, X_{ij} > 0 \qquad (i, j = K, L, S; j \neq i)$$

$$X_{LL} X_{KK} - X_{LK}^2 > 0$$

and in Y

$$(3b) \qquad Y_j > 0, Y_{jj} < 0, Y_{LK} > 0 \qquad (j = L, K)$$

$$Y_{LL} Y_{KK} - Y_{LK}^2 = C$$

where X_i and Y_i are marginal productivities and X_{ij} and Y_{ij} are changes of marginal productivities of factor i with respect to a change in factor j.

Under the small country assumption, the relative prices of X in terms of Y, P and P*, will differ only by a tariff rate after making exchange rate adjustment. Since this paper focuses on the effects of variations in exchange rates on foreign direct investment, tariff and nontariff trade barriers are assumed away to simplify analysis. There are three factors of production employed by the multinational corporation. Because labor is assumed to be nonspecific and mobile between the two sectors, only one wage rate prevails within each country. It should be noted that the capital owned by the multinational corporation is not universally defined in the literature. In this paper the multinational corporation's capital is treated in both monetary and physical terms.

The objective of the multinational corporation is assumed to be maximization of its after-tax global profits.[3/] Generally, a corporate income tax is levied by both countries. However, to avoid double taxation on foreign income, the tax paid to the host country is usually treated as tax credit at home (Coburn, Ellis, and Milano, 1981). Compared to the rest of the world, the U.S. corporate income tax is the highest, at 48 percent. Therefore, the U.S. based multinational corporation will pay the same tax for both foreign and home income.[4/] Following the above discussion, we can formulate a (capital) constrained profit maximization problem for the multinational corporation. The Lagrangian function of the problem can be expressed as:

For monetary capital,

(4a) $$L_1 = (1 - t)\,[(PX - WL_x - F) + e(P^*X^* - w^*L_x^*)]$$

$$+ \lambda(\overline{K} - K_x - e\,K_x^*)$$

For physical capital,

(4b) $$L_2 = (1 - t)\,[(PX - WL_x - F) + e(P^*X^* - w^*L_x^*)]$$

$$+ \lambda(\overline{K} - K_x - K_x^*)$$

where t is the corporate income tax, e is the exchange rate (home country's currency/host country's currency), $\overline{K}$ is the corporation's fixed capital and F is the research expenses for obtaining the factor S.

<u>The Role of Exchange Rates in the Capital Allocation of the Multinational Corporation</u>

In the first part of this section, comparative static analyses are performed to investigate the role of exchange rates in the capital allocation of the multinational corporation. I emphasize the case of monetary capital, since the analysis of physical capital yields similar results. The results obtained via comparative static analyses are then confirmed by graphical demonstrations in the second part of this section. Finally, the American experience is cited to support the analytical results.

Comparative Static Analyses

(i) Monetary capital: We can derive the following first order conditions from (4a) for the multinational corporation.

(5a) $$PX_L = W_x$$

$$P^*X_L^* = W_x^*$$

(6a) $$PX_K(1 - t) = \lambda$$

$$\cancel{e}P^*X_K^*(1 - t) = \cancel{e}\lambda$$

(7a) $$\overline{K} = K_x + eK_x^*$$

Similarly, the first order conditions for the capital constrained profit maximization in the local sectors are:

(8) $$Y_L = W_y \text{ and } Y_L^* = W_y^*$$

(9) $$Y_K = \lambda_y \text{ and } Y_K^* = \lambda_y^*$$

Mobility assumption of the nonspecific labor in each country leads to the same wage rate, i.e.,

$$(10) \qquad W = W_x = W_y \text{ and } W^* = W_x^* = W_y^*$$

Equations (5a), (6a), (8), and (10) can be rearranged so as to lead to the equations (11a) - (13a),

$$(11a) \qquad PX_L(L_x, K_x, S) = Y_L(L_y, K_y)$$

$$(12a) \qquad P^*X_L^*(L_x^*, K_x^*, S^*) = Y_L^*(L_y^*, K_y^*)$$

$$(13a) \qquad PX_K(L_x, K_x, S) = P^*X_K^*(L_x^*, K_x^*, S^*)$$

These three equations can then be differentiated to derive the equations (14a) - (16a),

$$(14a) \qquad PX_{LL}\, dL_x + PX_{LK}\, dK_x - Y_{LL}\, dL_y = 0$$

$$(15a) \qquad P^*X_{LL}^*\, dL_x^* + P^*X_{LK}^*\, dK_x^* - Y_{LL}^*\, dL_y^* = 0$$

$$(16a) \qquad PX_{LK}\, dL_x + PX_{KK}\, dK_x - P^*X_{LK}^*\, dL_x^* - P^*X_{KK}^*\, dK_x^* = 0$$

Under the assumption of full employment, two more equations can be specified. They are:

$$(17) \qquad L_x + L_y = \bar{L}$$

$$(18) \qquad L_x^* + L_y^* = \bar{L}^*$$

These two equations and the equation (7a) when differentiated can be used to rearrange equations (14a) - (16a) and lead to the system of equations (19a)[5/].

$$(19a) \begin{cases} (PX_{LL} + Y_{LL})\, dL_x + PX_{LK}\, dK_x = 0 \\ 0 - \frac{P^*}{e} X_{LK}^*(K_x^* de + dK_x) + (P^*X_{LL}^* + Y_{LL}^*)\, dL_x^* = 0 \\ PX_{LK}^*\, dL_x + PX_{KK}\, dK_x + \frac{P}{e} X_{KK}^*(K_x^* de + dK_x) - P^*X_{LK}^*\, dL_x^* = 0 \end{cases}$$

(19a) can then be arranged into the matrix form (20a)

$$(20a) \begin{bmatrix} (PX_{LL} + Y_{LL}) & PX_{LK} & 0 \\ 0 & -\frac{P^*}{e} X_{LK}^* & (P^*X_{LL}^* + Y_{LL}^*) \\ PX_{LK} & (PX_{KK} + \frac{P^*}{e} X_{KK}^*) & -P^*X_{LK}^* \end{bmatrix} \begin{bmatrix} \frac{dL_x}{de} \\ \frac{dk_x}{de} \\ \frac{dL_x^*}{de} \end{bmatrix} = \begin{bmatrix} 0 \\ \frac{P^*}{e} X_{LK}^* K_x^* \\ -\frac{P^*}{e} X_{KK}^* K_x^* \end{bmatrix}$$

or [A] [B] = [C]

The determinant of the matrix [A] is given by

$$(21a) \quad |A| = (PX_{LL} + Y_{LL})\, P^* \frac{1}{e} [P^*(X_{LK}^{*2} - X_{LL}^* X_{KK}^*) - Y_{LL}^* X_{KK}^*] + (P^* X_{LL}^* + Y_{LL}^*)\, P\, [P(X_{LK}^2 - X_{LL} X_{KK}) - Y_{LL} X_{KK}]$$

It becomes clear to see that $|A|$ is positive, since X_{ii}, X_{ii}^*, Y_{ii}, Y_{ii}^* ($i = L, K$), $(X_{LK}^2 - X_{LL} X_{KK})$, and $(X_{LK}^{*2} - X_{LL}^* X_{KK}^*)$ are all negative. To analyze the effects of changes in exchange rates on K_x, we can use Cramer's rule to get

$$(22a) \quad \frac{dK_x}{de} = \frac{1}{|A|} (PX_{LL} + Y_{LL})\, P^* \frac{1}{e} K_x^* [P^*(-X_{LK}^{*2} + X_{LL}^* X_{KK}^*) + X_{KK}^* Y_{LL}^*]$$

We can see that dK_x/de is negative regardless of what relationship between labor and capital inputs is postulated (i.e., X_{LK}^* can be either positive, negative, or zero). However, this assumption is needed, shown later, to examine the effects of changes in exchange rates on labor employment. The result tells us that the domestic investment will be cut back when exchange rates move against the home country. This is not a surprising result for two reasons.

First, the purchasing power of the total fixed capital shrinks as the home country's currency depreciates. To establish the new equilibrium condition, the rate of return (in terms of home country's currency) on both foreign and domestic investment has to be raised.

Secondly, the same amount of capital in terms of the home country's currency will yield a higher rate of return abroad after a depreciation in the domestic currency than before depreciation. This is because the schedule of the value of marginal productivity of capital (PX_k) is assumed to be downward sloping. To equalize the rates of return at home and abroad, domestic capital moves to the host country. These two arguments are supported by a graphical demonstration demonstration presented later.

Less capital for domestic investment means more capital in terms of the home country's currency should be allocated to foreign investment, i.e., $d(eK_x^*)/de > 0$. But ther foreign investment when measured in terms of the host country's currency will decrease with respect to a depreciation in the home country's currency, i.e., $dK_x^*/de < 0$. To reach this result, we can replace dK_x by $(-edK_x^* - K_x^* de)$ for equations (14a) - (16a) and hence obtain (20b).

The determinant of the matrix D is negative as shown in equation (21b). Using C-amer's rule, we can see that $dK_x^*/de < 0$, as shown in equation (22b).

$$
(20b)\quad \begin{bmatrix} (PX_{LL} + Y_{LL}) & -ePX_{LK} & 0 \\ 0 & P^{*}X^{*}_{LK} & (P^{*}X^{*}_{LL} + Y^{*}_{LL}) \\ PX_{LK} & (-ePX_{KK} - P^{*}X^{*}_{KK}) & -P^{*}X^{*}_{LK} \end{bmatrix} \begin{bmatrix} dL_X/de \\ dK^{*}_X/de \\ dL^{*}_X/de \end{bmatrix} = \begin{bmatrix} PX_{LK}K^{*}_X \\ 0 \\ PX_{KK}K^{*}_X \end{bmatrix}
$$

or [D] [E] = [F]

$$
(21b)\quad |D| = (PX_{LL} + Y_{LL})\, P^{*}(P^{*}(X^{*}_{LL}X^{*}_{KK} - X^{*2}_{LK}) + X^{*}_{KK}Y^{*}_{LL}) + (P^{*}X^{*}_{LL} + Y^{*}_{LL})\, eP\,(P\,(X_{LL}X_{KK} - X^{2}_{LK}) + X_{KK}Y_{LL}) < 0
$$

$$
(22b)\quad dK^{*}_X/de = \frac{-1}{|D|}(P^{*}X^{*}_{LL} + Y^{*}_{LL})(P^{2}K^{*}_X\,(X_{LL}X_{KK} - X^{2}_{LK} + \frac{1}{P}X_{KK}Y_{LL})) < 0
$$

AS to the effects of changes in exchange rates on the labor inputs employed by the multinational corporation, the relationship between capital and labor inputs becomes relevant. If these two inputs are complementary and the home country's currency depreciates, labor will move from the X to the Y sector in both the home and host countries of the multinational corporation. If these two inputs are substitutional, labor will move from the Y to the X.

(ii) Physical capital: a derivation similar to that for the case of monetary capital will yield the following conditions:

$$
(11b)\quad PX_L(L_x, K_x, S) = Y_L(L_y, K_y)
$$

$$
(12b)\quad P^{*}X^{*}_L(L^{*}_x, K^{*}_x, S^{*}) = Y^{*}_L(L^{*}_y, K^{*}_y)
$$

$$
(13b)\quad eP^{*}X^{*}_K(L^{*}_x, K^{*}_x, S^{*}) = PX_K(L_x, K_x, S)
$$

Then we totally differentiate the above conditions and use the relationships $dL_y = -dL_x$, $dL^{*}_y = -dL^{*}_x$, and $dK_x = -dK^{*}_x$ to come up with the following system of equations for a comparative static analysis.

$$
(23)\quad \begin{bmatrix} (PX_{LL} + Y_{LL}) & PX_{LK} & 0 \\ 0 & -P^{*}X^{*}_{LK} & (p^{*}X^{*}_{LL} + Y^{*}_{LL}) \\ -PX_{LK} & -(eP^{*}X^{*}_{KK} + PX_{KK}) & ep^{*}X^{*}_{LK} \end{bmatrix} \begin{bmatrix} \frac{dL_x}{de} \\ \frac{dK_x}{de} \\ \frac{dL^{*}_x}{de} \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ -p^{*}X^{*}_K \end{bmatrix}
$$

or [G] [H] = [I]

It can be shown that the determinant of the matrix G is negative. Using Cramer's rule, we can see that $dK_X/de = -\,dK_X^*/de = \frac{1}{|G|}(P^* X_K^*/e)\,(P^* X_{LL}^* + Y_{LL}^*)\,(PX_{LL} + Y_{LL}) < 0$. This result, again, demonstrates that the MNC's capital will move away from home when the home country's currency depreciates. It is,however, interesting to note that (13b) differs from (13a) by including the exchange rate parameter. Therefore, we can argue more convincingly that it is incorrect to assert that ".. neither their rate of return nor the relative attractiveness of real investment at home and abroad need be affected by exchange rate."

