OCEAN RESOURCES : INDUSTRIES AND RIVALRIES SINCE 1800

Working Papers on Ocean Resources History
for the 10th International Economic History Congress, Leuven

Compiled by Harry N. Scheiber, Session Convenor
Professor of Law, University of California Berkeley

Distributed by the
UNIVERSITY OF CALIFORNIA
INTERCAMPUS ECONOMIC HISTORY PROGRAM

and the
CALIFORNIA SEA GRANT COLLEGE PROGRAM

in collaboration with
The Center for the Study of Law and Society,
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These papers were originally presented at an international experts' conference on the subject, "Ocean Resources: Industries and Rivalries since 1800," at the Center for the Study of Law and Society, University of California at Berkeley, in May 1990; and were revised for presentation at Leuven, Aug. 1990, and distribution in the present form.

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PREFACE AND ACKNOWLEDGEMENTS

The papers that follow in this collection all consider the theme of ocean resources history. The collection is in three parts: (I) Atlantic and Pacific Ocean Regions, (II) History of Whaling and Sealing, and (III) Environmental Policies and Ocean Regimes. These papers were prepared originally for a conference at the University of California, Berkeley--a meeting generously cosponsored by the University of California's Intercampus Economic History Program--a cooperative research and teaching effort of economic historians on the several individual UC campuses--and by the California Sea Grant College Program. The Center for the Study of Law and Society at UC Berkeley hosted the conference and provided additional support.

The impetus for the conference at Berkeley was the organization by the 10th International Economic History Congress of a session on "Ocean Industries, Resources, and Rivalries." Most of the authors represented here also are presenting their studies at the 10th International Economic History Congress, Leuven, Belgium, in a session on "Ocean Industries, Resources, and Rivalries since 1800."

The authors, and I as session convenor and organizer of the conference at Berkeley, are deeply grateful to the organizations and agencies that have been mentioned. In addition, thanks are owed to the following:

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In addition, it should be noted that individual participants were in many instances given substantial university or governmental support for

their travel. This support is acknowledged with gratitude by all concerned both for making possible the intellectual interchange that these papers represent and also as a mark of concern on the part of these sponsors for the importance of a better understanding of ocean resources history. As organizer, I wish also to thank very warmly the scholars who have contributed the studies that are in this collection. It has been a privilege for me to work with them.

Harry N. Scheiber
Berkeley, Oct. 1990

EDITORIAL INTRODUCTION

Harry N. Scheiber, Professor of Law
University of California, Berkeley

The subject of ocean resources--exploitation of primary resources, processing, rivalries among nations and industries, and environmental impact of the ocean industries--has been much neglected recently in the study of economic history. At one time, the study of marine fisheries industries, which for centuries were of critical importance to major regions and entire national economies, did receive close attention from scholars in the field. But even this area of study has waned in prominence, except insofar as economists have seized upon the record of marine fisheries management as material for theorizing on the subject of the "ocean commons." To be sure, there continue to appear occasionally studies in a traditional mode on special ocean fishery industries; but monographs on other areas of ocean resource development have never been pursued by economic historians with the same vigor or as prominently as studies, for example, of the land-based resources (forestry, mining, agriculture, water).

Many contemporary issues in resource development, economic policy, and environmental science and law now give us very strong reasons, however, to turn with renewed attention to the history of ocean industries and resources. How some of the papers in this collection respond to these issues, in addition to mobilizing research concerns and strategies long associated with this subfield of study, can be suggested briefly here:

First, in the area of marine fisheries development--to consider the most traditional focus of historical study--there has been since World War II an astonishing acceleration of technology, investment, and intensity of exploitation. Abetted by importance advances in marine science, the ocean fishing industries have sought out resources with increasing efficiency, have brought vastly more highly capitalized gear and larger ships (with capacity for freezing, canning, long-distance voyages, and extended time at sea) to bear on the world's fishery resources. A decline in productivity, very dramatic in some of the world's leading fisheries, has put in motion a serious impact on resources--and in some instances, on the very survival of species that historically have been of great importance to world protein supply. This collection addresses very directly some of the issues that this contemporary development raises for us. Historical studies, such, for example, as those provided here by Prof. Carmona on the development of Spain's marine fisheries and by Dr. O'Bannon on the linkages between fishing and processing technologies and investment, cast in a bold and revealing light the dynamics of the commercial fishing enterprise and its impct on regions and nations. Prof. Ingmanson deals with Brazilian

whaling in its international context, in an earlier era of exploitation of species that today are the focus of the most intense ideological and scientific disputation as to management policies. Prof. Fisher offers an overview of the important UK fisheries enterprise in a broad social and political context, providing insight into how a regional approach can give focus to the problems. My own contribution deals with the geopolitical context of Japan's reemergence as the world's leading ocean fishing power after World War II; the paper also deals with the concept of ocean regimes and its application in the postwar era, a topic that overlaps with studies by Dr. Franckx, Dr. Hoshino, and Prof. Freeman in its attention to the institutions of international management and their impact.

Second, the modern era has seen a considerable controversy over the principles of active marine resources management--for conservation purposes, for purposes of economic maximization, and for purposes of advancing social goals--through the regulation of the technology, organization, institutions and dynamics of the harvest. Some of this controversy has gone to the very heart of property rights theory and the sharp focus given that subject by reference to "ocean commons" resources and the possibility of controlling them through allocations of rights. The matter is broader, however, than that, especially for the economic historian seeking to uncover something of how basic oceanographic science has interacted, historically, with the commercial and political interests that come to such a dramatic focus upon ocean resources. The papers that address these issues here in historical context represent a variety of methodological perspectives: Dr. Deacon is author of a classic and pioneering study of ocean exploration and science in political context, and examines Scots fisheries science in the light of commercial goals and pressures; Walter Lenz considers the German contribution to the formation of the International Council for Exploration of the Sea, an organization whose research is a lodestone for fisheries and oceanographic studies in the 20th century. An economic analysis of a highly controversial area of resources management for more than a century, the sealing industry, is treated from the economist's perspective by Profs. Bjørndal and Conrad.

Third, the global debate of ocean resource uses and regulation has been framed for the last thirty years in considerable measure by legal and institutional considerations inspired by bilateral and multilateral negotiations over management, but most decisively of all by the UN Law of the Sea conferences and draft conventions. Dr. Franckx's study of the international agreements dealing with the fur sealing rivalries and industries offers an historical analysis that provides long-range context and also some challenging suggestions for comparison with contemporary international ocean law development. Dr. Hoshino considers the Antarctic regime, both in its recent history and its future prospects, from the perspective of law but also from that of modern international relations theory. Viewing ocean history problems from the latter perspective, especially insofar as analysis can center usefully on the concept of "ocean resource regimes," as has become common, is highly suggestive for purposes of comparing historic ocean resources exploitation with the history of land-based resources.

Fourth, the postwar era has been marked by applications of science and new technology to the non-living resources of the ocean--most dramatically with respect to offshore oil drilling, but, as the Profs. Charlier demonstrate in their paper providing an overview of the modern period, by no means exclusively so. In this area, as in the case of fisheries, the intersections of science, technology, industry, and markets offers a richly complex framework for historical analysis.

Finally, there has been a rising awareness in recent years of the profound effects that the ocean industries of the advanced countries--and the application of advanced technologies by even some of the emerging industrial nations that have been major players in world fisheries exploitation--have had upon the traditional fishing communities in many areas of the world. Here the anthropologist's perspective, useful not only for application of the methodology to understanding effects and social dynamics but also for the appreciation of cultural stresses and casualties, is vitally important. Prof. Freeman offers such a perspective, informed in his case also by a long period of close scholarly attention and distinguished writings on the international whaling conservation issues that have impinged so controversially upon Japan in the last half century.

Thus the papers presented here--which are by scholars from eight countries and representing the disciplines or subfields of economic history, anthropology, law, political science, history of technology, history of science, environmental studies, and natural science--are offered to the scholarly public in hopes of stimulating discussion and also further scholarly study of the ocean resources issues they treat.

PART I:

ATLANTIC AND PACIFIC OCEAN REGIONS

THE DEVELOPMENT OF SPANISH COMMERCIAL FISHERIES BETWEEN 1830 AND 1930. A GENERAL SURVEY

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Spain

1.- SPAIN IN THE MIDDLE OF THE 19TH CENTURY: A FISH IMPORTING COUNTRY

In spite of its 1.731 miles of coast and an old fishing tradition, Spain was in the middle of the 19th century an outstanding importer of fish. As one can see in Table 1, sales of salted sardines, the main Spanish fish export, were of very little importance compared with the main import, salted and dried cod. A similar picture is reflected in Table 2, where one can see that the value of the total fish exports hardly reached 10% of codfish imports.

Table 1

Exports of salted sardines and imports of cod (metric tons)
Annual Average

	Cod imports	Sardine exports
1851-56	9.131	741
1856-60	13.181	782

SOURCE: Estadísticas del Comercio Exterior de España

Table 2

Imports of cod and total exports of fish products(value in pts.). Annual Average

	Cod imports	Total exports of fish products
1851-60	3.970.244	391.437
1856-60	5.730.878	573.110

SOURCE: "Importación en España", La Gaceta Industrial, n.298, 1872 and Estadisticas del Comercio Exterior de España

Coastal fishing was very common and fresh fish represented an important source of proteins for all communities living near the sea. Sales to the poorly communicated interior of the country required some previous processing and this was usually salting. Fishes suitable to be processed in this way benefitted from an additional demand and as a consequence of it their fisheries had a more commercial character than that of other species. The sardine was doubtlessly the most important of these species and played the leading role in ninteenth century Spanish maritime fishing. It was caught all around the coast but especially in Galicia, where it was salted and pressed and then shipped to the Mediterranean coast and sometimes to Italy and Cuba. In this region of the Spanish North West there were about 300 sardine processing plants that yearly sold some 17.000 metric tons of this product(Carmona, 1983).

Tuna salting was of less importance and was concentrated in Andalucía (especially in the province of Cádiz), but catches were not restricted to this region and fisheries of tuna and bonito were also important in northern provinces of Santander, Asturias and the Basque Country where hooks were used in a special frame called a "curricán". Tuna fishing was carried out in a very different way in Andalucía and the Mediterranean coast where a reduced number of very big, permanently placed nets which were called "almadrabas" (madragues) played the main role in this type of fishing. At the time of the Ancient Régime the use of these nets was a privilege of the old nobility, the duke of Medina Sidonia being the main owner of Spanish madragues. However, in the middle of the nineteenth century such a privilege had already been abolished and the state auctioned the right to fit the madragues every four years (Carlier, 1907).

Although salting was the main processing method, pickling was also of some importance in northern ports of the Cantabrico where sea bream, hake and tuna were processed in this way to be sold in the Castilian provinces of the

interior. Bermeo was the main port in sea bream landings, and Laredo in tuna(Gracia, 1979 and Rodriguez Santamarina, 1909).

What was lacking in Spanish fisheries in the middle of the nineteenth century was proper deep-sea fishing. The closest thing to this kind of activity is found in the case of around thirty canarian ships which sailed in a trip of two or three days to the saharian banks, located at between 300 and 500 miles away, in order to fish sama and cherne which were salted on board and sold on their return to the Canary Islands (de la Puente, 1884 and Pérez del Toro, 1892). Old Newfoundland cod fishing was very important for the basques in the sixteenth century but had practically ceased a century later, as a result of a combination of elements such as the price revolution, the decay of Spanish naval power and inappropriate salt taxation(Innis, 1969). Recovery at the end of the seventeenth and beginning of the eighteenth century was hampered by the treaty of Utrecht and by competition from the Compañía Guipuzcoana de Caracas, a monopolistic firm which was involved in the cocoa trade which was a better alternative for guipuscoan capital than the risky business of a restauration of Spanish Newfoundland cod fishing(Fernández de Pinedo, 1983).

Bad internal communications and heavy taxation on salt were two important obstacles to salted fish sales in the center of Spain. Taxation on salt, in particular, which was a crown monopoly ("estanco de la sal") since the sixteenth century until 1869, was a heavy burden for development of this branch of the industry. Salt was sold at a very high price and the difference between market price and sale price was an important fiscal revenue. Paradoxically, Spanish salt was exported at a much lower price so foreign salters could get Spanish salt cheaper than the spanish. The cost of this policy was twofold. On the one hand, exports of Spanish salted sardines were severely affected because their prices were artificially high, and on the other hand, this policy helped the introduction of foreign salted fish into the Spanish market, -although the complaints of Spanish salters which stated that cod was cheaper than salted sardine were never true.

The maintenance of a relatively high level of cod imports during the whole century was mainly related not to its retail price, which was higher and heavily taxed before 1869, but to firstly supply problems of salted sardines, secondly to the tradition of cod consumption, thirdly to elements of social differentiation and finally to the fact that cod and salted sardines were replaceable goods only in a relative way. Spain, like Portugal, imported cod from Norway and was one of the main customers of this country, so some historians of Norwegian fisheries have called the period between 1830 and 1880 "the Spanish Era"(Sommers,

1950). In a well-known book on this last topic T. Solhaug has pointed out that Spanish purchases of Norwegian klippfisk (salted and dried cod) amounted to between sixty and ninety five percent of the whole exportation of this product during the period 1836-1880(Solhaug, 1976).

This was the condition of the Spanish fishing industries in the middle of the nineteenth century. Sixty years later on the eve of the First World War the industry was completely different. The main part of this change took place in a relatively short period between 1885 and 1914, when the fisheries went through dramatic changes and grew quicker than any other economic sector in Spain(Giráldez, 1989a). As a consequence Spain, although still a fish importing country, has impressively improved its ratio of exports to imports of this product and in the favourable circumstances of Spain at the time of the First World War, the country was able to reach a positive balance. (see Table 4).

Table 3

Cod imports, preserves and salted fish exports, 1901-1920
Annual Average
(amount in metric tons)

	Cod Imports	Canned fish exports	Salted fish exports
1901-1905	42.701	13.331	9.305
1906-1910	45.918	19.788	10.209
1911-1915	50.339	19.162	8.680
1916-1920	37.593	21.928	10.239

SOURCE: ECRE

Table 4

Average value of main Spanish fish imports and exports in thousands of pts.

	Cod imports	Total fish imports	Canned fish exports	Total fish exports
1901-1905	29.811	32.797	20.673	25.760
1906-1910	35.425	37.878	31.504	37.298
1911-1915	38.237	40.464	29.447	34.806
1916-1920	28.571	29.366	35.569	42.244

SOURCE: ECRE

2.- GROWTH AND CHANGE BETWEEN 1885 AND 1930: SOME GENERAL REMARKS

In many ways the development of Spanish commercial fisheries in the late nineteenth century fits into the general patterns of development followed by other European countries during the same period. Demographic growth and urbanization caused a high increase in the demand for fish. Railways enabled rapid transport of a highly perishable good such as fresh fish, and practically created a new market for a product that before could only be consumed a few miles from the coast.

In some other aspects the development of Spanish fishing was not so similar. For instance, the delay of the start of this process in Spain, compared with England or France, countries where the demand pull was noted earlier due to a previous and more vigorous industrial growth as well as to a better transport network even before the arrival of railways. Of particular importance was the very late arrival -1885- of the railways to Galicia, the main fishing region of Spain. A second feature of this development was the big influence of the canning industry on the growth of the fisheries. Thirdly, the speed the movement took was considerable once the railway come and demand for fish preservation had increased.

The first statistics concerning fishing were done in 1829, but not until 1908 were there any continuous series which allowed us to see the annual evolution of landings. However the existence of some twenty fishing statistics from between 1829 and 1908, some of which have been published, while others haven't, make possible an understanding of the dimension of overall growth(Carmona, 1983 and Giráldez, 1989a).

Table 5

Some estimations of Spanish fish landings (metric tons.)

1830	39.000
1860	71.000
1880	67.000
1890	81.000
1910	134.000
1920	360.000
1930	296.000

SOURCE: See Carmona (1983) and Giráldez (1989a)

As Table 5 shows, growth was relatively slow until 1890 and very quick during the following thirty years. Behind this impressive growth of landings was the new fishing equipment as well as new ships and new methods of propulsion. With regard to these new methods of propulsion, introduction of the steam engine in fishing ships is the most visible sign of transformation and is frequently used to indicate the rate of this overall growth.

Table 6 shows the evolution of the number of steam fishing vessels in Spain. Rapid change could be observed throughout the period, but especially between 1894 and 1904. By european standards it must be noted that the application of steam to Spanish fishing ships began early, in second place after Great Britain, and that during the early years of the twentieth century Spain has continued to be second after "the first industrial nation".

Table 6

Steam Fishing Vessels in Spain

1885	8
1887	11
1894	36
1904	363
1911	574
1921	1.852
1932	1.772

SOURCE: Dirección General del Instituto..(1888); Revista de Navegación y Comercio, 15-X-1904; Anuario Estadistico de la Pesca Maritima en España, Madrid, 1906; Rodriguez Santamarina (1912); Rodriguez Santamarina (1923); Estadistica de Pesca de 1933.

This rapid application of steam is proof of the economic dynamism of this industry, but this must not be exaggerated because steam was only one option for modernization among several others, and solutions leading to expansion of fisheries were different in each European country. For instance, steam application in Norway was slower because it took place in conjunction with the expansion of the internal combustion engine, a propulsion method at least equally accurate for the Norwegian type of coastal fishing(Sommers, 1950), which in Spain rarely existed before the First World War. Moreover, steam could be adopted or not depending on non-economic factors, such as resource conservation policies, social conflicts between old and new ways of fishing, and so on. Legislation was very different in countries such as Norway, France or Spain and while the latter was permissive in relation to trawling, a fishing

technique highly suitable for steamers, this was not the case with the former, where steam trawling was practically forbidden (Bergh, 1981).

Table 7

Steam fishing vessels in some european countries

	Germany	England	Spain
1885	2	77	8
1894	59	578	36
1904	172	1.755	363
1911	303	1.978	574

SOURCE: Bulletin Statistique des Pêches Maritimes (several years); Winter (1909), "Report on German Sea-Fishing Industry and Trade", BPP, A&P, 1906, CXXII, pp.153-171

Early fishing steamers under the Spanish flag were owned by merchants of Cádiz and were devoted to trawling in the neighbouring portuguese coast as early as the year 1863. Shortly after, in 1867, steam trawling was allowed by the Spanish authorities but only fifteen miles out from of the coast(Guillén, 1970). Attempts to use steam in Spanish fishing in the sixties and early seventies were however only isolated experiments with no continued activity. In fact, the birth of the Spanish steam fishing fleet must be dated later, in 1878 when a guipuscoan firm, Mercader y cía, used a fishing steamer, which had been bought in Scotland, for the first time(Navaz, 1948). The same firm managed to acquire in twelve years some 15 steamers of about 60 tons each(Bustinduy, 1894). From 1885 some merchants of other ports started to adapt English steam engines to old wooden fishing ships so at the beginning of the new century Spain had a fairly abundant fleet of fishing steamers. At that time some workshops in the Basque Country and Galicia were able to make engines and boilers although most of the machines used in Spanish fishing were still imported. Vigo played an outstanding role in this process band became the primary fishing port of Spain in few years.

Though neither the spread of steam nor the change in fishing gear were homogeneous for all types of fishing, it is thought that the process of modernization can be analyzed using two general patterns, one for sardine catches and one for white fish to be consumed fresh.

3.- PATTERNS OF CHANGE IN SARDINE FISHING

The sardine, which was the main product of Spanish fishing at the beginning of the modernization process, was caught by two main procedures both carried out very close to the coast. Firstly, the "xeito" or "sardinal", a drift net which was very common all around the coast, was laid from a little undecked boat. It was very popular because its low price enabled it to be used by every fishermen, thus allowing an easy coexistence between fishing and other activities like crofting or weaving within the same family. After the "xeito" the other type of fishing gear which was popular for sardine fishing was the "xábega", a beach seine which required more capital and more labour than the "xeito", one reason why it was in most cases owned by merchants or fish salters. Dragging by boat ("bou") was less important because it was only allowed on the Mediterranean coast where the sardine was not the main catch. Old big seines ("cercos") were still in use, especially in Galicia, in about 1880, but their importance in the fish catches as a whole were tiny if compared to those of a century earlier(Carmona, 1983).

The main drive in transforming sardine fishing was the upsurge of the canning industry in the 1880s. Some factories had already existed some fifty years before but they did not have enough production capacity to make a relevant influence on the extractive branch of the business. In fact it can be said that the canning industry in Spain developed in the eighties when sardines disappeared in Brittany and French canners and merchants in fish preserves turned to Galicia and Portugal in search of any kind of partnership in order to keep their overseas markets. Consequently the galician salters, counting on French techniques and markets, started to invest in canneries -which were in many cases new factories installed in old buildings hitherto devoted to salting- , and canning grew very quickly between 1880 and 1914. The fish canning industry in this period was located mainly in Galicia, where it produced almost exclusively sardine to be sold in foreign markets(Carmona, 1985). Western Andalucía(Cádiz and Huelva) and the Cantabrian region (Santander and Basque Country) developed in this period a less important but more diversified industry where tuna, bonito and anchovy as well as sardine were the main canned products(Bello, 1926).

Rapid development in sardine canning brought about a rise in fish prices which jeopardized competition in foreign markets. In order to cope with this challenge canners promoted the use of new fishing gear, especially a type of purse-seine called "cerco de jareta", a fishing gear which was already used in some Cantabrian ports from 1883.

Attempts had been made to use this purse-seine also in Galicia, but they had failed because of the opposition of drift-net partisans, and only after a lot of riots did canners succeed in imposing the new gear. This was in 1897.

So in this period, the 1890s, innovations in sardine fishing affected only the gear, not the drive procedure. Only later, on the eve of the first World War, when the size of seines and the distance to the places where sardines were taken increased, was necessary to shift to mechanical drive (Giráldez, 1989b). Steam pursers were first used in Southern Spain where opposition of fishers using smaller seines was less acute. To sum up, in this first period of transformation in sardine fishing, the main role was played by traditional forms of energy while steam or other forms of mechanical drive were only marginal.

4.- PATTERNS IN FRESH-CONSUMED FISHING

If development of the canning industry was the main factor accounting for growth and transformation in sardine catching, then railway communication between ports and the interior was the decisive element for species to be consumed fresh, especially white fish. The railway link between Cantabrian ports such as San Sebastián and Bilbao and the important cities of Madrid and Barcelona was established in about 1865. The railway came to Santander a bit later, and lastly, the galician ports of Corunha and Vigo were connected to the interior as late as 1885. We have already seen how San Sebastián was the first port to have had a fleet of fishing steamers devoted to white fish and how the spread of steam engines in galician fishing began in the same year as the link between Vigo and Madrid was opened.

Not only drive factors but patterns of change were different if we compare sardine with white fish catching. We can distinguish two stages in the evolution of the latter. During the first stage steam was introduced without a parallel change in fishing gear; during the second, the advance of trawling also brought about a transformation of the gear.

The spread of steam in fishing of species to be consumed fresh took place slowly between 1878 and 1885, while railway links with the country's interior were restricted to the basque ports, where there existed at that time other poles of economic growth (mining, steel production,..)which competed for capital and labour. But the spread was very fast when the railway arrived in Vigo and Corunha, which were ports of a region that was very rich in fish but lacked other buoyant industries. The addition of English steam engines to old wooden vessels enabled more distant fishing as well as transporting more fish from the banks to the port, without ceasing to use the traditional palangre,

the typical baited line used for white fish. Fishing of hake and sea bream was the occupation of most Spanish fishing steamers during the years 1885 to 1905, and so this was the main factor which prompted the spread of steam in Spain.

A similar case was that of tuna and bonito fishing in the Cantabrian ports, where steam was soon used not for new gear but for laying the currican, which was also a traditional baited line. Thanks to steam engines, Cantabrian tuna fishing clearly surpassed the other traditional Spanish tuna fishing, such as Andalusian and Mediterranean madragues, thus bringing about the start of their decay.

The second phase of fresh-consumed fishing evolution began in about 1905 with the spread of steam trawling. Steam trawling had been used in San Sebastián since 1878 but was only carried out by a very limited number of ships, never more than ten before 1904. Attempts had been made to introduce this kind of fishing in Galicia in 1888, but they failed because of violent riots. In about 1904 steam trawling was hardly carried out by the Spaniards, but this did not mean that trawling wasn't important on Spanish coasts, because English, French and german trawlers were fishing there with this gear by then and causing troubles with liners who felt this foreign presence was detrimental to their fishing.

The actual developmente of Spanish steam trawling began in about 1904. On the one hand, pair trawling spread from Guipuzcoa throughout the Cantabrian Sea and Galicia, where many old steam liners began to fish as pair trawlers after 1905. On the other hand, and nearly at the same time, the first otter trawlers were imported by San Sebastián and Corunha.

Table 8

Number of steam trawlers in Spain

	Otter trawlers	Pair trawlers	Total
1904	13	10	23
1911	29	136	165
1921	45	304	349

Fuente: Anuario (1906); Rodriguez Santamarina (1912) and (1923)

5.- THE BEGINNING OF MODERN SPANISH DEEP-SEA FISHING

The transformations which took place before the first world war meant an important growth in the distance from the shore to the place where they fished. Certainly not a negligible part of the fleet, steam trawlers, long liners, and tune liners, fished outside the three-mile zone of Spanish waters. But it cannot be said that this as properly deep-sea fishing. In this category we can only include some trawlers from Cádiz that sometimes went to the North of Africa at the end of nineteenth century or a limited number of basque expeditions to the Grand Sole, but in general practically all Spanish steamers took a maximum of 48 to 72 hours to sail back to their port of origin. The only relevant exception before 1920 was a fleet of otter trawlers owned by a firm from Corunha, which from 1914 went from Barcelona to the North African banks of atlantic Morocco in journeys of about 20 days and sold their catches in the catalan city (Boletin, 1914).

It can be argued that the development of the modern Spanish deep-sea fishing fleet occurred in the twenties when steam trawlers started going north to the banks of the Grand Sole and south to the southern coast of Morocco. What is also important was the return of Spanish fishermen to Newfoundland from 1923, when a trawler from Vigo started this new epoch in the history of Spanish cod fishing (Paz Andrade, 1954), but it was the guipuscoan firm PYSBE which took over the task of consolidating this activity from 1927 on (LLed6, 1943).

The second important event in the twenties was the increase in the use of the internal combustion engine in fishing vessels. If it can be stated that Spain was one of the pioneers in Europe in using steam engines in fishing, it must also be said that it was one of the last countries to introduce the use of liquid fuel. Some motors existed in fishing from about 1905 but their figures increased very slowly until 1920 as can be seen in Table 9.

Table 9

Fishing vessels with liquid fuel engine in Spain

1920	311
1932	5.998

SOURCE: Rodriguez Santamarina (1923) and Estadistica de Pesca de 1933

To sum up this brief account of the development in the Spanish fishing industry, we emphasize that Spain was, in the 1930s one of the six or seven most prominent fishing nations of the world, as a resultof the growth of its fisheries in the period which we have just referred to. It was seventh as regards the weight of landings and fourth if we consider their cash value. Fifty years before Spain was irrelevant in the world of fishing. Although Spanish fishing in this period continued to have many problems, such as the continuance of a great proportion of wooden ships, the delayed diffusion of combustion engines, an inadequate structure of shipping property, and so on, the truth is that not many Spanish economic sectors have performed as well as this one, and this is what I've wanted to stress in this paper.

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STATE SUPPORT FOR 'USEFUL SCIENCE': THE SCIENTIFIC INVESTIGATIONS OF THE FISHERY BOARD FOR SCOTLAND, 1883-1899.

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Introduction

During the second half of the 19th century there was growing concern in Britain, as in a number of other countries where rapid technological progress and expanding population was beginning to put a strain on natural resources, about various aspects of the fishing industry. While the herring fishery increased throughout this period, it was feared that other stocks of fish were declining, though before the collection of statistics this was often hard to prove. Traditional line and drift net fishermen were quick to blame new methods, in particular trawling, for upsetting natural recruitment of populations. Numerous enquiries, either instigated by government departments or in the form of Royal Commissions, were followed by a series of acts of Parliament designed to regulate different aspects of the industry. However, lack of factual information about the fish themselves made regulation difficult and a loose confederation of individuals and organizations, including scientists, businessmen and politicians began to press for scientific research to be undertaken, along the lines already begun in the United States and other countries. Behind the pressure for more information lay not only an appreciation of the need to understand the life histories of food fishes if stocks were to be intelligently exploited but also the hope that such knowledge might enable man to intervene to restore declining fish stocks, as was already happening with freshwater fish. Because of the expense of any form of sea-going science some government involvement was inevitable if such research was to take place, but this delayed the start of research in Britain. There the prevailing political philosophy was generally antagonistic to increases in public expenditure, and both governments and the civil service tried to avoid commitments to finance scientific research, in spite of the nation's increasing economic and social dependence on technological innovation in a variety of fields. This policy could however be breached by the determined if they could show sufficient reason that the outcome would be to the public good. The economic importance of fisheries meant that this argument could be successfully used and once the initial barrier was overcome what Roy MacLeod has called 'the logic of expansion' ensured its continuation. In this way fisheries science was able to expand rapidly in the first place in Scotland at a time when marine science there and in the rest of the United Kingdom was otherwise being starved of resources. Yet the development initially occurred in a way that was quite unplanned, because unenvisaged by central government, and also without any direct control as regards scientific content being exercised either by the state or any representative body of scientific opinion. As a result of this, though much pioneering work was done, there was also a waste of scarce resources and loss of opportunities during the early years, in a way that was avoided in fisheries research based in England and Ireland when this began only a few years later. By the turn of the century departments had been set up within

government boards in all three countries to administer state spending on fishery research, though in England the actual research itself continued for some years to be done entirely by independent organizations. This paper looks in more detail at the events in Scotland during the last two decades of the 19th century and how scientists were able to breach government policy and obtain support for their research.

The situation before 1882

Until 1882 control of Scottish fisheries 'was vested in the Commissioners of British White Herring Fishery'. (FULTON, 1889) Originally established in 1808, by an Act for the further Encouragement and better Regulation of the British White Herring Fishery, its duties latterly included superintending the herring fishery, affixing its brand to barrels of cured fish (for which a fee was charged from 1859), collecting statistics and administering an annual government grant for the construction and repair of harbours. The cod and ling fisheries had been subsequently (1820) added to its remit but it dealt only with cured, and not with fresh fish. At first the commissioners had been empowered to continue the system of bounties paid by their 18th century predecessor, the Board of Trustees for Manufacturing and Fisheries. These had originally been instituted to encourage fisheries with the motive of ensuring a reserve of trained seamen who could be drafted into the Royal Navy in time of war, and were continued for a time to encourage the construction of larger boats, but had all been phased out by 1830. (REPORT OF THE FISHERY BOARD FOR SCOTLAND, 1883, 2: xii-xiii) The Commissioners originally appointed fishery officers to the major fishing centres of the United Kingdom with the job of enforcing regulations on the size of mesh in nets and similar regulations, and of compiling statistics on catches etc. Their work continued in Scotland after the English stations were discontinued in 1850.

During the 18th century, commercial fishing in Scotland was an east coast activity and was mainly a line fishery for haddock and other small fish in inshore waters, supplemented by seasonal long-line fishing for cod (GRAY, 1978). It was not until the 1790s that the herring fishery developed on a large scale in Caithness and from there gradually spread to other areas on the east coast and to the Clyde and the outer islands on the west. During the late 18th and early 19th centuries the British Fisheries Society attempted to promote the herring fishery but their efforts were mainly confined to the west Highlands (where they founded the port of Ullapool) and met with only mixed success (DUNLOP, 1978) Nevertheless, by the middle of the 19th century, herring fisheries were established in most coastal regions of Scotland, most of the fish being cured for export. The industry continued to expand both in size and economic importance into the early 20th century, peaking just before the outbreak of war in 1914 (GRAY, 1978).

However, even during this largely prosperous period fluctuations occurred in the herring fishery, and hardship could arise as a result of good seasons as well as bad. From the 1850s to the mid-1880s the scene was one of almost uninterrupted prosperity but in 1884 a glut caused the system to collapse because the curers were committed to paying out more for catches than they could recoup on the open market; the ensuing slump lasted until the early 1890s. But even before this period other aspects of

the industry were giving cause for concern, in particular the supply of flat fish, and as the century progressed these problems became urgent as other fisheries expanded and new methods were adopted.

The origins of scientific research on sea fisheries

As early as 1842 the Commissioners had asked Harry Goodsir to make investigations in the Firth of Forth with a view to adopting measures to protect young herring. (REPORT OF THE FISHERY BOARD FOR SCOTLAND, 1883, 2: xiii-xiv) The problem had arisen through an increase in sprat fishing in the Forth during 1836. Complaints were made to the Commissioners that the herring fishery was being destroyed because of the small mesh of the nets being used to catch sprats. Indeed many people believed that sprats were young herring, but the anatomist Robert Knox confirmed that they were different species. In 1837 the Commissioners had recourse to a gunboat to stop the sprat fishery but they were aware that this was scarcely a solution and realized the need for more expert knowledge. Twenty years later the herring fishermen were again protesting, this time about the activity of vessels trawling for white fish over the herring spawning grounds in the Forth. This time the Commissioners consulted George Allman, Professor of Natural History at Edinburgh University, but he could not see that the trawling was harmful. It was not then generally realized that herring ova sink and develop on the bottom, although this fact was known to fishermen and had been reported to the Board by the scientists working on herring in the 1840s. The problem was not only lack of information but lack of continuity. As the new Fishery Board expressed it (REPORT, 1883, p. xv):

> Although the Commissioners seem to have been perfectly conscious of the great want of information as to the habits of the food fishes, they always, as soon as the complaints ceased, abandoned the inquiries they had instituted, so that little or no useful knowledge was gained; and as a result sooner or later a new agitation began amongst the fishermen, to be followed by another enquiry, or the appointment of a Commission, and so it has continued until the present day. Had the Board been provided with the necessary funds to carry on continuous investigations as to the mode and time of spawning, the nature of the eggs, and the food and migration of the herring, and other useful fishes, not only would an immense amount of valuable information have been obtained but the great expense of Commissions of Inquiry might have been avoided. It cannot, however, be a matter for surprise that uninterrupted investigations were not carried on by the Fishery Commissioners twenty years ago, when it is remembered that at the present time, notwithstanding the example of other States, the influence of Fishery Exhibitions, and the united demand of all interested in Scottish Fisheries for more knowledge, the Treasury have not yet provided the necessary funds.

Several Royal Commissions had been appointed to enquire into various aspects of sea fisheries in the 1860s and 1870s but all ran up against the problem of lack of information. Some statistics were available on the number and size of boats, size of catches etc, collected by the Fishery Board's officers in Scotland, the English stations having been discontinued

in 1850, but little was known about the fish themselves. The intention of the commissions was to fill in the gaps in knowledge by asking fishermen but Sir Lyon Playfair, who headed two of them, afterwards remarked (LANKESTER, 1885) that 'he had found, by experience, that the last person in the world to know anything about fish was a fisherman.' The information thus gained, he said, was generally unreliable and in spite of the presence of distinguished scientists such as Huxley on the commissions 'the most absurd laws were passed' as a result.

The drawbacks of what Playfair called this unique British way of getting information were soon apparent and a movement began to try and find a different way. E. Ray Lankester in a speech to the Royal Society of Arts (1885) compared the scientific basis of agriculture with the lack of demand

> for a knowledge of marine life which might enable the fisherman to pursue his calling to the greatest advantage. In fact our fishery industries are still barbaric; we recklessly seize the produce of the sea, regardless of the consequences of the method, the time, or the extent of our depredations...So long as fishing was relatively small in amount this method was not altogether objectionable. But with the increase of population, and the introduction of steam fishing boats and more effective instruments of capture, there is reason to believe that some at least of our coast fisheries are being destroyed.

Other countries had 'perceived the necessity of attempting to regulate the various kinds of sea fisheries on rational principles - that is to say, on principles based on an exact knowledge of the life and habits of the fishes which it is desired to capture' but Britain had lagged behind.

In fact the British record was not quite so poor as Scottish sources might suggest. The decline of salmon fishing throughout the British Isles had already led in the early 1860s to the appointment of inspectors for England and Wales, and later for Scotland, to recommend improvements. Their remit was gradually expanded to include sea fisheries (BURGESS, 1967; MacLEOD, 1968). Growing concern about the latter led a loose alliance of individual scientists, politicians and industrialists and groups such as the Scottish Fisheries Improvement Association to arrange a series of fishery exhibitions at Norwich (1881), Edinburgh (1882) and London (1883) with the aim of drawing attention to the problems involved and arousing public interest. The origins of government involvement in sea fisheries research in England are admirably summarized in a forthcoming monograph by Arthur LEE (in press) and the antecedents of the Irish Fisheries Branch have been described by WENT (1972). In both these countries the initiative was taken by scientists through scientific societies, in Ireland by the old-established Royal Dublin Society which formed a fisheries committee. In England a new organization, the Marine Biological Association of the United Kingdom, was established as a consequence of the London exhibition, to establish a laboratory where fisheries research might be carried out. In Scotland things could have developed in a similar fashion as the Scottish Meteorological Society was already interested in the study of fisheries, in particular the influence of weather. As a result of the 1882 Act creating the new Fishery Board for Scotland, however, events there took a different direction, with the initiative being taken by an official, but non-

governmental body. All these bodies had to combat the prevailing hostile attitude to increases in government expenditure but with its direct line of communication to the Home Department and later to the Scottish Office the Fishery Board for Scotland may be considered to have had an advantage over its rivals.