Graphical Confirmation of Comparative Static Results

In this part, I introduce a recent development in graphical demonstrations of the effects of changes in exchange rates on trade flows and international equilibrium prices (Edwards, 1982). It will be seen that this newly invented device is helpful to picture the mechanism working behind the comparative static results obtained earlier. There are two figures included. The first pertains to the case of monetary capital and the second deals with the case of physical capital.

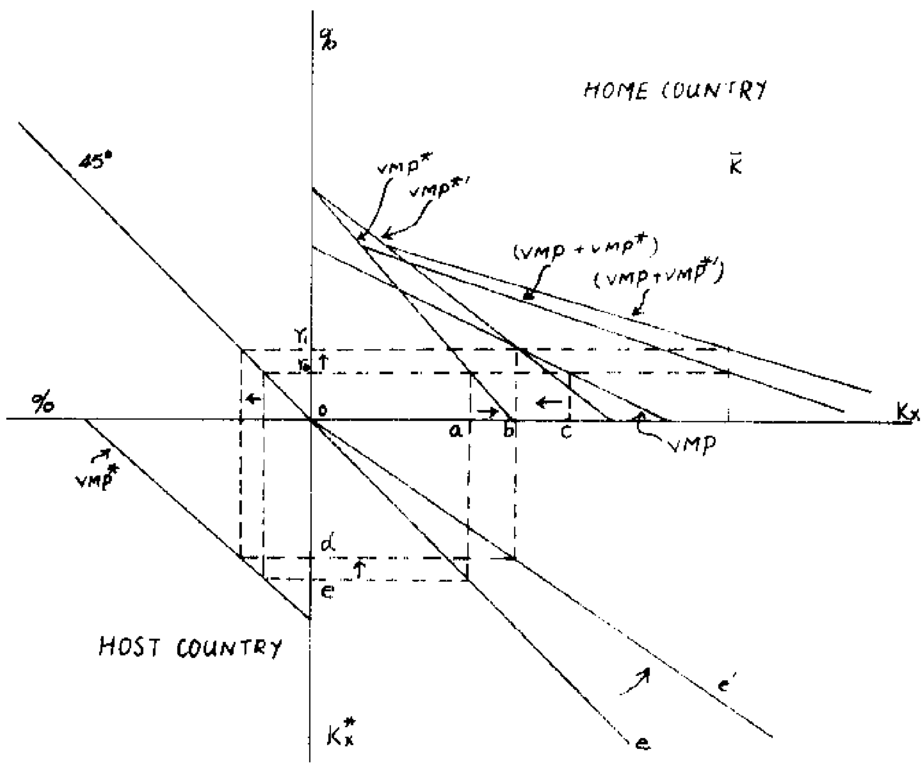


Figure 1: monetary capital

In Figure 1, VMP and VMP^* are the values of marginal productivity of capital for domestic and foreign investment, respectively. Because VMP is defined as the price of good X times the marginal productivity of monetary capital ($VMP=PX_K$), it is expressed in percentage terms. Hence, a 45 degree line is drawn in the second quadrant to equate the rates of return on both domestic and foreign investment. When the home country's currency depreciates, the purchasing power of the home country's currency in the host country shrinks. As a result, the same amount of monetary capital in terms of the home country's currency will yield a higher rate of return abroad, i.e., the VMP^* in the first quadrant will shift upward to $VMP^{*'}$.

To determine the equilibrium rates on investment and capital allocation, we sum horizontally the two VMPs in the first quadrant and determine where this new line intersects the vertical line representing a fixed amount of capital. By so doing, we can see that the rate of return on investment is increased from r_0 to r_1 when exchange rate changes from e to e'. Domestic investment decreases from Oc to Ob. Foreign investment increases from Oa to Ob in terms of the home country's currency, but decreases from Oe to Od in terms of the host country's currency.

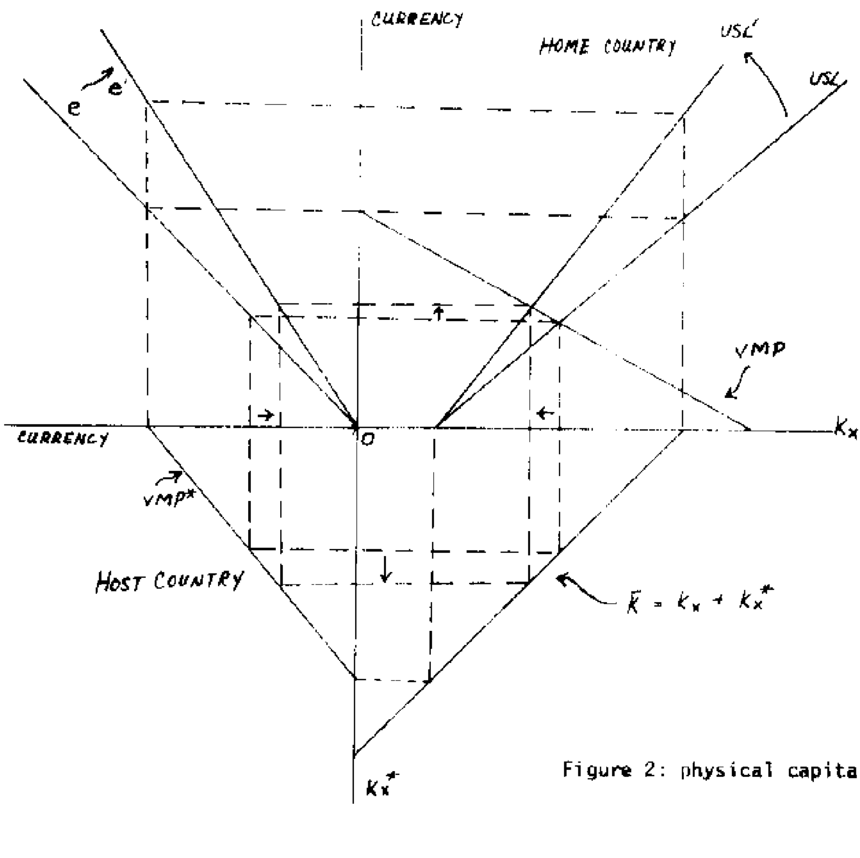


Figure 2: physical capital

When capital is measured in physical terms and provided by the home country, two quadrants are defined differently as shown in the Figure 2. First, exchange rate lines are drawn in the second quadrant. This is because VMPs are defined as the monetary return on a unit of capital, or VMP = (price of good X) (units of X/units of capital) = monetary value per unit of capital. Secondly, a 45 degree line can be drawn in the fourth quadrant, reflecting the fact that capital is measured in physical terms. But, we can use the capital constraint, $\bar{K} = K_X + K_X^*$, to replace the 45 degree line and reach identical results. Also, we can replace the exchange rate line in the fourth quadrant of the first figure by the capital constraint, $\bar{K} = K_X + eK_X^*$, without altering the results obtained previously.

As shown in Figure 2, the VMP^* is transformed into an upward sloping line (USL) in the first quadrant. This line represents the rate of return on foreign investment which is given up (gained) when the domestic investment is increased (decreased). Therefore, the equilibrium rate of return is determined at the point where the upward sloping line intersects the VMP. As a result of a depreciation in the home country's currency, more of the MNC's physical will move away from domestic operations to foreign operations.

Empirical Evidence

In the first part of this section, comparative static analyses were performed to show that the multinational corporation's domestic investment will be decreased as a result of a depreciation in the home country's currency. These comparative static results were then confirmed by graphical demonstrations. These results are in direct contrast to Baldwin and Richardson's prediction that the U.S. foreign investment should have been decreased since the early 1970s. Therefore, the historical data on foreign direct investment by U.S.-based multinational corporations serve as a benchmark to resolve this dilemma.

Bergsten, Horst, and Moran have compiled the statistics on the foreign expenditure as a share of total plant and equipment expenditure by American corporations for 1960 and 1966-76. They are reproduced in Table 1. The U.S. dollar devaluated twice in the early 1970s, the first time in late 1971 and the second time in early 1973. Although the 1972 foreign share of total investment drops by a small percentage, this particular year's data should be treated with caution because this unprecedented event undoubtedly cast a new dimension of risk into the foreign direct investment. The continuous increase of the foreign share of total investment from 1972 to 1975 can then be regarded as an evidence supporting the analytical results of this paper.

As for the Japanese case, the analytical results show that Japan-based multinational corporations should allocate more of their capital for domestic operation than foreign operation during the 1970s. This conclusion may or may not be consistent with the Japanese experience, depending upon the relative growth rates of domestic and foreign investment that have been made by Japan-based multinational corporations. Unfortunately, the Japanese (and European) data are not available for

Table 1. Foreign Expenditure as a Share of Total Plant and Equipment Expenditure by American Corporations, 1960 and 1966-76.

Year	Plant and equipment expenditure (billions of dollars) Total	Domestic	Foreign	Foreign share (percent)
1960	40.6	36.8	3.8	9.4
1966	72.2	63.5	8.7	12.0
1967	75.2	65.5	9.7	12.9
1968	77.8	67.8	10.0	12.9
1969	87.2	75.6	11.6	13.3
1970	93.8	79.7	14.1	15.0
1971	97.5	81.2	16.3	16.7
1972	105.1	88.4	16.7	16.0
1973	120.3	99.7	20.6	17.2
1974	138.2	112.4	25.8	18.5
1975	139.5	112.8	26.7	19.2
1976	146.4	120.5	25.9	17.8

Sources: Economic Report of the President, January 1976 (GPO, January 1976), p. 216; Survey of Current Business, vol. 56 (March 1976) pp. 19-24; and ibid, vol. 57 (March 1977), pp. 31, 33.

Compiled by Bergsten, Horst, and Moran.

testing the conclusion. Nevertheless, even if these data were available, it is still quite possible that Japanese multinational corporations might have invested more in foreign ventures than domestic production since the early 1970s. As Sullivan and Heggelund (1979) point out that during the early 1970s the Japanese government changed its attitude toward overseas investment from control to promotion by instituting various liberalization and stimulation measures (p. 47 and p. 51). Those policy stimuli are not incorporated in the analysis and they may overwhelm the impediment caused by currency adjustments.

Conclusions

During the last two decades the literature in foreign direct investment and multinational corporations has grown at a phenomenal pace. However, most progress in the explanation of the foreign direct investment by multinational corporations is based upon the studies of domestic investment. This paper focuses on the role of exchange rates in foreign direct investment that serves as the essence of the distinction between domestic and foreign investment. Based upon a general equilibrium framework, it was shown that the multinational corporation will allocate fewer (more) capital for domestic operation than for foreign operation when its home country's currency depreciates (appreciates). These results were confirmed by graphical demonstrations and were supported by the American experience.

These theoretical results appear to have some implications for the research pertaining to the international seafood trade. The emergence of multinational corporations in the fisheries industry is a rather new phenomenon but has grown at a rapid pace; especially, after the currency realignment and the worldwide proliferation of extended jurisdiction over coastal waters. It appears that most of those foreign direct investment are resource-oriented. This particular characteristic of foreign fishery investment will enhance rather than reduce the activities of international seafood trade. For example, the export of surimi from the U.S. to Japan has been initiated by the Japanese investment in the U.S. fisheries industry. Therefore, a better understanding of the factors affecting the growth of multinational corporations will help explain the pattern and trend of international seafood trade. As just mentioned the growth of multinational corporations in fisheries industry embodies different characteristics and motivations as that in other industries. Hence, future research on this subject is warranted in order to improve our understanding of international seafood trade.

Footnotes

1. Although Stevens (1974) identifies the inclusion of an exchange rate variable as a future research need in the analysis of the MNC, Batra and Hadar's (1979) research is one of very few studies pursuing the need.

2. The main purpose of devaluation is usually to improve a country's balance of payments position via encouraging export and discouraging imports. Therefore, inflation often accompanies currency devaluation. The assumption of constant relative price, put in other words, is that the prices of both X and Y will increase by the same proportion.

3. Stevens (1974) discusses the progress that has been made in specifying different objective functions, such as sale maximization and profit maximization as well.

4. It can be shown that the analytical results are not altered even when the host country charges a higher corporate income tax than the home country.

5. Differentiating the capital constraint, $\overline{K} = K_x + eK_x^*$, we have

   $$dK_x^* = -\frac{1}{e}(K_x^* de + dK_x) \text{ or}$$

   $$dK_x = -e dK_x^* - K_x^* de$$

References

Baldwin, R.E. and J.D. Richardson. International Trade and Finance: Readings. Second edition. Boston: Little, Brown and Company. 1981.

Batra, R.N. and J. Hadar. "Theory of the Multinational Firm: Fixed versus Floating Exchange Rate." Oxford Econ. paper. July 1979, 258-69.

Batra, R.N. and R. Ramachandran. "Multinational Firms and the Theory of International Trade and Investment." American Economic Review. June 1980 70(3):278-290.

Bergsten, C.F., T. Horst, and T.H. Moran. American Multinational and American Interests. Washington, D.C.: Brookings Institution. 1978.

Calvet, A.L. "A Synthesis of Foreign Direct Investment Theories and Theories of the Multinational Firm." Journal of International Business Studies. Spring/Summer 1981:43-59.

Coburn, D.L., J.K. Ellis, and Duane R. Milano. 'Dilemmas in MNC Transfer Pricing." Management Accounting. November 1981 63(5): 53-58, 69.

Edwards, J.A. On the Role of Exchange Rates in the Analysis of International Trade. Unpublished manuscript. Department of Agricultural and Resource Economics, Oregon State University. 1982.

Hymer, S. The International Operations of National Firms: A Study of Direct Investment. Doctoral dissertation. MIT. 1960.

Stevens, Guy V.G. "The Determinant of Investment," in J.H. Dunning, editor, Economic Analysis and the Multinational Enterprise. London: Geoge Allen and Unwin Ltd. 1974.

Sullivan, J.J. and P.O. Heggelund. Foreign Investment in the U.S. Fishing Industry. Lexington Books. 1979.

This work is a result of research sponsored, in part, by the Oregon State University Sea Grant College Program supported by NOAA Office of Sea Grant, U.S. Department of Commerce, under grant number NA81AA-D-00086.

The author gratefully acknowledges Richard S. Johnston and John A. Edwards for their constructive suggestions for improvement. All remaining errors are the author's responsibility.

An Input-Output Table with Particular Reference to the Danish Fishing Industry

Hans Frost
Institute of Fisheries Economics
Esbjerg, Denmark

Abstract

I Background

Because of the depletion of a number of species in different waters over the world the discussion of how to manage the resources and how to distribute the benefits has been started again in a wider perspective than previously.

Although the proposals of how to manage the exploitation of the resources have been based on biological advice so far, politicians, government officials and industrial managers have realized that decisions have to be founded on a broader basis including economic and social aspects. The demand for operational economic models has increased, but it seems that to some extent the economists have failed in supplying operational models at least in Europe.

II Objectives

The wishes of managing the resources seem to demand modelling, in which it is possible to assess the impact of changes in the allocation of the fish species on other variables such as income, employment, production and exports. Trying to meet that demand an input-output table seems to be a suitable solution. Many countries have developed input-output tables for the economy, but normally these tables are not detailed to such a degree that the above wishes can be satisfied.

Therefore the main purpose of this work is to develop a simple input-output table for the fishing industry in which the main variables are linked together. The table only includes fishing sectors and fishery commodities.

In order to estimate the total impact of changes within the fishery or the processing industry or the economy a substantial amount of information about purchasing and selling between non fishing sectors is required too. The second objective of this work is to incorporate the detailed input-output table for the fishing sectors in the input-output table for the Danish economy.

III Accomplishment

The paper contains a very simple static input-output model aiming to show the principles of this kind of model. Assumptions for constructing the input-output table are discussed, and it is described how the table is constructed. It is carried out in the same way as input-output tables normally are constructed. The only difference is the use of product-coefficient (ex.: percentage of filet produced per fish) when constructing the fishery table. This implies that it is not necessary to collect data from the industry about the purchase of fish, which counts for the major part of the raw material input. Furthermore this approach provides some advantages, as the input of fish in the processing industry is estimated in quantity. The prices can then be treated as parameters, and the technical coefficient is more stable than the Leontief-coefficient normally estimated.

Finally a small input-output table (6 commodities, 4 branches) is worked out on Danish data as an example.

1. Introduction

Because of the strong depletion of a number of fish stocks in the 60's the discussion has been started again of how to exploit the fishery resources in the best way and by which means. Consequently there is a growing interest to assess the economic and social consequences of various regulatory measures.

This interest seems to be caused by the fact that the biological objective (maximum sustainable yield), which has formed the basis of the regulatory measures, has been too biased compared to the economic objectives which often make the basis of the development of society.

Since the 70's, when the problems of the allocation of the fishery resources rose, there has been a growing tendency in Denmark to consider the fishery and the processing industry a unit rather than considering them isolated sectors.

The fishermen's associations have shown greater interest in the commodity market realizing that the development of the prices is influencing the development of the raw material prices. In the same way the managers of the processing industry have been interested in how the fishery is performed, among other things in order to try to adjust the raw material supplies and in doing so to reduce the production costs to be able to contain the markets and to plan future investments.

An important objective of arranging economic models is to provide better possibilities to assess how changes in different variables will influence other variables.

Today trade in fish is broadly subject to open competition, while the allocation of the fishery resources is subject to a central control at least within the EEC. Therefore it is important that the models can be quantified if they are to be used as a basis of decisions for political considerations. This applies on the long view, but especially it is important to be able to quantify models which apply on a short view.

Therefore it is likely to try to use the input-output technique to assess the shortsigted consequences of changes in supply and demand.

The main purpose of arranging an input-output table for the fishing sectors is to quantify the relations between catching and marketing to be able to assess how changes in one variable will influence the other in order to sustain the political decision process. Certain knowledge of production and market conditions has to be obtained if the input-output technique is to be used. Furthermore it is demanded that the historical data, on which the input-output table is based, is available to a reasonably detailed degree. In Denmark it seems to be possible to produce sufficiently detailed and reliable data on the basis of official statistics for the elaboration of an input-output table.

2. The Input-Output Table

An input-output table can be described as an analysis of the production account of the survey of the national economy, where supply and application of commodities and services are classified and described in a way that basis is created for various economic analysis. Input-output tables are used as data basis for input-output models.

So far input-output tables have been applied by public institutions in connection with macroeconomic planning and priority problems. Trade organizations, large establishments and other institutions, which are occupied with planning problems, have a useful instrument in input-output tables.

Input-output tables are often worked out as industry x industry tables. These tables show for each row the production of the industries distributed on use as input in other industries or as final use in the shape of consumption, investment, exports, etc.. For each column the table shows the production of the industries and the demands they make on input from other industries, from abroad and in the shape of labour and capital. It is also possible to work out a commodity x commodity table, an industry x commodity table and a commodity x industry table.

Traditionally an industry x industry table has been worked out for Denmark. In this table the effect on the economy of activity changes in the fishery and processing industry can be measured. As, however, the economic-political interest is concentrated on the allocation of the species, and as the species have different importance for the activity level in the additional links, this formulation of the table is not suitable when the consequences of various allocations of fish are to be assessed.

Here the interest is concentrated on the other three tables mentioned as it is useful to know the relation between species, commodity, employment, etc. for each species.

3. The Input-Output Model

In the most simple, general form the input-output table can be summed up as in figure 1. In the following description it is assumed that there is no imports or exports and that there are not applied labour and capital or other raw materials than fish (primary input).

Figure 1. Schematic Input-Output Table

	Receiving industry (processing industry)	Final use (consumption)	Total
Supplying industry (fishery)	X	e	g

The table is thus constructed for a closed community. The supply from the fishery in the shape of raw fish can be utilized either in the processing industry as raw materials or direct for consumption. If the quantity of catch is measured in whole fish it is seen that (1) X + e = g.

If the supplying industry (fishery) and the receiving industry (processing industry) are organized in groups so that each group in the fishery is identical with one or more species in the processing industry with one or more commodities, a matrice X is obtained with the dimension: number of species x number of commodities. Accordingly e will be a column vector of the dimension: number of species x 1. The same applies for g.

Then the model for a closed community will look in this way.

$$X \times v + e = g \qquad (2)$$

where v is a column vector consisting of the figure one.

If g* is a diagonal matrice of the dimension of X and with the elements of the column vector g in the diagonal this model is obtained:

$$X = A \times g^* \qquad (3)$$

where A is a coefficient matrice, the elements of which show the input (e.g. fillet) of the receiving industry j from the supplying industry i compared to the production of j.

If (3) is inserted in (2) this equation is obtained:

$$A \times g^* \times v + e = g \iff$$

$$A \times g + e = g \qquad (4)$$

If (4) is solved as regard g this equation is obtained:

$$g = (I - A)^{-1} \times e \qquad (5)$$

The relation (5) shows the input-output model in a simple, static shape.

$(I - A)^{-1}$, where I is the identity matrice (the figure 1 in the diagonal), is the inverse static matrice. In this model it is possible to estimate which demands are made on the production (g) if consumption (e) should grow.

If (5) is rewritten so that

$$(I - A) \times g = e \qquad (6)$$

one will see the growth which is necessary in consumption (e) if the production or catch (g) should grow.

An input-output model of the above type is based on the principle of proportionality, and it demands some assumptions to be fulfilled. First it is demanded that raw materials are utilized in a fixed, relative proportion without regard to the size of the production. This assumption is called the assumption of fixed industry technology. Secondly, if a commodity is produced in several industries it is demanded that an industry has got a fixed market share without regard to the size of the production of the commodity. This assumption is called the assumption of market shares. If these assumptions are not fulfilled the coefficient matrices are not constant. The assumptions must be presumed to hold for most of the fishery products. It is e.g. unlikely that a large production of fillet demands relatively less raw materials than a small one. It is also unlikely that an increase of the production will result in a changed composition of raw materials. Therefore the assumption of fixed industry technology seems to hold. Especially the assumption of market shares can be difficult to fulfil, if a commodity is produced in many different industries.

This might be illustrated by considering herring and herring commodities. Herring are used for direct human consumption in the shape of fresh herring, fillet, cured and canned commodities. Part of the potential catch is further used for fish meal and -oil, as the consumer market cannot take the potential catch.

As to the north sea herring, a rough estimate says that the potential catch quantity makes out 500,000 to 600,000 tons, when the population has its maximal efficiency (MSY). But presumably only about 200,000 tons can be disposed of for direct human consumption while the rest must be used for fish meal and -oil.

The catches of herring fluctuate because of nature conditions and the fish is caught by different types of vessels, which do not all have the herring fishery as their primary aim. Under these conditions the coefficients in the matrices will hardly be constant and it would improve the utility of the model if the supply and demand conditions within different groups of commodities were better examined. However, fish and fishery commodities aremainly produced in one single industry for which reason this assumption must presumably hold too.

4. The Basic Matrices

In figure 2 the four fundamental matrices in an input-output table are shown. The matrices can be completed on the basis of primary statistics, which often is collected for that special purpose, and it is often necessary to collect supplementary information or to make calculations in order to produce the necessary statistic basis.

Figure 2. The Basic Matrices of an Input-Output Table

commodity x commodity A	commodity x industry B	e final demand	q total production (commodities)
industry x commodity D	industry x industry C		g total production (industry)
	y' primary input		
q'	g'		

In Denmark the primary statistics rest on international commodity and industry classifications e.g. ISIC (International Standard Industrial Classification). The data collected on that basis can be used for constructing B and D in figure 2. Matrice B shows the application of commodities (input) of the industries to produce output (g'). The industries can indicate a commodity as input, while normally they cannot indicate other industries which provide them with input. Matrice D shows the output of the industries distributed on commodities. The final use of commodities (e) can be constructed residually by deducting the use of commodities of the industries from the total production of commodities (g). The production of an industry (g) is obtained by aggregating the value of the commodities which the industry produces.