Fisheries research and the funding of science in the late 19th century

The new Fishery Board was empowered to make scientific observations but nothing had been said about how these were to be financed. Scottish affairs came under the Secretary of State for the Home Department, until 1885 when the Scottish Office was established, but expenditure of government money throughout the United Kingdom was controlled by the Treasury which had its own priorities. As Roy MacLEOD (1976) and others have shown, its officials were committed to a policy of avoiding increases in government expenditure for any purpose, including scientific research. MacLeod shows that this attitude to science was not necessarily based on any informed appreciation of the pros or cons of any particular project but it was the more powerful because it coincided with a similar view of the undesirability of state support for science, held by many politicians, and, for rather different reasons, by not a few scientists, who believed that introducing a system of financial rewards or inducements to carry out research would encourage mediocre science, if not charlatanism. It was acknowledged that lack of funds might cause difficulties and a system of grants to individuals was set up, to be administered by the Royal Society (MacLEOD, 1971). However some sciences had advanced beyond the point where isolated researches were the most fruitful method of progress and needed institutions to provide continuity and resources beyond the reach of most individuals. The expense of making observations at sea meant that marine science came up against this barrier sooner than more theoretical or laboratory-based sciences.

However, there were some exceptions to the general rule. Projects involving national prestige did receive support. The *Challenger* expedition is an example frequently given (MACLEOD, 1976, p. 144: MORRELL, 1976, p. 83) - not surprisingly as it was the largest scientific project of its kind to be undertaken up to that time. (BURSTYN, 1968) In this sense, as well as in others, it was an exceptional event, and marine science otherwise suffered under the general disinclination of successive governments to fund ongoing research as much as did other sciences, and perhaps more because of the high overheads involved in work at sea. This refusal to become involved in long-term projects (ALTER, 1987), even though there were no practical alternative sources of finance, was behind the difficulty experienced in obtaining money to finish the *Challenger* Report, and undoubtedly held back the further development of marine science in Britain during the last two decades of the 19th century and the first two of the 20th. However, as MacLEOD (1976) has pointed out, the Treasury was not a monolithic structure and individuals were capable of flexibility and of being influenced by circumstances. One mitigating circumstance was held to be if widespread economic or social benefits to a significant section of the population could be expected, especially in areas such as public health and education, though even here the Treasury resisted new commitments, especially if they were open-ended. However, external pressures for new organizations to

perform scientific tasks of public benefit, together with internal developments in these organizations once founded, meant that as the 19th century progressed a small but growing number of permanent institutions dedicated to scientific discovery came into being, such as the Geological Survey and the Meteorological Office.

Fisheries research fell very much into this pattern. Pressure in support of conducting research came from a variety of sources and could be operated in a number of ways, including articles in the press and questions in the House of Commons from members whose constituencies included ports where fishing was an important part of the local livelihood. In this way both the larger commercial interests and the smaller men could exert pressure on central government. Another body of people who were interested, but generally less influential, were scientists, especially those already interested in aspects of marine biology. A minority, were concerned either because they had already been connected with the inquiries that had already taken place or because they specialized in fish taxonomy. Others, the majority, had interests of their own which would be promoted by such an undertaking. It was a time when the study of marine biology was at the forefront of academic zoology, not just because of the great expansion of knowledge which became possible through study of the collections from the voyage of the *Challenger* and other similar expeditions, but also because of the realization that many interesting topics in biology, not least those undertaken by supporters of Darwin's theory of evolution, anxious to contribute to the body of evidence in support of his paradigm, could most fruitfully be pursued by the study of marine life. For these scientists it was the marine invertebrates, rather than fish which were of interest, but some invertebrates were also of economic importance, especially oysters, which were already in decline round British coasts, lobsters and mussels which were the bait preferred by British line fishermen. Furthermore they realized that fish were predators of marine invertebrates and that marine biology thus had a doubly important role to play in any in-depth investigation of fisheries. This being said, there was undoubtedly an element of opportunism in the enthusiasm of British scientists for fisheries research in the early 1880s. For over a decade both individually and collectively many had been anxious to follow the continental movement to found marine stations which had made a great impact in Britain, in particular the founding by Anton Dohrn of the Stazione Zoologica at Naples (from the mid-1870s onwards British scientists were regular visitors to the SZN). Various avenues were explored but none had so far succeeded in producing an institution viable in British conditions. With the much wider public concern over the state of fisheries in the early 1880s it at last looked as though a lever might have been found to extract money from a reluctant government for research into the economic aspects of marine life. The scientists like Ray Lankester were well aware that such research could not be done without paying attention also to other wider questions concerning both marine life in general and the marine environment as a whole. Through taking on work of economic importance they also hoped to be able to found the dreamed-of institutions where work of fundamental biological importance could be done.

This is how the first marine biological stations of Great Britain, or at least the first as the record is generally given, came into existence in the 1880s and 1890s. Many still exist today: Plymouth, St Andrews, Port

Erin, the Dove Laboratory, all owe their existence to a greater or lesser extent to the fact that grants began to be available for fisheries research at this time, even though the impetus for their creation was in some cases very different. So how did this happen? Given the unfavourable circumstances already described, how was it that even these small amounts became available, so that starting much later in this field than other nations, including the United States, Britain, originally a pioneer in oceanography had by 1910 virtually ceased to count in this field, but had achieved a pre-eminent position in fisheries research? KOFOID (1910, p.144) summarized the situation thus when comparing the marine stations of Europe:

> The scientific fisheries work done by the British stations is unsurpassed in its excellence and effectiveness, and the popular features such as public aquaria, elementary and technical instruction, are generally well developed, but the strictly scientific phases of the stations' activities too often suffer for lack of adequate financial support and from consequent loss of scientific interest.

The early years of the Scottish Fishery Board - plans for scientific work

When the new Fishery Board for Scotland was established in 1882 most of the members were officials from local government, politicians and businessmen, but several were appointed for their scientific expertise, and/or practical knowledge of fish and fisheries. One of these was Sir James Ramsey-Gibson-Maitland, a pioneer of freshwater fish farming who had established a successful trout hatchery which has only recently passed out of the hands of his descendants. Another was James Cossar Ewart, a Scottish scientist who had taken the well-tried route to success by obtaining a post in the London academic world where he showed promise and was rewarded by being appointed Professor of Natural History at Aberdeen University while still in his twenties. Only a few years later the chair at Edinburgh became vacant with the resignation through ill health of Wyville Thomson and the withdrawal of the clear favourite for the post, E. Ray Lankester. While at Aberdeen, with the assistant of his friend and former colleague the Darwinist G.J.Romanes, he had founded by private enterprise a small marine laboratory, the Scottish Zoological Station, to form part of the zoology department and undertake advanced teaching and research. During the years of its nominal existence the laboratory functioned in a small way, financed by public subscription (which never raised enough to keep it going) and some grants from the British Association for the Advancement of Science but when Ewart moved to Edinburgh he was prepared to let both name and equipment go to his successor as part of the paraphenalia of office, though the University does not appear to have contributed to the station's upkeep. However the next appointee was a geologist with no interest in running a marine station. The building remained in Ewart's hands and the name lapsed.

Ewart would almost certainly have made more effort to keep the Scottish Zoological Station going had it not been for the fact that his appointment to the Fishery Board presented him with more exciting possibilities. During his first few years in Edinburgh his ambition was to create a new permanent station, jointly run by the university and the Fishery Board, on the shores of the Firth of Forth, and he continued to

press for such a home for the Board's scientific work throughout his connection with it. Two obstacles initially stood in his way. One was the announcement by John Murray and the Scottish Meteorological Society in the summer of 1883 that they intended to use the £1600 surplus generated by the Edinburgh Fisheries Exhibition of 1882 to expand the fisheries research which had been undertaken by the society during the previous decade, and specifically to found the Scottish Marine Station for Scientific Research at Granton on the Forth which opened in early 1884. There is no doubt that Ewart found this development frustrating since his own plans were failing to materialize due to the second obstacle which he had underestimated, and which in fact was far more serious. This was the Board's financial situation and the fact that any new expenditure was going to have to be met either out of its existing scanty resources or be sanctioned by the Treasury. The new Board's terms of reference were to 'take cognisance of everything relating to the coast and deep-sea fisheries of Scotland, and take such measures for their improvement as the funds under their administration and not otherwise may admit of.' Its funds came from the herring brand fee and were used to pay the Fishery officers. The surplus, which in 1882 came to £2,300 was used with the government grant for the purpose to build and repair harbours and instal telegraphs, both urgently needed by fishing communities to reduce the risks of a dangerous calling. Boats were increasing in size and could only be used if adequate harbours were available. If scientific observations were going to claim a share of this money they were going to have to prove their practical worth, or the government had to be persuaded to think again.

In looking at the work carried out during these years it is necessary to remember that at that stage there were strong hopes that sea fish could be farmed as successfully as was proving possible with freshwater fish, or at least that the sea could be restocked by releasing millions of artificially hatched and reared young fish. This also lay behind the interest in finding out about the development of young fish, the stages they passed through from egg to adult, the food they needed at different stages, their migrations and their natural enemies. Because fisheries research was already well established in the United States and in several European countries it was not a question of launching in blindly and Ewart himself made extensive visits abroad during the first few years of his membership of the Board in order to see what was being done elsewhere. Meanwhile a scientific investigations committee of the Board was set up early in 1883, consisting of himself, Maitland and two others, and they consulted T.H.Huxley, who had served on Royal Commissions and was currently one of the salmon fishery inspectors (MacLEOD, 1968). He recommended that they begin with studying the natural history of the herring and a request was therefore made through the Home Department for the loan of a steam pinnace from the Admiralty. This was turned down but a repeated request resulted in the offer of the fishery protection vessel, H.M.S.*Jackal*, for the month of August. The Admiralty supplied hydrographic equipment but Ewart had to pay his own expenses and that of his assistant. The work was carried on off the north-east coast of Scotland and the building of the Scottish Zoological Station, still in its final resting place on the shore of the Cromarty Firth not far from Romanes' summer home at Geanies, was used for the laboratory work.

As a result of the first season's work the Board applied for the sums of £1,200 to build two small laboratories, one on the east and one on the west coast, and £1,000 to finance scientific work in the coming year. This was quite big money by contemporary standards and the demand was the more audacious for seeking it as a special grant, over and above the Board's own revenue. The initial reaction of the Treasury was to refuse any more money, from whatever source, for the remainder of that financial year and the next but Steven Williamson, M.P. for St Andrews and a member of the Board, persuaded them to change their minds and allow up to £600 from the herring brand fee surplus to be spent on scientific research, and this was renewed for the following financial year (1884-85). However the scientific investigations committee renewed its request for a larger grant, and for special facilities, including not only laboratories but replacement of the existing fishery protection vessels by ships more suitable for scientific investigation. Astonishingly, the Treasury did an about turn and in September 1884 agreed to the special grant of £1,000 (this was increased to £1,500 in 1885) and in principle to the replacement of the vessels. This apparent change of heart was due to pressure being brought to bear in favour of a grant towards the building of the Marine Biological Association's Laboratory at Plymouth and fishery researches there, but as MacCLEOD (1970, p. 148) shows this even-handedness was made in the belief that both organizations would fail in their objectives, thus enabling grants to both to be brought to an end. In fact the Board's committee had been without funds through the summer of 1884 but Ewart himself hired a small steam yacht and carried out a variety of projects in the Cromarty Firth.

Expansion of the Fishery Board's research in the late 1880s

These developments were overshadowed in 1885 by the accretion of new powers to the Board under the Sea Fisheries (Scotland) Amendment Act. Hitherto the scientific work envisaged by the Board had been wholly directed towards studies of the fish themselves, their development from egg to adult and food preferred at different stages, together with studies of commercially important shell-fish, including mussels, the preferred bait species, and the physical environment in which they lived. Now the task of assessing the effects of trawling was to be added to its duties. Writing only at the end of this decade the future director of the Board's scientific work, Thomas Wemyss FULTON (1889), referred to the 'official inertia and unenlightened obstruction' encountered by his predecessors. In fact, though the work had to proceed on a stop-start basis during the first years, and sometimes later, for lack of ready cash, a great deal was achieved very rapidly when compared with the slow growth of comparable institutions, because of the comparatively generous sums available. As a result, during the mid-1880s the Board's scientific work expanded quickly, both in terms of manpower and equipment. It now became possible to engage scientists and provide premises for them to work in. In January 1885 George Brook was appointed scientific assistant to work on the west coast herring and a small field station was constructed for him at Tarbert on an inlet in the Firth of Clyde. He and Ewart also made use of the facilities at the Rothesay Aquarium.

However, even before acquiring laboratories of their own, the Board had begun supporting an external institution. This was the Marine

Laboratory at St Andrews (McINTOSH, 1888) established by W.C. McIntosh (GUNTHER, 1977) as a result of the work of the Trawling Commission. McIntosh had only recently been appointed professor of natural history at his old university, but his dream of founding a marine laboratory went back to his student days. However, the university had no resources to finance such an undertaking and the opportunity did not arise until he was invited by Lord Dalhousie to undertake observations on behalf of the Trawling Commission which was seeking to establish whether, as line fishermen claimed, trawlers were adversely affecting the supply of fish. McIntosh took over a disused fever hospital to use as a base but he would have been unable to complete its conversion into a laboratory, and to maintain it for future use, had it not been for a series of grants from the Fishery Board, who also paid the salary of an assistant to work on fisheries, from 1884 onwards. It is the more surprising that the Board should have agreed to make these payments out of resources it considered inadequate for only a few months earlier they had turned down a request, forwarded by the Treasury, to assist finance fisheries research at the Scottish Marine Station. Later (LEE, in press) they tried to do the same to the Marine Biological Association, but this time were overruled by the Treasury.

The Trawling Commission report had recommended that as there was evidence of a decline in flat fish and haddock on the east coast, further research should be carried out and powers were given to the Board to close off areas of inshore waters to trawlers so that they could compare the progress of fish stocks in the open and closed areas. Initially these areas comprised the Firths of Forth and Tay, and stretches of water off St Andrews and Aberdeen. In order to carry out the work the Board acquired a ship, the *Garland*, and additional assistants. In 1886 the scientific work was divided into two sections, with George Brook as superintendent of the west coast work and J. Duncan Matthews on the east coast, with W.L. Calderwood as naturalist. Ewart and Maitland remained in overall charge under the Board.

At this point there was a chance that the work might have settled into a pattern and gone on smoothly. Unfortunately this did not happen, for a variety of reasons. Finance continued to be a problem, principally because the *Garland*, which proved not entirely well suited for its task, cost more to maintain than had been budgeted for. Also the closing of waters to trawlers was a highly controversial measure and attracted much criticism, especially from trawler owners, when the closures were maintained over the years and actually increased (the 1889 Herring Fishery (Scotland) Act closed the whole of Scottish territorial waters, and the matter was raised in parliament on more than one occasion. There were problems too with staff - all the scientists originally employed resigned and were not easy to replace. Partly because of this the Tarbert Laboratory was abandoned and shortly afterwards burnt down. Some members of the Board came to feel that there was a problem both in the way the scientific work was being run and over accountability. Their proposal that a salaried official should be appointed to take charge was adopted by the majority but Ewart and Maitland sent a letter of dissent to the Secretary for Scotland, the Marquess of Lothian, and he persuaded the Board not to proceed, since the five years for which members had been appointed would shortly be up. In fact the disagreement was patched up and the scientific arrangements were continued without any major changes until 1889, though future alterations

were foreshadowed with the appointment of T.W.Fulton as scientific assistant and secretary to the scientific report committee in 1888.

An era of reorganization and change, 1889 to 1899

When the Fishery Board had been reappointed at the end of 1887 the arrangements for scientific research had been left little changed, with a small committee in charge of both work and expenditure. However, the problems encountered earlier now came to a head and in 1889 a further committee was appointed by the Board to report on the state of the scientific work. It recommended that the scientific report committee should be discharged and that the work should be continued under the direction of Fulton who would henceforth be responsible directly to the Board. The crisis came at a time when the Board was trying to persuade the Secretary of State and the Treasury of the value of setting up a fish hatchery and laboratory at Dunbar at the mouth of the Firth of Forth. Ewart had not lost sight of his scheme for a more permanent home for the Board's work and was also anxious that they should carry out work on the hatching and release of sea fish along the lines pioneered in the United States by the U.S. Fish Commission and elsewhere. However, it appears to have been the discrepancy between his enthusiasm for research and his administrative talents and judgement that seem to have lain at the root of the trouble, though the effects of this had undoubtedly been exacerbated by the lack of an adequate framework for advice and control of the research. It was characteristic of Ewart that, though apparently aware that something was wrong, he did not see the problem this way and was always pressing for even greater autonomy than that which he already enjoyed. For example when referring to work in America he wrote: 'By having absolute control of the fishery work, Professor Baird has had striking successes in fields where a timid Board would never have dared enter.' (REPORT, 1886, 5: 234) He was impatient of bureaucracy and many of the complaints against him involved failure to follow routine procedure when spending the Board's money, sometimes without even informing his colleagues. Ewart was unable to see the force of their objections; indeed he felt hard done by, pointing out that he had spent his own money and also made university resources freely available for the work of the Board. In fact the outcome had been just the kind of self-indulgent behaviour that many had feared if research funds became freely available. While no one doubted that hard work and valuable additions to knowledge had resulted from the efforts both of Ewart and of the salaried scientists employed by the Board during the 1880s, there had been a lack of overall direction which had resulted in continual shifts of emphasis and subsequent waste of resources on a substantial scale. The investigating committee concluded (SCOTTISH RECORD OFFICE, AF.37/185, draft dated 24 December 1889) 'that if a systematic plan had been originally adopted and adhered to, the Board would now have been in possession of at least one thoroughly equipped Laboratory for scientific fishery work.'

The 1890s proved a decade of transformation for the scientific work of the Fishery Board for Scotland during which it left behind the somewhat turbulent events of its formative years but still had troublesome waters to navigate before reaching the haven of a more settled existence in its permanent laboratory at Aberdeen. Under the competent scientific direction of Fulton the day-to-day work proceeded more smoothly, but there were still many problems regarding both its organization and operation to be sorted

out. Though Ewart ceased to be associated with the Board, and indeed abandoned marine science altogether, his plan for the hatchery and marine station at Dunbar was continued, frustrating McIntosh's hope that the Board would chose St Andrews as its scientific headquarters. However, for a variety of reasons the site was not satisfactory and the station was never completed and it eventually became clear that the only solution was to move again. In 1897 Fulton recommended they should cut their losses and transfer all the equipment to a site where the Board's scientific staff could be united for the first time, adequate enclosures could be made, and with access for their sea-going vessel. It was John Murray, a member of the Board from 1896, who proposed the move to Aberdeen which took place two years later. However, the work on the trawling question was still involving it in controversy on a wider scene.

Results of the Board's early work - the trawling experiments

During the early years of the Board's scientific work a considerable amount of effort had been spent in questioning fishermen about the effects of trawling and other methods, but the results were generally inconclusive. A report published in 1888 observed that the 'fishermen, as a rule, seem to have made up their minds that certain modes of fishing are injurious' - usually those followed by their commercial rivals. Nor was it a simple matter of the rest versus trawlers. For example, 'the seine net fishermen of Campbeltown insist on the great injury done by the trammel net fishermen who work on the Ballantrae banks, while the Ballantrae fishermen believe that the use of the seine nets on the banks is ruining the herring fishery.' At first it was hoped that the trawling experiments would settle the major question in an unambiguous manner. In 1887 the Board (5th REPORT, p. lxxiii) reported that:

> Evidence already collected seems to indicate that, by regulating the trawling in the territorial waters, they will in the course of time yield more mature fish, and serve as nurseries or feeding grounds during certain months of the year for shoals of herring, haddock, cod, and other valuable fish.

However, the early results, which showed an increase in the number of round fish and a marked increase in the number of flat fish in some of the protected areas, proved in the longer run to be somewhat exceptional, and scientists were far from unanimous about their interpretation. W.C. McINTOSH (1899; 1907, p.12), who became a severe critic of this aspect of the Board's work, believed that the whole premise on which it was based had been mistaken, that no real decline had taken place and that 'the marine food-fishes are able to withstand man's interference'. However, Walter GARSTANG (1900) who had undertaken similar work on statistics for England and Wales on behalf of the Marine Biological Association found that they exhibited 'a melancholy unanimity'. While agreeing with McIntosh that some of the methods and conclusions of the Fishery Board were open to question he arrived at the inescapable conclusion that bottom fisheries were not only not inexhaustible but were already being exhausted. One or two species, especially dabs which were inshore spawners, had increased as a result of the Scottish closures but he agreed with Fulton that even in these waters there had been a general decline due to overfishing by trawlers on offshore grounds.

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Conclusion

The Scottish Board was far from unique among British institutions for marine science in going through teething problems in its early years. It was howeverunique in that these problems stemmed at least partly from having too much money at its disposal, instead of the reverse as was usually the case. It would be unfair to blame either the scientists or the non-scientific members of the Board exclusively for things going wrong. The government departments concerned had acted responsibly according to their lights but both sides had still a lot to learn about the administration of institutional science. The reluctance of successive governments and civil servants to grasp the nettle of state support for science meant that they were liable to be overtaken by developments instead of initiating or guiding them. Perhaps it may be argued that this is a perennial situation; certainly reconciling scientific creativity with external organization remains problematic. In this case however it does seem that the Treasury's low expectation of science and scientists was partially self-fulfilling. They expected inefficiency and that was to a certain extent what they got for not trying harder to promote better mechanisms of communication and co-operation both between scientists and between scientists and the rest of society. It would be quite wrong however to blame them entirely for this; their attitude was not wholly cynical and one or two tentative suggestions were made for better co-operation, only to be thrown out by the scientists. Much official expectation concerning science, and also much of the anxiety about such things as duplication of effort, betrayed a lack of understanding of the scientific process, which seems both to have affected the reactions of the scientists themselves and made civil servants, perhaps somehow aware of their own shortcomings, reluctant to press their conclusions.

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FISHERIES PROTECTION CONVENTIONS IN THE NORTH SEA: FROM SCIENTIFIC DISPUTES TO THE FOUNDATION OF ICES IN 1902

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1. Introduction

The International Council for the Exploration of the Sea (ICES) was founded in 1902 by Denmark, England and Scotland, Finland, Germany, Netherlands, Norway, Russia and Sweden. Its aim was to prepare for a rational exploitation of the sea on a scientific basis. The seas in question were the North Sea, Norwegian Sea, Barents Sea, White Sea, English Channel, and the Baltic.

The president of ICES from 1966 to 1969, Arthur E. J. Went, has written a history of ICES, published in 1972. He begins his book with the following words:

> In the middle of last century there was a firm belief in the inexhaustibility of the seas. So great were the resources of the seas, many people believed, that with his existing methods of capture MAN could hardly make any impression on them. However, with the great expansion in the trawling fleet and the introduction of steam propulsion and the otter trawl many thinking scientists had other views. In fact some were satisfied that overfishing was taking place.

If we look into the details of the scientific disputes on overfishing, we find that the arguments were not always independent of the fisheries interests of the competing countries. Some of the scientists involved were even employed by their national fishery agencies. Others seem to have used the question of overfishing to gain governmental support for marine investigations on a purely scientific level. The interrelationship of these different approaches shall be outlined in this paper.

I have mainly used German sources. Therefore, my view is restricted to how the question of overfishing was dealt with in Germany. I think, however, it is representative, since Germany played an important part in the foundation of ICES, as may be taken from the fact that its first president was Walther Herwig, president of the German Sea Fishery Association.

2. The Growing Fishery Industry

Up to the middle of the 19th century fishery in the North Sea was restricted to coastal areas. Since then the introduction of steam power -- first to handle larger fishing nets and later also for ship propulsion -- enabled the fishermen to catch more fishes and to go to more distant regions. Consequently, more fish was brought to the markets, the prices dropped, fish became a common food especially for the poor, and the fishing fleets enlarged. Fishery became a new industry, which included the fishing activities in the open sea as well as the transportation of fish, its processing, distribution and selling in specially-built market halls around the coast but also in the bigger cities, and further the production of fishing gear and the building of new ships.

However, parallel to the increasing industry it was recognized that the fishing effort per catch began to decline.

TABLE 1

Annual Catch (in Tons) of a Trawlsmack

(LUNDBECK 1977 after GARSTANG 1900)

	"prime"	plaice	haddock	rough	total
1860-67	12	45	37	2	96
1875-84	4	19	30	3	56
1885-92	3	11	23	4	41

("prime" = best-paid flat fish)

In order to face this development, the size of the mesh was reduced to catch also smaller fishes, which were sold as fertilizer in agriculture.

In this scenario the introduction of a new fishery method, the beam trawl, played an outstanding role. It enabled the fishermen to clean up fishing grounds actively while the common methods up to then were of passive character -- line and net fishery. Trawling was claimed to interfere with and destroy the other gear, which only drifts in the sea.

3. Germany Enters the Scene

In the late 1860s influential circles in Berlin began to recognize the low level of German fish production, in rivers and lakes as well as off the coast in the North Sea and the Baltic. At that time, only one percent of the seafood consumed was caught by German fishermen; the rest (99%) was imported from the Netherlands, England and Scotland. By founding the German Fishery Association (Deutscher Fischerei-Verein) in 1870 they started an initiative to raise this matter as a national problem. The crown prince of Prussia took the patronage.

In contrast to other countries, this national association was a body run neither by fishermen and their local unions nor by the government, but by individuals, although many of them had high government positions. It might be said that they had been prompted by Enlightenment ideas, which were certainly influential in circles of higher education in Prussia in those days. However, national political and capitalistic interest was another reason, to be sure, as some of the members were great landowners who looked for governmental support in the attempt to diversify their agricultural production.

In its first years, this association focused its activity on freshwater fishery. With increasing effort in the support of that branch they turned their attention towards sea fishery and, on the initiative of Walther Herwig, a special section for coastal and high sea fishery was founded in 1885 (SMED 1989). The main objectives of this section were:

--to build little seaports along the coast;
--to establish an insurance policy;
--to train recruits;
--to improve transport facilities.

However, already in the founding year, the Deutsche Fischerei-Verein succeeded with the appointment of a governmental commission for marine investigations in the interest of sea fishery. It was named "Königlich Preussische Commission zur wissenschaftlichen Untersuchung der Deutschen Meere," and it was founded in Kiel. From the beginning, the most prominent member of the commission was Prof. Victor Hensen, who pushed its work into basic investigations of the marine environment as well as into fisheries statistics by recording and analyzing the catches of German fishermen. The commission members, although only honorarily active and without institutional backing, laid the foundation of German sea fishery research (KÖLMEL 1989).

4. Dispute on Overfishing and Call for Protection Conventions

Already in 1864 a governmental commission was set up in England to investigate complaints against trawl fishery. The result was negative. No evidence could be found either of destruction of the fish spawn or of a reduction of fish stock (HEINCKE 1886). Therefore, the commission recommended even "that all Acts of Parliament which profess to regulate, or restrict, the modes of fishing pursued in the open sea be repealed, and that unrestricted freedom of fishing be permitted hereafter" (RUSSELL 1942).

One of the earliest records on fishery problems in Germany was an accusation published in 1873 saying that more than 300 English fishing boats were fishing off the island of Helgoland, and that they would destroy the hatch of fishes by using too small meshes of the nets. The absence of international regulations for the protection of the hatch was complained of (ANONYM 1873).

The rapidly growing fishery in the North Sea forced the surrounding countries to agree on a North Sea Convention in 1882 which was signed by

Belgium, Denmark, France, Germany, Great Britain and the Netherlands. Its main objects were the definition of territorial waters (3 miles), registration of fishing boats, orders in case of conflicts between fishermen using different types of gear and superintendence by fishery protection vessels. Norway and Sweden did not sign this convention. They had demanded a limit of 4 miles.

As the lamentations of British line and net fishermen against trawling increased, again a governmental commission was set up in 1883 to prove the facts (Huxley, Prady, McIntosh). The results of their investigations on the effect of trawling and their recommendations were (HEINCKE 1886):

--Only few young fishes were caught; however, the meshes in the cod-end should be enlarged.

--Spawn cannot be destroyed, because it floats near the surface.

--The food of the fishes can scarcely be destroyed, because the benthic organisms live in deeper levels of the sediment.

--Repeated trawling on the same ground is very harmful, because it can lead to exhaustion of the fishing ground. However, for economic reasons fishermen will leave before exhaustion takes place.

--In coastal areas a reduction of fish stock can be recognized, which might lead to overfishing. Here, an inexhaustible abundance of fishes can no longer be thought of. However, great worry is not necessary, since the stocks will quickly recover, if sensible restriction takes place.

--In the open sea, rather, a rise of stock can be observed. Sudden decreases in single areas may have natural causes like changes of water temperature or currents.

They concluded that high sea fishery has a future. But there is a need for more scientific investigations and more precise fishery statistics.

In a paper on sea fisheries in the years 1869 to 1879 the German author M. Lindemann (1888) criticized that fishery statistics prepared in the different countries were not comparable.

The German fishery biologist Friedrich Heincke visited fishery organizations in Denmark and Sweden in 1887 and he reported a growing consensus that rational exploitation of the sea would need international cooperation and scientific exploration (HEINCKE 1887).

However, in the next year, Heincke published an article in which he stated the scientifically accepted fact that the shallow North Sea is much richer in fish than an equal area in the deep ocean. Here he expressed his opinion that scientific investigations would not be necessary until a real decrease of fish stock were evident in the North Sea. Therefore it would

be wrong for Germany to restrict its trawling activities. Further on he argued that in case of evident decrease of the stock it must first be scientifically proved whether this were caused by overfishing or by another factor. If the first were the case, then this could also be faced by hatching fish eggs and breeding larvae, a method which was already introduced in freshwater fisheries. Coastal areas, where spawning is found, should be protected. In these statements Heincke followed the British arguments in the main (HEINCKE 1888).

The Belgian cod catches dropped from 11.4 thousand tons in 1874 to only 1 thousand in 1886. Also in Scotland a decrease of fish stock was registered off its coast. Investigations on the migration of food fishes were demanded (ANONYM 1888).

In 1890, the British National Sea Fisheries Protection Association called for an international conference in London. Besides other topics it was proposed to close the region off the German and Danish coasts for all fisheries. This attempt was refused by the German delegate Victor Hensen with the argument of lacking scientific evidence that this region would be the only nursery ground of the main commercially-used species in the North Sea. In Germany, Hensen was given credit for his success that this "terrific" proposal was not put to a vote. As a consequence it was postulated to increase the German fishery in the North Sea as fast as possible in order to strengthen the German position when international regulations could no longer be avoided. Herwig used the words "not be a gnome between monsters". He even forced his association to suppress complaints, since they could support protection regulations. On a proposal of Heincke the association concluded, "International protection regulations of any kind seem to be too early at the present and only suited to handicap the growth of the German high sea fishery". They knew that this argument could contribute to overfishing. But to guarantee the maintenance of the growing German population with protein there was an urgent need for developing a German high sea fishery in order to become independent in the supply of fish food.

There was still another conflict to be solved, the rivalry between German sailing and steamship fishermen, and the government was asked to find out if the use of steam power influenced the situation in the North Sea -- a question which had already been brought up in Great Britain some twenty years before (LINDEMAN et al. 1890). However, there is no evidence that the German government had reacted on this request. It seems that there was no interest in looking for arguments against the progress of steam power.

After Great Britain had ceded the island of Helgoland to Germany the Königliche Biologische Anstalt auf Helgoland (Royal Biological Station) was established in 1892 with Heincke as its first director. It was thought to be an experimental station for mariculture such as the stations in Plymouth/England, St. Andrews/Scotland, and Woods Hole/USA, with the aim of developing a rational exploitation of the living resources of the North Sea, to explain rapid fluctuations in fish stock and hopefully to get a sustained fish supply for the fleet. Investigations were planned which should lead to the right measures for the protection of food fish.

For example, in the Marine Biological Association in Plymouth (Cunningham and Holt) the question was brought up which are the suitable mesh sizes. Should every fish be allowed at least to spawn once, then the mesh size would have to be oriented on the smallest spawning specimen. However, it appears that juveniles are sometimes larger than those and, therefore, one would have to agree on an average value. The German fishery biologist Ehrenbaum at Helgoland did not like rigid solutions. He argued for a more differentiated system like selecting closed areas according to the condition of the ground. Of course, the knowledge on this was not available by then. It seems merely to be a pleading for more investigations of basic character on the one side and, secondly, he tried to turn away the British idea from preserving the whole interior region of the German Bight ($\leq$40 m depth) as a hatchery ground (HEINCKE 1894).

In 1894, motivated by the same reason, Heincke supported the view of Fulton from the Fishery Board for Scotland that the fish stocks were locally restricted. In the case of herring he himself was able to distinguish different races migrating in certain regions only. He too called for more scientific investigations, which should be organized internationally, before preservation grounds are established. He feared the ruin of German fishery and, therefore, he was also against close seasons, because each species would have different spawning times -- different also from place to place. As a first step to international regulations he proposed to extend the territorial waters from 3 to 12 miles which would enable the nations concerned to contribute to the preservation of young fishes by national laws (HEINCKE 1894).

One year later, the co-worker of Heincke at Helgoland, E. Ehrenbaum, reviewed a report by Hoek from the Netherlands, in which Hoek stated that the minimum size of fishes, which had already been introduced in some countries by legislation, were much too small to be effective for protection purposes. This would even have the effect, that the fishes sold were now smaller than before these regulations were introduced. In this context he cited a remark of Huxley and called them "golden words". Huxley should have said "One who is not absolutely convinced of the efficiency of a protection regulation proposed by him, should be more punished than one who is violating it" (EHRENBAUM 1895).

In 1894, the section guided by Herwig became independent as the German Sea Fishery Association (Deutscher Seefischerei-Verein). At its third annual meeting, guest delegates were invited from Belgium, Denmark, France, the Netherlands, and Scotland. Heincke started a great accusation against trawling, blaming it as enormous robber-fishing, while land cultivation is practiced since centuries already. He explained, "Hundreds of thinking men, namely in England, raise already their warning voice to stop the senseless extermination and to be moderate. However, thousands of other voices praise the inexhaustibility of the sea and they won't hear either of preservation regulations or of any other restriction on their operations." He did this certainly to draw more attention to the work of the scientists. As international negotiations on protection regulations would depend on specific knowledge of the life of the fish, their behavior and also of fishery statistics, the most important role should fall to scientists. They would need much more financial support, because "the sea is large and it can't be tackled with little money" (Heincke 1896).

The scientific dispute on the question of overfishing culminated in Britain in 1899 on the eve of handing over the problem to an international board, which was already negotiated. In an extensive study, McIntosh (1899) in Scotland tried to furnish evidence that man is not able to affect the fish productivity of the sea by fishing methods capable to him. This opinion was criticized by Garstang (1900) in England, who stated that bottom trawl fishery was facing a rapid ruin, although not equally regarding different species of food fish. In Germany, the view of Garstang was favored, calling McIntosh's analysis a violence on the statistics (EHRENBAUM 1901).

4. To the Foundation of ICES

The problems of the fisheries in the North Sea were not only dealt with by biologists, but also oceanographers who tried to find answers for the appearance and sudden disappearance of fish shoals. Outstanding examples were the investigations of Norwegians (G.O. Sars, J. Hjort), Swedes (O. Pettersson, G. Ekman), and Scots (H. R. Dickson, T. W. Fulton). In 1893/94 they had started to coordinate their work internationally, and at the Sixth International Geographical Congress held in London in 1895 a scheme was supported which was proposed by Pettersson.

After correspondences with Fridtjof Nansen and Johan Hjort of Norway, John Murray and H. W. Fulton of Scotland, P. P. C. Hoek of the Netherlands, and Walther Herwig of Germany, Pettersson asked the King of Sweden to call for a conference to establish regular international investigations in the interest of fisheries. This meeting was held in Stockholm in 1899.

In the same years the German Sea Fishery Association was active in initiating an international commission for investigations on the problem of overfishing. In a confidential meeting in 1897 a plan was outlined with Hoek from the Netherlands and in the same year the German government was asked to call for an international conference in Hamburg or Bremen. As the Swedish plans seemed to gain more backing, the Germans gave up their initiative. Instead, they tried to introduce the overfishing problem into the Stockholm conference with success, making their participation dependent upon this (ANONYM 1904). On July 22, 1902, ICES was founded with Walther Herwig as president, Otto Pettersson as vice-president, and P. P. C. Hoek as General Secretary.

The program of ICES was to conduct hydrographic, biological and fishery statistical investigations by international cooperation. To perform these, three commissions were set up:

A: Committee on Migration of Food Fishes
B: Committee on Overfishing
C: Committee for the Baltic

However, it took until 1937 for an international convention to agree on protection (Overfishing Convention of London). Regulation of net mesh sizes was thought to be the proper measure for rational exploitation of the living resources.

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THE SEA AS A RESOURCE:
THE CASE OF DEVON SINCE 1780

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The paper below illuminates some of the principal ways Devon men and women have made use of the sea - both local and distant seas - as a resource, as a means of transport and of employment and income, in the two centuries since the 1780s. It also deals with the transitions, the growth and innovation as well as actual decline, that have occurred, and the factors underlying these changes. These maritime interests may be summed up as mercantile - coastal as well as foreign trade, shipowning, shipbuilding and ship repair; fishing; naval activity; and, especially from the Napoleonic War and increasingly as time has passed, seaside tourism. This last activity justifies its place among the more traditionally-judged maritime activities examined, by its essential sea-relatedness.