The imports can either be distributed on commodities and industries (endogeneous), or the imports can be added to the national supply (exogeneous). In the last case the effects on imports as a result of changes in other variables cannot be determined in the model but have to be determined exogeneously.

The primary input in the form of wages and taxes are often distributed on industries in the primary statistics, and it can directly be inserted in figure 2. Accordingly the residual income can be worked out residually, and y is determined in figure 2.

On the basis of the matrices B and D the matrices A and C can be constructed. By these means the four matrices commodity x commodity matrice etc. result.

The input-output tables for Denmark are constructed in the above way, but they are as mentioned not sufficiently detailed to estimate the effects on species level or commodity level. In the ISIC-classification of branches there are three branches which produce fish and fishery commodities as objects: fishing, canning and preserving of fish and production of fish meal. First this is not very detailed and secondly data in the primary statistics is of such a character that it cannot be determined how the consumption of raw materials is distributed when these branches are subdivided.

5. Product-coefficients

The key to construct a table for the fishing sector is the commodity statistics, a reasonable knowledge of the structure of production and knowledge of product-coefficient.

With knowledge of product-coefficients (e.g. percentage of fillet produced per fish) and knowledge of the species and semi-products of which the commodities are produced it is possible to construct the matrices B and D by mean of the commodity statistics.

Information about product-coefficients is often available in a more or less detailed form, as it forms the basis of calculations of the domestic market consumption of fish and fishery products (consumption/capita).

It appears often from the commodity names in the commodity statistics how the species form part of commodities, but in some respects it is necessary to obtain supplementary information in the processing industry.

On the basis of a classification of all species names and all commodity names a number of function oriented sectors can be defined which include commodity classifications, e.g. cod industry, herring industry etc.. It can also be suitable to aggregate to commodity groups instead of working at a specific commodity level.

The coefficient-matrices which can be worked out partly on the basis of knowledge of product-coefficients and partly on the basis of commodity prices will be more stable than the coefficient-matrices (Leontief-Matrices), which are calculated to show input in value per output in value in fixed prices. In addition to this the assumption of a constant input structure (constant industry technology) and a constant output structure (constant market share) are less important the more detailed the table is.

In this limited table for the fishing sector the largest data problems are attached to the distributior of primary input, which includes subsidiary materials, wages and residual income. In Denmark part of this problem seems to be solved in the near future, since fishermens association have given high priority to the work dealing with analysis of accounts as regard fishing vessels. For the fishery subsidiary materials especially consist of energy and net. Wages and residual income are constant parts of the net catch (the gross catch - energy).

Probably the energy consumption can hardly be proportional to the gross catch (output), as to a high degree this depends on biological conditions, that is the size of the stocks every year and the concentrations in which the stocks are found etc. Therefore wages and residual income cannot be presumed to be proportional to the gross catch. Calculations of the effects of employment and income of changes in the gross catch or final use will therefore be subject to uncertainty.

It is more reasonable to presume that the primary input is proportional to the output in the processing industry. The employees get time rates and are dismissed when there is no fish to process.

There is a large over-capacity in the capital stock. The capital costs per produced unity must be presumed to be small by large capacity exploitation. But the avarage capacity exploitation over the year is notoriously more or less constant from year to year.

Data dealing with subsidiary materials, wages and residual income is only available for the branches fishery, canning and preserving of fish and production of fish meal. However, it is possible to calculate these items properly for a more detailed classification of branches. As the input of raw materials in the processing industry constitues about 70 per cent of the output the absolute errors in the calculations are not grave, although relative they can reach a considerable size.

6. Estimation of Matrices in a Table for the Fishing Industry

It is possible to count about 120 commodity names on the basis of the Danish Statistics of catches distributed on species and the Danish commodity statistics distributed on commodities. This implies that matrice A theoretically can be constructed as a 120 x 120 commodity matrice, and with knowledge of product-coefficients it is possible to estimate the elements in the matrice.

However, it is difficult in a logical way to interpret this matrice, as there is a combined production in the fishing sector, e.g. fillet and offal. This can be shown by the following example. Production of fillet of plaice demands plaice as input. As the output of fillet is about 40 per cent of the weight of the plaice the raw material input of plaice must be about 2.5 times the quantity of fillet produced. But by production of fillet here is also produced fish offal, which is resold and worked up into feeding stuff or fish meal. Therefore it seems more reasonable to explain the input-output relation as input of the commodity plaice and output as the commodities fillet an offal from the sector "plaice". However, the problems of explaining the matrice can be solved in different ways.

In order to construct a table on an aggregate level the sectors and commodity groups are limited on the basis of the above list of about 120 species and commodities so that a commodity x sector matrice and a sector x commodity matrice are constructed corresponding to the matrices B and D in figure 2. Concerning the Danish fishing industry it seems proper to construct eight to twelve sectors so that each sector includes a number of related commodities. Furthermore the 120 commodity names are aggregated to about 40 commodity groups of which each commodity group consists of uniform commodities.

For the eight to twelve sectors it is possible to estimate the input of primary factors, while it is not possible to estimate an input of primary factors for each commodity. The eight sectors e.g. might be made up as follows, two for fishery, namely the fishing for edible fish and the fishing for trash fish, and six for the processing industry, namely fillet, salted/dried, smoked, cured and fish meal/-oil.

With a view to illustrating how the matrices can be calculated a table which corresponds to the table in figure 2 with four sectors and six groups of commodities has been worked out in figure 3.

In this table the matrices B and D are constructed. The matrice B is constructed in this way: input of plaice in the fillet industry = output of fillet in quantity x 2.5 x the price of plaice in first link. Something equivalent applies to cod. The total catch of fish for industrial purposes is imputed in the fish meal industry. The fish offal from the production of fillet is imputed in the fish meal industry. It is calculated as quantity of plaice and cod in whole fish imputed in the fillet industry x 0.55 (because of waste) x the price of fish for industrial purposes.

The domestic consumption is calculated residually by deducting the quantity of exports from the total quantity of production (including imports, though in the table it is presumed that there is no imports). Accordingly the price of exports is multiplied by exports and domestic consumption. This price must be a basic price (price of exports - gross profit). Now the matrice E is worked out. And the vector q, g, f can be calculated.

The matrice D, which shows the output of the sectors distributed on commodities, is worked out assuming that plaice and cod are produced solely in the consumption fisheries and fish for industrial purposes solely in the industrial fisheries. There is no reason why some fish for industrial purposes should not be attached to the consumption fisheries and some fish for consumption should not be attached to the industrial fisheries. The fillet industry produces fillet and offal, and the meal industry produces meal and oil.

On the basis of the matrices B and D and according to input-output textbooks the matrices A = B x D and C = D x B have been worked out. If the matrices A and C are deducted from the identity matrice I and inverted these equations are obtained:

$$q = (I - BD)^{-1} \times e \qquad (7)$$

and

$$g = (I - DB)^{-1} \times D \times e \qquad (8)$$

These equations show the impact on production of commodities q and on

Figur 3. Input-output table. 1976.

		Commodities						Industries				Final demand		Total
		Plaice	Cod	Trash fish	Fillet	Fish meal/oil	Fish offal	Cons. fishery	Indus. fishery	Fillet industry	Meal industry	Domestic consumption	Exports	
Commodities											B		E	q
	Plaice							0	0	104,8	0	68,2	48,8	221,8
	Cod							0	0	342,1	0	44,0	179,1	565,2
	Trash fish							0	0	0	666,8	0	1,7	668,5
	Fillet							0	0	0	0	121,4	488,4	609,8
	Fish meal/oil							0	0	0	0	166,6	836,3	1002,9
	Fish offal							0	0	0	44,6	0	0	44,6
Industries							D							g
	Cons. fishery	221,8	565,2	0	0	0	0							787,0
	Indus. fishery	0	0	668,5	0	0	0							668,5
	Fillet industry	0	0	0	609,8	0	44,6							654,4
	Meal industry	0	0	0	0	1002,9	0							1002,9
Primary input														
							q'				g'		f'	
	Total	221,8	565,2	668,5	609,8	1002,9	44,6	787,0	668,5	654,4	1002,9	400,2	1554,3	

industry production g, when final demand e changes. e is exogeneously given. q and g are endogen variables and (I - DB) and D are parameters. Figure 4 contains an estimate of coefficients and of primary input.

The table can be extended so that all species and commodities are included by estimating, commodity for commodity, the raw material consumption, which is implied in the manufaction of the commodity. This can be done by using the product coefficients. The detailing level determines the information quantity about the product coefficients. A high detailing degree demands a detailed knowledge about product coefficients.

As mentioned earlier, it is logically consistent to attach input of subsidiary materials, labour and capital to industries rather than to commodities. In the fishery model the industries are made arbitrarily on the basis of aggregations of commodities. But they might be formed on basis of vessels groups, way of fishing, plants etc. as well. Theoretically each industry might be put equivalent to a commodity, to which the input of subsidiary materials, labour and capital are attached. But it seems to be without meaning in practice.

By the application of the estimated coefficients in figur 4 and the relations 7 and 8 it can be expounded how the model works.

We assume that market conditions have changed so that it is possible to increase exports of fillet by 100 units compared to the 609,8 units of total production. We now want to know the impact on the production of species and on the industry production.

The demands on production of plaice and cod can be estimated by regarding matrice 1 in figur 4. An increase in final demand (exports) of 100 units requires 1 x 100 units of fillet. It requires 0.5222 x 100 units of cod and 0.1601 x 100 units of plaice. If the units of cod and plaice are divided by the price of cod and plaice the additional catch quantity of cod and plaice is determined.

If relation 8 is applied the required production of the industries are estimated. The fillet industry has to produce 1 x 100 additional units, while the fishery for human consumption have to produce 0.6823 x 100 additional units. These results cannot be red directly from the matrices, as the matrices must be multiplied according to relation 8.

It might also be of interest to estimate the additional income earned as a result of the growth in final demand (exports). This can be done rather easily simply by multiplying the right side of relation 8 by the matrice Y. Matrice Y expresses the application of materials and the value added by the production of one unit in the industries.

By multiplying we obtain:

$$P = Y(I-DB)^{-1} \times D \times e \qquad (9)$$

Where P is the total use of primary input distributed on materials, wages and residual income.

If the calculation is carried through the additional input of subsidiary materials is estimated to 28,5 units, additional wages to 56,9 units

Figur 4. Input-output coefficients. 1976.

		Commodities						Industries				Final demand	Total
		Plaice	Cod	Trash fish	Fillet	Fish meal/oil	Fish offal	Cons. fishery	Indus. fishery	Fillet industry	Meal industry	Domestic consumption Exports	
Commodities		1.				$(I-BD)^{-1}$		2.			B	e	q
	Plaice	1	0	0	,1601	,0071	,1601	0	0	,1601	0	117,0	
	Cod	0	1	0	,5222	,0232	,5222	0	0	,5222	0	223,1	
	Trash fish	0	0	1	0	,6649	0	0	0	0	,6649	1,7	
	Fillet	0	0	0	1	0	0	0	0	0	0	609,8	
	Fish meal/oil	0	0	0	0	1	0	0	0	0	0	1002,9	
	Fish offal	0	0	0	0	,0445	1	0	0	0	,0445	0	
Industries		4.					D	3.		$(I-DB)^{-1}$			g
	Cons. fishery	1	1	0	0	0	0	1	0	,6823	,0304		
	Indus. fishery	0	0	1	0	0	0	0	1	0	,6649		
	Fillet industry	0	0	0	1	0	1	0	0	1	,0445		
	Meal industry	0	0	0	0	1	0	0	0	0	1		
Primary input											Y		
	Sub. materials							,30	,40	,08	,06		
	Wages							,30	,30	,16	,10		
	Residual income							,40	,30	,07	,14		
	Total							1	1	1	1		

and additional residual income to 34,3 units, this means that the value added is 91,2 units if the final demand of fillet is increased by 100 units.

7. Conclusion

It seems as though the advantages by constructing an input-output model for the fishing sector is connected with the product coefficients, which involve that statistical information about commodities can be used directly. There is a need for technical knowledge on the possibilities for replacing raw materials mutually, and to what extend highly refined commodities might be produced from semi-products or by application of raw fish. The margin of errors here depends on the production quantity of highly refined commodities measured in relation to the production of the commodities which might be used as input in this production. In Denmark this production share is relatively small, and because of the modest size of the fishing sector, it should be possible to obtain this technical knowledge.

The stability of the product coefficients and consequently the technical coefficients depend on the detailing level, at which one work. The detailing level, at which it is possible to work by taking advantage of the present statistics, causes that the coefficients must be considered fairly stable.

Added to this it must be considered practicable to update the tables if it turns out that because of improved production methods, it is reasonable to calculate with higher product coefficients.

The weakness of the tables and the unstability of the coefficients are attatched to the assumption about constant market shares. This assumption imply, as mentioned earlier, that the input distribution by the production of output must be constant.

Finally, it might be a long-term aim to try to work out a sector model for the fishing sector, in which the input-output model is a kind of submodel. In the input-output model the final demand is considered as given from outside and it can be fixed arbitrarily. Alternatively the catch quantity could be considered as given from outside and the demands for a final use could then be compared with an estimate of the marketing possibilities, which might be estimated outside the model.

The set up of a proper sector model claims inclusion of behaviour relations both on the consumer side and on the catch side, and this brings with it both a theoretic development and empirical investigations. But until this work has been developed, the input-output tables can be used as a basis of evaluation in the connection with arbitrary fixed catch quantities and demands for fishery commodities.

8. References

Briggs, Hugh, Ralph Townsend and James A. Wilson (1982): "An Input-Output Analysis of Maine's Fisheries". Department of Economics, University of Maine.

Jørgensen, Niels Lihn (1976): "Rectangular Static Input-Output Models." Yellow Memo No. 35. Institute of Economics, University of Copenhagen. (In Danish).

Jørgensen, Niels Lihn (1976): "Input-Output Models - An Introduction." Blue Memo No. 108. Institute of Economics, University of Copenhagen. (In Danish).

King, Dennis M. and Kenneth L. Shellhammer (1982): "The California Interindustry Fisheries (CIF) Model: An Economic Impact Calculator for California Fisheries". Volume I. Working Paper No. P-T-5. Center for Marine Studies. San Diego State University.

King, Dennis M. and Kenneth L. Shellhammer. (1982): "The California Interindustry Fisheries (CIF) Model: An Input-Output Analysis of California Fisheries and Seafood Industries". Volume II. Working Paper No. P-T-6. Center for Marine Studies. San Diego State University.

Statistical Department of Denmark (1973): Input-Output Tables for Denmark 1966. Volume I. Statistical Investigations No. 30. Copenhagen. (In Danish, English Summary).

Yan, Chiou-shuang (1969): Introduction to Input-Output Economics. Holt, Rinehart and Winston, Inc., New York.

Fisheries Law Enforcement and International Trade in Seafood

Peder Andersen
University of Aarhus
Aarhus, Denmark

Jon G. Sutinen
University of Rhode Island
Kingston, Rhode Island, USA

Abstract

This paper presents a formal model of fisheries law enforcement by combining the analytical frameworks of fisheries economics and the economics of crime. Our principal result is that when enforcement costs are taken into account when setting policy, the stock size is lower than it would be if enforcement costs were ignored. The resulting catch rate in the presence of enforcement costs can be greater, equal to, or less than the catch rate where enforcement costs are not considered. This implies that enforcement costs may have a significant impact on trade in seafoods and therefore the economics of fisheries law enforcement should not be ignored in analyses of seafood trade.

I. Introduction

In this paper a formal model of fisheries law enforcement is developed to show how firms behave and policies are effected by costly, imperfect enforcement of fisheries laws.[1] This is achieved by combining the well-known bioeconomic model and Becker's ideas on the economics of crime (Becker, 1968).

The relationship of fisheries law enforcement to seafood trade can be seen easily in the context of the Copes paper (Copes, 1982). Copes describes how extended jurisdiction has affected world patterns of fish production and trade. We argue that the costs of defining and securing property rights under the new extended jurisdiction regime are a principal determinant of the production and trade patterns that eventually will emerge. This implies that the existence of enforcement costs may have a significant impact on trade flows in seafood in the future when more states start to regulate foreign as well as domestic fishing fleets.

The paper is organized as follows. The next section illustrates the empirical significance of the fisheries law enforcement problem. Sections three and four briefly present the formal model of fisheries law enforcement and how optimal management policies are affected by costly, imperfect enforcement. The final section contains a summary of the main results and the impact on trade flows of enforcement costs.

II. Background

History reveals changes in property rights to ocean resources have been significantly influenced by enforcement costs. According to Clarkson (1974), the common property doctrine for ocean resources was articulated by the Romans as early as the second century, and later codified by Justinian in the sixth century. While feudal law in medieval Europe transferred to the state all property that previously had been common, only "utilized" fisheries were given legal status since "feudal law ignored resources whose definition or enforcement were prohibitively costly" (p. 120). By the fifteenth century Scotland claimed exclusive rights to fishing within fourteen miles of its shores. "These exclusionary policies reflect several forces, including Scotland's comparative advantage in maritime activities and lower costs of policing their coastal fisheries...." (p. 120).

By the seventeenth century, an extensive treaty network recognized national claims to territorial seas. Enforcement of these claims involved "substantial naval forces to provide escorts for fleets, evict trespassers, confiscate catches or ships and other similar activities" (Clarkson, p. 121). Changes in technology and economic conditions during this period stimulated political and legal debates about ocean property rights. Grotius' doctrine of free and equal access to the seas was based on "the assertion that the rewards of exclusive rights were not sufficient to offset the costs of obtaining and holding those rights" (p. 122). Application of Grotius' doctrine eventually restricted national claims to narrow bands of coastal waters.

When in the nineteenth century important fisheries were threatened with depletion, multilateral agreements, such as the North Sea convention of 1882, were formed to establish and enforce rights on the open seas. Such efforts were only partially successful, however, largely because of the high costs of definition and enforcement of property rights. Thus, the common property doctrine prevailed for most of the oceans' resources well into the twentieth century.

After World War II the United States significantly altered the structure of property rights for ocean resources by asserting jurisdiction and control over the natural resources of the subsoil and seabed of its continental shelf. This action was a catalyst for similar and more extensive unilateral claims to ocean resources by other coastal nations. In 1952, Chile, Ecuador and Peru asserted jurisdiction over ocean resources out to 200 nautical miles from their shores. By the 1980s, most coastal nations had established exclusive economic zones, claiming exclusive rights to exploit all living and nonliving resources within their zone. The zones most commonly extend 200 nautical miles from the coast.

According to Eckert (1979, p. 354), this surge in extended jurisdiction was induced by, inter alia, "new technologies which have lowered the costs of monitoring and enforcement [making] it economical for coastal nations to expand their areas of jurisdiction."

Many coastal nations now have mechanisms which not only exclude or control foreign exploitation, but also control domestic exploitation of the ocean resources in their exclusive economic zone. The efforts to control the exploitation of fisheries likely are greater than those for any other extractive ocean resource. The stationary operations for extracting petroleum from the continental shelf are simply less costly to monitor and control than mobile fishing vessels.

The costs of controlling fisheries exploitation appear high relative to potential benefits. The United States government spent approximately $100 million annually on fisheries law enforcement alone following its extension of jurisdiction over marine fisheries.[2] Additional transactions costs (which include the costs of administration, data collection and research) may approach $200 million annually.[3] Potential benefits from fisheries, in the form of economic rent, may range from $200 million to $500 million annually.[4]

Few enforcement programs result in perfect compliance and the U.S. fisheries law enforcement program is no exception. In the U.S. fishery conservation zone approximately 20 percent of the foreign and 4 percent of the domestic vessels boarded have been cited for violating fisheries law.[5] For the years 1979 through 1981 there were averages of 440 civil penalty actions, 16 seizures of (foreign) vessels, and fines collected of $2.5 million per year (Peterson, 1982). There also is reason to believe that significant violations are going undetected (e.g., in one of the largest U.S. fisheries, effective monitoring of Japanese pollock catches is not possible). For these and other reasons, the economic rent being realized likely is nowhere near its potential.

Given such high costs and likely modest benefits it is reasonable to ask how much fisheries law enforcement is desirable. An even more fundamental question is how fisheries law and regulations should be modified to reflect costly, imperfect enforcement. The framework for examining these issues is described in detail in Andersen and Sutinen (1982) and in the following sections briefly presented.

III. A Model of Fisheries Law Enforcement

It is well known that in an open-access fishery fishing effort is larger than optimal. So the basic problem in fisheries management is to reduce and keep fishing effort below open-access fishing effort. The most common means of curbing the tendency to overexploit fish stock include quotas (aggregate and individual), gear restrictions, area and seasonal closures, and other forms of limiting effective effort applied to the fishery.

In the following we assume that individual quotas, $\bar{q}_i$, are used although our results are not restricted to this form of regulation. Using individual quotas implies that the individual firm's catch above its quota, i.e. $q_i-\bar{q}_i$, is illegal.

If detected and convicted, some penalty fee is imposed on the firm in an amount given by

$$f = f(q_i-\bar{q}_i) \tag{1}$$

where $f(\cdot) > 0$ if $q_i > \bar{q}_i$, $f(\cdot) = 0$ if $q_i \leq \bar{q}_i$, $\frac{\partial f}{\partial q} = f_q \geq 0\ \forall q_i > \bar{q}_i$, and $f(\cdot)$ is continuous and differentiable for $q_i > \bar{q}_i$.

In an imperfect law enforcement system not every violator is detected and convicted. Let the probability of detection and conviction be given by p which is assumed constant and identical for all firms. The firm's expected profits are

$$p[\Pi(q_i, x) - f(q_i - \bar{q}_i)] + (1-p)\Pi(q_i, x) \tag{2}$$

where the firm's profits before penalties are $\Pi(q_i, x) = \rho q_i - C(q_i, x)$; ρ = a constant price of fish, q_i = catch rate and $C(q_i, x)$ = firm's total costs. Furthermore, we assume that $\Pi_q > 0$, $\Pi_{qq} < 0$, $\Pi_x > 0$ and $\Pi_{qx} > 0$.

Assuming firms are risk neutral and maximize expected profits, the first order condition is

$$\Pi_q(q_i, x) = pf_q(q_i - \bar{q}_i) \tag{3}$$

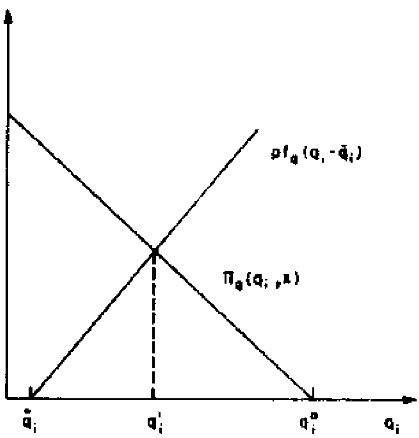


Figure 1

The solution to (3) is illustrated in Figure 1. For any given stock size, x, the firm sets its catch rate at q_i' where marginal profits equal the expected marginal penalty, $pf_q(\cdot)$. If there were no penalty for fishing beyond $\bar{q}_i$, or if there were no chance of being detected and convicted (i.e., either $f(\cdot) = 0$ or $p = 0$) then the firm would set its catch rate at q_i^o, the open access catch rate.

From equation (3) we find that the level of illegal catch is a function of the probability of detection and the stock level, i.e. $q_i - \bar{q}_i = v(p, x)$. If aggregated we get the illegal catch function for the fishing fleet, i.e., $q - \bar{q} = V(p, x)$ where $\frac{\partial V}{\partial p} < 0$ and $\frac{\partial V}{\partial x} > 0$. In other words, if the probability of detection increases the level of illegal catch rate would decrease and if the stock size increases the illegal catch rate would increase.