The paper is presented in the form of an introductory overview that is currently being prepared for Volume II of the 'New Maritime History of Devon', which is to be published in two volumes in 1991 by Conway Maritime Press in association with the University of Exeter. The volumes are the product of a substantial research project at the University of Exeter over the last four years;[1] this overview draws on the work of the numerous contributors to

Volume II. The author here wishes to express his indebtedness to their findings.

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As is shown in detail in the contributions to Volume II of the 'New Maritime History of Devon' some of the traditional maritime pursuits of Devon, that is trade - coastal and foreign - and shipowning did undergo further expansion from the late eighteenth century to the onset of the First World War: shipbuilding, however, reached its peak in the 1860s and then underwent absolute decline in the tonnages launched. The commercial transactions carried on with other parts of the United Kingdom and abroad, inwards and outwards, had great variety and exhibited considerable change over this period to 1913, woollen textiles in particular falling away as exports in both home and foreign trade, while ball clay emerged as a notable export. Such commerce required substantial volumes of shipping, and the county's shipowners built up and maintained during this period to 1913 fleets of wooden sailing vessels. Furthermore, a sizeable tonnage of Devon-owned merchant shipping was also employed in the trades of other British ports, both coastal and foreign. This non-Devon-related carrying business indeed offers striking testimony to the liveliness of Devon's shipping enterprise at this time. As a result the period to 1913 was also one of distinct activity in Devon's shipbuilding and ship-repair industry, although shipbuilding tonnages of wooden sailing vessels failed to expand after the 1860s. Never organised into large-scale enterprises, the county's shipbuilding was located in all the main ports and estuaries, where a range of sailing vessels were constructed, most notably

perhaps the celebrated merchant schooners of the age. However, important as these Devon trading, shipowning and shipbuilding activities were in the nineteenth century, they were overshadowed by the remarkable commercial, shipowning and shipbuilding growth occurring in other British regions. As a consequence, Devon's foreign seaborne commercial transactions as a proportion of national foreign trade began to decline from the 1860s, although coastal trade held its share of national coastal trading transactions until about 1905. Devon's registered shipowning also held its share nationally until 1913, but the county's shipbuilding as a share of the national total declined quite sharply from the 1860s. This latter decline reflected very much the fact that neither the county's mercantile shipowning nor its shipbuilding figured to any significant extent in the mid-nineteenth century national transition to iron-built and larger vessels and the turn to steam engines for propulsion.

Actual decline in Devon's seaborne trading and its shipowning appears to date from the First World War, when enemy action had devastating effects on seaborne trade and many locally-owned vessels were either destroyed or laid up, although for some vessels this was a time of intense activity. In the inter-war years movements in maritime trading activity more or less responded to the timing of the United Kingdom trade cycle, with Plymouth standing out in terms of tonnages of cargo handled and their variety as it had done over the previous century. Neither shipowning nor shipbuilding, however, showed any real sign of revival in Devon between the wars, although a few shipyards, notably in Dartmouth, continued to produce significant numbers of vessels, modern in design but invariably of relatively small tonnage. After the Second World War, and especially in the 1960s and 1970s, there was some recovery

in Devon's maritime trade, notably in the expanding ball clay shipments from Teignmouth, in the development of 'roll-on, roll-off' traffic with Brittany at Plymouth, and at various ports in agricultural products and fertilisers. In shipbuilding the outstanding growth point was the re-establishment of a highly successful shipyard at Appledore in North Devon in the 1970s, which for a number of years was a world leader in its covered factory system of production.

Devon's other notable traditional maritime pursuit in earlier times had been the fishing industry, both off-shore and in distant waters. Here the modern story is one of marked vicissitudes but of essential continuity and even success. In the second half of the nineteenth century Devon's local fisheries in fact underwent significant growth, the leading fishing centres of Plymouth and Brixham enjoying much prosperity. The inter-war years, however, were generally difficult for all fishing communities in the county, but from the 1950s onwards there has been a return to high activity and prosperity. Devon's other historic fishing interest was the Newfoundland cod fishing off the Grand Bank. Here the involvement of Devon-based fishermen in the actual fishing for the codfish virtually ceased in the Napoleonic War as the Newfoundlanders themselves came to man their own fishery. Instead Devon merchants and shipowners devoted their Newfoundland-related energies to a carrying business in dried cod to Southern European markets. For a hundred years or so, until this business died out just after the First World War, Dartmouth, Salcombe, Bideford and other Devon owners of the fast topsail schooners so employed earned useful incomes, these shipping freights being an important part of their impressive Atlantic and Mediterranean carrying interests.

In contrast to the mixed fortunes of the mercantile and fishing interests of the county over the nineteenth and twentieth centuries, stand the two maritime and maritime-related success or growth stories of the period since 1780. The first was the continuing and indeed generally increasing interest of the British Admiralty in Devon ports, and most particularly Plymouth, both as a base and as a shipbuilding and repair facility for the Royal Navy. Much expansion and modernisation of Plymouth's facilities occurred overall over the nineteenth and twentieth centuries. Plymouth Dock (renamed Devonport in 1843) began the period as one of the three principal Royal Navy dockyards, alongside Portsmouth and Chatham, but by the 1980s Plymouth/Devonport had assumed a clear position of primacy. Admiralty interest in Devon is also seen in its choice as a fitting location for advanced naval education and training, for officer cadets at the naval college at Dartmouth from the 1880s, and shortly after for naval engineering training at Keyham and later at Manadon, both within the boundaries of Plymouth. Increasingly over the twentieth century basic training for the Royal Marines (at Lympstone on the Exe) and naval ratings (at Plymouth) has been concentrated in Devon too.

The other outstanding Devon maritime growth story of modern times, seaside tourism and other sea-related leisure activities, had its beginnings in the royal and aristocratic patronage of Sidmouth and Dawlish, Teignmouth and Torquay in the last decades of the eighteenth century. Through the nineteenth century the social basis of seaside tourism broadened as the middle classes began to travel to the Devon coasts in growing numbers, from Bristol, the Midlands and London. From the later nineteenth century too the south Devon resorts began to be rivalled by the later-developing north Devon

resorts, particulary Ilfracombe. The twentieth century has seen a further broadening of the tourist clientele, and, especially from the 1920s and even more the 1950s, a diversification of this activity into leisure yachting and other forms of small boat pursuits. Devon in the last two centuries then was in the van of English maritime counties, although in a rather more socially select way than most, in developing and responding to the Englishman's and his family's modern liking for the sea - that is, in the exploitation of the sea, the coastline and maritime communities as a leisure resource. Seaside tourism after 1945 became a key growth point in the Devon economy.

As the contributions in Volume II of the 'New Maritime History of Devon' also reveal, these varied developments in Devon's maritime history in modern times have been the product of a number of factors. They may be summed up broadly as technological, economic, social and political, operating both within the county and in other competing areas of the British economy. Devon in the nineteenth century, it may be said, did not play a leading part in the Industrial Revolution and the continuing industrialisation of Britain. Its previously important woollen textile industries in fact declined greatly from the 1830s with the competition from more technologically innovative regions in the north. And from the 1870s the copper mining interests in West Devon severely contracted, in response to rising costs as the most accessible lodes were exhausted and competition from copper producers elsewhere in Britain and abroad. The virtual absence of any significant new industry in the county requiring large volumes of shipping for transport of production to home or foreign markets - the one exception is the ball clay extraction of the Teign valley - or significant bulky raw material imports - the one exception

here is coal - meant that the economic mainstay for a vigorously expansive, as opposed to a steady growth, of local commerce and the shipowning industry disappeared. This loss of a great productive basis for local trade and shipping compared to the stimuli operating in certain select industrial regions and ports elsewhere in Britain, was reinforced by the relatively slow growth of Devon's population, that is its internal market - there is one exception, again, which was Plymouth - caused particularly by heavy migration out of the county, within England and overseas. Indeed it was very much the traditional enterprise and skill of Devon shipowners and seafarers, and particularly their initiatives in creating a significant carrying fleet for other British ports, that ensured a vital Devon shipping interest was maintained for as long as it was.

The classic Industrial Revolution of the late eighteenth and nineteenth centuries and continuing industrialisation, however, was to bring further blows to Devon's maritime world. The mid-nineteenth century and later transition to iron vessels and the use of steampower for propulsion was, for various reasons, not adopted by Devon's mercantile shipowners and shipbuilders although there were a number of attempts and successful enterprises. The reasons lie mainly in the continuing profitability of the traditional vessels in the case of local shipowning, and, in the case of shipbuilding, in cost factors including poor external economies of scale. So Devon's mercantile shipowning and shipbuilding remained attached to the gradually but inexorably declining technology of the wooden sailing vessel. Moreover, steam, this time in the form of the railways, which came to Devon in the 1840s, was also, in general and gradually, to undermine the local trading world, in the com-

petition it brought to coastal traffic, although the damage done to the coastal trades did not become decisive until the advent of another and complementary major transport innovation, the coming of the motor lorry in the 1920s.

There were two prime exceptions to the generally debilitating effects of British technological change in the nineteenth century for the Devon maritime world. One was the benefits granted to the county's fishing industry by the relatively speedy access the railway system gave to markets in the industrial towns and regions of the Midlands and in London. The second was the constant technological modernisation of Devonport dockyard through large-scale state investment, which is discussed more below as a political factor.

Whilst the onset and earlier phases of the British Industrial Revolution then were essentially stultifying or even damaging to traditional mercantile maritime Devon, the county's sea-related economy has benefited greatly from the later stages of industrialisation, from the maturing industrial economy and society. The rising real incomes of all classes in Britain associated with productivity advance, and the coming of increased leisure, of 'holidays with pay', have sustained the impressive growth of Devon's sea-related leisure industries, tourism and boating of all kinds. Here Devon's broadly 'missing out', as it might be put, on the classic Industrial Revolution, the escaping of its traditional seaside communities and ports, and its beautiful and varied coastline, from the despoiling effects of industrial and urban growth, has proved to be a real bonus for the county.

The last fundamental factor shaping Devon's maritime story in this period was political in nature, and relates to the major and continuing naval involvement with the county. For the Admiralty's persisting need for a major naval base, with significant warship building and repair facilities, close to the western approaches to the Channel, stems from national political decisions or, more exactly, strategic considerations.

Over the nineteenth century as Britain's imperial interests and foreign trade expanded, and as sea power came to be even more crucial in the conduct of British foreign policy, so naval thinking rated bases with ready access to the Atlantic as of prime importance. Continuing Anglo-French rivalry for much of the century also gave priority to this westward focus in naval planning. Rising international tension from the close of the century, two World Wars, and the 'cold war' after 1945 have all maintained the Admiralty's interest in its great naval base and facility at Devonport. So too has the quite recent ending of the age of the large warship, at least for the British, and the turn strategically to increasing emphasis on submarine means of warfare. In this latest era of naval weaponry a 'Western Approaches' base with easy access into the open, broad Atlantic, which Devonport eminently provides, remains paramount. Nevertheless, strategy did not require that British warships in the later nineteenth century and into the inter-war years should be built at Devonport, as many of them were, instead of in arguably more efficient and better-located regions for modern shipbuilding, for instance, the North East or the North West. The decision to do so, which meant that iron and steam-propelled vessels were constructed in number at Devonport, contrasts remarkably with the virtual absence of modern mercantile shipbuilding else-

where in Devon. It can only be ascribed to deliberate decision-taking by central government and the Admiralty, to the acceptance of the need for substantial subsidy for political and strategic ends. It has had the effect of Devonport dockyard remaining throughout this period from the 1780s to the 1980s Devon's largest industrial enterprise, a great factory and workshop sustained by political and maritime factors.

1. In October 1985 the Leverhulme Foundation made a grant to the University of Exeter to assist fund a modern investigation into and reassessment of the maritime history of Devon from the earliest times to the present. The project had three co-directors, Professor (now Professor Emeritus) Joyce Youings, Dr Basil Greenhill (formerly Director of the National Maritime Museum, Greenwich and Hon. Research Fellow in the University), and the present author. Dr David Starkey was appointed Research Fellow, a number of scholars from within and without the University of Exeter were invited to contribute special studies, and subsequently a second Research Fellow, Dr Peter Hilditch, financed by the British Academy, Exeter University, Devon County Council and Bideford Town Council, was appointed for two years, to work particularly on naval history.

PACIFIC RESOURCES, TECHNOLOGY, AND PROCESSING: THE CASE OF THE U.S. SALMON INDUSTRY

by

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PACIFIC RESOURCES, TECHNOLOGY, AND PROCESSING: THE CASE OF THE U.S. SALMON INDUSTRY

Humans first exploited the annual runs of Pacific salmon thousands of years ago. The fish formed a vital part of the diet of the native peoples of the northwest coast of North America and figured prominently in their social and religious customs. Commercial exploitation of Pacific salmon began with the arrival of European settlers, who initially relied on traditional techniques, such as salting, pickling, smoking, and drying, for processing and preserving their catch. In 1864 the establishment of the first salmon cannery on the Pacific Coast introduced an entirely new processing technology, one that ultimately changed the exploitation of this ocean resource in fundamental and far-reaching ways.

All processing methods demand a certain level of technical knowledge. Canning, however, constitutes an inherently industrial technology dependent upon industrial products such as tinplate, solder, lacquer, and labels. The introduction of this industrial technology to the Pacific salmon fisheries transformed the manner in which salmon were caught and processed and irrevocably moved the fishery into the industrial age.

Technology has often been viewed as autonomous, with a deterministic quality and an inherent logic removed from market constraints or other factors that influence the course of an industry's development. In this view technical knowledge inevitably begets machinery, and new machinery inevitably begets more machinery in a continuous process of advancement and progress.[1] The reality is far more complex than this scenario. Technology exerts its influences from within a complex and ever-shifting context of ongoing social and economic change. Factors apparently unrelated to questions of mechanization play a vital role in determining the breadth and character of technological innovation. Additionally, the tendency to view an industry monolithically obscures the often microcosmic nature of technical innovation. An industry such as salmon canning, which operates in several regions within a broad geographic area and that serves a variety of markets is subject to a host of pressures and influences that vary from region to region. Generalizations about the industry can remain a useful intellectual activity, but must be accompanied by a recognition and understanding of the critical role played by local conditions.[2]

Salmon canning offers an excellent opportunity to examine the discontinuous and complex nature of technological innovation and change. The industry played a major role in the economic development of the northwest coast of North America. As late as 1934 taxes,

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[1]Judith A. McGaw, *Most Wonderful Machine: Mechanization and Social Change in Berkshire Paper Making, 1801-1885* (Princeton: Princeton University Press, 1987), 4-10.

[2]Patrick W. O'Bannon, "Waves of Change: Mechanization in the Pacific Canned-Salmon Industry, 1864-1914," *Technology and Culture* 28 (1987): 558-577.

license fees, and other charges levied on the industry comprised nearly ninety percent of the territory of Alaska's tax-derived income.[3]

The physical nature of the Pacific salmon greatly influenced the character of technological innovation. The industry exploited five distinct species with wide variations in size, weight, texture, and oil content. Designers of machinery had to allow for these physical variations, since machinery that processed only a single species, or fish of a single size, ultimately retarded productivity. As machinery became more common on the canning lines machinery manufacturers touted the flexibility of their products and the ease with which production could be shifted between different species or sizes of salmon.[4]

The perishable nature of raw salmon also influenced the efforts of machinery designers. The efficient exploitation of the efforts of fishers required high-speed machinery that could quickly process the catch. Salmon that spoiled on the cannery wharf represented an expense with absolutely no prospect of an economic return.

The life cycle and habits of the salmon also helped determine the character of technological innovation. Throughout the industry's first fifty years fishers could exploit the resource only when the salmon massed into schools and began to migrate towards their spawning streams. These spawning runs largely occurred between May and November, with a wide variation in the precise timing among the various fishing grounds and species. In Alaska, for example the red salmon runs seldom lasted more than four weeks, during which canners had to process their entire year's production.[5] A failure to exploit the runs to the utmost capacity of the cannery resulted in lower returns on the capital already invested in material and labor. This characteristic, like the extreme perishability of the resource, served to place a heavy emphasis on the speed and efficiency of canning machinery.

Canners could predict neither the size nor duration of the annual runs. Certain species, in certain locations, followed definite natural cycles, such as the sockeye that ascended the British Columbia's Fraser River in vast numbers every four years and the pink salmon of southeast Alaska, which followed a two-year cycle. These cycles provided canners with crude guideposts upon which they could base their annual preparations, but for the most part the unpredictability of the runs forced them to gamble that the fish would arrive in sufficient numbers to assure profitable operations. The failure of a run to materialize, or the arrival of fish in numbers far smaller than anticipated, could spell financial disaster. To offset these risks canners endeavored to pack as many fish as possible each season. This resulted, particularly in regions such as Alaska's Bristol Bay and Puget Sound, where the runs lasted only a few weeks, in the construction of canneries with production capacities far exceeding average requirements.

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[3]"Status of the Canned Salmon Industry," in "The Canned Salmon Industry," supplement to *Statistical Yearbook of the Pacific Fisherman* 34 (January 1936).

[4]Dianne Newell, "The Rationality of Mechanization in the Pacific Salmon-Canning Industry before the Second World War," *Business History Review* 62 (1988): 653.

[5]"Where and When Salmon Are Caught," in "The Canned Salmon Industry," supplement to *Statistical Yearbook of the Pacific Fisherman* 34 (January 1936).

The remote location of many canneries combined with the lack of a technology that permitted freshly caught salmon to be transported significant distances prior to processing, placed upper limits on the size of individual canneries. As a result, during the early twentieth century corporate canners seeking to reduce the risk associated with operating in a single locale diversified geographically. The Alaska Packers Association operated canneries near all of Alaska's major fishing grounds as well as on Puget Sound. The British Columbia Packers Association established canneries in the province's northern regions to reduce its reliance upon the Fraser River sockeye runs.[6]

The "common property" nature of the salmon resource, competed for by many and owned by none, meant that no operator could prevent exploitation of the resource by others. This increased the pressure on fishers and canners to exploit available salmon stocks to the utmost of their abilities, since restraint on the part of one operator simply meant that potential profits became actual profits in a competitor's pockets.[7]

The course of technological innovation in fishing and canning are inextricably entwined.[8] Regardless of whether fishers worked as employees of canners or as independent operators, the interaction between these two groups tended to increase the pressure upon the resource. The desire to operate canning lines at maximum efficiency increased the demand for raw salmon. Large catches encouraged canners to increase the speed of the lines to assure that the catch was processed before it spoiled. Fishers and canners pushed and pulled each other to increased levels of production through more efficient fishing methods and increased cannery capacity.

The chronological and geographical development of the industry and the position that the product of a particular canning region occupied within the world market greatly influenced the course of technological innovation. Canners operating in the oldest, most established regions resisted mechanizing operations that affected the appearance of salmon in the cans. British Columbia operators, where canning began in 1866, and Columbia River operators, where canning started in 1867, continued to hand-process their packs long after canners in other regions had fully mechanized their lines. Both the British Columbia and Columbia River packs occupied premium positions within the English market, commanding high prices. In the 1880s, English consumers, long familiar with hand-packed salmon, rejected machine-packed salmon because of the unappetizing appearance of the product in the cans. British Columbia and Columbia River operators, anxious to retain their market position, removed filling machines from their canning lines and reverted to hand-filling. The higher costs associated with hand-filling were more than offset by the threat that machine-packed cans represented to the dominate market position these canners enjoyed in Great Britain.

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[6]Patrick W. O'Bannon, "Technological Change in the Pacific Coast Canned Salmon Industry: 1864-1924" (Ph.D. diss., University of California, San Diego, 1983); Dianne Newell, ed., *The Development of the Pacific Salmon-Canning Industry: A Grown Man's Game* (Montreal: McGill-Queen's University Press, 1989).

[7]Arthur F. McEvoy, *The Fisherman's Problem: Ecology and Law in the California Fisheries, 1850-1980* (Cambridge: Cambridge University Press, 1986), 9-10.

[8]See O'Bannon (n. 6 above).

Labor concerns also influenced American canners' attitudes toward new machinery. The industry quickly became dependent upon a Chinese work force supplied by Chinese labor contractors, but passage of the Oriental Exclusion Act in 1882, barred the immigration of Chinese laborers into the United States. By 1890 labor contractors began to experience difficulty securing adequate numbers of able-bodied Chinese workers. Contractors substituted other ethnic workers, first Japanese, then Filipino, and finally Mexican, but canners considered none of these groups as satisfactory as the Chinese. Skilled Chinese workers exploited this situation by demanding, and frequently receiving, wages as much as double those earned by unskilled cannery labor. In British Columbia the continued availability of Chinese workers, who were not fully barred from the province until 1923, and the availability of an adequate supply of inexpensive native labor freed canners from the need to accommodate the Chinese.[9]

The position of a given region's product within the market, the availability of adequate supplies of inexpensive labor, the intensity of competition for raw salmon, and the relationship of canners to fishers, all shaped the character of technological innovation within that region. In general, mechanization proved a most effective business strategy in regions where the market position of the pack relied upon price rather than quality, where canners sought to free themselves from expensive skilled labor, where no adequate supply of unskilled labor existed, and where competition for raw salmon proved most intense. The Alaskan and Puget Sound regions met all these conditions, and it was in these areas that the mechanization of the industry occurred most rapidly and most thoroughly.

The process of mechanization took place in what may best be described as two waves of innovative activity. During the first of these periods the machinery introduced onto the canning lines largely operated upon cans, rather than upon salmon. Machinery that manipulated cans proved simpler to design, since each can was virtually identical. Canners proved more willing to adopt machines of this type, since they did not affect the appearance of the fish in the can, and therefore did not threaten the market reputation of the product. The second surge of innovative activity centered on machinery that manipulated raw salmon, a more complex engineering task since every fish was different, and a more risky move on the part of canners, since these machines did alter the appearance of the fish in the cans.

Both periods of innovative activity began with the development and adoption of machines that deskilled tasks performed by highly paid workers. Canners sought to undercut the level of skill required to perform these tasks in an effort to rid themselves of workers they considered overpaid and unmanageable. The innovations that followed these deskilling machines onto the lines largely served to replace unskilled workers. They provided significant increases in productivity over the hand methods they replaced.

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Salmon canning's first wave of technological innovation began in the mid-1870s with the introduction of the steam retort. Developed in Baltimore, an eastern canning center, the

[9]O'Bannon (n. 6 above), 181-83, 223-28, 344-53; Newell (n. 4 above), 646.

retort cooked and sterilized the contents of cans using pressurized steam, a significant advantage over earlier cooking methods, which consisted of cooking trays of cans in open kettles of boiling water.[10]

Traditional processing depended upon the specialized knowledge, generally acquired through years of experience, of the worker responsible for cooking the pack. Processors considered this knowledge a valuable trade secret and sought to limit and control its dissemination. In many early canneries the proprietor personally processed the pack. Because of their knowledge, processors commanded higher wages than other cannery workers.

The retort undercut the power of the processors by eliminating the usefulness of their accumulated knowledge. Processing under pressurized steam at high temperatures required a new knowledge, which retort manufacturers generally supplied to canners. The retort effectively deskilled the processing operation and enabled canners to replace highly paid skilled workers with machine tenders.[11]

The retort also offered significant technical advantages over traditional processing methods. The higher temperatures it employed reduced cooking time, offering a potential increase in productivity, while temperature and pressure gauges attached to retorts permitted precise monitoring of the cooking process.[12]

Salmon canners adopted the retort because of both its deskilling attributes and its technological advantages. However, widespread adoption of the new device occurred only after the basic design was modified to accommodate the distinctive conditions that characterized salmon canning. Vertical retorts imported from the East were "charged" by hoisting trays of cans in and out using block and tackle. Salmon canners modified eastern retorts by laying them on their side so that they could be charged using handcarts that were running on rails. This reduced the time and the number of workers required and helped assure that the new device would not reduce labor costs while complicating or hampering production. The brevity and unpredictability of the salmon runs left few canners willing to risk a season's profits on an untested piece of machinery that might impede production more than the craft laborers it replaced.

Like the retort, many of the machines that operated on cans in salmon canneries originated in the eastern United States. However, this pattern of technological diffusion should not be taken to mean that salmon canning functioned solely as a technological client of other sectors of the food processing industry. Virtually all eastern-designed machines underwent a process of refinement and modification before they became widely used. The industry's

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[10]See Andrew K. Shriver, U.S. Patent No. 149,256 (March 31, 1874).

[11]Martin Brown and Peter Philips, "Craft Labor and Mechanization in Nineteenth-Century American Canning," *Journal of Economic History* 46 (1986): 744-47.

[12]Duncan A. Stacey, "Technological Change in the Fraser River Salmon Canning Industry: 1871-1912" (master's thesis, University of British Columbia, 1977), 15; Alfred S. Eichner, *The Emergence of Oligopoly: Sugar Refining as a Case Study* (Baltimore: Johns Hopkins University Press, 1969), 31.

prevailing characteristics demanded machines that operated at high speed, with a high degree of reliability, and that produced few faulty cans. Salmon canning's geographical and physical conditions precluded widespread adoption of any device that failed to operate reliably at high speed, since an inability to quickly process raw salmon, or a catastrophic breakdown on the canning line could jeopardize an entire season's profits. Consequently, Pacific Coast mechanics and engineers tinkered with eastern canning machines to improve their reliability and operating speed.

The retort became a common fixture in many canneries by 1880, creating opportunities and imperatives for innovation at other points on the canning line.[13] The increased output the new device afforded over traditional processing methods, a result of the retort's larger capacity and reduced processing times, spurred canners to seek the elimination of production bottlenecks that restricted the flow of cans to the retorts and prevented their operation at full capacity.

The soldering bench immediately caught the attention of canners seeking to assure a steady flow of cans to the retorts. There, skilled Chinese soldered tops onto filled cans at the rate of one per minute, yet few soldering gangs could seal cans quickly enough to keep the retorts operating at full capacity.[14] Canners rarely sought to increase production at the soldering bench by negotiating with their labor contractors for additional solderers. The small pool of skilled solderers and the high wages they commanded mitigated against this strategy. Consequently, canners perceived themselves as confronted by a serious production bottleneck caused, at least partially, by the solderers' high wages. Canners sought to remove this bottleneck by introducing mechanical soldering machines that deskilled the work, facilitating the replacement of skilled solderers with less expensive, unskilled laborers, while hopefully increasing productivity.

During the 1877 season an Oregon cannery installed a Howe soldering machine, designed and manufactured in the eastern United States. A metal chain dragged topped cans through a trough filled with molten solder, which "floated" onto the seam between the top and the body and sealed the can.[15] The device proved workable, and increased output beyond the levels attained by hand solderers, but it also produced a large number of improperly sealed cans that required resealing by hand; a failure that offset any benefits accrued by improvements in productivity and prevented canners from eliminating skilled solderers from their work force.

Modified and improved by Pacific Coast mechanics, the soldering machine appeared, at first glance, to offer an efficient and economical alternative to hand soldering. A single

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[13]Stacey (n. 12 above), 17.

[14]George B. Goode et al., *The Fisheries and Fishery Industries of the United States*, Sec. 3, "The Fishing Grounds of North America" (Washington, D.C.: GPO, 1887), 41; Stacey (n. 12 above), 16, 25; *The West Shore* (June 1877): 160.

[15]W. H. Barker, "Reminiscences of the Salmon Industry," *Pacific Fisherman Yearbook* (January 1920): 68; Earl Chapin May, *The Canning Clan: A Pageant of Pioneering Americans* (New York: The Macmillan Company, 1937), 28; Arthur I. Judge, ed., *A History of the Canning Industry by Its Most Prominent Men* (Baltimore: The Canning Trade, 1914), 92.

machine, tended by two unskilled workers, closed 3,000 cans in a ten-hour day, three times the output of the average soldering gang. The two machine tenders earned a combined wage of about fifty dollars a month, a fraction of the 900 to 1,000 dollars earned monthly by the average twenty-man soldering gang.[16] However, despite such apparently dramatic increases in productivity and reductions in labor costs, many canners balked at paying 250 to 300 dollars for a machine that failed to reliable seal cans.[17] Increased output and lower soldering costs proved meaningless if canners had to continue to maintain a sizeable soldering gang simply to reseal cans improperly closed by the machine.

Adoption of the soldering machine also hinged on questions of labor relations. Many canners hesitated to introduce soldering machines because of a reluctance to antagonize their Chinese work force. In at least one instance an entire Chinese cannery gang refused to work until a soldering machine was removed from the cannery.[18] Strikes and protests proved effective short-term tactics for workers in American canneries because of the practical lack of a substitute labor force and because these work actions invariably occurred during the height of the fishing season. Few canners opted to defy strikers and let the salmon escape upstream to the spawning grounds or into the nets of competitors.

Protests from Chinese workers, a reluctance to abandon established methods, and a high rate of failure all contributed to the lukewarm reception received by the soldering machine. The most significant obstacle to the new device's adoption, however, lay in the continued dependence of canners upon cans fabricated by hand prior to the start of the fishing season. Canners had to maintain a soldering gang for this work regardless of whether or not they used soldering machines.

The development of can-making machinery enabled canners to dispense entirely with the services of hand solderers and hastened the adoption of the soldering machine. Edwin and O. W. Norton pioneered the use of can-making machinery in Chicago in 1883. The Nortons employed a series of machines to fabricate a can body, solder the body seam, fit a bottom to the body, solder that seam, and test the entire assemblage. This line of machinery produced thirty cans a minute and used one-sixth the workers required to hand-fabricate cans at the same rate.[19]

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[16]*The West Shore* (June 1877): 160; *Astoria* (Oregon) *Daily Astorian* (May 24 1878); Duncan A. Stacey, *Sockeye & Tinplate: Technological Change in the Fraser River Canning Industry. 1871-1912*, Heritage Record No. 15 (Victoria: British Columbia Provincial Museum, 1982), 5.

[17]W. S. Van Vleet, "Engineering the Tin Can," *Mechanical Engineering* 47 (August 1923): 612.

[18]J. G. Megler & Co. to John N. Cobb, 1916, John N. Cobb Papers, University of Washington Library, Seattle; Stacey (n. 12 above), 16.

[19]*Pacific Fisherman* 25 (August 1927): 19; *American Machinist* 6 (July 14, 1883): 1-2.

During 1883 a Pacific Coast firm, licensed by the Nortons, produced 3,000 cases of machine-made salmon cans for an Alaskan cannery.[20] Despite this early experimentation with the new product few salmon canners rushed to purchase ready-made cans. The principal cause for this hesitation appears to have been a reluctance to antagonize Chinese cannery workers and labor contractors. Chinese workers objected to ready-made cans because their use enabled canners to dispense with hand solderers and deprive the remainder of the cannery gang of several weeks of light duty while the solderers fabricated the season's cans. Packers who purchased ready-made cans in the mid-1880s often found it difficult to secure an adequate work force. Chinese frequently refused to work at these canneries, preferring to sign on with firms that hand-fabricated cans and consequently offered longer terms of employment.[21]

Ready-made cans were first widely used in Alaska, where commercial canning began in the mid-1880s. Alaskan canners discovered that ready-made cans significantly reduced the time that workers had to be maintained at remote cannery sites. The savings associated with maintaining the cannery gang for a shorter period apparently outweighed any benefits gained by placating the Chinese. As early as 1890 Alaskan canners shipped millions of ready-made cans north, despite the objections of the Chinese and the sacrifice of valuable cargo space on cannery transports to cases of empty cans.[22]

Not coincidently, soldering machines came into widespread use in Alaskan canneries during the late 1880s, at approximately the same time that canners began purchasing large quantities of ready-made cans. Since canners no longer needed hand solderers to fabricate cans, they could now afford to take advantage of the increased output offered by soldering machines, which had been improved during the intervening years to a point where they produced no more improperly sealed cans than hand methods.

The first can-making machinery used on the Pacific Coast proved too fragile and unreliable to permit its operation at individual canneries. During the mid-1890s, Pacific Coast machine shops marketed their own can-making machinery, more rugged and faster-operating versions of eastern machines. This development enabled canners to fabricate cans mechanically at their own plants, eliminating the need to fill cannery transports with cases of empty cans. Manufacturing cans on site also provided cannery superintendents with greater flexibility, enabling them to respond to unforeseen variations in the size of the runs, and enabled canners to placate the Chinese labor contractors by providing work for

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[20]*Pacific Fisherman Annual* 10 (February 1912): 36; *Pacific Fisherman* 25 (August 1927): 18; Joseph A. Craig and Robert L. Hacker, "The History and Development of the Fisheries of the Columbia River," in U.S. Department of the Interior, ***Bulletin of the Bureau of Fisheries No. 32*** 49 (Washington, D.C.: GPO, 1940): 155.

[21]Harry K. Ralston, "The 1900 Strike of the Fraser River Sockeye Fishermen" (master's thesis, University of British Columbia, 1965), 6.

[22]A. B. Alexander, "Report of A. B. Alexander, Fishery Expert," in Z. L. Tanner, "Report upon Investigations of the U.S. Fish Commission Steamer *Albatross* from July 1, 1890 to June 30, 1891," in U.S. Commission of Fish and Fisheries, *Report of the Commissioner of Fisheries: 1889-1891* (Washington, D.C.: GPO, 1893), 286.

the cannery gangs prior to the start of the fishing season; work largely lost by the practice of shipping ready-made cans directly to the canneries.[23]

By 1900, most Alaskan canners used machine-made cans, either fabricated at the cannery or purchased ready-made. Canners in British Columbia and the lower United States, however, continued to use hand-fabricated cans. Operators in these regions did not need to support crews at the canneries for long periods, as at the remote Alaskan canneries, because their plants were located nearer the population centers of the Pacific Coast. Canada's continuing admittance of Chinese workers and the adequate supply of inexpensive native labor available to the province's canners proved important factors in British Columbia's continued commitment to handmade cans.[24]

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Not every innovation that followed the retort onto the canning line deskilled the work of highly paid Chinese laborers. In 1883 a Columbia River fisherman named Mathias Jensen perfected a machine that mechanically filled cans with salmon, a task performed by unskilled workers. Jensen's machine used a plunger to force pieces of fish through a chamber and into a waiting can. A knife sliced off the mass of fish when the can was full. Early models filled about fifty cans per minute, but by 1900 improved versions could fill seventy cans per minute.[25]

As with previous innovations, canners did not rush to adopt Jensen's filling machine. Operators on the Columbia River, the most important salmon stream on the Pacific Coast in the 1880s, refused to use the new machine after English customers complained about the mangled appearance of machine-packed salmon. Columbia River canners marketed most of their pack in England, and rather than alienate their best customers they rejected Jensen's machine and continued to hand fill.[26] British Columbian operators encountered similar consumer resistance and, endowed with an adequate supply of inexpensive native labor, also rejected the new device.[27]

Although canners in other regions were not as wed to the English market as those on the Columbia, adoption of the filling machine proceeded slowly until 1895. In that year the

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[23]*Pacific Fisherman* 25 (August 1927): 19; *Pacific Fisherman Statistical Number* 25 (1927): 116.

[24]Ralston (n. 21 above), 6; Stacey (n. 12 above), 14.

[25]*Pacific Fisherman Statistical Number* 25 (1927): 116; Jefferson F. Moser, "Alaska Salmon Investigations in 1900-1901," in U.S. Commission of Fish and Fisheries, *Bulletin of the U.S. Fish Commission: 1901* 21 (Washington, D.C.: GPO, 1902): 225; M. L. Dodge, "The Mechanical Features of Salmon Canning," *Mechanical Engineering* 47 (August 1925): 612.

[26]Henry Doyle, "Rise and Decline of the Pacific Salmon Fisheries," 2 vols., ca. 1957, 1:82, Henry Doyle Papers, University of British Columbia Library Special Collections, Vancouver.

[27]Newell (n. 4 above), 646.

Alaska Packers Association (APA) purchased the patent rights to Jensen's filler and began installing the machine in its Alaskan canneries.[28] The APA, the world's largest salmon canner, produced about seventy percent of the Alaskan salmon pack in the late 1890s. Most of this output consisted of red salmon, a different species than that canned on the Columbia and one not highly regarded by the English market. The APA sold much of this salmon in the urban centers of the eastern United States, a new, developing market where few consumers were familiar with canned Pacific salmon or had preconceptions regarding its proper appearance in the can. The APA's size enabled it to flood these developing markets with inexpensive, machine-packed salmon that was accepted virtually without consumer resistance. The market position of the product depended upon price, not quality, a circumstance that encouraged the APA to take advantage of the lower labor costs and increased productivity offered by the filling machine. The host of new filling machines that appeared on the market following expiration of the APA's monopoly rights to the Jensen filler in 1901 testifies to the success of the Association's strategy. Canners in all regions except the Columbia River and British Columbia rushed to install the new machines after 1901.[29]

The filler's popularity did not stem solely from the canners' need to compete with the APA in the marketplace. The filling machine provided canners with an opportunity to reduce the size of their labor force while increasing output. In the United States the shrinking Chinese labor pool, a result of the Oriental Exclusion Act of 1882, increasingly forced labor contractors to substitute other ethnic workers, whom canners viewed as unsatisfactory, for the Chinese. Filling machines offered an opportunity to dispense with a significant portion of the unskilled work force.

The prospect of increased output probably proved the most significant reason for the incorporation of fillers onto Puget Sound and Alaskan canning lines during the first decade of the twentieth century. The competition for raw salmon greatly intensified during this period as the number of canneries increased sharply. In 1890 eighteen American and Canadian canneries competed for the Fraser River sockeye runs. In 1900 sixty-four canneries exploited the runs. Filling machines provided canners with an opportunity to increase the rate at which salmon passed through the cannery, permitting purchases of large quantities of raw salmon with the knowledge that the fish could be processed before they spoiled. The introduction of the filling machine in canneries that depended upon the quantity, not the quality of their pack, allowed more aggressive competition for the limited supplies of raw salmon taken by fishers.

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[28]John N. Cobb, "Pacific Salmon Fisheries," 3rd ed., Appendix 1 to U.S. Department of Commerce, *Report of the Commissioner of Fisheries: 1921*, Bureau of Fisheries Doc. 902 (Washington, D.C.: GPO, 1922), 29; U.S. Circuit Court, Western Division of Washington, Alaska Packers Association v. J. M. L. Letson and F. W. Burpee (1901), File 911, Carton 74535, Record Group 21, U.S. Federal Records Center, Seattle; Alaska Packers Association v. Letson et al., 130 F. 129 (1904).

[29]*Cathlamet* (Washington) *Gazette* (February 7, 1902); Alaska Packers Association, "History: 1891-1940," 8 vols., Alaska Packers Association Papers, Alaska State Historical Library, Juneau, 1: passim; John N. Cobb, "Pacific Salmon Fisheries," 4th ed., Appendix 13 to U.S. Department of Commerce, *Report of the Commissioner of Fisheries: 1930*, Bureau of Fisheries Doc. 1092 (Washington, D.C.: GPO, 1931), 572.

After the turn of the twentieth century, only the Columbia River, where the English market dictated the actions of canners, British Columbia, where similar market pressures operated, and where an ample inexpensive labor force existed, and the small handicraft operations scattered along the Oregon and Washington coasts, remained committed to hand-filling. The history of the filling machine suggests the constellation of factors that influenced canners' decisions to mechanize portions of the canning line. The practicality and efficiency of a particular machine had to be considered within the context of questions of labor supply, market position, and competitive pressure for raw salmon supplies. Even if a new machine proved practical, consideration of these other questions, which might at first seem unrelated to technological concerns, could impede or prevent its adoption in certain regions.

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The canned-salmon industry's first wave of technological innovation came to a close about 1900. By that date mechanization had reached virtually every operation within the cannery that manipulated tin cans. The wave broke on the problem of developing a mechanical means for butchering and cleaning salmon. A second period of innovative activity began about 1905, following the solution of this complex technical problem.

The first innovative wave contributed to large increases in productivity in the industry's most heavily mechanized canneries. Prior to mechanization, a cannery gang of 130 to 150 workers could produce 240 cases of salmon per day. By 1883, with the widespread adoption of retorts and the first introduction of soldering machines and other innovations, the same number of workers could produce 1,000 cases per day. Productivity continued to rise as more machinery came onto the lines. By 1900 the industry's most heavily mechanized plants, those of the Alaska Packers Association, could pack 2,400 cases per day. These canneries employed more workers than most plants, but their work force consisted largely of unskilled machine tenders, which resulted in payrolls little higher than in smaller canneries.[30]

A comparison of the average pack produced by canneries in different regions clearly indicates the uneven course of mechanization throughout the industry. During the period from 1890 to 1900 the most heavily mechanized canneries operated in Alaska, where average individual cannery output totalled 30,500 cases per season. The average pack of Puget Sound canneries over the same period amounted to ninety-six percent of the Alaskan output, or 29,300 cases per season, a figure that reflects the highly mechanized nature of most of the plants operating on the Sound. The Fraser River canneries in British Columbia offer a sharp contrast to the Alaskan and Puget Sound plants. Fraser River canners packed for the discriminating British market, enjoyed access to an adequate supply of inexpensive labor, and largely rejected machinery that might jeopardize their market standing. The differences between Canadian canners and their American counterparts are starkly revealed in average production figures. During the period from 1890 to 1900 the average Fraser River cannery produced 11,500 cases per season, only thirty-eight percent of the

[30]Stacey (n. 12 above), 26; Moser (n. 25 above), 235; Alaska Packers Association, "History" (n. 29 above), 1:43, 50-54.

average output attained by Alaskan canneries.[31] Clearly, Canadian canners had not mechanized to the same extent as their American counterparts in Alaska and on Puget Sound.

By 1900 butchering constituted the only canning operation completely untouched by mechanization. Chinese workers cleaned virtually every salmon put into cans on the Pacific Coast. Despite the skill of these workers, who could clean as many as six fish per minute, butchering represented the industry's single greatest obstacle to higher levels of productivity. The work of the butchers set the pace of the entire cannery, since all subsequent operations required cleaned salmon. By 1900, canners in Alaska and on Puget Sound perceived of butchering as a significant production bottleneck. Butchers could not clean salmon as quickly as fishers, using improved and intensified fishing efforts, could catch them, nor could butchers supply the lines with sufficient fish to permit full speed operation.

The bottleneck in the butchering shed retarded the introduction of newer, faster-operating machinery elsewhere on the line. If the butchers could not supply the salmon needed to run existing machines at full speed, little incentive existed for the adoption of more efficient, higher-speed machinery. The logical solution -- hiring additional butchers to boost production -- proved impossible. Skilled Chinese butchers were in short supply in the United States, and those still working earned twice as much as unskilled cannery laborer. Little incentive existed for canners to train new butchers, since such efforts would likely have met resistance from the Chinese, and since the contract labor system placed the responsibility for hiring butchers outside the control of canners. Consequently, canners turned to machinery as a means to both deskill the work of the hand butchers and eliminate the production bottleneck that they represented.[32]

The physical variations among individual salmon complicated development of a butchering machine. Canners required a machine that performed all the tasks of the hand butchers -- removal of the head, tail, and fins, as well as opening and cleaning the body cavity. The difficulties involved in accomplishing all these tasks are apparent in the half-dozen butchering machines that operated on canning lines between 1901 and 1904, all of which failed to perform at least one of the operations performed by hand butchers.[33]

The 1904 season marked the commercial introduction of the machine that eventually mechanized butchering in most salmon canneries. Edmund A. Smith, a corpulent former

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[31]Cobb (n. 29 above), 515, 557, 572; George A. Rounsefell and George B. Kelez, "The Salmon and Salmon Fisheries of Swiftsure Bank, Puget Sound, and the Fraser River," in U.S. Department of Commerce, *Bulletin of the Bureau of Fisheries: 1933-1938* 48 (Washington, D.C.: GPO, 1940), 703, 759.

[32]*Stacey (n. 16 above), 20-21; Seattle Times* (August 22, 1905). In 1903 an Alaskan cannery sent one hundred Chinese workers north. These men averaged forty-five years of age and twenty percent were estimated to be at least seventy years old. *Seattle Post-Intelligencer* (April 9, 1904).

[33]For early butchering machines see O'Bannon (n. 6 above), 195-196.

mining camp cook, developed his butchering machine during 1902 and 1903.[34] A large vertical carrier wheel, with salmon attached along the rim, carried the fish past a series of knives and brushes that removed the fins and split and cleaned the body cavity. Workers removed the heads and tails by running the fish through band saws prior to placing them on the carrier wheel. The trials of Smith's first machine, conducted in a Seattle cannery during 1903, proved very successful. Operated by three unskilled workers, the device cleaned forty salmon per minute, the equivalent of an eighteen-man Chinese butchering gang.[35] Smith Cannery Machines Company immediately dubbed its product the "Iron Chink," a name by which it is still known today.

Six canners leased Smith butchering machines for the 1904 season. Smith prominently featured the testimonials of these canners, one of whom claimed that the device enabled him to pack up to 1,500 cases per day without Chinese butchers.[36] Smith first sold his machines, for about $2,600 each, in 1905.[37] Testimonials solicited at the close of that season focused on the machine's labor-saving qualities. One canner exulted that he had "made my last contract, I hope, with Chinese butchers," while another belligerently declared, "hereafter I want no Chinese butchers in the plant. . . ."[38] These promotional efforts clearly reflect the butchering machine's role as a deskilling innovation intended not only to increase productivity, but also to undermine the position of a segment of skilled workers by devaluing the tasks they performed and making them more easily replaceable by lower paid, unskilled machine tenders.

Smith's butchering machine operated in such a superior manner to the other machines on the market that it quickly drove its competition from the field. By 1910 few, if any, salmon canneries used a butchering machine other than Smith's.[39] Yet, as with prior innovations, regional conditions determined the reception that the machine received. Columbia River operators could not use Smith's machine because it could not handle the large chinook salmon that constituted the majority of their pack. Canners in this region had no choice but to continue to employ hand butchers. In 1917, Smith's firm introduced a new model capable of processing chinooks, but many Columbia River canners continued to hand butcher because it produced neater, less mangled looking fish.[40]

More than any other single innovation, Smith's butchering machine revolutionized the canned-salmon industry. It shattered the last major bottleneck on the canning lines and

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[34]*Pacific Fisherman Annual* 4 (January 1906): 47; *Pacific Fisherman* 7 (July 1909): 19.

[35]*Pacific Fisherman Statistical Number* 25 (January 1927): 112; *Pacific Fisherman* 1 (September 1903): 12; ibid. 2 (August 1904): 5; ibid. 7 (June 1909): 12.

[36]*Pacific Fisherman* 2 (December 1904): 16.

[37]*Pacific Fisherman Statistical Number* 25 (1927): 112.

[38]*Pacific Fisherman Annual* 4 (January 1906): 45-46.

[39]Smith Cannery Machines Company v. Seattle-Astoria Iron Works et al., 261 F. 85 (1919).

[40]*Pacific Fisherman* 15 (January 1917): 35.

permitted mechanization of virtually the entire canning process. One butchering machine could keep two full lines of machinery amply supplied with salmon. This enabled canners to double the capacity of their plants by simply installing a new line of machinery, or to pack two sizes of cans simultaneously.[41] Smith's machine also unleashed a second wave of technological innovation, lasting from roughly 1905 to 1914, characterized by the refinement, improvement, and replacement of many of the canning machines introduced during the first wave.

By 1910 the industry's largest and most heavily mechanized canneries all used butchering machines. The impact of the machine on productivity is evident in average pack statistics for Puget Sound and the Columbia River during the period from 1903 to 1910. During this period the average Puget Sound cannery packed 41,300 cases per season. The average Columbia River cannery, where butchering machines were not used, produced only 20,500 cases per season, approximately fifty percent of the Puget Sound output.[42] While Columbia River canneries tended to be less mechanized than those on Puget Sound because of the different position within the market occupied by their pack, at least part of the differential in production between the two regions may be attributed to the impact of the butchering machine.

The most important innovation to follow the butchering machine onto the canning lines, the sanitary can, epitomizes the second innovative wave's process of refinement and replacement. Machines known as double seamers crimped ends onto cans without solder, eliminating the need for soldering machines and greatly reducing any risk to consumers of lead contamination. Sanitary cans represented a major refinement that simplified production and facilitated increased output, not a wholly new innovation. Double seaming originated in Europe, but the European technology proved far too slow for use in American canneries. Despite a few experiments with the new system, salmon canners did not begin to explore its potentials seriously until the development of high-speed can-bodymaking machines about 1906, though Pacific Coast fruit and vegetable canners used sanitary cans prior to this date.[43] The slowness of the double seamers, which closed only ten cans per minute, precluded introduction of the new system into mechanized salmon canneries where the slowest machines operated at a rate of fifty to seventy-five cans per minute. Only after the 1906 development of a double seamer that closed thirty cans per minute did salmon packers express any interest in the new technology.[44]

The American Can Company, the nation's largest producer of tin cans, controlled the patent rights to the improved double seamer.[45] American Can attempted to secure a market for

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[41]Newell (n. 4 above), 650.

[42]Cobb (n. 29 above), 556-57, 562-63.

[43]James W. McKie, *Tin Cans and Tin Plate: A Study in Competition in Two Related Markets* (Cambridge: Cambridge University Press, 1959), 190; Judge (n. 15 above), 94; May (n. 15 above), 92; Dodge (n. 25 above), 613; *Pacific Fisherman* 9 (October 1911): 11.

[44]*Pacific Fisherman* 4 (February 1906): 20; ibid. (July 1906): 21.

[45]*Pacific Fisherman Yearbook* (January 1916): 75.

its ready-made sanitary cans by requiring lessees of double seamers to purchase all their cans ready-made. This gambit failed when few salmon canners proved willing to abandon their own can-making machinery and revert to shipping cases of empty cans to the canneries.[46] Prior to the start of the 1912 season American Can dropped its leasing restrictions and agreed to provide its customers with both sanitary can-bodymaking machines and double seamers. Freed of American Can's restrictive leases, canners quickly made the new system commonplace in salmon canneries. In 1911 sanitary cans accounted for only twenty-five percent of the industry's pack. Two years later, after elimination of the leasing restrictions, the new-style can made up sixty-five percent of the output.[47] By 1917, American Can Company advertisements implied that sanitary cans had vanquished "old-style soldered cans."

The double-seaming process refined and improved an existing technology. Its incorporation onto the lines permitted faster and more efficient operations by eliminating several steps in the canning process and reducing the time needed to perform the remaining steps. But the second wave of innovation encompassed more than just the introduction of a new-style can. Machines attached to the fillers replaced the early hand jigs used to add salt to each can prior to filling. Filling machines equipped with turrets operated on several cans simultaneously. Weighing machines prevented the waste of salmon that resulted from overfilled cans and assured compliance with the Pure Food and Drug Act of 1906. Can washers replaced workers armed with wet rags, while lacquering and labeling machines prepared the final product for delivery to market. Several of these innovations existed prior to 1905, but the opportunities and imperatives for innovation that arose with the introduction of the butchering machine led to their perfection, refinement, and wide-spread adoption in the following decade.

By 1914 many salmon canneries on the Pacific Coast, particularly those in remote locations and those facing intense competition for raw salmon, operated as fully mechanized fish-processing factories. Further refinement of the canning process occurred during the next decade, with the emphasis placed upon increasing the flexibility of the lines so that canners could quickly respond to variations in the runs, but the essential ingredients of the mechanized cannery existed by this date. The productivity of the average cannery increased by about fifty percent during the industry's second period of innovation. By 1914 canneries routinely packed 30,000 cases per year, compared to an average of about 20,000 cases in 1900, at the close of the first wave of innovation.

The introduction of the collection of machines and devices that mechanized salmon canning occurred at differing rates in the several regions that constituted the Pacific Coast salmon industry. Technological innovation clearly did not operate in a deterministic manner, forcing its way onto canning lines as a result of an inherent logic associated with increased output. Instead, canners in each region examined each new innovation from within the context of their economic, social, and business milieu and adopted those machines that best fit their needs.

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[46]Mckie (n. 43 above), 91, 182.

[47]*Pacific Fisherman Yearbook* (January 1912): 33; ibid. (January 1915): 54; *Pacific Fisherman* 13 (May 1915): 15.

General patterns of technological innovation and diffusion are apparent within the industry. The position that a cannery's pack occupied within the market played a critical role in determining the type and amount of machinery introduced onto the lines. Canners whose pack commanded premium prices based on its reputation for quality, such as those on the Columbia River and in British Columbia, proved far less likely to mechanize operations that affected the appearance of the salmon in the cans than operators whose market position depended upon price.

Canners who operated in remote regions, far removed from labor supplies, proved more likely to adopt labor-saving machinery than canners proximate to a supply of inexpensive unskilled workers. Unlike eastern canneries, where machinery that deskilled tasks performed by highly paid craft workers could find a place on the canning line without offering any improvement in productivity, the conditions that characterized salmon canning demanded improved production from virtually every new technical innovation as compensation for the risk inherent in using new machinery.[48]

A complex constellation of factors shaped the patterns of technological innovation within the Pacific Coast salmon canning industry. Canners chose to mechanize or not mechanize portions of their lines based upon specific needs and desires. Technology operated within a framework of changing economic and social conditions that varied from region to region and which precluded innovation solely for the sake of innovation.

[48]Brown and Philips (n. 11 above), 743.

POSTWAR FISHERY REGIMES OF THE PACIFIC: OCEAN LAW, INTERNATIONAL RIVALRY, AND JAPANESE ECONOMIC EXPANSION AFTER 1945

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Introduction:

The post-World War II era has been characterized by a steadily mounting, unremitting assault on the world's ocean fishery resources--an assault made possible by new oceanographic scientific techniques and by profound changes in the technologies of fishing, processing, and marketing. Increased size, range, and efficiency in operations have characterized the diesel-powered trawlers, tuna clippers, factory ships, and other deepwater vessels that were added to the world's fishing fleets from 1945 to the 1970s. New types of gear, most notably in trawling design and the combination of nylon netting and power-operated nets in seining technology, have enhanced the impact of the new vessels on the patterns of ocean resource exploitation. The demand side has been of crucial importance, of course, for the foregoing innovations have occurred in a symbiotic causal relationship with rising world demand for food associated with the postwar population surge.

A revolution in oceanography, involving a merging of physical-chemical ocean studies with biological, had produced by 1950 a new emphasis upon holistic study of ecosystemic environments. The new research in ocean science transformed the deepwater fishing industry's capacity to conduct efficient explorations, to understand the population dynamics of commercial species, and, finally, to formulate the scientific aspects of management

programs for conservation and profitability. Meanwhile, important innovations occurred in marketing and processing: the advent of frozen fish marketing and changes in dietary preferences, generating demand for species not previously acceptable in the diets of many cultures, converged with another major change on the demand side: a steady increase in the volume of fish products used for meal and for poultry feed, augmenting the traditional consumer markets for table food.[1]

A dramatic rise in ocean fisheries production reflected the impact of these interrelated transformations. During the century-long period from 1850 to 1950, the world's marine fish harvest rose from 2 million to 20 million tons per year. But in only the next decade, 1950-60, the catch doubled again. And then, from its new level of 40 million tons, it rose to more than 60 million tons by 1967.[2] In the slash-and-burn tradition that was associated with the industrialization process of the previous century, this intensified fishing effort on the high seas had an often-devastating effect on specific species and fishery populations, and beginning in the 1970s there was a wakening and finally a levelling off of marine fishery production globally.[3]

The rising intensity of fishing and the spectre of depletion crises have given impetus since 1945 to the dramatic movement in international law known as "ocean enclosure." At first by dint of unilateral policy initiatives--especially by the Latin American states and Iceland--and then, since 1960, by virtue of UN Law of the Sea initiatives, the three-mile limit for offshore jurisdiction of coastal nations, which had been almost universally accepted prior to the war, has given way to the predominance of the 200-mile Exclusive Economic Zone rule. Under the EEZ concept, fishing activity in vast areas of the world's oceans have come under the exclusive

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1. See, e.g., J. A. Gulland, "Fisheries and Other Biological Resources," Exclusive Economic Zones: Resources, Opportunities, and the Legal Regime (London, n.d. but 1989); Edward Miles et al., The Management of Marine Regions: The North Pacific (Berkeley, 1982).

2. Wilbert C. Chapman, "The Ocean and the Food Industry," address to American Management Association, New York, 1969 (MS.), copy in Wilbert C. Chapman Papers, Manuscripts Library, University of Washington Library, Seattle (hereafter cited Chapman Papers, UW Library).

3. See annual FAO reports on fisheries, and also essays in Lewis Alexander et al., eds. New Developments in Marine Science and Technology: Economic Legal and Political Aspects of Change (Honolulu, 1989).

unilateral control of individual coastal states.[4] Moreover, within the areas of exclusive national control, as well as in the various fisheries that have come under international agreements for management of fishing operations, there remain the classic perplexities of how to manage in a rational way fisheries that are a common property resource--indeed, how to define what is "efficient management," along with how to deal in scientific terms with the uncertainties standing in the way of "maximum sustained yield" calculations.[5]

The Pacific Ocean fisheries have participated fully in all these developments since 1945; and so the history of this vast ocean area and its marine fishing nations illustrated the full range of phenomena at issue--the exploration for previously unexploited species, development of new techniques for the harvest, expansion of output for an expanding world market. The current-day crisis produced by the notorious "drift nets" used by the Asian nations in the North Pacific (as elsewhere, e.g. in the Mediterranean, by others), the threat to fishery resources from tanker accidents and drilling platform spills, the spectre of long-term pollution of the ocean food system from nuclear and industrial waste--all these elements of today's situation are the culmination of these longer-term trends.[6]

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4. Of course, extension of coastal limits from the traditional three miles out to 200 miles, for purposes of fisheries and other economic jurisdiction, is a variant of vesting ownership, albeit in this case in the national authority rather than private parties. Still, it leaves unresolved the problem of exploitation beyond the 200-mile line. See, inter alia, Lewis M.Alexander, "The Ocean Enclosure Movement," San Diego Law Review, 20 (1983), 561-94; R. R. Churchill and A.V. Lowe, Law of the Sea (Manchester, UK, 1983).

5. See, e.g., James A. Crutchfield and Giulio Pontecorvo, The Pacific Salmon Fisheries: A Study of Irrational Conservation (Baltimore, 1969); Gary Libecap, "Contracting Problems and Regulation: The Case of the Fishery," American Economic Review, 72 (1982), 1005-22; Philip A. Neher, et al., eds., Rights Based Fishing (NATO Advanced Science Institute Series, Dordrecht, 1989).

6 Current-day problems in the Pacific Rim region are considered in various papers presented to the Council of State Governments/Western Legislative Conference session on ocean resources and policy (mimeographed, Boalt Hall School of Law, UC Berkeley, November 1989). For a case study of the California fisheries combining the approaches of legal and economic history, to illustrate environmental and cultural change as well as economic development, see Arthur F. McEvoy, The Fisherman' Problem: Ecology and Law in the California Fisheries, 1850-1980 (Cambridge, 1986). I have dealt with some of the same issues in another context, in Scheiber, "Pacific Ocean resources, Science, and Law of the Sea: Wilbert M. Chapman and the Pacific Fisheries, 1945-70," Ecology Law Quarterly, 13 (1986), pp. 381-534.

This presentation is a preliminary effort at reconstructing from the perspective of economic and legal history the immediate postwar history, centering on Japan and its postwar recovery to a leading position in Pacific Ocean and indeed global fishing. The specific focus is on the emergence of new ocean regimes -- the institutional frameworks based in economic relationships but also in the formal structures of marine policy, diplomacy, and international law --of the postwar Pacific Ocean fisheries economy. I will suggest briefly the significance of these regimes of the postwar a period to subsequent patterns of change; in the process, I can only point to how early postwar regime development has been related to the longer-term trends: (a) the vast expansion of "fishing effort" (inputs of capital and labor, with accompanying increases of efficiency of input) in the 1946-60s period; (b) the peaking of fishery productivity and output in many areas of the Pacific as soon as the early 1960s, with concomitant mobilization of science and management techniques, based in certain key fisheries on collaborative international arrangements; and, finally, (c) the path to some of the critical dangers of resource depletion and environmental crisis--both as to specific resources in terms of endangered fishery and marine-mammal populations, and as to the ecology of ocean systems more generally--that we confront so dramatically now in our own day.

Geopolitics, The Japanese Occupation and Allied policies:

Japan was the world's leading marine fishing nation in the 1930s, and the future of Japanese distant-water and coastal fisheries was one of the great "unknowns" in the immediate aftermath of the war. By the mid-1950s Japan had returned to its prewar position of preeminence, and by 1960s Japan's distant-water fleets were fishing intensively in the Atlantic and the Eastern Pacific as well as in the regions where they had operated prior to the war. Japan participated fully, moreover, in the most dynamic sector of 1950s-early 1960s ocean fisheries development in the Pacific, the opening up of new areas to fishing for tuna; and the swift and unique rise in the tuna harvest throughout the Pacific area.

This did not occur automatically, as it were. On the contrary, it was the result of a carefully designed and vigorously pursued U.S. policy to rebuild as quickly as possible this segment of the Japanese economy. Under the Occupation regime, headed by General Douglas MacArthur as Supreme Commander, Allied Powers (SCAP), allocation priorities were given from the start for revitalization and recovery of Japanese fishing and the allied industries in processing and distribution. These allocation priorities helped to rebuild quickly the Japanese fleets, foster modernization of key elements of that fleet, and re-establish Japanese distant-water fishing (and also whaling in the Antarctic, as well as coastal whaling) in order to provide food for the domestic population and eventually to generate foreign trade earnings as well.[7]

To call the resulting legal and economic framework a "regime" is in this instance subject to accurate without question, subject to none of the usual quarrels about the "actual" regime boundaries or rules. For Japan during the Occupation from 1946 to 1952 offers a rare but classic example of a command regime, with the fishing industry, like all other sectors, under the orders of the military. Even as a the functions of civilian government were expanded, as the new constitution was put into effect and elections took place, still the institutions and dynamics alike of the Japanese marine fisheries were under close supervision of the Occupation authorities. Indeed, in this instance physical boundary lines were drawn across the oceans map: the so-called "MacArthur Zone" or "SCAP Zone," constituting the permitted area of Japanese fishing.[8] This zone was expanded in several stages, so that in June 1946 Japan was permitted to send its fishing vessels to the waters where 80 per cent of its prewar fishing product had been harvested.[9]

The areas and types of expansion under the Occupation regime for Japanese fishing were distinctive. First, the coastal fisheries and trawling in the China Sea were vigorously reestablished, so well indeed that by 1949 the Occupation's resource experts were concerned that

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7 H. N. Scheiber, "Origins of the Abstention Doctrine in Ocean Law: Japanese-U.S. Relations and the Pacific Fisheries, 1937-1958," Ecology Law Quar., 16 (1989), pp .23-99.

8 See map of these zones, Figure 1, ibid.

9 SCAP, Natural Resources Section, Mission and Accomplishments of the Occupation in the Natural Resources Field (Sept. 26, 1949, processed).

overfishing and the dangers of depletion might undermine these areas of rapid recovery. Second, in 1949-51, SCAP reintroduced Japanese fleets into the tropical waters of the south-central Pacific, where they explored for tuna and commenced a highly capitalized "mothership" operation--setting the stage for Japan to challenge the United States' own tuna industry based in southern California, for the American market as well as ultimately for world markets in this most dynamic growth sector of Pacific fisheries.[10]

Third, and most controversially of all, SCAP planned, equipped, and directed annual whaling expeditions into the Antarctic. The other Allied nations bitterly opposed the re-entry of Japan into Antarctic whaling: their own whaling fleets had been largely destroyed and were replaced only at great cost to other priorities, even while MacArthur was gearing up Japan's shipyards and assuring the successful re-entry of Japan's whaling fleet to the southern polar waters. Besides, the UK, Australia, and Norway were hopeful that Japan would be excluded permanently, leaving the International Whaling Commission (amenable to the Allied nations' economic interests and showing only slight inclination to exercise stringent controls) in their own hands and ready to exercise very restrictive controls if Japan were to be allowed to resume on a limited basis. Once expeditions had been successfully launched, under SCAP control, each year from 1946 to the end of the Occupation--with increasing effort each year, so that Japan was harvesting an increasing percentage of the annual whale take--any hope of excluding Japan or keeping her to a wholly subordinate position by IWC was lost, as a political matter, for the long run.[11]

The Northeast Pacific: Japan confined and North American interests protected

A vital exception to the generalization that SCAP, and the U.S. Government, gave full support to expansion of Japan's marine fishing re-expansion was the Northeast Pacific quadrant. Here a very different ocean

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10 The orders called for expeditions of motherships and catching boats, and the expeditions were confined largely to the area of the U.S. trust territories (formerly Japanese mandated islands). See map cited note 8, supra.

11 J. N. Tonnessen and A. O. Johnsen, The History of Modern Whaling (Berkeley 1982), 486-99 et passim. The author has in progress a study of Australian responses to the postwar Japanese fleet expansion.

regime was to be established by 1953. This was a regime, established formally by treaty (the 1953 International North Pacific Fisheries convention) in which Japan was granted, as part of the postwar diplomatic settlement--a limited though not unimportant role in fishing and a potentially powerful role in decision making. It was also a regime, however, that excluded the Japanese definitively from full participation in harvesting one of the richest fishing resources of the world, the salmon that spawned in the rivers of North America, and also excluded them from the halibut fishery off the North American coastline.

I have written elsewhere a detailed analysis of this international agreement--a tripartite convention between Canada, the USA and Japan--and there given full attention in that study to the economic as well as political interests at stake.[12] Hence a brief recapitulation will suffice.

Both Canada and the United States had long maintained fishery management (also called conservation) regimes in the Northeast Pacific salmon fisheries; and by a bilateral agreement in the late 1930s, the two nations provided for joint scientific cooperation and a coordination of management effort. As early as 1931, moreover, halibut fishing had been brought under joint Canadian-US management in what was often cited as a uniquely successful example of management producing the recovery of a seriously endangered commercial fishery. In addition to placing restrictions on gear technology, length of season, and other aspects of the salmon and halibut fisheries, the two countries had also invested a great deal over several decades' time in the development of salmon fish hatcheries on the streams that supporting salmon runs to the sea.[13]

When the SCAP Zone lines were first drawn, the salmon fishing area was wholly protected from Japanese entry in the Northeast Pacific since it lay beyond the SCAP Zone's delimiting boundary to the east at 180 degrees. The question for Canadian and US fishing interests was, however: Would the

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12 Scheiber, "Origins of the Abstention Doctrine," cited note 7 supra. See also R. Jackson and W. Royce, Ocean Forum: An Interpretative History of the International North Pacific Fisheries Commission (1986).

13 On the history of the halibut management, see W. A. Carrothers, The British Columbia Fisheries (Vancouver, 1941); F. Bell, "Management of the Pacific Halibut," A Century of Fisheries in North America (New York, 1970). On the salmon regime, see Larkin, "Management of the Pacific Salmon of North America," in ibid.

Japanese be excluded, in one way or another, after the peace treaty had been concluded and Japan resumed its status as a sovereign nation?

Strong industry pressure was mounted from the Canadian and American fishing companies to include an exclusion clause in the Peace Treaty--a tactic strongly opposed by MacArthur and by the top-level U.S. diplomatic leaders. But still, there was in the industry's favor a predisposition in the US State Department--or at least among the fishery experts in the Department, who throughout the war had sought to develop a new policy that would extend American jurisdiction over offshore fisheries beyond the traditional 3-mile limit to which the US and Canada had long adhered--to obtain exclusion of Japan from the salmon and halibut fisheries. A crucial element in the picture was the introduction of scientific management principles, so that the notion of basing a special fisheries treaty upon the "Maximum Sustained Yield" became the central strategy that was finally embodied in the 1953 tripartite agreement. The Japanese government, for its part, was unhappy with the prospect; but clearly Premier Yoshida Shigeru felt he had no choice except to accept U.S. and Canadian direction, and only weeks after the main peace treaty was signed Japan accepted the tripartite convention.[14]

The terms of this convention set firmly in place for a decade the effective exclusion of Japan from salmon and halibut fishing. It held out promise of a different regime in the future, in that it provided for annual scientific reassessment after five years of the condition of the stocks of salmon, halibut, and herring so that Japan could end the policy that became known formally as "abstention" and re-enter on the basis of agreed quotas. And, in fact, Japan did do so under terms of the treaty: in 1960-61 virtually all herring stocks were lifted from protection of abstention, and in 1965 the famous halibut fishery was also opened up to Japan. Moreover, throughout the crab fishery--which Japanese fishermen exploited at great profit--was left entirely open to Japan, on the theory that this resource was not at risk.[15]

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14 Scheiber, "Origins of the Abstention Doctrine," passim.

15 Ibid. at pp. 87-88; Miles et al., Management of Marine Regions, 97-98.

The open seas regime outside the Northeast Pacific:

The 1953 North Pacific Fisheries Convention did not include the Soviet Union, whose ambitions in this area of world fishing would within 15 years raise an important challenge to the regime set in place by the convention. But for the interim period, the Convention was important for several reasons, whether viewed from the standpoint of economic growth and management of the fisheries at stake, o from the standpoint of geopolitics and international law.

First, the treaty represented a departure for the USA, Canada, and Japan from their traditional adherence to the principle of the three-mile territorial sea. Adopting the "principle"--actually a policy--of Abstention was a way of obscuring somewhat the impact of this abandonment of a concept so long basic to the regime of open seas and free access for fishing by any nation to all ocean waters beyond three miles of national coastlines. The linkage of this scientific concept, and the objective of maintaining Maximum Sustained Yield, to ocean regime formation would become a focal point of attention in the UN debates of Law of the Sea and resource regimes beginning with the 1955 Geneva and Rome conferences and the 1958 convention on living resources of the sea.[16]

Second, for Japan, the acceptance of exclusion--even if clothed in the benign rhetorical gown of "Abstention"--was ominous. There was great fear in Japanese policy and fishery industry circles that this would become the opening legal wedge for similar exclusion of Japan elsewhere in the world, especially where the most powerful Allied nations were concerned. The Japanese were saved from this fate in the area where the most logical predictions of 1946 would have been that Japan could not possibly have its way: this was in the Antarctic whaling area, where Japan's earlier refusal to accept international "conservation" regulation otherwise might have given the UK, Norway, and Australia strong arguments against their reentry.[17]

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16 Scheiber, "Origins of the Abstention Doctrine," 85-95; New Developments in Marine Science, op. cit., at 95-193.

17 I will consider this issue as debated in 1947-53, in the context of peace negotiations, in the study on Australia cited supra note 11. For an earlier study, still standard, see Richard N. Rosecrance, Australian Diplomacy and Japan, 1945-51 (1962).

More generally, however, Japan feared that once exclusion in any form was accepted vis-a-vis Canada and the USA, it would become difficult for Japan to resist pressures for identical types of agreement in the western Pacific region, where even by 1951 Japan was vigorously pushing its dramatically successful warmwater tuna fishing expansion. And in fact, the United States did protect Japan from such pressures, especially from efforts by the Chinese, Philippine, Indonesian, and Anzus governments to confine Japan's fishing expansion via the peace treaty. The US Government refused to accept such limitations in the treaty, just as the US representative had resisted successfully similar efforts in the Far East Commission to direct Macarthur to confine Japan; and Japan had US backing after 1952-52 in resisting exclusion from any of the Pacific waters into which it expanded.

Australia took formal measures to protect its offshore pearl fishery by actually extending its formal claim over extraterritorial seas beyond three miles (1951-53), forcing Japan to arrive at a bilateral management agreement. Otherwise, however, the postwar settlement--over objections of the major Allied powers in the Pacific Rim area--left the Japanese free to expand their distant water fishing without substantial constraint except where Canada and the USA had looked after their own interests so successfully. The three-mile rule had been breached, an ominous development from the standpoint of Japan, but Japanese fleets had been rebuilt under patronage of the Occupation government; reestablishment of vertically integrated, large-scale enterprise in the fisheries and allied industries had been sanctioned; MITI, the government loan facilities, and the banks were lined up to support integrated and coordinated Japanese penetration of foreign markets for tuna products; and the waters of the areas even of the Northeast Pacific were not wholly lost to Japanese enterprise. The freedom of the seas that prevailed elsewhere in the Pacific Rim meant that Japan could successfully transfer labor, capital, and ships that might potentially have been used for salmon fishing in the Northeast region--and which in fact had been used, previously, in waters now closed to them by the Soviet Union north of Hokkaido--to the distant-water effort elsewhere in the Pacific and by 1957 in the Atlantic Ocean as well.

The Eastern Pacific tuna regime--Research, regulation, and new entrants:

While setting in place the tripartite agreement that instituted the Abstention principle in the salmon area, the United States also took initiatives to protect its quickly expanding tuna fleet in the tropical waters of the Eastern Pacific. This fleet was finding and exploiting new areas of tuna resources off the coast of Central and South America, and beginning in 1954 also began moving into newly discovered tuna areas farther out to sea between Hawaii and the Central American coast. Even as early as 1946-47 some of the Latin American republics were beginning to make their own dramatic departures from the principles of the 3-mile territorial sea, and US tuna industry leaders and diplomats worried that the day was not far off before American vessels would be subject to strong legal constraints, licensing taxes (which they began to pay early as 1948 for bait fishing in coastal waters) and even outright exclusion in favor of domestic tuna fleets in those waters.

The response once again was to raise the banner of fishery management science, advancing under those colors for purposes of US fishing industry interests as well as the less interested purposes of resource conservation. In this instance, it was the formation of the Inter-American Tropical Tuna Commission by convention between the USA and Costa Rica in 1949--with the agreement left open for signature and adherence by other nations in Central and South America. The agreement provided for bilateral (and later multilateral) research, and one of the world's most distinguished fishery scientists, Milner Schaefer, was appointed as director. The IATTC in subsequent years produced under Schaefer's direction a series of basic and applied studies of tuna that became the basis for imposing regulatory quotas in the 1960s.[18]

Although for the U.S. Government and industry, the IAATC had been put in place to assure not only scientific advances but also cooperative management relationships, and presumably an instrument for guarding the US tuna fleet's interests, by the early 1960s Japanese vessels had begin to

18 See, for discussion both of the IATTC's scientific studies and its management efforts, I. Barrett, Development of a management regime for the Eastern Pacific Tuna fisheries (Ph.D. dissertation, University of Washington, 1980).

enter the waters covered by IAATC management. Hence the obtaining of Japan's consent to participate in the regulatory regime--that is, to accept quotas imposed on each nation by agreement, on the basis of the commission's scientific studies--became a key objective of the IAATC. Japan delayed for several years in accepting IAATC direction of its tuna fishing operations in the Eastern Pacific region, but finally did come into the agreement. Here, then, was a regime that consisted largely of a highly capitalized U.S. fleet, one that effected a massive increase in efficiency and productiveness by applying the new technology of power seining after 1958, in a tense equipoise with coastal nations that had their own ambitions in regard to tuna fishery expansion; and, maintaining that uneasy arrangement to impose quotas on fishing in the 1960s, adapted to accommodate the entry (which IAATC sought energetically) of the major Asian fishing power into the agreement.[19]

Meanwhile, however, the Latin American states were moving on an entirely different tactical line in world diplomacy concerning the international law of fisheries. Beginning in the mid-1950s and continuing through the 1970s, both through the Organization of American States and through the UN, the Latin American nations pursued the alternative policy of international recognition for new rules of territorial waters that would permit them (and all states) to extend their area of jurisdiction and/or territorial ownership from 12 to 200 miles rather than the three miles that had so long been taken as the standard in international law.