Detecting and convicting firms violating legal catch levels requires costly inputs (e.g. aircraft, patrol boats, on-board and on-shore observers, judicial personnel). Let us assume the existence of an enforcement cost function E of the following kind

$$E = E(q - \bar{q}, x) \tag{4}$$

where $\frac{\partial E}{\partial (q - \bar{q})} < 0$ and $\frac{\partial E}{\partial x} > 0$.[6]

That is, a reduction in the level of illegal catch increases costs, and a larger stock size will require greater expenditures to achieve a given violation level (i.e., level of illegal catch).[7]

IV. Optimal Policy

Assuming optimal policy is that which maximizes the discounted sum of net benefit, the problem is to

$$\text{maximize } \int_0^{\infty} [B(q) - C(q,x) \quad E(q,x)] e^{-\delta t} dt \tag{5}$$

$$\text{subject to } \frac{dx}{dt} = h(x) - q \tag{6}$$

In (5) benefits and costs of catch are given by $B(q)$ and $C(q,x)$, respectively, where $B_q > 0$, $B_{qq} < 0$, $C_q > 0$, $C_x < 0$, $C_{qq} > 0$, $C_{xx} > 0$ and $C_{qx} < 0$. Enforcement costs are given by $E(q,x)$, where $E_q < 0$, $E_x > 0$, given an exogenously determined quota, $\bar{q}$. The net social benefits in each period are given by $B(q) - C(q,x) - E(q,x)$ and δ represents the social discount rate. (6) represents the net growth rate of the stock, and $h(x)$, the natural growth rate, is strictly concave.

As shown in Andersen and Sutinen (1982) the steady-state solution to equations (5) and (6) turns out to be

$$\delta - h_{x^{**}} = \frac{(C_{x^{**}} + E_{x^{**}})}{B_{q^{**}} - (C_{q^{**}} + E_{q^{**}})} \tag{7}$$

where x^{**} is the steady-state optimal stock size and q^{**} the optimal catch rate.

Given the same assumptions, but ignoring enforcement costs, the condition for optimality is

$$\delta - h_{x^*} = \frac{C_{x^{**}}}{B_{q^*} - C_{q^*}} \tag{8}$$

where x^* is the steady-state optimal stock size and q^* the optimal catch rate.

Comparing equations (7) and (8) it can be shown (Andersen and Sutinen, 1982), that the presence of enforcement costs results in a smaller optimal stock size than otherwise, i.e. $x^{**} < x^*$. Similarly, higher enforcement costs result in a lower optimal stock level.

To compare catch rates in the cases with and without enforcement costs accounted for, we must specify whether the stock sizes are above or below the maximum sustainable yield (MSY) level. The results on catch rates can be summarized as follows:

$$x^{**} < x^* < x_{MSY} \Rightarrow q^{**} < q^*$$

$$x_{MSY} < x^{**} < x^* \Rightarrow q^{**} > q^*$$

$$x^{**} < x_{MSY} < x^* \Rightarrow q^{**} \gtrless q^*$$

In addition, the optimal stock sizes for both cases are greater than the open-access stock size.

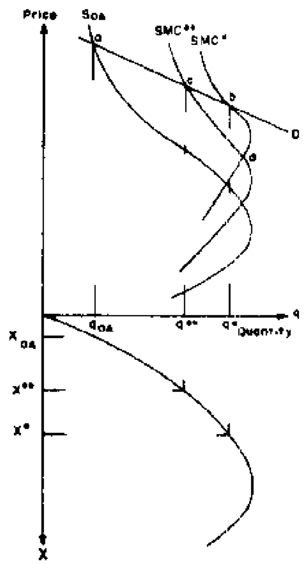


Figure 2

The case where $x^{**} < x^{*} < x_{MSY}$ is illustrated in Figure 2. The demand curve (D) intersects the backward bending, open access supply curve (S_{OA}) at a, resulting in a low catch rate (q_{OA}) and stock size (x_{OA}) in equilibrium. Ignoring enforcement costs, the social marginal cost schedule (SMC*) intersects the demand curve at b, resulting in a higher catch rate (q^*) and stock level (x^*) in steady-state equilibrium. Accounting for enforcement costs results in a lower social marginal cost schedule (SMC**), lying everywhere below SMC* for corresponding values of q and x. The lower SMC** intersects the demand curve at c resulting in an optimal catch rate $q^{**} < q^*$, and stock level $x^{**} < x^*$. Were the demand schedule to intersect the two SMC schedules below where they cross (at d), then $q^{**} > q^*$. Therefore, $q^{**} \gtreqless q^*$ as the demand schedule intersects the two SMC schedules below/at/above where they cross (i.e., at d). Regardless of the height of the demand schedule, however, $x^{**} < x^*$ always. In Figure 3 we show the supply of fish over time in the case where $x^{**} < x^* < x_{MSY}$.

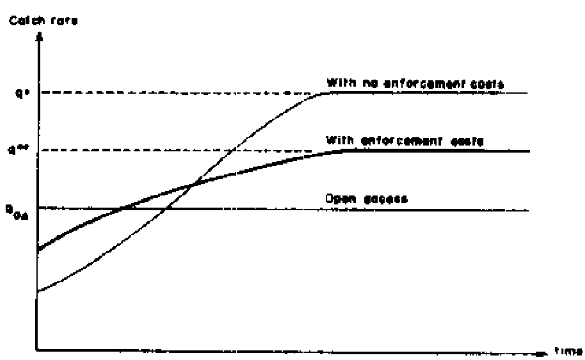


Figure 3

V. Summary and Concluding Remarks

In summary, the principal contribution of this paper is the development of a formal model of fisheries law enforcement. This has been achieved by combining the analytical frameworks of fisheries economics and the economics of crime. While clearly over-simplified for use in practical applications, the model helps us to have a better intuitive understanding of the complexities involved in fisheries management.

Our principal result is that when enforcement costs are taken into account when setting policy, the stock size is lower than it would be if enforcement costs were ignored. The resulting catch rate in the presence of enforcement costs can be greater, equal to, or less than the catch rate where enforcement costs are not considered.

Both historical evidence and logical reasoning demonstrate that enforcement costs will be a major determinant of the extent to which restricted access will emerge. This means, among other things, that significant increases in sustainable fish production may not be realized. That is, high enforcement costs may preclude effective management of both conventional and unconventional stocks, and therefore preclude realization of the potential fish production.

In cases of foreign exploitation, costly imperfect enforcement results in more foreign catch than coastal state policy prescribes. Thus, more of the foreign caught product arrives in foreign markets than desired by the coastal state. This may weaken the foreign market for exports from the coastal state. For example, enforcement authorities admit it is nearly impossible to effectively monitor the catch of Japanese pollack in the Bering Sea. Therefore, it seems very likely that the actual catch is much larger than recorded. If pollack is a close substitute in Japan for a U.S. export, then the price paid for the U.S. export product may be significantly lower as a result of imperfect enforcement.

Some coastal states require foreign fleets to land their catches in local ports before transshipment. This appears to be a low-cost, effective means of monitoring foreign catches. If this method becomes common, trade flows and world prices may be significantly different than otherwise.

Enforcement cost considerations will also affect the form fishery regulations take. For example, closed seasons may be chosen because of its low enforcement cost. This will result in supply disruptions and require large inventory capacity in order to supply world markets. If holding inventories is too costly, foreign trade in the product may not be possible or be reduced significantly.

For such reasons as listed here, we believe the economics of fisheries law enforcement are inextricably linked to international seafood trade and should not be ignored in analyses of seafood trade.

Footnotes

[1]This model is based on our earlier paper (see Andersen and Sutinen, 1982). For an excellent survey of the economics literature on fisheries regulation, see Scott (1979) who briefly discusses the information and enforcement costs of tax and quota systems. More formal analyses of fisheries regulation include Clark (1980) and Andersen (1982).

[2]Bell and Surdi (1979) estimate the U.S. government spent nearly $280 million during the fiscal years 1977 and 1978 implementing the Fisheries Conservation and Management Act of 1976.

[3]V. Norton, Problems and Opportunities. Published in Tim Hennessey (ed.), US-Fishing Industry and Regulatory Reforms. J.S. Bergin Inc., Mass. Forthcoming in 1983.

[4]Estimated by Robert R. Nathan Associates, cited in Eckert (1979, p. 51). These estimates are for 1985 in 1972 dollars and, therefore, not strictly comparable to the cost estimates. We use them regardless since only the orders of magnitude are essential to the discussion.

[5]These are approximate averages for six month periods from March, 1977, through February, 1980. (U.S. Coast Guard, 1977-80).

[6]See Andersen and Sutinen for formal derivation of this function.

[7]This specification of the enforcement cost function ignores some possibly important aspects of enforcement practices. For example, it is conceivable that complete closure of the fishery (i.e., at the lower bound on $q-\bar{q}$) costs less to enforce than permitting some positive amount of fishing. There also may be economies of scale in enforcement. That is, the marginal enforcement costs may decrease over some range of $q-\bar{q}$. The implications of these alternative specifications are not considered here.

References

Andersen, P., 1982, Commercial Fisheries under Price Uncertainty. Journal of Environmental Economics and Management 9, pp. 11-28.

Andersen, P. & J.G. Sutinen, 1982, The Economics of Fisheries Law Enforcement. Working Paper. The Institute of Economics, University of Aarhus and The Department of Resource Economics, University of Rhode Island.

Becker, G.S., 1968, Crime and Punishment: An Economic Approach. Journal of Political Economy 86, pp. 169-217.

Bell, F. & R. Surdi, 1979, An Economic Benefit-Cost Analysis of the Fishery Conservation and Management Act of 1976. Mimeo. Economic Department, Florida State University.

Clark, C.W., 1980, Towards a Predictive Model for the Economic Regulation of Commercial Fisheries. Canadian Journal of Fisheries and Aquatic Sciences 37, pp. 1111-1129.

Clarkson, K.W., 1974, International Law, Seabeds Policy and Ocean Resource Development. The Journal of Law and Economics 17, pp. 117-142.

Copes, P., 1982, Extended Jurisdiction and Its Effect on World Trade in Seafood. Published in these Proceedings.

Eckert, R.D., 1979, The Enclosure of Ocean Resources: Economics and the Law of the Sea. Hoover Institution Press, Stanford.

Peterson, Jr., A.E., 1982, Testimony before the Subcommittee on Coast Guard and Navigation Committee on Merchant Marine and Fisheries of the U.S. House of Representation, Washington, D.C.

Scott, A., 1979, Development of Economic Theory on Fisheries Regulation. Journal of the Fisheries Research Board of Canada 36, pp. 725-741.

U.S. Coast Guard, 1977-1980, Semiannual Reports to Congress on Degree and Extent of Known Compliance with the Fishery Conservation and Management Act of 1976. Unpublished. Department of Transportation, Washington, D.C.

Financial support from Aarhus University Research Foundation, the Danish Social Science Research Council and Alaska Sea Grant College Program is gratefully acknowledged.

Data Collection Systems

Report on the Ad Hoc Data Exchange Working Group and Workshop on Data Collection Systems

Joseph M. Terry
National Marine Fisheries Service
Seattle, Washington, USA

Establishment of the Ad Hoc Working Group

At the request of Dr. Dick Johnston (OSU), Dr. Joe Terry (NWAFC) contacted designated individuals to request their participation on the working group. It was determined that the working group would meet prior to the Workshop on Data Collection Systems to discuss methods for improving information exchange systems and serve as the panel during the workshop for which Clint Atkinson would be moderator.

Working Group Members

Mr. Paul Adam, OECD, Fisheries Unit (Paris)
Mr. David Cross, EEC, Eurostat (Luxembourg)
Mr. Tom Eyestone, Development Planning and Research Associates, Inc. (Manhattan, Kansas)
Dr. Renzo Franco, GATT, Agriculture Division (Geneva)
Dr. Wolfgang Krone, FAO, Infofish (Kuala Lumpur)
Mr. Jim Richardson, Frank Orth and Associates, Inc. (Anchorage)
Mr. Samuel Seligmann, EEC, Office of the Director of Fisheries (Brussels)
Dr. Joe Terry, NMFS, NWAFC (Seattle)

Planning for the Workshop

Clint Atkinson and Joe Terry met in Seattle prior to the International Seafood Trade Conference to develop an agenda to be used during both the initial meeting of the working group and the workshop. During that meeting it was determined that the focus of the workshop would be on information exchange systems, not data collection systems.