Ocean science, international law, and changing regimes:

There was a great irony in the historical turn that had been taken by the Latin American states, for now the U.S. tuna fleet joined forces in international diplomatic talks with its counterpart fleet interests in Japan (and also with the distant-water trawler interests of Great Britain) to oppose any abrogation of the 3-mile rule. Contrary to the policy position of the American and Canadian salmon and halibut industries, favoring Abstention and other exclusionist formulae, the position of the distant-water tuna and Atlantic trawler fleets was (of course) that ships

19 Ibid.; James Joseph and J. W. Greenough, International Management of Tuna, Porpoise, and Billfish: Biological, Legal, and Political Aspects (Seattle, 1979).

of all nations had a right to open and free access to the waters off other nation's coastlines. This political and diplomatic alignment thus was in place as early as the 1950s, and it has worked itself out in international ocean diplomacy from that time to the most recent Law of the Sea debates and the Convention that is now open.[20]

For a long period after the 1955 Rome meetings that led to the 1958 convention, the scientific ideal of Maximum Sustained Yield was a lodestone in the efforts to define new international rules for access to ocean waters and international management of marine fisheries. The concept had in its favor politically as a leading scientist wrote in 1967, that, "Apart from a few economists, everybody is in favor of the conservation of marine stocks, and this is a standard to which all can rally."[21] Increasing criticism of this approach came from three directions. Initially it was from the nations, such as those already mentioned in Latin America -- but joined by Norway and other smaller nations seeking to protect their coastal fisheries, by Australia in an effort to exclude Japan from its pearl fisheries, then by newly dependent and other developing nations seeking to protect the future of their own control over offshore resources in line with ambitions to build up fishing fleets or at least to levy license fees for use of their waters --, who for their own varied reasons wished to put the old law of territorial waters to rest.22

Second came criticism of the MSY approach from academics and from industry interests that were impatient with the common style of fishery scientists. These scientists had abandoned the original MSY approach, which had been based upon statistics generated by the fishing boats-- measurements of output from the harvest that were compared to inputs and then taken as an index of the condition of fish populations. Instead, the scientists had adopted the more realistic but much less easily attainable measure of ecological research: the condition of the ocean environment and

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20 See Scheiber, "Pacific Ocean Resources," 500-524; E.D. Brown, "The Legal Regime and the UN Convention on the Law of the Sea," Exclusive Economic Zones, 15-35; Law of the Sea and Ocean Industry, ed. D. Johnston and N. Letalik (Honolulu, 1984), 317-46 (on Atlantic-oriented issues).

21 Wilbert Chapman, Food production From the sea and Nutritional Requirements of the World, ms. of address, March 1967, Chapman Papers, Univ. of Wash.

22 See inter alia, Donald McRae and Gordon Munro, "Coastal State 'Rights' within the 200-mile Exclusive Economic Zone," Rights Based Fishing, 97-111.

its biological resources, and the dynamics of the system, as the subject to be measured and understood. Consequently, management assumptions and goals became an ever-receding goal, and the scientists always saw the need for more information--either to revise existing management regulations, or, more commonly over time as depletion threatened, to approve the introduction of new management constraints.[23]

Finally, there was the attack from market-oriented economists on resource conservation as an ideal. They pushed for substituting "economic maximization" for the older concept of "yield maximization."24

Under these multiple pressures, but especially because of failure to accommodate the ambitions of the nations that advocated extended jurisdiction to 12 or up to 200 miles, the nations of the world moved instead to the 200 mile Exclusive Economic Zone as the emerging accepted rule of international ocean law. For Japanese industry and government leadership, this was the final step in a long and difficult journey that had begun with acceptance of Abstention, in the course of peace negotiations following Japan's defeat in World War II.
What had begun as a concession to exclusionism clothed in the rhetoric of science and legal principle now was ending with a worldwide "ocean enclosure" movement.

In the meantime, however, Japan had so increased the size and efficiency of its fishing fleets that it became a major partner in joint venture projects behind the protective curtain of other nations' 200-mile offshore limits.25 The enclosure of coastal waters has also given impetus, tragically enough, to the use of methods devastating to resources and the

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23 John Gulland (cited note 1) and Brian Rothschild, among fishery management scientists, have pursued this important theme in many essays published early as 1965. See also L. A. Nielsen,"The Evolution of Fisheries Management Philosohy," Marine Fisheries Review, 38 (19786), 15ff.

This sort of debate emerged forcefully nearly thirty years ago in one of the pioneering ecological research projects, focused on the disappearance of the California sardine fishery and is discussed in Scheiber, "California Marine Research and the Founding of Modern Fisheries- Oceanography," forthcoming in California Cooperative Oceanic Fisheries Investigation Reports, 1990, in press.

24 See Rights-Based Fishing, passim.

25 Japan pursued joint venture arrangements in distant coastal waters, e.g., in Mexico and Latin America, even before World War II. Before 1957 Japanese fishing interests had begun to develop joint venture arrangements also throughout the South Pacific and Southeast Asia. I will treat these developments in Scheiber, "Economic Interdependence and Ocean Resources: The Political Economy of Tuna," in progress, presented in preliminary form to the Economic History Association meeting, Detroit, 1988.

environment on the high seas beyond the national fishery zones--hence the resort to drift-net fishing, with its dreaded consequences for ocean ecology and the future of this planet's marine fishery resources. Japan is not alone, of course, nor even the most irresponsible user of such technologies, but its own resort (as other Asian nations do the same) to these destructive methods on the Pacific Ocean's high-seas waters serves to underline the breakdown and failure of the regimes set in place in the years just after World War II. A new ocean order has replaced that one, it is now certain.

PART II:

HISTORY OF WHALING AND SEALING

OCEAN RESOURCES IN BRAZIL
1770-1830

Tenth International Economic History Congress
Leuven, Belgium
1990

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Ocean Resources in Brazil, 1770-1830

I. Introduction: The Colonial Economy
   A. The Portuguese Approach
   B. Sugar, Slaves and Tobacco
   C. Gold Rush and Rise of Mercantilism
   D. The Search for New Products and Innovations
   E. Dom João in Brazil
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II. Ocean Resource Development
   A. Whaling and Related Products
      1. Whale oil
      2. Whale bone
      3. Whale meat
      4. Ambergris
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   B. Salt
   C. Turtles
   D. Fisheries
   E. Transportation

III. Some key questions and possible answers
   A. Why did whaling decline?
   B. Why did the fisheries industry not develop?
   C. Why didn't the Amazon develop earlier?

ABSTRACT

Ocean Resources in Brazil, 1770-1830

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This paper discusses the use of ocean resources in Brazil during the late colonial period and the first decade after independence. An introduction gives an historical overview of the colonial economy in Brazil making some comparisons to the colonial economy of the British colonies in America during the same epoch. The main ocean resources used in Brazil were whales, salt, fish and turtles. Ocean transportation was a crucial factor in the economy of Brazil. Ocean fisheries were not a significant indigenous industry during the period discussed. Reasons for the decline of whaling after 1800 and the lack of other fisheries are proposed. Speculation is made about the lack of development of Amazon resources prior to 1880.

Introduction. In 1933, Herbert Eugene Bolton called on historians to view the history of the Americas between 1776 and 1826 in a comparative context in a search for similarities that might have shaped "The Epic of Greater America" (Bolton, 1933). Continued analysis of Brazil builds a case for uniqueness. When Portugal signed the Treaty of Tordesillas in 1494 with Spain, it had no idea what the implications were. Portugal wanted to entrench its position on the Atlantic Islands (Azores, Madeira, Cape Verde, Canaries) and the coast of Africa. Spain wanted to secure its title to the newly found islands in the Caribbean, which they believed lay off the coast of Asia. The Tordesillas line was drawn 370 leagues (1184 miles) west of Cape Verde at about 45° West longitude (see map). Neither country knew that a major portion of South America lay east of that line, land destined to be Brazil.

Brazil was discovered initially by Pedro Alvares Cabral in 1500. Forays along the coasts revealed hardwood forests and the first resource returned to Portugal, pau brasil (Brazil wood), which was known to be an important source of red dye for wool and cotton products. The first coastal explorations, unfortunately for Portugal and for Brazil, revealed no cities and no obvious wealth, mineral or otherwise. The climate, however, was tropical and the soils appeared productive, especially south of Cabo São Roque. The Portuguese decided to exploit the new land by planting sugar. By 1580, the Indians on the coast had been exterminated or driven inland, so the Portuguese also decided to import slaves from their African colonies (especially Angola) to work on the sugar plantations. Between 1550 and 1600, more than 50,000 slaves were brought to Brazil (Lang, 1979).

The first element of the Portuguese approach to colonial exploitation was to create large sugar plantations using slaves and run by land barons (capitanias) given grants by the King. Since Portugal was prosperous, there

was little motivation for middle or lower class immigration to Brazil. So Brazil became a true colony with a dependency on Portugal and, later on, Britain for amenities, manufactured goods and food. In the British American colonies immigrants flowed in, started many small farms, and a diverse middle-class infra-structure evolved. This did not happen in Brazil until the late 19th century (Furtado, 1972).

Sebastião Borges, Treasury Superintendent for the King, introduced in 1610 an economic innovation, the monopoly contract system. He proposed to give exclusive contracts to wealthy merchants to transport sugar, to carry out whaling in support of the sugar industry and to supply salt for meat and fish preservation. The king added a special feature. He told Borges to auction the monopoly contracts to the highest bidders in exchange for a tax exemption (Schwartz, 1973). Bidders included French and Spanish merchants as well as Portuguese. A negative effective of this economic approach was to discourage entrepreneurs in the Brazil trade and to funnel profits back to Europe. The king's treasury received the fruits of the auction without any investment or risk.

The years from 1690 to 1750 are often called The Golden Age in Brazil (Lang, 1979). Gold and silver were discovered in placer deposits in the interior of Brazil in what is now the state of Minas Gerais. Portugal had previously paid little attention to Brazil and had looked eastward to its colonies in India and China for wealth. Now Brazil achieved new status. A gold rush ensued inland from Rio de Janeiro and the economic center of Brazil shifted from the sugar regions of Recife and Salvador to Rio de Janeiro. The increased value of Brazil to the Portuguese government brought more beaurocratic attention and a tightening of controls. The mining districts were closely controlled so that the crown received 20% of all gold and silver produced. More trading monopolies

were established. All shipping and manufactured goods were provided by Portugal. Brazilians were prohibited from entering the shipping or manufacturing businesses. Unfortunately, the easily exploited placer deposits in Minas Gerais began to diminish.

In the latter part of the 18th century, Brazilian intellectuals at the University of Coimbra in Portugal were encouraged to travel to other European universities in order to seek new ways to exploit Brazil through new products and innovations in production. This had two effects. One was to diversify plantations in Brazil to expand production of cotton, rice, tobacco, indigo and whale products. The other was to introduce Portuguese and Brazilian intellectuals to the European Enlightenment.

The hemorrhaging of Europe after 1800 caused by the Napoleonic wars had a unique effect on Brazil. While other European nations fought Napoleon, King Dom João of Portugal decided to take his whole government to Rio de Janeiro and to vacate Lisbon. He left Lisbon in November, 1807 under the protection of the British fleet. In January 1808, appropriately, Rio de Janeiro (River of January) was established as the seat of the Portuguese Empire. Concomitantly, cultural evolution accelerated in Brazil. The first printing press in Brazil went into operation and the Banco de Brasil was established in 1808. The first university began. The mercantilist controls of Brazil as a colony were terminated. Trade and industry were stimulated. Those who traded with Portugal, notably Britain, now came to Rio de Janeiro to curry favor and to trade. Direct trade with the Asian colonies commenced.

When King Dom João left in 1821, his son, Dom Pedro I, remained in Brazil. By this time, Brazilians did not want to return to a colonial status with trade restrictions and foreign monopolies. To resolve this conflict, Brazil declared independence and named Dom Pedro king of the new Empire of Brazil.

Brazil already had taken the place of the former British American colonies as supplier of cotton, rice, tobacco, sugar and indigo to Britain while Britain provided Brazil with manufactured goods. Brazil, with a national economy similar to that of the former colony of Virginia, was content with this relationship.

Coffee was introduced to Brazil from Africa in the 18th Century. Who could have guessed that it was destined to be so popular in Europe and the USA? Coffee production jumped from 19% of Brazilian exports in the decade of 1821-30 to 63% by the decade 1881-90. Coffee continues as a major export. The great rubber boom lasted only from the 1880s to World War I and served mainly to introduce the Amazon's potential to Brazilians. Today, Brazil still struggles to escape dependency on the export of low-cost agricultural products dominated by coffee, sugar, rice and tobacco.

Whaling. The first ocean resource developed in Brazil that was significant to the colonial economy was whaling. Diogo Botelho, the new Governor General of the Captaincy of Bahia, thought that whaling could support the sugar plantations of Bahia. He thought that the oil could be used to light the sugar mills so that they could be run twenty-four hours per day and the excess could be sent back to Portugal. The whale meat could be a valuable source of protein for the slaves who worked the mills and fields. The whalebone could be turned over to the contracted Basque whalers for profit (Peterson, 1948). When Botelho went to Brazil in 1603, he brought two Basque whaling ships with him under the command of Pedro de Orecha from Bayonne (now France). The Basques found small coastal whales similar to those in the Bay of Biscay which they had hunted traditionally. Botelho's idea worked. The sugar mills were lit continuously and the slaves accepted the meat. The Basque whalers received small compensation from the crown but profited from legal

whalebone trade and illegal hardwood smuggling. The crown monopoly for whaling was established in 1610 and the first contractor was Julien Michel from the Basque city of Bilbao.

The exploitation of whaling expanded with the sugar industry. Unfortunately, the oil had a propensity to turn opaque at low temperatures (10°c) so the resource could not be exploited fully in Europe but was used in Lisbon. The whales were also somewhat smaller than those of the Bay of Biscay. For these reasons, the coastal whales of Brazil may not have been the true southern right whale, Eubalaena australis, as previously reported. Instead, they may have been a tropical/temperate sub-species or even a separate species not previously described.

The value of whale product exports was about 33,000 pounds sterling annually during the last twenty-five years of the 18th Century (Ellis, 1958). There are no direct figures for the value of whale products to the Brazil sugar industry. Most of the whale oil rendered was used in the sugar industry, perhaps 90% or about 90,000 pounds sterling. Whale meat was provided as food for the slaves worth, perhaps, another 10,000 pounds sterling if they had substituted beef. Unquestionably, whaling was an important contributor to the sugar industry.

Tobacco was another major export commodity of Brazil (Table 1). Brazilian tobacco was cured and twisted. then it was dipped into a syrup of tobacco juice, lard (whale product?), various herbs, molasses and ambergris (Lang, 1979). Ambergris is an intestinal concretion from sperm whales. The Basque whalers in Brazilian coastal waters did not take sperm whales, and sperm whales are known to be pelagic (open ocean) mammals. The ambergris was often found on the beach or floating near shore prior to the mid-19th century when sperm whales were abundant. Some ambergris may have been

collected in the Portuguese Atlantic Islands and brought to Brazil. There are no figures for the value of this product in Brazil but it was a valuable export from the British American colonies which took many sperm whales in the 18th and 19th centuries. In the 17th and 18th century, ambergris was more valuable than gold on an ounce vs. ounce basis (Peterson, 1948).

Whale oil was also used extensively to produce tallow for candles (vela de sedo). This was a major export industry in Rhode Island colony in North America. Candles were apparently not a major export of Brazil but they were produced for local use.

Another use of whale oil for which there are no Brazilian records is in the hide tanning industry (Peterson, 1948). Around 1800, hides were exceeded only by sugar and gold in export value for Brazil (Table 1.)

Salt. Salt was an extremely important commodity in the 17th-19th centuries. It was the main ingredient in preserving meat and fish and was also used to preserve vegetables. It enabled people to survive on ships at sea for the two months passage from Europe to the Americas. It also prevented spoilage in the tropical climate of coastal Brazil. In addition, salt is a major ingredient in the preservation of hides for tanning after shipment (Ellis, 1955).

In colonial Brazil, the crown monopoly for salt was first auctioned in 1631 and was one of the principle monopolies along with tobacco and whaling (Ellis, 1955). Although salt deposits that could be mined were found in Ceara, the lagoonal salt flats at Cabo Frio (north of Rio de Janeiro) became the main source. There was good water quality, a dry, sunny climate and easy access to the sea at Cabo Frio. This continues to be a significant product at Cabo Frio today.

Turtles and Fish. The first attempts to penetrate the Amazon occurred in the late 18th century. Manaus was established as the capitol of the

Captaincy of São José do Rio Negro in 1808. Many new forest products (cashews, quinine, etc) were harvested and other Brazilian agricultural products (cotton, tobacco, coffee, etc) were introduced. For the first time, new fisheries exports were initiated. Miscellaneous fish were harvested from the river with a value of 3,487 pounds sterling in 1819 (Simonsen, 1969. Also, turtle butter (manteiga de tartaruga) was exported in the same year worth 6,725 pounds sterling. Together these were exceeded only by tobacco as regional exports in the early 19th century.

Transportation. Sometimes people do not recognize the importance of the ocean as a medium for transportation because no product is exploited. Nevertheless, most international trade involves the transport of goods on ships via the ocean. That is as true today as it was in 1800. Brazil has two natural deep water harbors, Rio de Janeiro and São Luis (Maranhão). Access to safe harbors at Recife, Salvador, Santos, Belem, and Florianopolis were crucial to the successful implementation of Portugal's exploitation of the coastal zone for agricultural. Food, clothing and other manufactured goods could easily be unloaded and the agricultural products could be loaded. Portugal was rivaled only by Spain and England as a sea-faring nation. Its wealth was attributed to trade with India, China and America via the sea.

Portugal made a mistake, however, in not allowing Brazilians to enter the shipping business. Only Portuguese ships were allowed to trade and were granted the right to do so by the crown. This stultified potential entrepreneurs in Brazil and contributed to colonial status and dependency. Having no indigenous shipping industry slowed the economic growth of Brazil after independence. Even then, the British dominated the sea trade and encouraged the development of railroads to open the interior. Brazil never

developed a major shipping industry and this continues to impede new economic growth.

Questions and Comments. Why did whaling decline in Brazil from 1800 to 1830? For the period 1770-1795, one thousand whales were taken annually (Peterson, 1948). The whaling procedure was to harpoon a calf, drag it to shore, and to take the cow as it followed the wounded calf to shallow water. This technique was denounced by José Bonifácio de Andrada e Silva, a Brazilian intellectual at Coimbra (1790). He argued that this practice would lead to the elimination of the population. He predicted that the industry would collapse in twelve years. The population, indeed, crashed between 1795-1801. In 1801 the crown monopoly auction for the whaling industry had no bidders. The industry was privatized, and whaling continued in Santa Catarina and Rio de Janeiro. The whalers took 50 to 90 whales annually and made no profit. After independence in 1822, the whaling stations diminished their operations. In 1828, the last station was terminated in Santa Catarina and sold for scrap (Peterson, 1948). The population of whales may have been hunted to extinction if they were a separate species or sub-species.

Why didn't Brazilians start to hunt pelagic whales as the USA whalers did? Why didn't Brazilians develop their fisheries industry? Why didn't Brazilians develop a shipping industry? The answers may be closely related. The Portuguese have long had a reputation as sea-faring, implying that they traded across the sea and were fishermen. That is well-deserved. The Portuguese crown reserved fishing and shipping for Portuguese citizens via monopolies. Fish were caught by fishermen from Portugal and the Atlantic Islands and transported to Brazil. In addition, Brazilian waters were not as productive as the Grand Banks or off west Africa. Brazilians were discouraged as a matter of crown policy from entering the fishing and shipping industries.

Many Portuguese fishermen emigrated to the USA but not to Brazil. The reason was that they could operate as independent fishermen in the USA and could even strive to own and operate their own ships. In Brazil that entrepreneurial opportunity was unavailable.

Why didn't the Portuguese develop the Amazon resources? The Treaty of Tordesillas (1494) was a deterrant to expansion, but exploration took place in the 1500s and 1600s. In 1750, the Treaty of Madrid opened the Amazon region for settlement by the Portuguese. Gradually, they exploited the resources but faced formidable problems such as diseases (malaria, yellow fever, etc) and long distances to travel. Also, the gold boom diverted interest to the south. In the 19th century, fisheries, agriculture and lumber were exploited. Beginning in the 1880's, the Rubber Boom ensued.

Conclusions Brazil has never had a traditional reputation as a sea-faring nation. Instead, it has been an agricultural nation. In its early history, it was even monocultural (sugar). The exploitation of ocean resources probably peaked in Brazil in the last two decades of the 18th century. The 19th century was characterized by low utilization due to the overexploitation of whales and the low productivity of coastal waters. In addition, Portugal and Britain provided the shipping necessary for Brazilian trade during the 19th century so a national shipping industry did not evolve.

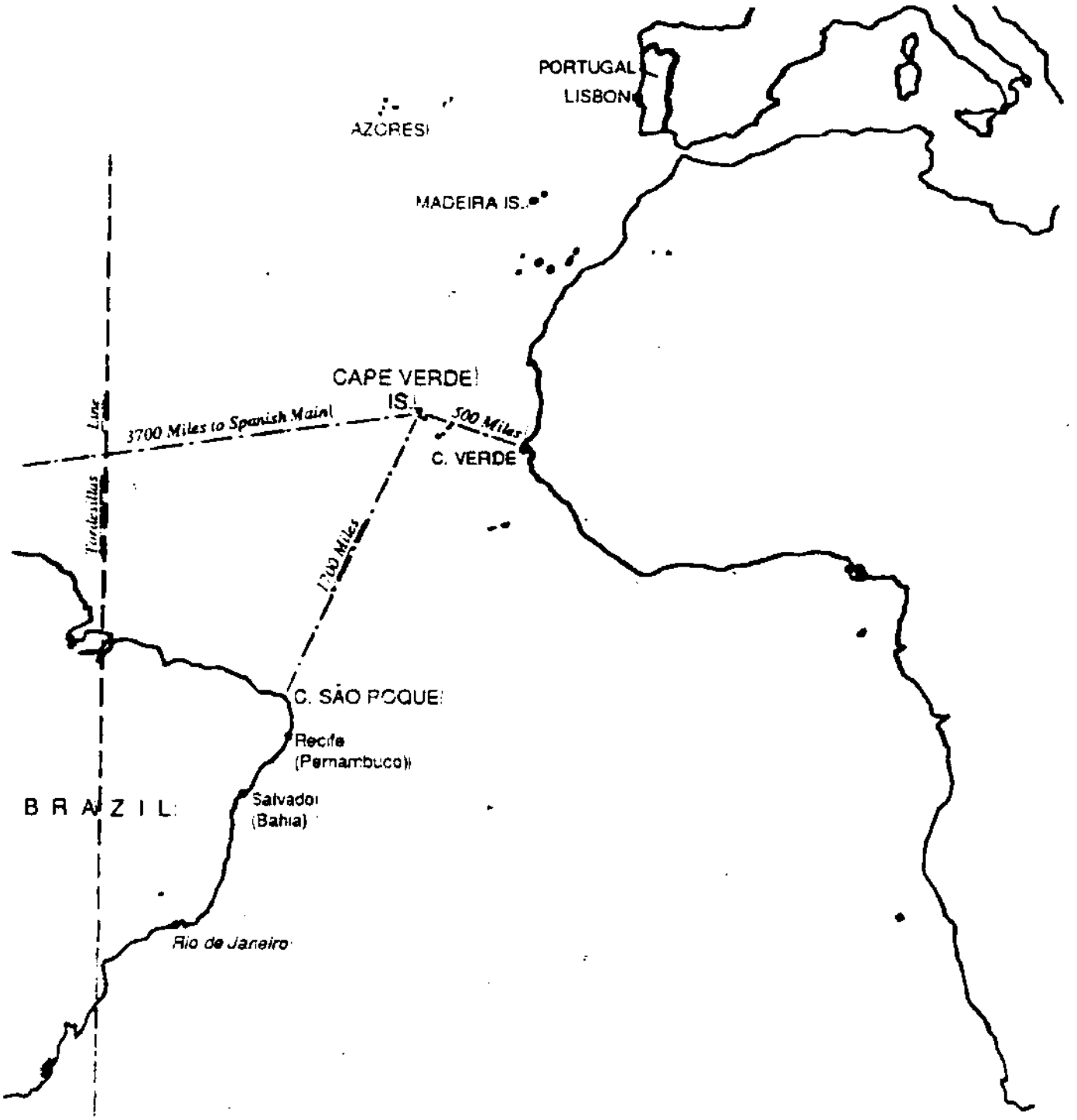
Table 1. Brazil Exports, 1777

(after Simonsen, 1969, p. 363)

Commodity*	Value (pounds)
Aguardente (rum)	10,367
Algodão (cotton)	70,752
Arroz (rice)	205
Açúcar banco (white sugar)	173,806
Açúcar mascavado (brown sugar)	35,408
Azeite de peixe (whale oil or fish oil)**	227
Barba de baleia (whale bone)	6,761
Cacau (cocoa)	78,100
Café (coffee)	581
Canela (cinnamon)	4,129
Chocolate (chocolate)	162
Couros (hides, etc)	146,904
Pau-brasil (Brazil wood)	29,912
Raízes medicinas (medicinal roots)	2,774
Salsaparilha (sarsaparilla)	6,763
Tabaco (tobacco)	141,310

*Does not include gold or diamonds worth about 400,000 pounds sterling

**Linnaeus first recognized that whales are mammals not fish in 1776


PORTUGAL
LISBON
AZORES
MADEIRA IS.
CAPE VERDE IS.
3700 Miles to Spanish Main
300 Miles
C. VERDE
Line
Tordesillas
1700 Miles
C. SÃO ROQUE
Recife
(Pernambuco)
Salvador
(Bahia)
BRAZIL
Rio de Janeiro

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France's Whaling Fleets in the Pacific Ocean in the Nineteenth Century.

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Whaling had been practiced in France since the ninth or tenth century. Whales were numerous in the Gulf of Gascony, and the Basques started to capture them on their coasts. Later on, they would hunt them up to Greenland and Spitsbergen. In the eighteenth century, French whaling was driven out of the fishery by the competition of the British and the Dutch fleets. King Louis XVI tried to revive this activity, and the French revolutionary government pursued this policy. But revolutionary and Napoleonic wars seriously hindered the anticipated results, as the English seized many French ships and sailors.

However, in the 1830s, the French whaling fleet became second in importance in the Pacific ocean despite being ten times smaller than that of the Americans. Until 1835, the number of French whalers in the Pacific ocean was very small: between 1818 and 1822, only four French whalers (three from Nantes and one from Havre), have been counted. Some followed, but many failed to cross Cape Horn and stayed on the coasts of Brazil or Africa. A good example is provided by the experience of a shipowner from Nantes. In 1825, Thomas Dobree instructed the captains of two of his whalers to go to the Pacific Ocean, namely to the grounds off Japan. Only one of them, the *Triton*, reached the designated place. As she arrived too early for the season, the campaign was fruitless, and the captain, after a rest

in California, turned to seal hunting. As for the other whaler, the *Ocean*, she could not even enter the Pacific Ocean. The crew was indeed so reluctant to cross Cape Horn that they used all kinds of stratagems to impede the ship's progress, almost to the point of threatening her security. So, the captain, perhaps to his relief, had to abandon the shipowner's purpose, and remain instead in the well known grounds off Brazil and Africa. But as these grounds became less and less productive, whalers were pushed to new hunting fields.

1. The subsidy from the French government.

The most important years for French whaling in the Pacific ocean were during the period of 1832 to 1846. The years 1835-1837 saw greater numbers of whalers leaving French ports, mainly from Havre.

This increase is due in part to the policy of the French government. Apart from financial and commercial reasons, whaling was valued as good training for shipmen, one that would accustom them to risky sea life, and prepare efficient crews for Navy ships in case of war.

The government offered a subsidy to shipowners who agreed to outfit whalers to go hunting past Cape of Good Hope or Cape Horn. This inducement was different according to the nationality of the ship and of the crew. During the first years, shipowners were encouraged to invite foreigners, mainly captains and harpooners from Nantucket, to teach their trade to French sailors. Once this process

was completed, the French government favored only domestic activities, and foreigners were compelled to ask for naturalization. Most did. Thus, Jeremiah Winslow, although born in Nantucket, became one of the most prominent shipowners in Havre.

To apply for the subsidy, a whaler had to lead a hunt "in the South Seas", on the other side of Cape of Good Hope or Cape Horn. This regulation provides a very interesting source for the study of French whaling. Upon a ship's return, the captain had to answer some questions about his voyage. Copies of these declarations are kept in the National Archives, in Paris, and are gathered into three boxes. The first one deals with the years 1817-1830, the second one concerns the years 1831-1839, and in the third one are the declarations of the captains who returned in the years 1840-1852. Out of a total of about 400, some 240 relate to campaigns led in the Pacific Ocean. A certain number of declarations are missing, but compared to departure figures recorded in governmental documents, the difference is minimal. The general trends are the same.

Each declaration provides the names of the ship, of the shipowner, of the captain, the dates of sailing and return, the dates and places of hunting, and the results: number of whales chased, number of whales killed, quantities of oil obtained from right whales, sperm whales, and sea elephants. The whale bones are also indicated. The first years, captains were asked to specify how many whales each harpooner had killed. Another question pertained to ports

of call. Some inquired whether the crew had received enough food and health care, and whether the captain was satisfied with their conduct. The answers were then read to the crew, and they were asked to give their opinion. Sometimes, they complained. As only a few logbooks were saved, these documents prove very useful, being a sort of summary of the captain's journals. Occasionally the captain would add some remarks about the risks and difficulties encountered during the campaign. He could also give the names of other whalers he met during the trip. But of course, this last indication is dependable only for French whalers, as the names of foreign whalers were often incorrectly transcribed.

Thus the source provides data for a statistical analysis, as well as glimpses of life aboard whalers. A more geographical point of view will be adopted for this paper.

As they arrived in the Pacific Ocean, whalers had to look for hunting grounds, shifting from one to another as the prey disappeared. Cruising across the waters in search of whales, they led a risky life. They had to cope with inclement weather, avoid hidden dangers such as uncharted rocks, in addition to fighting huge whales. Furthermore, their relations with the inhabitants of the islands were sometimes conflictual. It is no surprise that when they arrived at a port of call, they looked like "wild animals", as a French Naval officer stated. Some of them, disgusted with their captains, or with whaling, seized their chance and ran away. Nonetheless, whalers can be considered as the

vanguard of French interests in the Pacific Ocean. They sailed from one coast to the next, all across the ocean, rediscovering it, in a sense. It was mainly to assure them help and protection that the French government sent several vessels on exploration tours, and established a network of consulates in the main ports of call.

2. Hunting grounds.

During the period considered, four stages appear. Until 1835, most whalers would stay in the Atlantic Ocean, near the coasts of Brazil or Africa. They would sail across Cape of Good Hope merely to satisfy the requirements for the subsidy. On occasion, this could lead to abuse: one whaler applied for the subsidy after having sailed only one day at Cape of Good Hope. Overall, the campaigns were short and rather profitable, especially considering the governmental contribution.

Only a few whalers dared to cross Cape Horn. As late as March 1834, one captain declared having been obligated to abandon his attempt, as mountainous icebergs obstructed the passage. But this captain was one of the last to have given up, as the scarcity of whales in the Atlantic Ocean pushed whalers to new grounds. During the second semester of 1835, the number of French whalers off the coasts of Chile reached approximately twenty-six, compared to only ten during the previous austral summer.

As suddenly as their numbers had increased, French whalers abandoned the Chilean archipelagos. In October

1838, whales were scarce there, and the following year almost no French whalers were seen in these grounds. Since the beginning of 1838, they had flocked to New Zealand, where they directed their campaigns until 1843. During 1842, the season was very bad at Cloudy Bay (New Zealand). Whales were scarce and shy, while ships were numerous. It was time to leave. From New Zealand, whalers drifted often to the southern coasts of Australia. After reaching a climax in 1841, this last ground fell out of favor with the whalers in 1845. Whalers had then explored new grounds in the North Pacific. A few went to the Gulf of Alaska and to the Aleutian islands. The first to open the ground off the Canadian coast in 1835 was a French whaler from Havre, the *Gange*, under the direction of Captain Narcisse Chaudière. Sailing often through heavy fog, the crew met whales far bigger and stronger than those who swam near the coasts of Chile, and these monsters did much damage to the equipment. Nevertheless, most whalers directed their campaigns to Kamchatka, the Kuril islands, and the Sea of Okhotsk. Started in 1843, very busy in 1845, this ground was almost abandoned after 1848. A few hunted in the Sea of Japan, beginning in 1845, and only in 1847 did they enter the Western Arctic.

The shift from one ground to another one, from Chile to New Zealand, Australia, then Kamchatka, is clearly seen. When a campaign was no longer profitable, whalers left, in search of better opportunities. As soon as such were found, they all gathered there, until the extinction of the local prey. When, on a designated ground, whalers were numerous

and whales scarce, they left again, and with the end of easy opportunities, whalers turned into wandering sea vagabonds.

In fact, their numbers decreased dramatically at the end of the 1840s. As the campaigns were less and less productive, while the subsidy decreased and could not be a sufficient compensation, shipowners turned to more profitable speculations, and many whalers were sent on commercial expeditions.

To go hunting off the Chilean coasts, whalers had to cross Cape Horn both ways, and the duration of the entire trip was approximately eighteen months. When they went to New Zealand, they very often made their way through Cape of Good Hope. An average voyage would last twenty months, but during the early years, some were able to make the trip in a mere fifteen months. Of course, the longer the distance, the longer the time. When they went to Kamchatka and Kuril islands, they would sail accross the Indian Ocean, round Australia by the east side, make their way through the Melanesian and Micronesian archipelagos, and return to France by way of Cape Horn. This round-the-world journey lasted over three years, and up to forty months.

3. Ports of call.

A short campaign could allow a captain to stock enough provisions to avoid stopping during the trip. This was hardly possible in the Pacific Ocean. Campaigns were long, lasted several years, and the captain had to stop to give

the crew fresh food, or scurvy could weaken them to death. The tumultuous storms in a not-so-pacific ocean, were another reason to stop. The captains tried to limit these stops to the winter, after hunting season. These months were dedicated to rest and to repair of the ship. But this was indeed a dangerous moment. The most feared occurence was the desertion of sailors. Between sailors who ran away, those who died, or were too sick and had to be landed, a crew could be totally modified. This happened to a whaler from Havre, named *l'Indien*. She left France on December 29, 1839, with a crew of 26 seamen. When she finally returned on September 18, 1842, she was manned by 17 men, of whom only two were of the original crew. The captain himself had passed away in November 1840.

The busiest ports of call were Valparaiso and Coquimbo on the Chilean coast, Akaroa in New Zealand, and Honolulu. There, sailors were more liable to jump ship and find another hiring. As a result, captains would occasionnally attempt to reach less frequented places. Thus, California ports came into favor, being chosen mainly by those whalers who had tried their luck in the Gulf of Alaska, or near the Aleutian islands. Sixteen French whalers put into California ports between 1834 and 1848. They mainly reached Monterey, considered as a port where whalers were few enough. Then they sometimes sailed to San Francisco, where watering was easier. They crossed the Golden Gate, and anchored near Sausalito. One whaler from Nantes, the *Espadon*, appeared three times in San Diego, in 1846, 1847 and 1848, the reason being that the captain completed the

cargo with the oil of sea elephants hunted on the coasts of lower California. Due to the somewhat troubled situation of California during the 1840s, and to the restless tendancy of the crews, some encountered troubles with the local authorities. In 1843, the captain of the *Fanny*, from Havre, was fined for smuggling. In September 1844, some sailors from the *Angelina*, also from Havre, found themselves engaged in a fight with Mexican soldiers. These French captains and sailors complained about the absence of a French vessel to provide for their protection on the coast of California.

4. Dangers in the islands.

Relations with the inhabitants of the islands were not always idyllic. Indeed, they could be difficult and dangerous. Cultural differences, the natives' interest for white men's technology, and the white man's disdain for natives, led to dramatic clashes. On August 11, 1839, the *Liancourt* was the only whaler still at anchor at Cloudy Bay, New Zealand. On that date, natives working aboard warned the captain of a plot by other natives to overtake the ship the following day. As a precautionary measure, the captain ordered the ship's departure, which may have spared the crew the unfortunate fate of the *Jean Bart*, or the *Angelina*. The first one became famous as a whaler from Dunkerque, attacked in May 1838 in the Chatham islands, where the whole crew was murdered by the natives. The frightening news was heard at Cloudy Bay in November, and some whalers present there at the time accompagnied the

Heroine, a French warship stationned at Akaroa, to the place of the murder to seek revenge. Many questions were asked about the reasons for this tragedy. In fact, it seems that all this was an unfortunate mistake. The natives of the island may have sought revenge for the conduct of the captain of a Tasmanian whaler, the *Caroline*, who had hired some of them for work while at dock, and then left without paying them. Thus they attacked the first ship to appear, without consideration of her nationality.

Another deadly encounter occured when Edouard Hyenne, the captain of the *Angelina*, a whaler from Havre, and twelve men, including the doctor, landed on a charming atoll, on King's Mills ground, in December 1844. The natives were friendly, and the captain intended to obtain fresh food and water. None of the thirteen men was ever seen again. When the second captain tried to sail closer, the natives turned hostile, forced him to leave and go, with a diminished crew, to the nearest French consulate, Honolulu.

5. Revolts among the crew.

Many captains praised the presence of the *Heroine* in New Zealand, as an efficient protection in the event of attacks by the natives, as well as revolts among their crews.

Certain reports give samples of what could lead a crew to insubordination. On the *Cachalot*, from Havre, the captain, Louis Mauger, was a violent man. The crew

complained that he was often drunk and mistreated his men causing the desertion of seventeen sailors. French sailors did not accept harsh treatment. On the 1st of July, 1841, the captain clashed yet again with an officer, which led to the captain being clapped in irons, where he remained until the ship's return to France.

Another reason for the crew's revolt could stem from the captain's plans, that they judged as too risky. On March 1838, as the *Gange* was in New Zealand, the captain, then Oscar de Grandsaigne, ordered to set sail towards the Northwest coast of America, against the crew's advice. He immediatly faced a mutiny. Normally, in a similar situation, a captain would engage his officers and crew in an open discussion regarding the course to be followed. But the stubborn captain of the *Gange* stuck to his plans, which led to the departure of eighteen men, half the crew. Eventually, he had to abandon his project, and remain around New Zealand.

While certain crews would react at once to mistreatment, others awaited their return to launch their complaints. On July 26, 1844, after a three year campaign, the crew of the *Reunion*, captained by Aderial Smith, complained that they had been deprived of beer for one year, of coffee, tea and sugar for nine months, and of vegetables for three months. This captain's conduct is difficult to explain. He may have underestimated the needs for such a long voyage. He may have acted out of stinginess, anxious to economise as much as possible, which

was of course in the interest of the shipowner. Then again, he may have feared stopping and running the risk of numerous desertions. Such conduct could endanger the health of the crew, and the government tried to check these practices.

6. Desertions.

Desertions were the plague of the campaigns, and their causes were quite often discussed. Sometimes invoked was the reluctance of French crews to endure severe physical and moral hardships during a long period. But most naval officers would stress the fact that the shares were too small to enable and induce a sailor to carry out a satisfactory campaign. By comparison, a sailor hired on a commercial ship was assured earnings between 50 and 55 francs a month, while a sailor working on a whaler could seldom obtain as much. He more often would earn the equivalent of between 20 and 40 francs a month. On occasion, a sailor having received advances at the time of his hiring could even find himself indebted to the shipowner. And all the while he was exposed to many a danger, the smallest being the risk of being thrown into the air by the tail of a diving whale and drowned.

In response to these complaints, shipowners would object that French sailors received higher shares (lays) than their American counterparts, and that in any event the operation was not profitable enough to enable them to pay higher shares. The fact is that while French officers could receive higher lays than American officers, the contrary

was true when it came to ordinary seamen. Whatever the reason, sailors continued jumping ship each time they tired of that life. A precise study is yet to be done, but apparently more and more men originated from inland regions. Not having any sailing experience, they accepted the job merely as an escape from a situation of misery. Upon encountering whales they would be so frightened that they would vow to abandon whale fishing and subsequently do everything possible to leave the profession.

7. French consulates.

Protection of whalers was the main reason for the French government's creation of consulates at Valparaiso, Conception, Honolulu and Monterey. Consuls enabled smooth relations between captains and local political authorities. They would assist the captains to the best of their ability. In May 1837, the French acting consul at Concepcion (Chile), obtained permission for French whalers to enter certain bays, such as San Vicente Bay, which previously had been forbidden. The most appreciated action was the arrest of runaway sailors. In September 1835, Captain Narcisse Chaudière, of the *Gange*, lost five men at Monterey, California. Another ten men were to leave the *Fanny* in December 1843, taking advantage of the heavy fog that hung on the port. Five others jumped ship from the *Gange*, captained by Joseph Victor Nevé, in March 1844. But in September 1845, when five sailors tried to leave the *Argo*, originated from Nantes, and captained by Oscar de Grandsaigne, they were all arrested and sent back on board.

This difference was due to the presence of a French acting consul, Louis Gasquet, who had arrived at Monterey in March 1845. He managed to obtain the California governor's assistance for the arrest of runaway sailors.

8. Cruising the ocean.

Cruising all across the ocean in search of prey, whalers were confronted with their insufficient knowledge of the area. They asked help from the French government.

Already in 1785, Lapérouse, leaving France for an exploration tour, had been instructed by Louis XVI to inquire about the possibilities of whaling around Cape Horn and in the Pacific Ocean. While at Monterey, California, he was surprised to see how numerous and tame the whales were. He noticed that they swam within shot. At the end of the eighteenth century, the Pacific Ocean was at last known in its main outlines, from the reports of Cook, Lapérouse, and other explorers, but it was long before maps were really reliable.

Before the French Navy had recovered from the difficulties of revolutionary and Napoleonic wars, whalers had already sailed their way to the Pacific Ocean. Declarations were then used to gather information from captains. They were asked to say if they had seen any uncharted islands or rocks, as well as to report anything that could be of use to navigation. The logbook of the *Constance* (1834-1836), written by Captain Narcisse Chaudière, was deposited in the Navy archives because of

several valuable maps of South American ports, such as San Carlos of Chiloé. Thus, it is one of the few journals that were saved. At first the captains provided information. However, in 1844 ship captains petitioned the French government, asking for a ship to be sent to the Northwest coasts of America, to improve the maps of the area, especially those of the bays most frequented by the whalers.

Navy ships were sent to the Pacific Ocean to help whalers, and to collect information about the best opportunities. Thus, the *Vénus*, with captain Dupetit-Thouars, was sent on a round-the-world exploration tour, from 1836 to 1839. Dupetit-Thouars was instructed to survey the bays of the Northwest coast of America, and to examine the possibilities of establishing a port of call for whalers. On his return to Brest, the captain sent a report to the Ministry. It was soon published in the *Annales Maritimes*, which proves the interest of the French government towards whaling. During the years of 1835 to 1840, the government sent three expeditions around the world, and further developed French naval stations in the Pacific Ocean.

9. Conclusion

Whaling in the Pacific Ocean is a major part of the history of French whaling. The interest of the French government is manifested through a policy of subsidy and demonstrations of power such as the presence of the *Héroïne* and the *Vénus*. The allowance of a subsidy provides a source

of data which can be the basis for a study of French whaling from a quantitative, as well as a qualitative perspective. Completed with other documents, such as lists of crews, or accounts of oil sales, this source can also be used to measure the evolution of results and the productivity of the campaigns.

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THE 1893 BERING SEA ARBITRATION: A RETROSPECT

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THE 1893 BERING SEA ARBITRATION: A RETROSPECT

At the occasion of the approaching centennial of the 1893 Paris award in the Bering Sea Arbitration[1] it seems appropriate, once more,[2] to look back at this famous[3] 19th century effort to solve a particular dispute between Great Britain and the United States concerning fur sealing by means of reason rather than by a resort to war.

It lies not in the intention of this study to give a detailed overview of the arguments of the parties involved or to analyze the different aspects of the award itself. Other, more competent persons, have already done that.[4] Instead, this paper proposes to highlight two

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[1] The compromis by which Great Britain and the United States submitted the controversy to an arbitral tribunal was concluded on February 29, 1892. See Treaty for Submitting to Arbitration the Question Relating to the Seal Fisheries in Behring Sea, Great Britain-United States, signed at Washington on February 29, 1892, as reprinted in 176 Parry, C., The Consolidated Treaty Series, New York, Oceana Publications, Inc., pp. 447-453 (1978). Hereinafter cited as 1892 Compromis. After Paris had been chosen as scene for the arbitration, the French government placed part of the Ministry of Foreign Affairs on the Quai d'Orsay at the disposal of the parties. The Tribunal first met there on March 23, 1893 and on August 15 of that same year copies of the award were handed over to the parties during a public session. For an English version of the text of the award, the annexes and the declaration, see 6 AJIL 237-241 (1912) or 1 Moore, J., History and Digest of the International Arbitrations to which the United States has been a Party (hereinafter cited as Arbitration), Washington, Government Printing Office, pp. 945-955 and 956-957 (1898). Hereinafter cited as 1893 Arbitration.

[2] In 1943 another such retrospect appeared in the American Journal of International Law. At that time, Mr. F. Coudert, son of one of the members of the leading counsel for the United States during that arbitration, asked Mr. Williams, an associate counsel during that same arbitration, to review this famous arbitration as sole surviving member of that American delegation. For his recollections, see Williams, W., Reminiscences of the Bering Sea Arbitration, 37 AJIL 562-584 (1943).

[3] Or to use the words of de Martens, as expressed in 1894: "La décision du tribunal d'arbitrage ... restera à jamais mémorable dans les annales des relations internationales ... Il paraît incontestable que le tribunal d'arbitrage de Paris occupera dans l'histroire des relations internationales la même place d'honneur, qu'occupait jusqu'à ce jour le tribunal d'arbitrage de Genève de 1874, qui a réglé la fameuse affaire de l'Alabama." See de Martens, F., Le tribunal d'arbitrage de Paris et la mer territoriale, 1 Revue Générale de Droit International Public 32-33 (1894).

[4] For a good example written shortly after the announcement of the arbitral award, see Barclay, T., La question des pêcheries dans la mer de Behring, 25 Revue de Droit International et de Législation Comparée 417-465 (1893). This article contained three

major topics touched upon by this arbitration, and analyze them, past as well as present. The first topic concerns the regulation of fur sealing in the North Pacific. Three periods will have to be distinguished in this respect, with the 1893 Arbitration constituting one of the turning points. A second issue relates to the crucial part of this 1893 award, where it states that the United States does not have any right of protection or property in the fur seals outside its territorial sea. This raises the question of the relationship in public international law of the sea between the extent of the territorial sea on the one hand and the reach of fishery jurisdiction of the coastal state on the other. Fur sealing, it is submitted, played an important role in the crystallization of this relationship in international law. Two periods will have to be distinguished here. First of all, the period prior to the 1893 Arbitration will be analyzed (18th - 19th century). Russia, as well as the United States at a later stage, became both obliged to express their opinion on this relationship exactly because of the fur seal problem. A brief examination of the exact location which these claims concerning the protection of the fur seal herd take in the broader perspective of the attitude of these two countries towards offshore maritime jurisdiction in general, will be attempted. Secondly the period following the 1893 Arbitration will be addressed. As it turned out, the strict linkage between territorial sea and fishery jurisdiction, a thesis advanced by the 1893 Arbitration, did not withstand the ravages of time.

The lapse of a period of almost 100 years is of course not a reason by itself, but rather serves as a pretext to come back to this 19th century arbitration. The underlying reasons, justifying this reevaluation, are to be found in the fundamental developments which did occur in these particular fields during the last decade. As far as the first topic is concerned, the refusal of the United States to adhere any longer to the Interim

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annexes, including the Treaty of Arbitration of February 29, 1892 (ibid., pp. 447-457) and the text of the award (ibid., pp. 454-465).

Convention on the Conservation of the North Pacific Fur Seals since 1984[5] justifies a new look at the system of bi- or multilateral fur seal regulation, as initiated by the 1893 Arbitration. With respect to the second issue mentioned above, especially the conclusion of the 1982 United Nations Convention on the Law of the Sea[6] has to be mentioned here. For the first time in history a provision on the breadth of the territorial sea was agreed upon by the international community of states.[7] Moreover, this 1982 Convention introduces the novel concept of a 200-mile exclusive economic zone[8] in which the coastal state has far-reaching competence with respect to fisheries, including fur seal fishery. Even though the 1982 Convention has not yet entered into force,[9] it will be seen that some of its provisions have already become part of customary international law.

In order to better understand the legal aspects of the problem, a brief introductory chapter will be devoted to the particular lifestyle of the North Pacific seal herd, which formed the very heart of the dispute here under consideration.

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[5] See infra note 117 and accompanying text.

[6] Opened for signature on December 10, 1982, reprinted in United Nations, The Law of the Sea: United Nations Convention on the Law of the Sea (U.N. Pub. Sales No. E.83.V.5) 224 pp. (1983). Hereinafter cited as 1982 Convention.

[7] Art. 3 reads: "Every State has the right to establish the breadth of its territorial sea up to a limit not exceeding 12 nautical miles measured from baselines determined in accordance with this Convention."

[8] Arts. 55-75.

[9] Art. 308 (1) requires, inter alia, the ratification of 60 states. Early 1990, 43 states have ratified the 1982 Convention. See Oceans Policy News, April 1990, p. 1.

I The North Pacific fur seal herd[10]

The crux of this 19th century dispute has indeed to be explained by the very peculiar lifestyle of the fur seals frequenting these regions. In simple terms one could say that these animals, which sometimes attain the age 26 years, can be found at sea for the greater part of the year. They can be classified as bulls (over 6 or 7 years), bachelors (2-5 years), cows (breeding females) and pups. In summer, however, the majority of adult seals return to the island of birth and in most cases even rather close to the place of birth on that particular island. The islands which contain a fur seal population are: Robben Island in the Okhotsk Sea, the Kuril Islands in the western North Pacific, the Commander Islands in the western Bering Sea, the Pribilof Islands in the eastern Bering Sea, San Miguel Island off southern California as well as a small colony on Bogoslov Island in the Aleutian chain of the southern Bering Sea. The great majority of adult females give birth[11] and then mate within the first few days of arrival, many of them with the same bull, to whose 'harem' they belong. For about four months the pups are nourished with mother's milk. The females, in order to supply this milk, leave on feeding forays into the ocean during this period, returning at regular intervals to suckle their pup. If the mother does not return for one reason or another, her pup dies since no other mother will take care of it.

During their migration to and from the islands these animals range across the North Pacific. In the north their movements are normally limited by Arctic ice, in the south their normal range of operation is believed to be 32° N in the eastern Pacific Ocean (about the United States-Mexico boundary) and 36° N in the western Pacific Ocean.

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[10] This section is based on a Special Report to the President and Congress of the National Advisory Committee on Oceans and Atmosphere, North Pacific Fur Seals: Current Problems and Opportunities Concerning Conservation and Management, Washington D.C., March 1985, 84 pp. Hereinafter cited as North Pacific Fur Seals.

[11] Each female only to a single pup.

These animals were for a long time hunted by man. First by the aboriginal people for food, clothing and oil, later by outsiders because of the high commercial value of the fur seals on the international market. This has to be explained by the fact that the skins of these animals were much in demand especially because of their very dense structure which is characterized by having nearly 370 thousand hairs per square inch.

If these two factors, namely lifestyle and high commercial value are combined one automatically arrives at the center of the whole problem. Seals can be captured on land as well as on the high seas. Due to over-harvesting, however, the northern fur seal population started to decline fairly rapidly in number around the turn of the century:

1867: +/- 4.7 million fur seals near the Pribilof Islands

1890: +/- 1.0 million

1910: +/- 125,000[12]

It is easily understood that the United States blamed pelagic sealing for this marked decline whereas Great Britain rather pointed at the slaughtering on land. Basically Great Britain contended that outside the territorial sea all states had a right to harvest these natural living resources of the high seas. According to Great Britain, this right formed part of one of the most basic and well established principles of international law, namely the freedom of the high seas. The United States on the other hand stressed the fact that these fur seals returned every year to the same islands, which created special rights for the United States in these animals, even when outside American territorial waters.

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[12] Figures are based on Johnston, D., The International Law of Fisheries, New Haven, Yale University Press, p. 206 note 154 (1965).

Finally, since by far the greatest majority of these North Pacific seals (about three-fourth of their total number) belong to the Pribilof Island Group,[13] i.e. St. Paul and St. George, it should not surprise that the problem of fur sealing focussed on these island during the late 1800s. Between 1886 and 1890 not less than 15 British sealing-vessels were seized by United States revenue cruisers at distances between 15 and 115 n.m. from land.[14] After the British lodged formal protests, negotiations started which finally resulted in the above-mentioned 1892 Compromis.[15]

II Regulation of fur sealing in the North Pacific

It is generally recognized that the Bering Sea Arbitration had an important impact on the development of the fur seal protection in the North Pacific.[16] This first section will try to locate the 1893 Arbitration in its proper context and will also elucidate how the regulation of fur sealing was subsequently influenced by it.

Three periods have to be distinguished in this respect. First a period when states tried to solve the problem of decreasing stocks by themselves. Second, a period during which states involved in fur sealing in the region agreed to regulate fur sealing by means

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[13] This island group consists in order of their magnitude of four islands: St. Paul, St. George, Otter and Walrus Island. St. Paul and St. George are about 40 nautical miles (n.m.) apart. Otter and Walrus Island, which are both less than one mile long, are located within 6 n.m. of St. Paul.

[14] A table listing these seizures, indicating the name of the vessel, the date of seizure, the approximate distance from land and the name of the U.S. vessel making the seizure, was appended as annex C to the arbitral award. See supra note 1.

[15] See supra note 1.

[16] See for instance Höpfner, M., Behring Sea Arbitration, in 2 Encyclopedia of Public International Law (Bernhardt, R., ed.), Amsterdam, North-Holland Publishing Company, p. 37 (1981). This author did not have a chance to elaborate this particular point.

of international agreements. Third, the period 1984 to present where the regulation of fur sealing in the North Pacific seems once more to be based primarily on national efforts.

a Early 18th century - 1893 Arbitration

The uninhabited Pribilof Islands were first discovered by a Russian fur merchant, named Gerasim Pribilof. The Russians, which had already become acquainted with the fur seals on the Commander Islands, started to investigate upon what shores these animals, which semi-annually passed through the Aleutian Islands, landed. After having sailed for three weeks in the vicinity of the island group in dense fog, Gerasim Pribilof was finally rewarded for his untiring efforts in 1786.[17] A huge fur seal herd, estimated at that time between 2 and 3 million, proved to be present on the islands.

Fur sealing had very rapidly become a profitable business for Russian trading associations ever since the discovery of the Commander Islands by Bering in 1741.[18] For the period running up to the turn of the century, Berkh lists a landing of 417.758 fur seals.[19] By 1823 the number of fur seals exported by various companies since 1743 is estimated by the same author at 2.324.364.[20] From the tables provided by this author, one can furthermore conclude that fur seals only started to outnumber the other

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[17] Proceedings of the Tribunal of Arbitration convened at Paris under the Treaty Between the United States of America and Great Britain, Concluded at Washington February 29, 1892 for the Determination of Questions Between the two Governments Concerning the Jurisdictional Rights of the United States in the Waters of Bering Sea (hereinafter cited as Proceedings), Vol. 2, The Case of the United States, Washington, Government Printing Office, p. 23 (1892).

[18] For a detailed account of the different lucrative expeditions between 1741 and 1799, see Berkh, V., A Chronological History of the Discovery of the Aleutian Islands (translated from Russian original of 1823 by Krenov, D. and edited by Pierce, R.), Ontario, Brown & Martin, Ltd., pp. 6-72 (1974).

[19] Ibid., pp. 80 and 107.

[20] Ibid., p. 93.

commercial catches harvested during these voyages[21] since the 1780s, rapidly increasing afterwards. The strong competition between the different trading associations, however, led to disorder and aggression among them, resulting in the pillage and destroying of outposts of the competitor in a certain region.[22]

Russia, confronted with a rapidly decreasing stock, first tried to remedy the situation by bringing fur sealing under government control. In 1799 Paul I enacted an Ukase which required government charters in order to conduct fur sealing in the region.[23] A first charter for 20 years was delivered to the "Russian American Company" by that same Ukase of 1799.[24] Exclusive privileges were granted for the following area: The shores of northwestern America between 55° N and Bering Strait, the Aleutian Islands, the Kuril Islands and the islands of the Bering Sea. But besides privileges, also heavy burdens were conferred upon this company. It had to act as government of the region, which implied the duty to create and maintain churches, courts, a military force etc. A chief manager was appointed jointly by the Imperial Government and the directors of the Company who had absolute powers in the area.[25] During the period of this first charter the harvest of fur seals was enormous. Not less than 1.232.374 such animal pelts were exported from the

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[21] Especially sea otters.

[22] See Tikhmenev, P., A History of the Russian-American Company (translated from Russian original of 1868 and edited by Pierce, R. & Donnelly, A.), Seattle, University of Washington Press, p. 35 (1978).

[23] On the Designation of a Company Set Up for the Trade and Commerce on the Northeastern Sea by the Russian-American Company: with Annexed the Rules, Privileges and Act of that Company, 8 July 1799, Polnoe Sobranie Zakonov' Rossiiskoi Imperii c 1649 goda (Complete Collection of Laws of the Russian Empire Since 1649), Vol. 25 (1798-1799), pp. 699-718.

[24] Ibid., p. 701.

[25] Ibid., p. 703.

colonies.[26] At the same time, however, it must be admitted that the preservation of these animals during this first charter was completely disregarded, even if the board of directors decided, out of necessity,[27] to suspend all trade between 1804 and 1808 and restricted the annual catch to 40.000 pelts afterwards.[28]

Mainly because foreign traders and their government adhered to the opinion that this Ukase was of a strictly internal Russian nature, relating to Russian subjects only,[29] a further step was taken by Tsar Alexander in 1821. In an Ukase of that year[30] foreigners were expressis verbis prohibited from fur sealing in a zone of 100 n.m. around all land and islands stretching from Bering Strait to 45°50' N in the Kuril Islands chain in the western Pacific and 51° N in the eastern Pacific.[31] Reading through the correspondence between Russia and the United States which ensued out of this Russian claim,[32] one cannot but

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[26] Tikhmenev, P., supra note 22, p. 153.

[27] The reason was that fur seals taken when the supply was virtually depleted fetched pour prices or were sometimes even simply destroyed. Ibid., p. 152.

[28] Ibid.

[29] See Proceedings, supra note 17, Vol. 4, p. 27. According to the British government, this Ukase of 1799 in no way interfered with the rights of foreigners.

[30] Implementation of the Decree on the Limits of Navigation and on the Manner of Coastal Relations Along the Shores of East Siberia, Northwest America and the Aleut, Kuril Islands and Others, 4 September 1821, Polnoe Sobranie Zakonov' Rossiiskoi Imperii c 1649 goda (Complete Collection of Laws of the Russian Empire Since 1649), Vol. 37 (1820-1821), pp. 823-832.

[31] The field of operation was therefore clearly broader than that envisaged by the 1799 Ukase.

[32] Proceedings, supra note 17, Vol. 2, pp. 38-51. One has to be careful however when reading through these pages, for the United States in a later stage of the proceedings withdrew most of the original Russian sources relied upon in this part of their argument. The letters of April 9, 1820, April 10, 1820, April 23, 1820, March 31, 1821, March 15, 1821, September 20, 1821 and February 28, 1822, which were all referred to on these pages, were amongst those withdrawn. The reason behind the withdrawal was the willful falsification of this documentary evidence obtained from the archives of the Russian American Company. These archives, which were acquired by the United States at the time of the

be struck by the fact that the prohibition of foreigners to enter the region was in the opinion of Russia an absolute necessity in order to implement a preservation program, thought necessary for the survival of the fur seals in the region. The need for this preservation program, it should be remembered, was mainly the result of the behavior of Russian fur traders themselves, which resulted in an over-harvesting during the period of the first charter. The British, in their memorial, readily pointed out that, if internal competition had been eliminated for the Russian fur traders in 1799, the most serious drawback later on became the competition from abroad.[33]

A second charter[34] was delivered a few days after the enactment of this 1821 Ukase. Once again, the Russian American Company received a monopoly for 20 years. This time, however, because of the clear language of the 1821 Ukase, these exclusive rights were granted by exclusion, expressis verbis, of all foreigners.[35] Taking into account the over-harvesting which had occurred during the period of the first charter, protective measures appeared to be mandatory if complete extinction were to be prevented.[36] By

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cession in 1867, were believed to contain valuable evidence in support of the U.S. claim. Since competent Russian translators were scarce, a native Russian, named Ivan Petroff, who had been a government employee for some time, was attracted. In the hope to find a full time employment classifying and translating these archives, Petroff translated these documents while changing them in many crucial areas in order to sustain more fully the American claim, which in turn would enhance the over-all value of these archives for the U.S. government. See 1 Moore, J., Arbitration, supra note 1, pp. 814-815 and 821. About the rather accidental detection of this fraud after the exchange of the memorials by Mr. Williams, associate council for the United States, who himself knew almost nothing of the Russian language, see Williams, W., supra note 2, pp. 566-567.

[33] Proceedings, supra note 17, Vol. 4, pp. 30-31.

[34] On the Renewal of the Privileges of the Russian American Company, and on the Confirmation of the New Rules Worked out for it, September 13, 1821, Polnoe Sobranie Zakonov' Rossiiskoi Imperii c 1649 goda (Complete Collection of Laws of the Russian Empire Since 1649), Vol. 37 (1820-1821), pp. 842-854.

[35] Art. VI.

[36] The following section is based on Tikhmenev, P., supra note 22, pp. 205-206.

1830 their number had decreased sharply, not only when compared with the early years, but also when compared with a few years back. The board of directors enacted strict rules of which the main objective was not to affect the present numbers. All hunting on St. Paul was stopped, and selective hunting methods had to be employed.[37] When hunting on St. Paul Island was resumed in 1841, Bering and Copper Island sealing stopped. With such a stringent regime, at least when compared with the one operative during the previous years, it should not surprise that only 458.502 seals were exported from the colonies between 1821 and 1842.

When the Russians started to implement this Ukase in practice in 1822,[38] this action led to immediate protests by the United States and Great Britain.[39] Russia abandoned this claim by concluding treaties with the two countries directly affected by this

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[37] Only a limited number of two and three year old bachelors could be killed every year. Cows were protected.

[38] In that year the United States brig Pearl was seized en route for Sitka. See Baty, T., The Three Mile Limit, 22 AJIL 520 (1928), who also states that this was the only occasion on which the Ukase of 1821 was attempted to be enforced. As a result of United States protests the vessel was not only released later on, but compensation was also paid for.

[39] For correspondence on this matter, see 1 Moore, J., Arbitration, supra note 1, pp. 756-760. In view of the later history, it may be important to point out that the main arguments of the United States at that time, objecting to Russian special jurisdiction outside its territorial sea, were: 1)Since 1776, the United States had always freely navigated these seas; 2)the Pacific Ocean can hardly be considered as a closed sea because in latitude 51° north the distance between the American and Asiatic shores is not less than 90° of longitude, i.e. 4.000 n.m. See ibid., p. 758.

1821 edict, namely the United States in 1824[40] and Great Britain in 1825.[41] In these treaties Russia granted U.S. and U.K. subjects exactly the same rights as those granted to its own citizens in the area.[42] This fundamental change was reflected in Russian internal legislation by means of a confirmation of the 1821 charter in 1829.[43]

In 1844 a third charter was granted for another 20 years to the Russian American Company.[44] As could be expected, this charter relied on the 1829 confirmation of the 1821 charter in that it no longer explicitly mentioned the exclusion of foreigners. The strict regime adhered to during the period of the second charter resulted in an increase in population of fur seals. Nevertheless, protection of the herds remained a number one priority. The method of a closed season, already employed on the Commander Islands, was

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[40] Convention Regulating Navigation, Fishing, Trading, and Establishments on the Northwest Coast of America, Russia-United States, signed at St. Petersburg on April 17, 1824, as reprinted in 74 Parry, C., supra note 1, pp. 135-140 (1969).

[41] Convention Concerning the Limits of Their Respective Possessions on the North-West Coast of America and the Navigation of the Pacific Ocean, Great Britain-Russia, signed at St. Petersburg on February 16 (28), 1825, as reprinted in 75 Parry, C., supra note 1, pp. 95-101 (1969). About the prolongation of some of its provisions which were only operational for 11 years until 1867, see Barclay, T., supra note 4, p. 425.

[42] About the influence of these British and U.S. protests on these "prétentions exagérées," as they were called by a leading Russian internationalist of that time period, see 1 de Martens, F., Traité de droit international, Paris, Marescq Aine, p. 500 (1883). This scholar, who had access to the archives of the Ministry of Foreign Affairs, moreover concluded that the 1824 and 1825 treaties "annulaient en réalité les effets de l'oukaze de 1821." See ibid., p. 467.

[43] Imperial Charter Given to the Russian American Company: On the Confirmation of Rights and Privileges, November 24, 1828, Polnoe Sobranie Zakonov' Rossiiskoi Imperii c 1649 goda (Complete Collection of Laws of the Russian Empire Since 1649), Second Collection, Vol. 3 (1828), pp. 1020-1021.

[44] Imperial Confirmation of the Charter of the Russian American Company, October 10, 1844, Polnoe Sobranie Zakonov' Rossiiskoi Imperii c 1649 goda (Complete Collection of Laws of the Russian Empire Since 1649), Second Collection, Vol. 19 (1844), pp. 612-638.

applied on St. Paul.[45] For the period 1842-1862 372.894 fur seals were said to have been exported from the colonies.[46]

When the United States purchased Alaska from Russia in 1867,[47] the Pribilof Islands and its fur seal herd, which was estimated between 2 and 2.5 million at that time, became the concern of the United States.[48] Even though, and maybe it should be more accurate to say, just because it is pretended that the United States recovered the price tag attached to "Seward's folly", as the transfer was sometimes called,[49] namely ($ 7.2 million in gold) after only a few years of fur seal harvesting,[50] the new owner of the Pribilof Islands soon had to face the same problem of rapidly declining herds. It is noteworthy to stress in this respect that the United States took the very same steps, in the same chronology, as those taken by Russia earlier during the century. At first fur sealing was

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[45] Tikhmenev, P., supra note 22, p. 358.

[46] Ibid., p. 360.

[47] Convention Ceding Alaska, Russia-United States, signed at Washington on March 30, 1867, as reprinted in 134 Parry, C., supra note 1, pp. 331-335 (1976).

[48] According to Art. 1, the Russian Tsar ceded "all the territory and dominion now possessed by his said Majesty on the continent of America and its adjacent islands." The demarcation line established by this convention clearly locates the Pribilof Islands on the American side of the line.

[49] William Seward, at that time the U.S. Secretary of State, had almost independently negotiated this deal with Eduard de Stoeckl, at that time the Russian Minister in Washington. This generated criticism within the nation, which in turn labeled the purchase as "Seward's folly." For a brief historical overview, see Antinori, C., The Bering Sea: A Maritime Delimitation Dispute Between the United States and the Soviet Union, 18 Ocean Dev. & Int'l L.J. 5-6 (1987).

[50] To have an idea of the money involved in fur sealing, a document published by the Bureau of Statistics of the United States Treasury Department of 1890 indicated that the earnings of fur seals in the region returned within 23 years was $ 31.557.392. See Proceedings, supra note 17, Vol. 2, Appendix pp. 128-129.

restricted to private companies contracted by the United States government.[51] Again, strict quota's and rules were prescribed.[52] At the same time, however, a marked increase in pelagic sealing had to be observed.[53] This resulted in the exposure of the monopoly position of the Alaska Commercial Company to strong competition from abroad.[54] Confronted with this situation, the United States started to ban foreigners from sealing, as evidenced by the many seizures of foreign ships well outside the United States territorial sea between 1886 and 1890.[55]

Reading through the correspondence which took place between Great Britain and the United States on this matter, one is struck by the slowness by which the latter country handled this particular matter. Two examples will suffice in this respect.[56] Primo, when

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[51] An Act of March 3, 1869 prohibited any person to land or remain on St. Paul and St. George without authority from the Secretary of the Treasury. On July 1, 1870 the latter was empowered by "Act to Prevent the Extermination of the Fur-Bearing Animals in Alaska" to lease the right to engage in fur sealing on land. See 1 Moore, J., Arbitration, supra note 1, p. 764. These contracts were issued for 20 years. From 1870 until 1890 the Alaska Commercial Company was attracted. For the period 1890-1910 a contract was concluded with the North American Commercial Company. After 1910 the Federal Government assumed direct control of the herd.

[52] The Alaska Commercial Company could not harvest more than 100.000 males of 1 year of age or older. For the North American Commercial Company this annual quota was further reduced and ranged between 7.500 and 60.000 over the years. Furthermore, the use of firearms or other means which tended to drive the seals away from the islands, was forbidden. Only during the months of June, July, September and October could seals be harvested with the exception of female species. Geographically the harvest was restricted to land, excluding the waters adjacent to the island as well as those places where the seals haul up from the sea onto islands.

[53] From 1.029 seals caught on the high seas in 1872, the number of seal skins as a result of pelagic sealing increased almost constantly until it reached 62.500 in 1891. In 1886, for instance, 38.907 seals were captured during the summer. See Proceedings, supra note 17, Vol. 2, p. 366, where a table is given.

[54] Meyer, C., The Extent of Jurisdiction in Coastal Waters: Illustrated by State Practice and the Opinion of Publicists, Leiden, A.W. Sijthoff, p. 305 (1937).

[55] See supra note 14 and accompanying text.

[56] These examples are based on Moore, J., Arbitration, supra note 1, pp. 770-775.

the first three seizures occurred in August 1886,[57] it took the Federal Government more than 6 months to receive a copy of the juridical proceedings held at Sitka and another 3 months to communicate those documents to the British side. By that time (July 1887) the new sealing season had started and new seizures were already taking place. Secundo, after the President of the United States issued orders to release the detained vessels in 1886, this new element was communicated to the British on February 3, 1887. However, by the end of the 1887 hunting season, these vessels were still being held by the United States. Asking for explanations on this matter, the British minister was informed that the marshal at Sitka had thought the telegraphic order to be not genuine and that another order had been dispatched to prove the contrary. This fact may well reflect the tension which existed at that time between the Judge in Sitka on the one hand, who was driven by the local interests, and people of the federal government on the other, who did not like the idea of the Bering Sea being proclaimed a mare clausum since this could have averse effects for the United States' navigational interests elsewhere.[58]

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[57] All three vessels were more than 70 n.m. from land.

[58] In the correspondence between the United Kingdom and the United States the latter country clearly objected to the often made assertion that the United States claimed the Bering Sea to be a mare clausum. Or to use the words of Phelps, then United States minister in London, in a dispatch of September 12, 1888: "The government has never claimed it and never desired it. It expressly disavows it." See 1 Moore, J., Arbitration, supra note 1, p. 797.

This controversy finally resulted, after many ups and downs in the negotiations,[59] in the 1892 Compromis submitting the dispute to arbitration.[60]

The position of the United States was further complicated by the attitude of the Russian government during this particular period.[61] On August 2, 1891 a first U.S. ship, the James Hamilton Lewis, was seized at approximately 20 n.m. east of Copper Island on the basis of alleged fur sealing inside the territorial waters of Russia. During 1892 three more U.S. vessels followed this example, namely the C.H. White[62] and the Cape Horn Pigeon,[63] and one other vessel, the Kate and Anna, was ordered to transfer its catch of 124 seal skins onto a Russian cruiser.[64] All of them, it should be noted, were seized well

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[59] See in general 1 Moore, J., Arbitration, supra note 1, pp. 770-798. See also 1 Moore, J., A Digest of International Law, Washington, Government Printing Office, pp. 893-905 (1906), hereinafter cited as Digest, and Staton, S., The Behring Sea Controversy, New York, A.B. King, pp. 1-21 (1892). Although the United States started a broad multilateral quest for international cooperation in 1887, direct negotiations were held between Great Britain, Russia and the United States. This resulted in a tentative agreement in 1888 which would have established a closed season from April 15 until November 1 north of the 47th degree of latitude. See letter of the Marquis of Salisbury to Sir L. West of April 16, 1888, as reprinted in 2 Proceedings, supra note 17, Appendix, p. 238. Because Canada objected, however, Great Britain refused to enter into such a convention. For the circumstances under which these negotiations were suspended, see 1 Moore, J., Arbitration, supra note 1, p. 784. An ultimate proposal by Great Britain in 1890 was thought to be inadequate by the United States. Ibid., pp. 788-789. See also Johnston, D., supra note 12, p. 207.

[60] Treaty for Submitting to Arbitration the Question Relating to the Seal Fisheries in Behring Sea, supra note 1. It was the seventh time that both countries submitted a dispute between them to arbitration during the 19th century.

[61] This section is based on the arbitral award of November 29, 1902 by T.M.C. Asser, as reprinted in 10 Revue Générale de Droit International Public, Documents 2-13 and 35 Revue de Droit International et de Législation Comparée 75-95 (1903).

[62] Seized on July 15, 1892 at aproximately 20 or 11 n.m. from shore according to the source consulted (claimant or defendant).

[63] Seized on September 10, 1892. Russia later admitted that this whaling vessel had been seized by mistake on the high seas and offered to pay compensation.