Working Group Meetings

The working group met Tuesday, September 7 and Wednesday, September 8. During these meetings a list of information needed for the conduct and study of international trade of fishery products was developed (Attachment A) and a variety of information exchange issues were discussed. The issues include:

1. sources of data

2. access to data sources

3. standardization

4. timeliness

5. methods for improving information exchange

The working group considered two methods of improving information exchange and was in favor of supporting both methods. The first and significantly less difficult method is the development of a central directory of sources of information. Such a directory could include:

1. sources of information

2. methods of access

3. the length and timeliness of time series data

4. standardization problems

5. potential uses of the data

6. charges, if applicable

Potential methods of developing and periodically updating such a directory were briefly discussed. The working group considered the preparation of a central directory to be feasible within a relatively short period of time and considered it to be a necessary step if the second and more ambitious method of improving information exchange, the establishment of a central data base is to be pursued.

The working group discussed difficulties associated with establishing a central data base including:

1. its scope

2. the difficulty of obtaining accurate data for some topics

3. access

4. standardization problems

5. funding

6. conflicts with existing public and private entities involved in collecting and disseminating information

The working group concluded that the gradual enhancement of an existing data base would be a reasonable method for obtaining a data base which included information outlined in Attachment A. The working group supported the concept of a central data base and concluded that it would be desirable to further evaluate its establishment.

The working group also considered the membership and methods of operation of the working group that could evaluate and aid in implementing methods for improving information exchange. It was concluded that the working group should:

1. be representative but small

2. include a Secretariat appointed by the Executive Committee and other members appointed by the Executive Committee or the Secretariat

3. coordinate its activities through correspondence and meetings.

Workshop Summary

The Workshop on Data Collection Systems, which would have more appropriately been titled the Workshop on Information Exchange Systems, began at 10 a.m., Friday, September 10. Clint Atkinson, the moderator, made introductory statements which included a statement of the problem to be addressed by the workshop. He then introduced Joe Terry who in turn introduced the other members of the ad hoc working group. David Cross led the discussion of the types of information needed for the study and conduct of international trade of fishery products and the current availability of such information. Information provided by other members of the working group included Renzo Franco's discussion of sources of information concerning tariff and non-tariff barriers to trade.

Following the working group's discussion of this topic, comments were received from the floor. The comments generally fell into one of three broad categories:

1. What is the justification for the identified set of information or who are the intended users?

2. Isn't additional information required?

3. Is the quality of the data sufficient that anyone would want to use it?

The first type of comments can be paraphrased as follows:

The set of information outlines does not appear to have been developed with respect to meeting the needs of government, industry, or university researchers. The types of information used by each of these three groups are quite different.

The second type of comment consisted of requests for additional types of information including:

1. effort data

2. conversion factors to round weight equivalents

3. nationality of fleets for landings data

4. shelf life of processed products inventories

5. micro level data including data by vessel

6. consumption data by product

7. market research data

The third type of question focused on the quality of data from national and international agencies. For example, it was noted that catch statistics are subject to large errors when quotas provide fishermen with an incentive to make false landing reports. It was indicated that in some fisheries this problem is so pervasive that some agencies keep a separate "corrected" set of data for management purposes.

Additional comments were as follows:

1. Some items are redundant.

2. Confidentiality regulations are used too freely; there are often political reasons for this.

3. Having a list of institutes and individuals conducting research in specific areas may be more useful than access to data of questionable quality.

4. The list of information is too long and unrealistic, some of the information is just not available.

In addition to comments concerning the ability of government agencies to collect accurate data, there were comments concerning the propensity of many agencies to discard useful information.

Following the discussion of the types of information that are needed, Joe Terry briefly discussed the working group's recommendation with respect to establishing a central directory and a central data base and Samuel Seligmann discussed existing EEC data bases on computer networks. Following the working group's presentation, comments were taken from the floor. With respect to the directory, these comments and responses from the working group appeared to result in a consensus that:

1. Three separate directories might be needed:

    a. an annotated directory of sources of data

    b. an annotated bibliography

    c. a directory of institutes and individuals involved in specific areas of research

2. It is feasible to develop and update such directories.

3. The development of these directories should be supported.

The comments generated by the working group's suggestion that the establishment of a central data base be supported resulted in the following comments:

1. The establishment of the data base will be difficult.

2. The data base will be very large.

3. Regional data bases may be more feasible.

4. Each series in the data base will have to be well documented so that the problems associated with using a particular series or group of series are known by those who access the data.

5. The focus should be on human contacts.

6. Extending an existing data base is probably the most reasonable method of establishing the data base.

7. Such a data base will greatly increase data exchange capabilities if it is properly designed and a number of difficulty issues are resolved.

If there was a consensus with respect to supporting the establishment of a central data base it was that:

1. There are a number of issues to be resolved.

2. Such a project will need to be pursued very cautiously.

3. It will be a very long range project.

The last topic of discussion, the nature of the membership and oeprating procedures of a working group, was led by Clint Atkinson.

Conclusions

The working group and participants of the workshop have identified three directories which if developed could greatly improve information exchange capabilities. With the cooperation of workshop participants, the directories could potentially be produced within a year and updated thereafter at a reasonable cost. However, there are several issues concerning the directories which have not been resolved. They include:

1. funding

2. scope of information

3. method of development

The feasibility of creating a central data base containing reliable data was questioned based on a variety of issues that could certainly not be resolved during the workshop. These issues include:

1. its scope (geographic areas and topics)

2. validation

3. standardization (inter anc intratemporal)

4. access

5. site(s)

6. funding

7. usefulness

8. potential user groups

9. conflicts with existing private and public entities

The establishment of such a data base is certainly not a short term project that is within the capabilities of an infant organization. However, such an organization can attempt to provide agencies which maintain large data bases with some guidance as to 1) the types of information that could beneficially be added to these data bases, 2) the usefulness of current data collection and dissemination systems, and 3) methods of improving both collection and access.

The need for a working group to evaluate and assist in the implementation of methods to improve information exchange was recognized and the general nature of the membership and operations of a working group agreed upon. In addition to its other duties, the working group to be appointed by the Executive Committee would prepare an interim report for the Executive Committee for the next meeting of the organization.

List of Registrants

Bill Aberle
Office of Commercial Fisheries
Development
333 W. 4th Ave., Suite 35A
Anchorage, AK 99501

Paul Adam
Fisheries Division, Organisation and
Economic Co-operation & Development
2, rue Andre-Pascal
Paris, XVIe
FRANCE

Norman L. Albert
Rainbow Fisheries, Inc.
P.O. Box 3130
Anchorage, AK 99510

Andrew Alley
Ministry of Industry and Small
Business Development
Economic Analysis & Research Bureau
1405 Douglas Street
Victoria, British Columbia
CANADA V8W 3C1

Peder Andersen
University of Aarhus
Institute of Economics
Universitetsparken, DK-8000
Aarhus C
DENMARK

Norimasa Aoyagi
Marubeni America Corp.
4001 Sea-First National Bank Bldg.
Seattle, WA 98154

Clinton E. Atkinson
Fisheries Consultant and Advisor
800 Crest Dr., Northeast
Seattle, WA 98115

Adel Yousef Awad
85 Abid Elaziz Fahmy Street
Apt. #11
Alexandria
EGYPT

John Ball
University of Alaska
2651 Providence Drive
Anchorage, AK 99508

Jay Barton
President
University of Alaska
Fairbanks, AK 99701

Don Beeson
Icicle Seafoods
3424 W. International Airport Rd
Anchorage, AK 99502

Odin Bendiksen
East Point Seafood Company
Building C-3, Fishermen's Termin
Seattle, WA 98119

Martha Blaxall
BBH Corporation
1836 24th Street, N.W.
Washington, DC 20008

Nancy Bockstael
University of Maryland
Dept. of Agricultural Economics
College Park, MD 20742

James Branson
North Pacific Fishery Management
Council
P.O. Box 3136 DT
Anchorage, AK 99510

Marvin Breece
Summit Seafoods, Inc.
P.O. Box 4017
Kenai, AK 99611

Mary Brock
Oregon State University
Dept. of Agricultural and
Resource Econ.
Corvallis, OR 97331

John A. Butlin
University of Manchester
Dept. of Agricultural Economics
Manchester
ENGLAND M13 SPL

Frank Carson
Norgaard, Inc.
1577 "C" St., Suite 257
Anchorage, AK 99501

Frances M. Cassidy
Dept. of Primary Industry
Broughton Street, Barton
Canberra
AUSTRALIA 2600

Rainis Cedrins
Swedish University of Agricultural
Science
Dept. of Economics & Statistics
Uppsala
SWEDEN 75007

Ching-chun Chen
Council for Agricultural Planning
& Development, Executive Yuan
37, Nan Hai Rd.
Taipei
TAIWAN

J.R. Philip Chung
Prince William Sound Community
College
P.O. Box 590
Valdez, AK 99686

Michael Coleman
Kemp Fisheries
P.O. Box 726
Bethel, AK 99559

Jeff Collins
National Marine Fisheries Service
P.O. Box 1638
Kodiak, AK 99615

Parzival Copes
Director
Simon Fraser University
Institute of Fisheries Analysis
Burnaby, British Columbia
CANADA V5A 1S6

Douglas Coughenower
University of Alaska
Marine Advisory Program
P.O. Box 10048
Dillingham, AK 99576

Dallas Cross
Nana Seafoods
4706 Harding Drive
Anchorage, AK 99503

David Cross
Eurostat
BP 1907
Luxenbourg
EUROPE

Eric Eckholm
Alaska Seafood Marketing Institute
526 Main Street
Juneau, AK 99801

J. B. Crow
Manager
J.B. Crow and Sons, Inc.
Box 567
Bethel, AK 99559

Lottie Edelman
Fisherman's Packing, Inc.
Box 2601
Kenai, AK 99611

Stephen R. Crutchfield
University of Rhode Island
Resource Economics
Kingston, RI 02881

Tom Eyestone
DPRA, Inc.
P.O. Box 727
Manhattan, KS 66502

Nancy Davidson
International Fish, Inc.
3605 Arctic Boulevard, #1026
Anchorage, AK 99503

William C. Fields, III
Mrs. Paul's Kitchens, Inc.
5830 Henry Avenue
Philadelphia, PA 19128

Jeff Davis
Baader North America Corporation
3600 15th Avenue, W., Suite 301A
Seattle, WA 98119

Teri Frady
University of Alaska
Alaska Sea Grant College Program
3 Bunnell, 303 Tanana
Fairbanks, AK 99701

D. J. DeVoretz
Simon Fraser University
Dept. of Economics
Burnaby, British Columbia
CANADA V5A 1S6

Renzo Franco
Agriculture Division
GATT, Center William Rappard
Rue de Lausanne 154, CH-1211
Geneva 21
SWITZERLAND

John P. Doyle
University of Alaska
Marine Advisory Program
2651 Providence Avenue
Anchorage, AK 99508-4670

Hans Frost
Institute of Fisheries Economics
University Center of South Jutland
Glentevej 7
6700
Esbjerg
DENMARK

Chuck Gibson
International Fisheries and External
  Affairs (Japan Office)
338 Denali Street
McKay Bldg., 7th Fl.
Anchorage, AK 99501

Kathleen Graves
General Delivery
Port Graham, AK 99603

Bernard Gilly
I.N.R.A.
Economie Concarneau
Concarneau
FRANCE 29110

Nancy Gross
City of Akutan
308 G Street, Suite 317
Anchorage, AK 99501

Hermano Gines
La Salle Foundation of
  Natural Sciences
Ap. 1930
Caracas
VENEZUELA

Stan Hajenga
Office of Commercial Fisheries
  Development
333 West 4th Avenue, Suite 35A
Anchorage, AK 99501

Earl Glynn
DPRA, Inc.
200 Research Drive
Manhattan, KS 66502

Lynne Hale
LZH Associates
SRA Box 3250
Anchorage, AK 99507

William G. Gordon
National Marine Fisheries Service
3300 Whitehaven Street, N.W.
Washington, DC 20235