[64] Facts occurred on August 12, 1892. In this case too, the Russian government agreed to pay compensation due to a lack of convincing evidence.

before the 1893 Arbitration rendered its award and three of them after the conclusion of the 1892 Compromis. As will be mentioned later on,[65] these seizures finally resulted in a compromis between Russia and the United States by means of which this dispute was referred to arbitration. It is clear that the position which the United States had to take with respect to these seizures undercut to some extent their position before the 1893 tribunal.

It should finally be mentioned that a few weeks before the rendering of the award, Russia enacted legislation prohibiting all ships not having a special licence from sealing in a zone of 10 n.m. along the whole coast of Russia and 30 n.m. around the Commander Islands and Robben Island.[66] The Soviet Union justified this move by the fact that the consultations between Great Britain, Russia and the United States in 1888 had stressed the necessity of exceptional measures.[67] This had moreover been confirmed by the 1891 United Kingdom-United States agreement.[68]

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[65] See infra note 78 and accompanying text.

[66] Rules for Seal Fisheries, February 12 (24), 1893, partly reprinted in 6 Soviet Statutes & Decisions 20 (1969-70).

[67] See supra note 59.

[68] Agreement for a Modus Vivendi in Relation to the Fur Seal Fisheries in Behring Sea, Great Britain-United States, signed at Washington on June 15, 1891, as reprinted in 175 Parry, C., supra note 1, pp. 223-225 (1978). This treaty was agreed upon at a time when both parties were exploring the possibility of concluding a treaty of arbitration. Its content can be summarized as follows: Great Britain (Art. I) and the United States (Art. II) would prohibit their subjects from sealing on the high seas. The United States, moreover, would not be allowed to kill seals on land, except for 7.500 to be taken for subsistence and care for the natives (Art. III). The period of operation of this modus vivendi would last until May of the following year. By means of a new modus vivendi concluded after the signing of the 1892 Compromis, the 1891 agreement was prolonged during the pendency of the arbitration. See Convention Respecting a Modus Vivendi in Behring Sea, Great Britain-United States, signed at Washington on April 18, 1892, as reprinted in 176 Parry, C., supra note 1, pp. 499-502 (1978).

b **1893 Arbitration - 1984**

This arbitration, even though it denied the United States any rights outside its 3-mile zone, did establish, as requested by parties, a regulation for fur sealing to be observed by parties. A 60-mile prohibition zone around the Pribilof Islands as well as a dead season during three months (May-July) a year north of 35° of north latitude eastward of 180° of longitude formed the basic pillars of this regulatory scheme.[69]

Nevertheless, this rather strict regulation did not reverse nor even stop the rapidly decreasing trend of the Pribilof herd, not because Great Britain and the United States did not implement the arbitral regulations,[70] but mainly because the arbitral award only bound the parties to the dispute.[71]

Russia, which also possessed some sealing grounds in the area, tried to derive some indirect benefit from this arbitration between Great Britain and the United States. Relying on the fact that the latter two countries had just been compelled to more far-reaching measures by the arbitral award with respect to the Pribilof Islands, Russia managed to obtain that both countries signed bilateral agreements which gave some international

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[69] The United States officials have relied upon these regulations in order to refute the prevailing opinion in their country that the United States was on the losing side in this arbitration. The ex-secretary of state wrote in 1895 on this topic: "If they (i.e. the regulations) are carefully examined they will be found to be more favorable to the United States than the regulations which Mr. Bayard proposed to Lord Salisbury on a settlement of the question, or which Mr. Blaine offered to Sir Julian Pauncefote. If, therefore, we obtained more from the Tribunal than our government proposed to accept from Great Britain, the arbitration cannot justly be characterized as fruitless in its results for us." See Foster, J., Results of the Bering Sea Arbitration, 161 N. Am. Rev. 700 (1895).

[70] This can be inferred from the many seizures which followed. See 1, Hackworth, G., Digest of International Law, Washington, U.S. Government Printing Office, p. 100 (1940).

[71] See McDougal, M. & Burke, W., The Public Order of the Oceans, New Haven, New Haven Press, p. 965 (1987). Immediately after the arbitration de Martens predicted that if the regulation remained only obligatory for Great Britain and the United States, this award would not have the slightest beneficial effect on the protection of the fur seal herd itself. See de Martens, F., supra note 3, p. 35. As a result, pelagic sealing still exceeded 61.000 pelts in 1894 and 56.000 in 1895. See Williams, W., supra note 2, p. 584.

endorsement to their municipal legislation of early 1893.[72] A first such agreement was concluded with Great Britain at a time when this country was still involved in the oral proceedings of the fur seal dispute with the United States in Paris.[73] For a period ending on December 31 of that same year, Great Britain agreed to prohibit its ships from sailing in a zone of 10 n.m. along the whole coast of Russia and of 30 n.m. around the Commander Islands and Robben Island[74] and Russia committed itself to limit the catch of seals on land to 30.000.[75] This agreement was later prolonged indefinitely.[76] A year later a similar agreement was signed with the United States.[77]

This 1894 agreement with the United States, however, did not solve the dispute which had resulted from the Russian seizures in 1891 and 1892 of American fishing vessels on the high sea. This dispute was finally settled by compromis in 1900.[78] A sole arbitrator was appointed, T.M.C. Asser, who came to the conclusion that, since no special

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[72] See supra note 66.

[73] See Exchange of Notes for the Protection of Russian Sealing Interests in the North Pacific During the Year 1893, Great Britain-Russia, signed at St. Petersburg May 11/22/30, 1893, as reprinted in 178 Parry, C., supra note 1, pp. 451-456 (1979).

[74] Art. I.

[75] Art. IV.

[76] Exchange of Notes of December 23, 1893 and January 10, 1894. See ibid., p. 451.

[77] See Agreement for a Modus Vivendi in Relation to the Fur Seal Fisheries in Bering Sea, Russia-United States, signed at Washington on May 4, 1894, as reprinted in 180 Parry, C., supra note 1, pp. 141-143 (1979). This agreement was intended to be provisional with the possibility for both parties to terminate it at will by mere notification (Art. VI).

[78] Protocol Respecting the Claim of the Schooner James Hamilton Lewis et al., Russia-United States, signed at St. Petersburg on September 8, 1900, as reprinted in 189 Parry, C., supra note 1, pp. 66-68 (1979). It was clearly stipulated in the compromis that the arbiter could only apply those agreements which were in force and binding at the moment of the seizures. This means that the later concluded bilateral agreement (see supra note 77) could not be relied upon.

agreement existed between countries at that time, the ordinary rules of international law had to be applied. All vessels captured outside the 3-mile limit had to be released and damages were paid for.[79]

Japan, on the other hand, seized this unique opportunity and started to hunt seals on the high seas in the award area in 1901.[80] Nationals of this country were not limited in their operations by the 60-mile limit around the Pribilof Islands, neither by the prohibition to use shot guns inside Bering Sea. Instead, modern hunting methods were applied by the Japanese, such as canons and guns. Moreover, Japanese fishermen even landed on the Pribilof Islands in 1907 in order to pursue their sealing activities on land.[81] They were driven away by a guard maintained by the United States and some of them were taken prisoner and tried. As a result of this more liberal regime applicable to Japan, several Canadian sailors tried to bring their vessels under Japanese flag.[82] Japan eventually agreed to prevent this re-flagging of foreign vessels.[83]

Besides these unilateral actions, ways were sought to come to an intergovernmental solution to this problem. In compliance with the 1892 Compromis,[84] Great Britain and the United States extended invitations to other nations in an attempt to obtain their

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[79] See 1 Moore, J., Digest, supra note 59, pp. 923-929 where the U.S. correspondence on this matter can be found as well as a short analysis of the award itself and Johnston, D., supra note 12, pp. 210 and 265 note 32. For the integral text of the award, see references supra note 61.

[80] Comment, The Fur Seal Question, 1 AJIL 743 (1907).

[81] 1 Hackworth, G., supra note 70, p. 100.

[82] Meyer, C., supra note 54, pp. 312-313. This unfair competition from Japan led to an outburst of indignation from the Canadian sealers. See Comment, supra note 80, pp. 743-744.

[83] 1 Moore, J., Digest, supra note 59, 922-932.

[84] Art. VII para. 2 provided: "The High Contracting Parties furthermore agree to cooperate in securing the adhesion of other Powers to such regulations."

adherence to the award regulations. Of importance here was that Japan[85] and Russia[86] responded favorably on the condition that the award area would be extended to include the Asiatic waters. Great Britain, however, refused to enter into such agreement.[87] In 1897 the United States set up an international conference to which it invited the three other sealing countries. Great Britain, again, refused to participate. The other three countries apparently did arrive at an agreement, which could have banned pelagic sealing for a period of one year. A conditio sine qua non, however, was that the adherence of Great Britain would be secured, quod non.[88] The latter country, moreover, proved unwilling to undertake a revision of the award regulations which, according to the award,[89] should be reexamined after every 5 years. In 1898 as well as in 1903 Great Britain refused to do so.[90] In 1909 the United States once more invited the three other parties to attend an international conference on the subject, but this time Great Britain insisted that a bilateral agreement with the United States, outlining the future regulation, should precede such a four state agreement.[91] This was arrived at after two years of negotiations and early 1911 a bilateral agreement was concluded between Great Britain and the United States,[92]

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[85] As mentioned above, at that time Japan did not yet hunt fur seals pelagically in the eastern part of the Bering Sea.

[86] The position of this country was practically identical with that of the United States because Russia possessed seal breeding grounds of its own.

[87] This section is base on Comment, supra note 80, pp. 744-745.

[88] Comment, The North Pacific Sealing Convention, 5 AJIL 1028-1029 (1911).

[89] Art. 9 of the regulation established by the arbiters.

[90] Comment, supra note 88, p. 1028.

[91] Ibid., p. 1031.

[92] Treaty for the Protection of Fur Seals, Great Britain-United States, signed at Washington on February 7, 1911, 213 Parry, C., supra note 1, pp. 73-76 (1980). This agreement prohibited pelagic sealing in an area north of the 35th degree of north latitude

which paved the way for the adoption of the long awaited multilateral convention on the subject.

For a marked improvement of the situation, in other words, one had to wait until 1911. That year the four countries directly involved, namely Great Britain (for Canada), Japan, Russia and the United States signed the treaty of Washington,[93] the first multilateral fur seal treaty to become operational. All pelagic sealing was banned north of the 30th parallel of north latitude,[94] leaving mainly the Americans and the Russians to harvest on land.[95] Great Britain and Japan agreed to this treaty because they would receive 15 % of the harvested furs as their share unless the population fell beyond a certain

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and east of the 180th meridian (Art. I). The United States was obliged to transfer 20 % of all seal skins harvested to Canada (Art. II). An advance payment of $ 200.000 was provided for, as well as a minimum share of skins (1.000) to be delivered to Great Britain, even if this exceeded 20 %, unless the total number of seals frequenting the Pribilof Islands fell below 100.000. According to its Art. VI the treaty went into effect "as soon as, but not before, an international Agreement is concluded and ratified by the Governments of Great Britain, the United States, Japan, and Russia, by which each of those Powers shall undertake, by such stipulations as may be mutually acceptable, to prohibit for a period of not less than fifteen years, its own subjects or citizens ... from engaging in pelagic sealing in waters including the area defined in Article I ..."

[93] Convention on the Preservation and Protection of Fur Seals, Japan-Russia-United Kingdom-United States, signed at Washington on July 7, 1911, as reprinted in 1 Bevans, C., Treaties and Other International Agreements of the United States of America 1776-1949, Washington, D.C., Government Printing Office, pp. 804-813 (1968). Hereinafter cited as 1911 Treaty. See also 5 AJIL 267-274 (Official Documents, 1911). About the convening of this conference, see 1 Hackworth, G., supra note 70, pp. 792-795. A reservation was attached by the British delegation because they needed the assent of other self-governing Dominions as to certain wordings. A few days later, however, this reservation was withdrawn. See 5 Hackworth, G., supra note 70, pp. 111-112. This treaty has been labeled as "the first formal treaty in history that was chiefly motivated by a common desire to conserve a marine resource." See Johnston, D., supra note 12, p. 266 note 33.

[94] Art. I. The field of operation of this multilateral agreement was of course much broader than the one provided by the bilateral Great Britain-United States agreement concluded earlier that year. See supra note 92.

[95] Also Japan, it must be admitted, was left with a certain capacity to harvest on land. Robben Island, which carries a fur seal population, was ceded by Russia to the close of the Russian-Japanese war.

limit.[96] Under this treaty the fur seal population gradually recovered and by 1941 the population was back at 2.3 million.[97] At the beginning of World War II the Japanese, who regularly had exerted pressure to lift restrictions on commercial sealing at sea because of alleged damage caused to fisheries by the increasing fur seal population,[98] gave notice of their intention to abrogate the 1911 Treaty by note of October 23, 1940.[99] Consequently, according to its Art. XVI the 1911 Treaty terminated on October 23, 1941, about a month and a half before the attack on Pearl Harbor. Even though Japan indicated that it would not change its national legislation prohibiting sealing at sea during a first phase,[100] this country resumed pelagic sealing afterwards.[101] Canada and the United States, on the other hand, agreed by means of a bilateral exchange of notes that no pelagic sealing would be conducted by their nationals.[102] The field of operation of the agreement

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[96] See Art. XI for the United States where the limit was 100.000 and Art. XII for Russia, where that limit was 18.000. Japan had to deliver 10 % of the harvested sealskins to the other three contracting parties, unless the total number of seals frequenting the Japanese islands fell below 6.500. See Art. XIII. Since Great Britain did not have any islands under its sovereignty to which seals usually resorted, this was the only country which completely relied upon the harvest of the other three contracting parties. Art. XIV, it should be emphasized, foresaw the possibility that seals would resort to British islands in the future. In that case, 10 % of the harvest would have to be transferred to Japan, Russia and the United States respectively. The provisions were of course difficult to rime with the previously concluded Great Britain-United States agreement (see supra note 92). This new convention, therefore, provided in its Art. XV that its own provisions would supersede those provisions of the prior bilateral agreement which were inconsistent with it.

[97] 4 Whiteman, M., Digest of International Law, Washington, D.C., U.S. Government Printing Office, p. 1042 (1965).

[98] Seals live, to some extent, on other commercially harvested fish.

[99] 3 Department of State Bulletin, No. 72, November 9, 1940, p. 412.

[100] 5 Department of State Bulletin, No 122, October 25, 1941, p. 336, 337.

[101] In 1951 Japan unilaterally declined to continue pelagic sealing. See Johnston, supra note 12, p. 268 and note 39.

[102] Provisional Fur Seal Agreement, Canada-United States, Exchange of Notes December 8 and 19, 1942, 26 UNTS 363, US EAS 415, 58 Stat. 1379 which was

was still north of 30° north, but limited this time by the 180th meridian.[103] At the request of the Canadians, a part of the share formerly received by Japan under the 1911 Treaty was now attributed to Canada, raising to 20 % the share of the annual catch to be delivered to the Canadian government by the United States.[104]

After the war, which had given rise to several problems in this respect,[105] the United States, in order to prepare for a new international conference, proposed early 1952 to set up a research program to which this country invited all other three adherents to the 1911 Treaty to participate.[106] All except the Soviet Union agreed to participate in the research which was conducted between February and June 1952.[107] Only in 1955 a North Pacific Fur Seal Conference was held to which all four interested states adhered.[108] After

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subsequently extended by the Amendment to the Provisional Fur Seal Agreement, Canada-United States, Exchange of Notes December 26, 1947, 27 UNTS 29, US TIAS 1686, 62 Stat. 1821. This amendment only concerned the extension in time of the former Exchange of Notes for an indefinite period (new Art. X). The text of this Exchange of Notes incorporating the amendment can also be found in 18 Department of State Bulletin, No. 446, January 18, 1948, p. 94. Here it is also stated that by 1947 the herd had increased to over 3.6 million. For a short description of the content of the 1942 agreement, see Johnston, D., supra note 12, p. 267.

[103] Art. I.

[104] Art. III. As was the case under the 1911 Treaty, a special article was inserted placing similar burdens on Canada in the event seals would resort to Canadian territory in the future. See Art. IV. This did not happen.

[105] See 4 Whiteman, M. , supra note 97, pp. 1043-1044.

[106] Exchange op Notes Establishing a Joint Program of Scientific Investigations on the Fur Seals in the North Pacific Ocean, Canada-Japan-United States, signed at Tokyo on January 31 and February 8 and at Ottawa on February 7 and March 1, 1952, 168 UNTS 9, US TIAS 2521, 3 UST 3896-3904.

[107] Art. 1. Approximately 5.000 fur seals were taken on the high seas for this purpose. See Art. 2.

[108] By now Canada had become totally independent and replaced Great Britain. The Soviet Union took the place of Russia.

more than a year of negotiation, a new treaty was signed: The Interim Convention on Conservation of North Pacific Fur Seals.[109] This agreement was based on the same principles as its predecessor, namely a complete ban on pelagic sealing north of the 30th parallel of north latitude[110] and the distribution of profits by those countries sealing on land.[111] The 1957 Convention distinguishes itself from the 1911 one by the fact first that it is only of an "interim" nature because Japan refused to agree to a final treaty banning all pelagic sealing. Second that it established the North Pacific Fur Seal Commission which makes recommendations to parties.[112] This Convention was extended for 6 years in 1963[113] and 1969[114] and for additional 4 years in 1976[115] and 1980.[116]

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[109] Interim Convention on Conservation of North Pacific Fur Seals, Canada-Japan-Soviet Union-United States, signed at Washington on February 9, 1957, 314 UNTS 105, US TIAS 3948, 8 UST 2283-2341. Hereinafter cited as 1957 Interim Convention.

[110] Art. III.

[111] The U.S.S.R. and the United States have to deliver each 15 % of their commercial catch to Canada and 15 % to Japan. See Art. IX. A limit was set on the number of seals on the Commander Islands and Robben Island under which the Soviet Union would no longer have to comply with this requirement. See Art. IV.

[112] Art. V (2) lists the duties of the Commission, namely to formulate and coordinate research programs, to recommend these research programs to the parties, to recommend appropriate measures based on the scientific results of these programs and to recommend the methods of sealing best suited to achieve the objectives of the Convention. The Commission, where every party has one vote, decides by unanimous vote. Since the proposed research required some pelagic sealing, this aspect was regulated by an annexed schedule which limited by country the number of seals to be caught in that manner. For a good description of the structure and functioning of this Commission, see Bekiashev, K. & Serebriakov, V., International Marine Organizations: Essays on Structure and Activities, The Hague, Martinus Nijhoff, pp. 385-396 (1981). The last normal meeting of the North Pacific Fur Seal Commission has been held from April 15-18, 1985 in Tokyo, Japan. For its results, see North Pacific Fur Seal Commission, Proceedings of the Tokyo Meeting, April 15-18, 1985, issued from the Headquarters of the Commission, Washington, D.C., 51 pp. (October, 1985).

[113] Protocol Amending the Interim Convention on Conservation of North Pacific Fur Seals, Canada-Japan-Soviet Union-United States, signed at Washington on October 8, 1963, 494 UNTS 303, US TIAS 5558, 15 UST 316-319. This protocol reflects the recommendations adopted by the North Pacific Fur Seal Commission on November 30, 1962. See 49 Department of State Bulletin, No. 1270, December 28, 1963, p. 688. Its major innovations were the replacement of the schedule (Art. III; see supra note 112) by a treaty

Environmentalists in the United States were successful in obtaining the guarantee that this country would no longer be part to a treaty which allowed for the killing of seals. As a consequence, the United States, as only country, did not approve the new four year extension,[117] resulting in the lapse of the 1957 Interim Convention since October 1984.[118]

The main argument on which these activists based their claim was the almost steady decline of the fur seal population since 1957. From 2 million the size of the herd was reduced to about 1.1 million in the 1970s, or a 50 % decline in about 15 years. Between 1974 and 1984 especially the population of the Pribilof Islands has further declined at an average rate of 8 % a year.[119] And although many potential explanations have been suggested[120] scientists have not come up with a clear answer yet.

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provision limiting pelagic sealing for research purposes and the inclusion under the duties of the commission of a new point, namely "study whether or not pelagic sealing in conjunction with land sealing could be permitted in certain circumstances without adversely affecting achievement of the objectives of this Convention..." See Art. V. Art. VIII, finally, reassessed the division of the costs of the research to be conducted.

[114] Protocol Amending the Interim Convention on Conservation of North Pacific Fur Seals, Canada-Japan-Soviet Union-United States, signed at Washington on September 3, 1969, 719 UNTS 313, US TIAS 6774, 20 UST 2992.

[115] Protocol Amending the Interim Convention on Conservation of North Pacific Fur Seals, Canada-Japan-Soviet Union-United States, signed at Washington on May 7, 1976, US TIAS 8368, 27 UST 3371-3380.

[116] Protocol Amending the Interim Convention on Conservation of North Pacific Fur Seals, Canada-Japan-Soviet Union-United States, signed at Washington on October 14, 1980, US TIAS 10020.

[117] This country signed the 1984 Protocol, but never ratified it.

[118] Oceans Policy News, December 1987, p. 6.

[119] North Pacific Fur Seals, supra note 10, pp. 9 and 17.

[120] Such as commercial harvest, the female harvest which took place between 1956 and 1968, entanglement in debris, pollution, predation, disease, starvation, natural population fluctuations, incidental catch, climate, illegal pelagic sealing and others. See

c **1984 - present**

Taking into consideration the discontinuation of the 1957 Interim Convention, it appears that countries are sliding back from international to the national regulation of fur sealing. Whether this is an advisable trend under present international law, is a question which will be discussed next.

The United States, country responsible for the lapse of the 1957 Interim Convention, limited the harvesting of fur seals by means of internal legislation to a subsistence level. Fur seals have moreover been designated as "depleted" under the U.S. Marine Mammal Protection Act. The decision of this country to opt out of the (unsatisfactorily) international system of regulation in favor of a more stringent domestic regulation was certainly influenced by the fact that the risk of renewed pelagic sealing was considered to be marginal. The reasons behind this argumentation can be illustrated by reference to the 1985 report of the U.S. National Advisory Committee on Oceans and Atmosphere.[121] This report emphasized, first, that the high costs of pelagic sealing beyond the 200 n.m. zone and the low market price made it highly unlikely that even countries with low labor costs could conduct such business economically; second that the risk of incidental catch was also small because very few vessels fishing for other species frequent the migratory routes of the fur seal;[122] third that even the risk that Japan, country which always pushed towards pelagic sealing within the convention system, would return to this method of

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ibid., pp. 9-15, where these different possible causes are briefly discussed.

[121] North Pacific Fur Seals, supra note 10, pp. 20-21.

[122] The high sea squid and salmon grounds are located west of those migratory zones.

harvesting was considered slim;[123] fourth that the prohibition of pelagic sealing has become part of customary international law.[124]

This point of view has however been criticized by Soviet scholars, who stress that national legislation by itself can not be effective in this field, unless it is accompanied by international measures.[125] Hopes for a reduced market are very insignificant, according to these authors, who emphasize the flexible nature of the market as well as the possible impact of improved technology of sealskin processing.[126] Moreover, the fear that Japan might well resort to pelagic sealing once again is very real, they argue. In support of this contention, the authors rely on a notification by the Ministry of Foreign Affairs of Japan of February 20, 1986 directed to the Secretary of the North Pacific Fur Seal Commission where it was stated that "(s)ituations may arise when we will have to undertake procedures by which to resume pelagic sealing."[127]

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[123] As far as the United States 200-mile zone is concerned, Japan would need to comply with the regulations of this country. But even pelagic sealing in its own 200-mile zone of those seals which migrate to the Soviet rookeries would be extremely counterproductive since Japan very much depends on Soviet licenses for salmon fisheries in the Sea of Okhotsk.

[124] If the three former arguments appear to be plausible, this fourth one does not meet that standard. Indeed, it is not because four countries agree to something by means of an international agreement that others have to accept it as part of customary international law, even if that agreement, or at least its content, was operational for a considerable period of time. Moreover Japan, one of the four countries involved, has always been of the opinion that one day pelagic sealing could be allowed again. See for instance supra note 86 and accompanying text as well as the Japanese insistence to call the 1957 Convention an "Interim" Convention.

[125] Zilanov, V. & Vylegzhanin, A., Termination of the Interim Convention on Conservation of North Pacific Fur Seals (1957), Soviet Y.B. Maritime L. 86 (1989).

[126] Ibid., p. 85. They continue that "(i)t is a lack of foresight to base the state's attitude regarding an international agreement on the arguable opinion that sealing will remain unprofitable for a long time."

[127] Ibid., pp. 80 and 86.

Looking back at the particular history of fur seal regulation, where periods of national regulation usually corresponded with decreasing fur seal stocks, the more cautious approach of the Soviet has to be preferred. The United States, apparently aware of the precarious character of the situation created by them, hosted a meeting of the four parties to the 1957 Interim Convention in Washington, September 22-24, 1987.[128] Future cooperation in the management and research of fur seals was on the agenda of that meeting. The United States called for a new agreement, an idea to which Canada could subscribe if it had substantially equivalent benefits compared with its predecessor. Japan stressed the incorporation of a clause which would allow its fishermen to keep the incidental catch of salmon fisheries on the high seas. The Soviet Union, finally, called for an interim agreement until a new formal agreement would become operative. At present, however, there appear to be no plans for renegotiation of the 1957 Interim Convention.[129]

III The interrelation between territorial sea and fishery jurisdiction

When viewed in retrospect, contemporary writers submit, the Bering Sea Fur Seal Arbitration stands out in the history of the law of the sea as a consolidation factor of the absolute link between the territorial sea on the one hand and fishery limits on the other.[130] The arbitral tribunal in fact decided that "the United States has not any right

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[128] Oceans Policy News, December 1987, p. 6.

[129] As indicated by the Canadian Department of Fisheries and Oceans. Personal communication, May 1990.

[130] 1 O'Connell, D., The International Law of the Sea, Oxford, Clarendon Press, p. 523 (1982). At the time of the Arbitration, it should be noted, different opinions existed on this topic. Some writers attached much importance to the impact of this ruling on the breadth of the territorial sea in international law. Barclay, for instance, wrote: "C'est là

of protection or property in the fur seals frequenting the Islands of the United States in Bering Sea, when such seals are found outside the ordinary three-mile limit."[131] The 3-mile limit referred to by the arbitrators was that of the United States territorial sea. This particular wording has to be explained by the fact that the tribunal did not "undertake to decide which were, according to the principles of international law, the ordinary limits of territorial waters."[132] This proposition, made by one of the arbitrators, was accepted by the other members of the tribunal.[133] Apparently the parties had admitted that the 3-mile limit formed the ordinary limit of their territorial waters.[134]

Before elaborating on the impact of this ruling on later regulations, it seems appropriate to take a closer look at the influence which fur sealing had on the seaward extent of the jurisdiction claimed by Russia and the United States prior to the 1893 Arbitration.

a Prior to the 1893 Arbitration

It might be useful to try to locate the 18th and 19th century Russian legislation, and its United States counterpart, in the broader context of the general claims of these countries

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une décision d'une importance théorique considérable par rapport aux discussions juridiques dont la question de la limite convenable et pratique des eaux territoriales a, depuis quelque temps, fait l'objet." See Barclay, T., supra note 4, p. 440. Others, on the contrary, were of the opinion that the arbitration left the question undecided since it did not expressis verbis deal with it. See de Martens, F., supra note 3, pp. 36-43.

[131] See supra note 1.

[132] 1 Moore, J., Arbitration, supra note 1, p. 920.

[133] Ibid., p. 921.

[134] See the 1894 report and conclusions of Mr. T. Barclay, Rapporteur of the Third Commission of the Institute of International Law (Definition and regime of the territorial sea), 3 Annuaire de l'Institut de Droit International (1892-1896), Brussels, Falk Fils, p. 370 (new abridged ed., 1928).

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over the water areas adjacent to their coasts around that period. Since Russia was first confronted with this problem, this country will be addressed next.

i Russia

Until the end of the 19th century it can grosso modo be asserted that Russia generally adhered to the 3-mile limit in practice.[135] Numerous examples can be cited supporting this assertion.[136] However, at least as many examples can be listed as exceptions.[137] In a protest to Great Britain in 1837, the Russian government formally stated that each state reserves the right to resolve the question of the limit of the territorial

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[135] Schapiro, L., The Limits of Russian Territorial Waters in the Baltic, 27 Brit. Y.B. Int'l L. 444 (1950).

[136] In 1853 Russian cruisers were instructed to prevent foreign whalers from coming within 3 n.m. of the shores of Russian America. See Butler, W., The Soviet Union and the Law of the Sea, Baltimore, The Johns Hopkins Press, p. 28 (1971). A few years later, in 1868, the Russian Foreign Minister informed the United States that foreign whalers were forbidden within 3 n.m. from shore. See Swarztrauber, S., The Three-Mile Limit of Territorial Seas, Annapolis, Naval Institute Press, p. 74 note 48 (1972). The same year a 3-mile customs zone was established by decree. See Meyer, C., supra note 54, pp. 236-237. For an English translation of Art. 1, see 6 Soviet Statutes & Decisions 18 (1969). One year later, in 1869, the Russian Prize Regulations (Art. 21) prohibited the taking of prizes, which is only recognized in the open seas, within 3 n.m. from shore. See Crocker, H., The Extent of the Marginal Sea: A Collection of Official Documents and Views of Representative Publicists, Washington, D.C., U.S. Department of State, p. 620 (1919) and 6 Soviet Statutes & Decisions 18 (1969). The principle was repeated in the Customs Code of 1892. See Butler, W., The Law of Soviet Territorial Waters, New York, Praeger, p. 4 (1967). Finally, the 1893 instructions to the Russian cruisers sent to protect commercial fishing and hunting in the Bering Sea, in which the 3-mile limit was mentioned, have to be taken into account. See Crocker, H., ibid., p. 621 and 6 Soviet Statutes & Decisions 19 (1969). See also Nikolaev, A., The Problem of Territorial Waters in International Law (in Russian), Moscow, Gosudarstvennoe Izdatel'stvo Iuridicheskaia Literatura, p. 57 (1954), who lists most of these examples.

[137] For an 18th century example, see 1 de Martens, F., supra note 42, p. 500. He labeled it as ideas which could not be justified by custom nor by the theory of international law.

waters in accordance with its own convenience and interests.[138] In 1840 the Russian government was pressed by its trading officials to extend territorial waters to 40 Italian miles.[139] It declined however to do so, pointing at the protests that would certainly follow.[140] In 1857 a zone of customs control of about 4 n.m. was established along the coast of the European frontier. Schapiro pointed out, however, that only three of them extended seaward, and the remaining mile was an inland strip for frontier control.[141]

The most outspoken exception to the 3-mile rule as indicated above, however, which was actually implemented in practice, related to fur sealing. Since the early 1890s Russia started to seize foreign vessels well outside the 3-mile zone.[142] In 1893 this policy was further developed through the establishment of 10 and 30 n.m. zones.[143] Taking into account the particular timing of this Russian enactment, i.e. at a time when the United Kingdom and the United States were arguing similar rights before an international tribunal, Russia assured a certain endorsement by the two powers most affected by it. Even though the arbitration which solved this particular dispute between Russia and the United States required Russia to release the vessels and pay compensation,[144] the content of this claim

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[138] It is useful to stress that Soviet scholars relying on this particular policy established by the Russian government, like to emphasize this basic rule. See Nikolaev, A., supra note 136, pp. 57 and 240.

[139] This move was directed against foreign whaling near the shores of Russia.

[140] See Fulton, T., The Sovereignty of the Sea: An Historical Account of the Claims of England to the Dominion of the British Seas, and of the Evolution of the Territorial Waters, with Special Reference to the Rights of Fishing and the Naval Statute, Edinburgh, William Blackwood and Sons, p. 585 (1911).

[141] See Schapiro, L., supra note 123, p. 439, 444.

[142] See supra notes 61-64 and accompanying text.

[143] See supra note 66 and accompanying text.

[144] See supra note 79 and accompanying text.

was agreed to by Great Britain and the United States in later bilateral agreements.[145] Reference can also be made here to a memorandum, annexed to a note of the Russian Ministry of Foreign Affairs of 19 October 1898 to the Court of Arbitration in the Russia-United States dispute. Here it was stated that an area of about 5 n.m. had to be considered as Soviet territorial waters.[146]

It must be admitted that before this enactment of 1893 and the seizures immediately preceding it, Russia seemed to adhere strictly to the 3-mile rule even with respect to fur sealing. When Russian rules were made public in foreign ports in 1881 concerning trading, hunting and fishing in the Bering Sea region, the Russian minister of foreign affairs clearly stated in a letter of May 8 (20), 1882 that this regulation only applied to the territorial waters of Russia.[147]

This claim to special jurisdiction with respect to fur sealing, as it turned out, was the first concrete step undertaken by the Russia government to expand, step by step, its jurisdiction beyond the traditional 3-mile limit, a policy later to be continued by the Soviet Union.

ii United States

The protection of fur seals also played a significant role in the general U.S. policy with respect to the breadth of the territorial sea. The United States, it should be

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[145] See supra notes 72-77 and accompanying text.

[146] See Nikolaev, A., supra note 136, p. 59. This Russian claim of 5 n.m. can also be inferred from U.S. correspondence. See 1 Moore, J., Digest, supra note 59, p. 927. The arbitrator considered this fact to be irrelevant, since the vessels were seized well beyond 5 n.m. from shore.

[147] See 1 Moore, J., Arbitration, supra note 1, p.825.

remembered, was the first country to formally claim a 3-mile territorial sea in 1793.[148] A year later the diplomatic correspondence incorporating this policy[149] was transformed into an act of Congress making moreover the United States the first country to incorporate this notion into domestic laws.[150]

Pursuant to this commitment, the United States frequently protested against violations of the rule by other countries during the 19th century.[151] Especially the seizure of the U.S. vessel Pearl by the Russians should be mentioned here[152] since this vessel was detained on the basis of the 1821 Ukase of Tsar Alexander which prohibited foreigners from coming closer than 100 n.m. from land in the area in order to protect the fur seal

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[148] As was mentioned in the 1892 report and conclusions of Mr. T. Barclay, rapporteur of the Third Commission of the Institute of International Law, which studied the definition and regime of the territorial sea. See 3 Annuaire de l'Institut de Droit International (1892-1896), Brussels, Falk Fils, p. 50 (new abridged ed., 1928). See also, for instance, Heinzen, B., The Three-Mile Limit: Preserving the Freedom of the Seas, 11 Stan. L. Rev. 615 (1959). The United States did not come to this policy on a voluntary basis, but was rather pressured to take a stand on this point by France. See Swarztrauber, S., supra note 136, pp. 56 and 57 note 19.

[149] Note from Jefferson to the British Minister at Washington, November 8, 1793, reprinted in Reply of the United States to the Questionnaire of the Preparatory Committee, League of Nations Doc. C.74.M.39.1929.V (L.N. Pub. No. 1929.V.2), p. 130. The letter to the French Minister was basically the same. See also 1 Moore, J., Digest, supra note 59, pp. 702-703.

[150] Neutrality Act of June 5, 1794, ch. 50, para.6, 1 Stat. 384 (1845).

[151] In 1825, for instance, Monroe uttered formal protests against the British action by which an American fishing boat was ordered not to fish within 60 n.m. from shore. See Baty, T., supra note 38, p. 517, where he writes that the act was promptly disavowed by the British government and orders were given to prevent its recurrence. Strong diplomatic protest also followed after the Spanish 6 n.m. claim around Cuba in 1862. For an overview of the United States correspondence on this matter, see 1 Moore, J., Digest, supra note 59, pp. 706-714. For other statements by government officials of this country see ibid., pp. 702-706. Also the Canadian interference with American fishermen in 1877 triggered a similar reaction. See Baty, T., ibid., p. 525.

[152] See supra note 38 and accompanying text.

herd in the region. At the same time numerous public statements were uttered along the same lines[153] and treaties were concluded in accordance with it.[154]

But in spite of its dominance, the 3-mile limit was never an exclusive or inflexible boundary for the United States.[155] Here the American attitude towards the fur seal protection during the 1880s stands out as a prime example of jurisdiction not only claimed beyond the traditional 3-mile limit but moreover implemented in practice by this country.

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[153] It will suffice to refer to the numerous statements of the subsequent Secretaries of State as listed in the Reply of the United States to the Questionnaire of the Preparatory Committee, supra note 149, pp. 129-130.

[154] The plain 3-mile rule was embodied for the first time in international practice in the treaty of October 20, 1818 between Great Britain and the United States. See Convention of Commerce, Great Britain-United States, signed at London on October 20, 1818, Art. 1, as reprinted in 69 Parry, C., supra note 1, pp. 293-297 (1969). A never ratified treaty of 1888 between the same countries which served nonetheless as a modus vivendi, followed the same rule. See Treaty Relating to Fisheries in the Waters Adjacent to Canada and Newfoundland, Great Britain-United States, February 15, 1888, Art. 3, as reprinted in 3 Wektor, C., Unperfected Treaties of the United States of America, 119, 122 (1977). See also Treaty Relative to the Establishment of a Communication by Ship Canal Between the Atlantic and Pacific Oceans, Great Britain-United States, signed at Washington on November 18, 1901, Art. 3(5), as reprinted in 190 Parry, C., supra note 1, pp. 215-217 (1979).