Nancy Hasselback
Seafood Business Report
4215 21st Avenue, West
Seattle, WA 98199

Abby Gorham
University of Alaska
Alaska Sea Grant College Program
3 Bunnell, 303 Tanana
Fairbanks, AK 99701

Robert G. Hayes
National Marine Fisheries Service
National Oceanic and Atmospheric
  Administration
Washington, DC 20235

Pete Granger
West Coast Fisheries Development
  Foundation
812 SW Washington, Suite 900
Portland, OR 97212

Jeff Hendricks
Jeff Hendricks and Associates
P.O. Box 190
Anacortes, WA 98221

Alex Heskin
Bord Iascaigh Mhara
Hume House
Ballsbridge
Dublin 4
IRELAND

P. J. Hill
University of Alaska
2651 Providence Avenue
Anchorage, AK 99508

Yutaka Hirasawa
Tokyo University of Fisheries
Konan 4-5-7, Minato-ku
Tokyo
JAPAN

Don Hitchcock
Alaska Vocational Technical Center
P.O. Box 615
Seward, AK 99664

Erling Hulgaard
Danish Ministry of Fisheries
Royal Danish Consulate General
280 Park Avenue
New York, NY 10017-1271

Doug Humes
Bering Sea Fishermen's Assoc.
805 West 3rd Avenue
Anchorage, AK 99501

Jim Isherwood
310 K Street, Suite 500
Anchorage, AK 99503

Ronald Jensen
Sea-Alaska Products, Inc.
150 Nickerson, Suite 300
Seattle, WA 98109

Richard S. Johnston
Oregon State University
Dept. of Agricultural & Resource
Economics
Corvallis, OR 97331

Willard L. Jones
University of Alaska
Ketchikan Community College
7th and Madison
Ketchikan, AK 99901

Vlad Kaczynski
University of Washington
Institute of Marine Studies
3731 University Way, NE
Seattle, WA 98105

Jon Karpoff
University of Alaska
2651 Providence Drive
Anchorage, AK 99508

Curtis L. Kerns
University of Alaska
Marine Advisory Program
2651 Providence Drive
Anchorage, AK 99508-4670

Donald E. Kramer
University of Alaska
Marine Advisory Program
2651 Providence Drive
Anchorage, AK 99508-4670

Wolfgang Krone
Fao Infofish
P.O. Box 899
Kuala Lumpur
MALAYSIA 01-02

Patricia Ann Lavin
Pacific Fishery Management Council
526 S.W. Mill Street
Portland, OR 97034

Tsunenori Kusakawa
Tokai University
Marine Science and Technology
1000, Orido
Shimizu, Shizuoka
JAPAN

Richard M. Lenahan
Advance Vessel Agency, Inc.
P.O. Box 6044
Anchorage, AK 99502

Steve Langdon
University of Alaska
2651 Providence Drive
Anchorage, AK 99508

Rebecca J. Lent
Oregon State University
Dept. of Agricultural & Resource
Economics
Corvallis, OR 97331

Douglas M. Larson
University of Alaska
Alaska Sea Grant College Program
3 Bunnell, 303 Tanana
Fairbanks, AK 99701

Denez L'Hostis
I.N.R.A. Economie Concarneau
Laboratoire Maritime
Concarneau
FRANCE 29110

James C. Larson
Alaska Commercial Fisheries and
Agriculture Bank (CFAB)
P.O. Box 4-2070
Anchorage, AK 99509

Biing-Hwan Lin
Oregon State University
Dept. of Agricultural & Resource
Economics
Corvallis, OR 97331

Rolf Lasch
Institute Fur Landwirtschaftliche
Marktforschung
3301 Braunschweig
Bundesalle 50
FEDERAL REPUBLIC OF GERMANY

Kristy Long
Cooperative Extension Service
7th and Madison
Ketchikan, AK 99901

Rick Lauber
Pacific Seafood Processors Assoc.
P.O. Box 1625
Juneau, AK 99802

Noboru Matsuo
Alaska Herring Corporation
700 H Street, Suite #9
Anchorage, AK 99501

Jeanne McKnight
West Coast Fisheries Development
Foundation
812 SW Washington, Suite 900
Portland, OR 97205

R. W. McVey
National Marine Fisheries Service
Box 1454
Juneau, AK 99802

Brenda Melteff
University of Alaska
Alaska Sea Grant College Program
3 Bunnell, 303 Tanana
Fairbanks, AK 99701

Jeffrey R. Meucci
Icicle Seafoods
P.O. Box 1086
Petersburg, AK 99833

Chris Mitchell
Alaska Fisheries Development
Foundation
805 West 3rd Avenue
Anchorage, AK 99501

Henry Mitchell
Bering Sea Fishermen's Association
805 West 3rd Avenue
Anchorage, AK 99501

Gustavo Montero
Oregon State University
Dept. of Marine Resource Management
Corvallis, OR 97331

Kenji Nishihara
Japan Fisheries Association
333 West 4th Ave., #34
P.O. Mall Bldg.
Anchorage, AK 99501

Evelyn Oakeshott
Dept. of Agriculture and Fisheries
Chesser House, Gorgie Road
Edinburgh
SCOTLAND EH11 3AW

Robert O'Connor
Economic & Social Research Institute
4 Burlington Road
Dublin 4
IRELAND

Jean Oldham
Fullback Fisheries, Inc.
P.O. Box 3-127
Anchorage, AK 99501

Mary Oldham
Fullback Fisheries, Inc.
P.O. Box 3-127
Anchorage, AK 99501

Tricia Olsen
University of Alaska
Alaska Sea Grant College Program
3 Bunnell, 303 Tanana
Fairbanks, AK 99701

James O'Malley
New England Fisheries Development
Foundation
100 Summer Street, Room 2711
Boston, MA 02110

J. Richard Pace
Universal Seafoods, Ltd./Unisea
Box 94
Redmond, WA 98052

Maria Lucia D'Apice Paez
Ministerio Da Agricultura
CAE - 7° andar
70043
Brasilia, DF
BRAZIL

Cass M. Parsons
State of Alaska
338 Denali Street
Anchorage, AK 99501

Darryl K. Pedersen
Seawest Industries, Inc.
100 Second Avenue
Edmonds, WA 98020

Hank Pennington
University of Alaska
Marine Advisory Program
Pouch K
Kodiak, AK 99615

William Phillips
Office of Senator Stevens
United States Senate
Washington, DC 20510

Kay Poland
Office of Commercial Fisheries
Development
333 West 4th Ave., Suite 35A
Anchorage, AK 99501

Fred Prochaska
University of Florida
1170 McCarty Hall
Gainesville, FL 32611

Lewis E. Queirolo
National Marine Fisheries Service
P.O. Box 1668
Juneau, AK 99802

Atle Remme
Jangaard Alaskan Fisheries, Inc.
203 W. 15th Avenue, Suite 201
Anchorage, AK 99501

Dick Reynolds
Office of Commercial Fisheries
Development
Pouch D
Juneau, AK 99811

Frederick Richard
National Bank of Alaska
3420 One Union Square
600 University Street
Seattle, WA 98101

Amy Richards
University of Alaska
Alaska Sea Grant College Program
3 Bunnell, 303 Tanana
Fairbanks, AK 99701

Jim Richardson
Frank Orth & Associates, Inc.
420 L Street, Suite 306
Anchorage, AK 99501

Donald H. Rosenberg
University of Alaska
Alaska Sea Grant College Program
3 Bunnell, 303 Tanana
Fairbanks, AK 99701

Francis M. Schuler
National Sea Grant College Program
6010 Executive Boulevard
Rockville, MD 20852

Carl L. Rosier
National Marine Fisheries Service
P.O. Box 1668
Juneau, AK 99802

Samuel Seligmann
European Communities DG XIV
200 me de la Loi, L. 120 7.17
1049
Bruxelles
BELGIUM

Michael L. Rubinstein
National Marine Fisheries Service
Alaska Dept. of Fish and Game
3300 Whitehaven St., N.W.
Pg. 2 Bldg.
Washington, DC 20235

Yung C. Shang
University of Hawaii
Dept. of Agriculture & Resource Economics
210 Bilger Hall
Honolulu, HI 96822

David Rutenberg
Queen's University
Kingston, Ontario
CANADA K7L 3N6

Wesley Silverthorne
National Marine Fisheries Service
DOC
300 S. Ferry Street
Terminal Island, CA 90731

Carl Samples
University of Hawaii
Dept. of Agriculture & Resource Economics
210 Bilger Hall
Honolulu, HI 96822

Beckye Simpson
Alaska Resources Corporation
471 West 36th, Suite 204
Anchorage, AK 99503

Michael Samsel
Ursin Seafoods, Inc.
150 Nickerson St., #203
Seattle, WA 98109

Jos Smit
Landbouw-Economisch Instituut
Conradkade 175
2517 CL
Den Haag
NETHERLANDS

Paul L. Schilling
Alaskan Gourmet Seafoods
P.O. Box 6733
Anchorage, AK 99502

Wil Smit
Landbouw-Economisch Instituut
Conradkade 175
2517 CL
Den Haag
NETHERLANDS

Frederick J. Smith
Oregon State University
Dept. of Agricultural & Resource
Economics
Corvallis, OR 97331

Eydtinn Tausen
Baader North American Corporation
3600 15th, W., Suite 301A
Seattle, WA 98119

Jan J. Solecki
University of British Columbia
1262 1866 Main Mall
Vancouver, British Columbia
CANADA V6T 1W5

Kyle Taylor
National Bank of Alaska
P.O. Box 1067
Kodiak, AK 99615

Ulrich Sommer
Institut Fur Landwirtschaftliche
3301 Braunschweig
Bundesalle 50
FEDERAL REPUBLIC OF GERMANY

Joe Terry
Northwest & Alaska Fisheries
Center, NMFS
2725 Montlake Boulevard, E.
Seattle, WA 98112

John Spinelli
National Marine Fisheries Service
2725 Montlake Boulevard, E.
Seattle, WA 98112

Robert M. Thorstenson
Icicle Seafoods, Inc.
P.O. Box C99309
Seattle, WA 98199

Norman Stadem
Bio Economic Research & Analysis
1826 East 26th Avenue
Anchorage, AK 99504

Clem Tillion
International Fisheries and
External Affairs
333 Denali
McKay Bldg, 7th Floor
Anchorage, AK 99510

Jon G. Sutinen
University of Rhode Island
Dept. of Resource Economics
Kingston, RI 02881

Frances Turner
University of Delaware
College of Marine Studies
Robinson Hall
Newark, DE 19711

George Swaney
American Salmon Co.
1210 East 70th Street
Anchorage, AK 99502

Jack M. Van Hyning
Aquabionics, Inc.
P.O. Box 80165
Fairbanks, AK 99708

Michael R. Vann
Alaska Commercial Fishing and
Agriculture Bank
P.O. Box 4-2070
Anchorage, AK 99509

Wilma Williams
Blue Bird Fisheries, Inc.
P.O. Box 1232
Homer, AK 99603

Tom Waterer
Waterkist Corporation
P.O. Box 690
Valdez, AK 99686

James A. Wilson
University of Maine
Orono, ME 04469

Robert C. Webster
American Seafood and Export Company
627 North Donnelly St., Suite 100
Mt. Dora, FL 32757

Jim Wilson
Oregon State University
Agricultural Resource Economics
Corvallis, OR 97331

John Wedin
DOC, NOAA, NMFS
Fisheries Development Division
7600 Sand Point Way, N.E.
BIN C15700
Seattle, WA 98115

Richard Wilson
Arctic Sea, Inc.
1101 East Tudor Road
Anchorage, AK 99503

Ron West
Marine Law
4797 Business Park Blvd., Suite 5
Anchorage, AK 99503

Jack Yooh
Hyundai Corporation
510 L Street, Suite 609
Anchorage, AK 99510

Terry A. Whitbeck
Department of Education
Pouch F, ASOB
Juneau, AK 99811

Trevor Young
University of Manchester
Manchester
ENGLAND M13 9PL

Craig Wiese
University of Alaska
Marine Advisory Program
2651 Providence Avenue
Anchorage, AK 99508