[155] As early as 1790 the United States enacted anti-smuggling legislation in a zone of 4 leagues, i.e. 12 n.m. (Act of August 4, 1790, ch. 35, paras.12-13, 31, 64, 1 Stat. 157-158, 164-65, 175 (1845)). A similar act, extending custom jurisdiction to 12 n.m. was enacted around the turn of the century (Act of March 2, 1799, ch. 22, paras. 27, 54, 1 Stat. 627, 668). Baty, however, asserts that these provisions were never enforced against foreigners, as was also the case for the Anti-Slave Trade Act of 1807, which authorized the seizure of certain ships within 12 n.m. See Baty, T., supra note 38, p. 533. During the same year Great Britain refused to ratify an agreement it had signed with the United States establishing a special neutrality zone of 5 n.m. for similar reasons. See Riesenfeld, S., Protection of Coastal Fisheries Under International Law, Washington, Carnegie Endowment for International Peace, p. 138 (1942). This country also protested the United States-Mexico Treaty of 1848, in which a 3-league belt of territorial waters was provided for. See Swarztrauber, S., supra note 136, p. 92. See also, the Inland Rules of the Road Act of 1897, governing the navigation of ships in and near the United States and her territories, extending seawards as far as 15 n.m. in some areas, as mentioned by Swarztrauber, S., ibid., pp. 95 and 239. Also on policy level many statements can be traced down which contradicted the firm establishment of the 3-mile rule. This can best be illustrated by a statement of Jefferson himself, the originator of the 3-mile rule, who apparently advanced the thought shortly afterwards that the neutrality of the American territory should extend to the Gulf Stream which he saw as a natural boundary. As mentioned in the Memoirs of J. Adams, partly reprinted in 1 Moore, J., Digest, supra note 59, p. 703.

Not much endorsement was received on the international plane for the dispute was finally settled by reference to an international arbitral tribunal which strictly adhered to the 3-mile limit. Nevertheless, as requested by the parties, a special regime for fur sealing was worked out by the arbiters which certainly influenced a more positive reception by these two countries of a later similar Russian enactment.[156]

As was the case with Russia, it must be admitted that prior to these actions, the United States rather seemed to adhere to the 3-mile limit, even with respect to fur sealing. This was of course true at a time when Russia was still in control of the Pribilof Islands[157] but even during the debates in Congress on the acquisition of Alaska, no exclusive jurisdiction was ever suggested over waters or fisheries outside a 3-mile limit.[158] As late as 1872, the Secretary of the Treasury declared that the United States could not prevent seal fishing unless it was carried on within 3 n.m. from shore.[159]

Fulton, therefore comes to the conclusion that the United States, more than any other power, has varied her principles and claims as to the extent of territorial waters, according to her policy at a given time in history.[160] This ambivalent American practice led another author to conclude that the United States spent the 19th century unofficially "repenting at leisure" for the hasty decision of adopting a 3-mile limit in 1793.[161]

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[156] See for instance supra notes 72-77 and accompanying text.

[157] See supra notes 38-39 and accompanying text.

[158] See Baty, T., supra note 38, p. 522.

[159] As mentioned by Jessup, P., The Law of Territorial Waters and Maritime Jurisdiction, New York, Jennings Co., Inc., p. 54 (1927).

[160] Fulton, T., supra note 140, p. 650.

[161] Swarztrauber, S., supra note 136, p. 93.

Jessup, on the contrary, in his famous work on the law of territorial waters and maritime jurisdiction, comes to a totally different conclusion: "Like Great Britain, the United States stands out clearly today as a champion of the three-mile limit. On the whole, her position in this regard has been quite consistent."[162] Especially the United States claims over fur sealing "require some explanation" in this respect according to this author,[163] who stresses that a vital distinction, often overlooked by others, has to be made between the maritime belt which is claimed as part of the territory of a state on the one hand, and the limited rights of control or jurisdiction claimed upon the high seas on the other.[164]

The fur seal problem apparently also played a determinant role in the United States court decisions on the subject. Three periods can grosso modo be distinguished. A period up to the late 1880s during which no fixed rule can be revealed; the period of fur seal protection in which several captures of vessels outside the 3-mile limit were upheld, and finally the period following the decision of the Court of Arbitration when the judiciary of this country was, once again, left without a fixed rule.[165]

iii Comparison

The conclusion must therefore be reached that the fur seal protection legislation, of Russia as well as of the United States, were important factors in determining the attitude of both countries towards the extent of their maritime jurisdiction. Russia, first confronted

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[162] Jessup, P., supra note 159, p. 49.

[163] Ibid., p. 54

[164] Ibid., passim. This is the main thesis of his book, found throughout the work. See for instance at pp. xxxiii, 9, 26, 49, ... This is also the guiding principle of Smith, E., The Three Mile Limit, JAG J. 4-7 (March 1949) and 4-7 (April 1949).

[165] For a more detailed overview, see Note, The Three-Mile Limit as a Rule of International Law, 23 Colum. L. Rev. 473 (1923).

with the fur seal problem, tried to implement its policy during the 1820s but proved to be unsuccessful. When the United States took a similar step during the 1880s it was even willing to submit this particular dispute to third party settlement. But also the basic claim of the United States outside the 3-mile limit was dismissed.

Even though similar economic factors led to similar legislative action in both countries, its ultimate impact on the position of both countries with respect to the extent of their maritime jurisdiction was quite different. Writers in the United States have always tried to minimize that impact by arguing, as Jessup remarked, that adherence to a 3-mile territorial sea did not prevent a country from claiming special limited rights outside that zone. Moore, moreover, labeled this action with respect to fur seals as "an ironical aberration."[166] For the United States, in other words, these claims relating to special zones beyond the territorial sea were a goal per se.

Russia, on the other hand, had a clear intention of maintaining the 12-mile limit as a permanent policy.[167] But because the proclamation of such a definite policy would most certainly have proved unacceptable to the other major seafaring countries, the government opted for a more carefully planned approach. Instead of fixing its position once and for all by means of a clear theoretical definition of a simple general norm for all of the sea boundaries of the Empire, the government rather endorsed a policy of different limits for different interests in different locations.[168] After 1917 the new Soviet leadership simply pursued this policy.[169] When commenting on the state practice relating to

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[166] Moore, J., Fifty Years of International Law, 50 Harv. L.R. 399 (1937).

[167] Dispatch from Mr. Guild, American Ambassador at St. Petersburg to the Secretary of State, February 3, 1912, as cited by Swarztrauber, S., supra note 136, p. 33.

[168] Meyer, C., supra note 54, 236-237.

[169] The October Revolution stands out as a historic event through which a complete break was realized with the imperial Russian empire, including the latter's legal order, as evidenced by Art. 22 of the Decree of November 30, 1918 which prohibited any references to pre-revolutionary law in court decisions. See Grzybowski, K., Continuity of Law in

adjacent maritime zones under coastal state competence, Gidel wrote the following indicative paragraph about Soviet Russia in 1930: "Le droit positif de la Russie soviétique en matière d'eaux côtières offre un caractère de grande complexité dans le détail, mais de simplicité certaine quant aux idées essentielles dont il s'inspire. La Russie a traditionellement revendiqué une très large mer territoriale ... La Russie soviétique continue cette tradition."[170] In the same line of thought, de Hartingh does not characterize 1917 as a hiatus in the maritime policy of this country, but rather as an accelerating factor with respect to the seaward expansion of its jurisdiction.[171] It is noteworthy that even Nikolaev, a Soviet authority on the law of territorial waters, did not hesitate to rely in his basic treatise on the subject, on historic arguments rooted well into the imperial Russian period in order to sustain the Soviet argument concerning a 12-mile territorial sea limit.[172] Or as correctly remarked by Belli: "Soviet legislation does not define the width of the territorial waters of the Soviet Union ... but it establishes border and

Eastern Europe, 6 Am. J. Comp. L. pp. 48-49 (1957). It cannot be denied, however, that elements of continuity certainly appear to be present in the field of Soviet offshore maritime claims.

[170] 3 Gidel, G., Le droit international public de la mer, Paris, Recueil Sirey, p. 114 (1934).

[171] de Hartingh, F., Les conceptions soviétiques du droit de la mer, Paris, Librairie Générale de Droit et de Jurisprudence, pp. 7-8 (1960). Here she writes: "L'Histoire russe -- accélérée à la période soviétique -- de la domination des espaces maritimes est un example frappant de cet empiètement sur la mer."

[172] Nikolaev, A., supra note 136, pp. 60 and 170. This book, which constituted the only Soviet source of that time period on the subject, apart from two other dissertations written on that subject, received a critical review by Professor V. Durdenevskii. And although a number of infelicities were discovered, the latter's conclusion was that these mistakes did not affect the overall positive impression as a "serious and conscientious research into one of the most difficult problems of international law." See 7 Sovetskoe Gosudarstvo i Pravo 142 (1954). For reviews in the Western press, see comments of O. Lissitzyn, 49 Am. J. Int'l L. 592-593 (1955) and H.-A. Reinkemeyer, 2 Osteuropa Recht 216 (1956).

custom zones, fishing zones, zones for the use by radio equipment, fortified zones and closed waters for navigation."[173]

If these claims beyond the territorial waters can be classified as a goal per se for the United States, it is clear that for Russia, as well as for the Soviet leadership later on, the ultimate goal lay further. By claiming separate areas for separate purposes Russia hoped to provide a sound foundation for the later establishment of an overall extended territorial sea. The Russian government, however, did not bear the fruits of this policy itself. As one author observes, if the 12-mile limit was inherited by the U.S.S.R. from Russia, the most it could inherit was an unrealized intention.[174] Even the Soviet Union only endorsed this policy of an overall territorial sea of 12 n.m. openly since the preparation of UNCLOS I.[175]

b After the 1893 Arbitration

Today, with the establishment of a 200-mile exclusive economic zone by the 1982 United Nations Convention on the Law of the Sea, in which coastal states have inter alia sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources of the waters superjacent to the seabed,[176] this part of the award may look totally overtaken by reality. Even though the 1982 Convention has not yet entered into

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[173] As reprinted in Balupuri, S., Territorial Waters in Soviet Law and Practice, 14 Indian J. Int'l L. 220 (1974).

[174] Butler, W., The Soviet Union and the Law of the Sea, supra note 136, p. 33 (1971).

[175] As mentioned in Franckx, E., New Soviet Fishing Regulations Concerning the EEZ: An Appraisal, 18 Marine Pol'y 126 (1987), where it is submitted that, before the emergence of a 200-mile zone concept, the Soviet attitude towards fishing zones in general has always been closely linked with their position concerning the breadth of the territorial sea. See ibid., p. 125.

[176] Art. 56.

force (60 ratifications are necessary; only 43 ratifications have been received),[177] the exclusive economic zone concept has already expressis verbis been declared to form part of customary international law by the International Court of Justice.[178] In the area of fur sealing here under consideration, this evolution was reflected by the 1980 Amendment[179] where it is stated that the words "except within the territorial waters of another state" have to be replaced by "except within the areas in which another state exercises fisheries jurisdiction."[180]

This change, nevertheless, did not come easy. During the first codification attempt of the United Nations with respect to the law of the sea (Geneva 1958)[181] both problems, i.e. the breadth of the territorial sea and the fishery jurisdiction of the coastal state, remained unresolved. Shortly afterwards the General Assembly was of the opinion that these remaining problems were ripe for codification.[182] Consequently it convened a second conference[183] to be held at Geneva in 1960.[184] The expectations of the General Assembly, however, did not materialize. The basic proposal which came closest to being accepted at that time was a joint United States-Canadian text containing the so-called six

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[177] Oceans Policy News, April 1990, p. 1.

[178] Continental Shelf Case (Libyan Arab Jamahirya v Malta) 1985 ICJ 33 (para. 34).

[179] See supra note 116.

[180] See Art. III.

[181] February 24 - April 28.

[182] As UNCLOS I adjourned, it adopted a resolution requesting the General Assembly to study the possibility of calling a second Conference. See Resolution Adopted by the Conference, U.N. Doc. A/CONF.13/L.56, 2 UNCLOS I, p. 143 (1958).

[183] See U.N. GAOR Supp.(No.18) (A/4090), p. 54.

[184] March 17-April 27.

and six formula: A territorial sea of maximum 6 n.m., combined with an exclusive fishing zone extending from the outer limit of the territorial sea to a maximum distance of 12 n.m.[185] Even though this proposal was adopted in the Committee of the Whole,[186] it needed a two-third majority in the Plenary Meeting according the rules of procedure of that Conference.[187] When the proposal was put to a vote, however, it was rejected, having failed by one vote to obtain the required two-third majority.[188]

After this failure to reach an international agreement on the subject, states started to act in an unilateral manner.[189] Some responded by extending their territorial sea up to 12 n.m.,[190] others by extending their territorial sea up to 200 n.m.,[191] while still others preferred to proclaim an adjacent fishery zone. In this latter category especially Iceland has to be mentioned for it was the first country to extend a fishery zone beyond its

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[185] Canadian-United States proposal, U.N. Doc. A/CONF.19/C.1/L.10 (April 8, 1960), UNCLOS II, p. 169 (1960).

[186] 43 in favor, 33 against, 12 abstentions. Summary Records of the 28th Meeting, UNCLOS II, p. 152 (1960).

[187] Rules of Procedure adopted by the Conference (A/CONF.19/7), rules 35 and 49, UNCLOS II, at xxx and xxxiii (1960).

[188] 54 in favor, 28 against, 5 abstentions. Summary Records of the 13th Plenary Meeting, UNCLOS II, p. 30 (1960).

[189] For a good chronological table of territorial sea and fishing zone claims, see Smith, R., Exclusive Economic Zone Claims: An Analysis and Primary Documents, Dordrecht, Martinus Nijhoff Publ., pp. 17-23 (1985).

[190] Saudi Arabia, Egypt, China, Iraq and Panama in 1958, Libya and Iran in 1959, Indonesia and Sudan in 1960 ...

[191] Guinea in 1965, Ecuador in 1966, Argentina and Panama in 1967, Uruguay in 1969, Brazil 1970 ...

territorial sea.[192] Although Great Britain objected to this 12-mile fishery zone, a modus vivendi was worked out by parties in 1961.[193] This agreement also included the possibility to refer possible future disputes to the International Court of Justice.[194] When Iceland announced that it was extending its fishery jurisdiction to 50 n.m. as of September 1, 1972,[195] Great Britain, basing herself on the compromissory clause to be found in the above-mentioned modus vivendi, brought the case before the International Court of Justice. In 1974 the World Court in its famous Fisheries Jurisdiction Case ruling, once and for all disconnected the linkage between exclusive fishery rights and the territorial sea notion. Up to 12 n.m. the Court found Iceland's fishery claim to be in accordance with international law even though this country only claimed a 3-mile territorial sea at that time.[196] Beyond 12 n.m. this was no longer the case and a fair agreement had to be reached between parties according to the Court.[197] UNCLOS III further extended this limit to 200 n.m.[198]

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[192] For a chronological list limited to the unilateral establishment of 12-mile fishery zones, see Oda, S., International Law of the Resources of the Law of the Sea, Alphen aan den Rijn, Sijthoff & Noordhoff, p. 18 (1979).

[193] Exchange of Notes Constituting an Agreement Concerning the Settlement of the Fisheries Dispute, Great Britain-Iceland, signed at Reykjavik on March 11, 1961, 397 UNTS 283.

[194] Text following Art. 4.

[195] The Althing adopted a resolution to that end on February 15, 1972. The text of this resolution was distributed at the United Nations two days later. As reprinted in 1 New Directions in the Law of the Sea (Lay, S., Churchill, R. & Nordquist, M., eds.), New York, Oceana Publ., p. 89 (1973).

[196] Fisheries Jurisdiction Case (United Kingdom v. Iceland) 1974 ICJ 23 (para. 52). The Court stated that subsequent to the failure of UNCLOS II to reach an agreement on this point and state practice following this conference, two concepts had crystallized as customary law. The one here of importance was "the concept of a fishery zone, the area in which a State may claim exclusive fishery jurisdiction independently of its territorial sea; the extension of that fishery zone up to a 12-mile limit from the baseline appears now to be generally accepted." Emphasis added.

[197] Ibid., p. 34 (para. 79).

The post 1893 Arbitration period, as a consequence, illustrates that the fishery zone clearly moved away from the territorial sea concept. The next question to be raised then is whether this new concept of extended fishery zones has had any direct influence on the fur seal problem here discussed.

It is submitted that this drastic evolution extending the fishery competence of coastal states from 3 to 200 n.m., did not solve the problem of contemporary North Pacific fur sealing. For indeed, as long as all pelagic sealing was forbidden, as was the case under the 1911 and 1957 Conventions, no particular problems arose. After the United States allowed the 1957 Interim Convention to lapse in 1984, however, Japan notified the North Pacific Fur Seal Commission, as mentioned above,[199] that under certain circumstances Japan might decide to resume pelagic sealing in the future. As was the case at the time of the 1893 Arbitration, the problem is that fur seals do not respect these artificial legal boundaries invented by man.

As in the 19th century, the limits of the territorial sea, be it enlarged from 3 to maximum 12 n.m. at present,[200] are not respected by these animals in their usual pattern of behavior. Even during summer months nursing females are leaving on feeding forays to 100 n.m. and sometimes even more from land, returning at regular intervals to nurse their pups.

With the emergence of fishing zones and exclusive economic zones in international law, one could argue that this particular factor is no longer of crucial importance. Indeed, today all four countries party to the 1957 Interim Convention claim either a fishery or an

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[198] See supra note 8 and accompanying text.

[199] See supra note 127 and accompanying text.

[200] The Secretary-General of the United Nations wrote in his last Report on the Law of the Sea: "It is generally agreed that the 12-mile limit provided for in article 3 of the Convention has become a norm of the international law of the sea." See Law of the Sea: Report of the Secretary-General (November 1, 1989), U.N. Doc. A/44/650, p. 7.

economic zone, including jurisdiction over marine mammals: Japan established a 200-mile fishing zone in 1977;[201] Canada established 200-mile fishing zones in 1977;[202] the United States proclaimed a 200-mile exclusive economic zone in 1983[203] and the Soviet Union established what they called an economic zone in 1984.[204]

But it should be noted, and this is more important here, that fur seals do not respect these newly established 200-mile limits either. Even though it must be admitted that all seal rookeries are located within the 200-mile limit and that North Pacific fur seals are found predominantly within 200 n.m. of land, the Pribilof herd does not stay in the United States 200-mile zone but also wanders in the Canadian west coast fishing zone. Moreover,

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[201] Law No. 31 on Provisional Measures Relating to the Fishing Zone, as amended, May 2, 1977, reprinted in 7 New Directions in the Law of the Sea (Nordquist, M., Houston, L. & Simmonds, K., eds.), London, Oceana Publ. Inc., pp. 128-137 (1980). This law entered into force on July 1, 1977.

[202] Fishing Zones of Canada (Zones 4 and 5) Order, January 1, 1977, reprinted in 5 New Directions in the Law of the Sea (Churchill, R., Nordquist, M. & Houston, L., eds.), New York, Oceana Publ. Inc., pp. 55-62 (1977). This order entered into force on the same day. The Secretary of State for External Affairs before the House of Commons had announced this policy change on June 4, 1976. Statement reprinted in Copithorne, M., Canadian Practice in International Law During 1976 as Reflected Mainly in Public Correspondence and Statements of the Department of External Affairs, 15 Canadian Y.B. Int'l L. pp. 326-328 (1977). Only on February 24 was the extension of fishery zones completed in Canada by the establishment of a similar zone in the Arctic. See VanderZwaag, D., The Fish Feud: The U.S. and Canadian Boundary Dispute, Lexington (Massachusetts), Lexington Books, p. 67 (1983).

[203] Presidential Proclamation No. 5030 on the Exclusive Economic Zone of the United States of America, March 10, 1983, reprinted in Smith, R., supra note 189, pp. 467-468. The proclamation entered into force on the same day. In 1976 this country did establish a 200 n.m. fishery zone: Act to Provide for the Conservation and Management of the Fisheries and for Other Purposes, April 13, 1976, reprinted in 5 New Directions in the Law of the Sea, supra note 202, pp. 144-174. Title 1 of that Act entered into force on March 1, 1977.

[204] Edict on the Economic Zone of the U.S.S.R., February 28, 1984, reprinted in Smith, R., supra note 189, pp. 417-423. This edict entered into force on March 1, 1984. In 1976 the Soviet Union had already established a provisional 200 n.m. fishery zone: Edict on Provisional Measures for the Preservation of Fishing in Marine Areas Adjacent to the Coast of the U.S.S.R., December 10, 1976, reprinted in 5 New Directions in the Law of the Sea, supra note 202, pp. 141-143. This edict entered into force on March 1, 1977.

the migrating routes of these animals do cross the outer limits of these newly established zones. Especially the pregnant females, when returning to their breeding places in summer, follow a direct route between the waters off California, Oregon and Washington to the Pribilof Islands which leads them well outside the 200-mile zones of coastal states.[205] Taking into account the particular lifestyle of these animals, it is easily understood that under these circumstances pelagic sealing outside the 200 n.m. zones would have a most negative effect on the fur seal population.

IV Conclusions

The major conclusions reached by this study can be summarized as follows. First, the 1893 Arbitration paved the way for later regulations concerning fur sealing which established an effective international conservation regime preventing the fur seal herd from over-exploitation. Not the award itself, but the attached regulation proved to be instrumental in this respect. Moreover, it was not the 1893 Arbitration itself which reversed the steady decline of the fur seal herd, but only later regulations, inspired by it and concluded between all parties involved.

Second, fur sealing proved to be a determinant factor in the Russian and U.S. claims beyond the traditional 3-mile limit in the 18th and 19th century. For Russia, and later the Soviet Union, this policy rather framed in a general move towards an extended territorial sea of 12 n.m. For the United States, on the other hand, it constituted a goal per se, namely special jurisdiction for a special purpose.

Third, the fundamental ruling of the 1893 Arbitration, namely that no fishery jurisdiction existed beyond the territorial sea, was later reversed by the International Court

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[205] North Pacific Fur Seals, supra note 10, pp. 6 and 19.

of Justice in its Fisheries Jurisdiction Case of 1974. Today, coastal states are entitled to fishery jurisdiction well beyond their territorial sea.

If one combines the two topics addressed by this study, namely the regulation of fur sealing on the one hand, and the interrelationship between fur sealing and offshore maritime jurisdiction on the other, and analyzes them starting from a contemporary point of view, one cannot but come to the conclusion that fur seals are not much better off today than they were about 100 year ago. It is namely submitted that exactly the same problem could well arise today before an international tribunal or the International Court of Justice. Indeed, were the Japanese to resume pelagic sealing now that the Interim Convention is no longer operative, an almost identical dispute would arise between the United States and Japan as during the 1880 between the United States and Great Britain. The crucial question to be asked to the judges or arbiters would be very similar indeed: "Has the United States any right, and if so, what right of protection or property in the fur seals frequenting the islands of the United States in Bering Sea when such seals are found outside the 200-mile fishing or (exclusive) economic zone?" It will be noted that one only has to replace the words "ordinary three-mile limit" by "200-mile fishing or (exclusive) economic zone." It is submitted that parties to such a dispute could find a sound basis for their argumentation in the Bering Fur Seal Arbitration memorials and pleadings. At present the United States and the Soviet Union are already facing a very similar problem with respect to pollack fishing in the Bering Sea Donut, an area of high seas enclosed by Soviet and U.S. 200-mile zones.[206]

It appears appropriate to conclude this study by quoting the prophetic words of the President of the 1983 Arbitration, Baron de Courcel. At the occasion of the final session

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[206] See Burke, W., Fishing in the Bering Sea Donut: Straddling Stocks and the New International Law of Fisheries 16 Ecol. L.Q. 285-310 (1989).

of the arbitration the President made the following concluding remarks after a copy of the award had been received by the agents of Great Britain and the United States:

> "Hitherto the nations were agreed to leave out of special legislation the vast domain of the seas, as in times of old, according to the poets, the earth itself was common to all men, who gathered its fruits at their will, without limitation or control. You know that even to-day dreamers believe it possible to bring back humanity to that golden age. The sea, however, like the earth, has become small for men, who, like the hero Alexander, and no less ardent for labor than he was for glory, feel confined in a world too narrow. Our work is a first attempt at a sharing of the products of the ocean which has hitherto been undivided, and at applying a rule to things which escaped every other law but that of the first occupant. If this attempt succeeds, it will doubtless be followed by numerous imitations, until the entire planet -- until the waters as well as the continents -- will have become the subject of a careful partition. Then, perhaps, the conception of property may change amongst men."[207]

Maybe not only the arguments, but even the solution to a possible present day conflict over the North Pacific fur seals could well be found in this 1893 Arbitration.

Erik Franckx

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[207] As reprinted in Moore, J., Arbitration, supra note 1, p. 932.

OPEN ACCESS AND THE HUNT FOR THE HARP SEAL IN THE NORTHWEST ATLANTIC

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ABSTRACT

For most of its economic history the harp seal (*Phoca groenlandica*) in the northwest Atlantic has been hunted under conditions of open access; that is, it was treated as a common property resource and harvested by competitive firms and individuals with little or no regulation on the number of seals killed. This paper examines the post-World War II era, constructing an open access model for the period 1952-1970. The model can be written as a two-dimensional, second-order system or the three-dimensional, first-order system

$$P_{t+1} = rX_t(1 - X_t/K)$$

$$X_{t+1} = (1 - M_0)P_t e^{-\alpha E_t} + (1 - M)X_t e^{-\beta E_t}$$

$$E_{t+1} = E_t + \eta[P_H P_t(1 - e^{-\alpha E_t}) + P_Y X_t(1 - e^{-\beta E_t}) - CE_t]$$

where P_{t+1} is the number pups in year t+1, X_{t+1} is the number of seals one year or older (1+ seals) and E_{t+1} is the level of hunting effort. There are 10 "bionomic" parameters: four biological (r, K, M_0, M) and six economic (α, β, C, η, P_H and P_Y). Estimates or "guessimates" are assembled for all parameters and initial conditions, *circa* 1952, are specified. It is possible to numerically solve for the open access equilibrium for the given parameter set and to plot the approach trajectory in X-E space. Equilibrium is approached via a slowly converging spiral. The harp seal population is reduced from 2.5 million in 1952 to about 0.9 million in 1964. Open access equilibrium (for prices and costs prevailing in 1976) occurs at X_∞ = 1,170,679 (1+ seals) and E_∞ = 73.75 (large-vessel equivalents). The population projections from the the open access model are compared with projections from other, more complex, models. Additional research is planned and the open access model appears to be a useful paradigm for modeling the economic history of renewable resources.

Open Access and the Hunt for the Harp Seal in the Northwest Atlantic

I. Introduction

The harp seal (*Phoca groenlandica*) exists in three separate populations in the northern hemisphere. The population in the northwest Atlantic winters in the Gulf of St. Lawrence and off the coast of Newfoundland. The eastern populations winter off Jan Mayen Island (northeast of Iceland) and in the White Sea (in the northwestern Soviet arctic). All three populations have been hunted commercially. Perhaps the oldest, and certainly the most controversial hunt, was for the harp seal in the northwest Atlantic.

This paper will focus on the post-World War II economic history of this resource. The period 1952-1970 might be characterized as "open access", since landsmen from Newfoundland and the large-vessel fleet from Norway were not restricted by government regulation in either their effort or in the number of seals killed. The level of investment and effort in hunting the harp seal was presumably based on an "unfettered pursuit of profit". Open access might be defined as a situation where a common property resource is subject to harvest by unregulated competitors. It was not until 1971

that the concern over the level and method of harvest caused Canadian officials to introduce a system of quotas to regulate the hunt.

Under certain economic conditions open access will lead to the "tragedy of the commons" as described by Hardin (1968). An open access model attempts to describe the dynamics of the resource and the industry over time. The economic theory and qualitative dynamics of open access is discussed in two articles by Smith (1968 and 1969). Perhaps the first empirical test of the model was reported by Wilen (1976), Paterson (1977) and Paterson and Wilen (1977) who estimated parameters of an open access model of the northern fur seal (*Callorhinus ursinus*) for the period 1880-1900.

In the next section we will briefly describe the life history of the harp seal in the northwest Atlantic. The third section presents an open access model describing the dynamics of pups, seals one year or older (1+ seals) and effort. The fourth section presents some numerical results when the model is calibrated with "best-guess" estimates for the various "bionomic" parameters. The paper concludes with an assessment of the descriptive validity of the model, as applied to the harp seal in the northwest Atlantic, and the usefulness of the open access model as a general paradigm for quantitative research into the economic history of renewable resources.

II. Biology

During the summer the harp seal population in the northwest Atlantic is spatially separated by age. Immature seals and pups of the year spend the summer off the west coast of Greenland feeding on capelin and shrimp, while the mature adults are further west in the Canadian arctic feeding on capelin, cod and various crustacea (Sergeant 1973).

In late September adult and immature seals begin a southward migration in advance of the fresh forming pack ice (Figure 1). By December the two groups briefly merge along the coast of Labrador. At the Strait of Belle Isle the herd divides, with approximately one third proceeding into the Gulf of St. Lawrence and the remainder wintering on the drifting pack ice along the north coast of Newfoundland. The two groups are referred to as the "Gulf" and "Front" herds, respectively.

Pregnant females in the Gulf heard will haul out on the pack ice and give birth to (whelp) a single pup beginning in the last week in February. Whelping may continue until the third week in March. Large whelping patches have historically been located near the Magdalen Islands.

The age at sexual maturity (first parturition) appears to be

density dependent; that is, dependent of the overall size of the herd relative to food supply (carrying capacity). With a smaller herd and more abundant food, females may achieve sexual maturity at four years of age, while at larger herd sizes and slower individual growth, females may not mature until six years of age.

Females at the Front herd begin to whelp around March 8th. Newborn pups are covered with a long white fur and are called "whitecoats". The pups are nursed from 9-16 days and then abandoned. After lactation, but before leaving the whelping area, a female will mate with one or more males (Sergeant 1976).

The pups begin to loose their fetal coat at about 18 days, passing through a stage where they are known as "ragged-jackets". At four weeks of age they will have fully molted to a grey coat with black spots and they will begin to feed on smaller fish and crustacea in open water. They are now called "beaters".

In early April immature seals from earlier cohorts (called bedlamers) and mature males will haul out to molt. Females will start the molting process around the third week in April. By this time both the Gulf and Front herds will have started their northward migrations. The Gulf herd heads up the west coast of Newfoundland passing back

through the Strait of Belle Isle by the first week of May. The Front herd moves north from the vicinity of Notre Dame Bay (on the north coast of Newfoundland) following the retreating pack ice. The herd then separates by age, with beaters and bedlamers heading to the west coast of Greenland and adults heading toward the Canadian arctic.

Prior to 1983 the commercial hunt took place at several locations using at least four different methods for killing seals. Pups, bedlamers and mature adults were killed at the whelping and molting patches in late February, March and April. Pups would be clubbed and adults would be shot. Landsmen from Newfoundland (operating from small boats) along with large vessels (the majority from Norway) would participate in this phase of the hunt. Seals would also be taken in open water on baited longlines. Finally, a net fishery existed along the coasts of Quebec, Newfoundland and Labrador where nets could be placed between narrow passages to snare seals on their southward migration (Royal Commission, Volume 2, 1986).

In the early and mid-nineteenth century seals were harvested for food, oil and leather. With the development of petroleum distillates for illumination and lubrication, the demand for seal oil declined markedly toward the end of the nineteenth century. After World War II the harp seal was hunted for subsistence by the Inuit and

others and commercially for its fur and leather.

III. A Model of Open Access

Open access models attempt to describe both the population dynamics and the capital or effort dynamics of the harvesting sector. We will begin with a simple model of population dynamics.

Let P_t denote the number of pups born in year t and X_t the number of seals one year or older (1+ seals), also in year t. While the majority of females do not reach sexual maturity until five or six years of age, we will posit that the number of pups whelped in year t+1 depends on the population of 1+ adults in year t according to a logistic function written as

$$P_{t+1} = rX_t(1 - X_t/K) \qquad (1)$$

where r is called the "intrinsic growth rate" and K is a parameter reflecting carrying capacity.

Pups in year t may die of natural causes or be killed by hunters. Those that survive will augment the population of 1+ seals in year t+1. The latter group is also subject to natural mortality and commercial harvest. The population of 1+ seals in year t+1 is assumed to be

determined by

$$X_{t+1} = (1 - M_0)(P_t - H_t) + (1 - M)(X_t - Y_t) \qquad (2)$$

where M_0 is the annual rate of natural mortality of pups, H_t is the number of pups killed by hunters in year t, M is the annual rate of natural mortality for 1+ seals and Y_t is the number of 1+ seals killed in year t.

If there were a complete ban on sealing, $H_t = Y_t = 0$, and the system would presumably move to a steady-state equilibrium defined by

$$\bar{X} = \frac{K[r(1 - M_0) - M]}{r(1 - M_0)} \qquad (3)$$

$$\bar{P} = \frac{KM[r(1 - M_0) - M]}{r(1 - M_0)^2} \qquad (4)$$

At $(\bar{X}, \bar{P})$ the number of surviving pups precisely offsets the number of 1+ seals that die of natural causes. This "zero-harvest equilibrium" is shown in Figure 2 It depends on the four biological parameters r, K,

M_0 and M.

A sufficient condition for the stability of the zero-harvest equilibrium is

$$2 > 1 + (1 - M_0)r - 2M > (1 - M) \qquad (5)$$

[See Conrad and Bjørndal (1989) for details.] This equilibrium and its stability are of considerable interest as the harp seal population continues to recover from intensive harvesting in the three decades following the war.

In fisheries economics it is common practice to define some measure of "effort" and presume a functional relationship between effort, the resource population (or stock) and harvest. Let E_t denote sealing effort in year t. Then, the harvest of pups and 1+ seals is assumed to be characterized by the functions

$$H_t = P_t (1 - e^{-\alpha E_t}) \qquad (6)$$

$$Y_t = X_t (1 - e^{-\beta E_t}) \qquad (7)$$

where $\alpha > 0$ and $\beta > 0$ are economic (production) parameters that determine the fraction of pups and 1+ seals killed as a function of effort. This is the same production function that was used by Spence (1974) in his study of the blue whale (*Balaenoptera musculus*). Because of the diverse way in which seals were killed, devising an appropriate measure for E_t in the harp seal hunt is difficult. A discussion of the approach taken here is postponed until the next section.

Economic theory would suggest that the level of investment in an industry is a function of expected profits. Expected profits may be influenced by the recent net returns in the industry as well as the likelihood of future profits. A naive model of expectations would presume that the level of effort in period t+1 would depend on the profitability in period t. Let π_t denote the level of profits in year t. Then

$$\pi_t = P_H H_t + P_Y Y_t - CE_t \qquad (8)$$

where P_H and P_Y are the per unit pelt prices for pups and 1+ seals, respectively, and C is the per unit price of effort. The naive model specifies

$$E_{t+1} = E_t + \eta\pi_t \qquad (9)$$

where $\eta > 0$ is a "stiffness" or adjustment parameter indicating the responsiveness of effort to profits. If $\pi_t > 0$, then $E_{t+1} > E_t$, whereas if $\pi_t < 0$, $E_{t+1} < E_t$.

Substituting (6) and (7) into (2) and (8) and the resulting expression for profit into (9) results in a three-dimensional, first-order, nonlinear dynamical system in P_t, X_t and E_t given by equation (1) and

$$X_{t+1} = (1 - M_0)P_t e^{-\alpha E_t} + (1 - M)X_t e^{-\beta E_t} \qquad (10)$$

$$E_{t+1} = E_t + \eta[P_H P_t(1 - e^{-\alpha E_t}) + P_Y X_t(1 - e^{-\beta E_t}) - CE_t] \qquad (11)$$

It is possible to substitute equation (1) into equations (10) and (11) to obtain a two-dimensional, *second*-order, nonlinear system in X_t and E_t. The dynamic behavior of either systems will be the same and can be summarized by analysis in the X-E space.

In addition to the biological parameters M_0, M, r, and K the

dynamical behavior of equations (1), (10) and (11) will depend on the economic parameters α, β, η, P_H, P_Y and C. Open access equilibrium, denoted by (X_∞, E_∞), is reached when the following equations hold

$$X = K\left[\frac{r(1 - M_0) - [1 - (1 - M)e^{-\beta E}]e^{\alpha E}}{r(1 - M_0)}\right] \qquad (12)$$

$$E = [P_H rX(1 - X/K)(1 - e^{-\alpha E}) + P_Y X(1 - e^{-\beta E})]/C \qquad (13)$$

These equations do *not* permit an explicit (analytic) solution for X_∞ and E_∞, but with estimates for the bionomic parameters it may be possible to solve for the values of X_∞ and E_∞ numerically. These values are useful to know when simulating equations (1), (10) and (11).

To briefly summarize, a simple model of population dynamics, production and effort dynamics was constructed which depended on 10 bionomic parameters. The system could be written as three first-order, nonlinear difference equations. Analytic expressions for the open access equilibrium were not possible, but with estimates of the bionomic parameters numerical solutions for X_∞ and E_∞ might be obtainable and, when available, will prove useful in evaluating open access dynamics.

IV. Parameters and Simulation Results

Table 1 summarizes the parameter set and initial conditions used in calculating open access equilibrium and simulating the evolution of the harp seal population and effort since 1952. These parameter estimates come from a variety of sources. Some have been estimated from data or obtained directly from records maintained by the Canadian or Norwegian governments. Others are simply "best-guess estimates" based on studies of other *pinnipeds* or selected after repeated simulation of the open access system. We will briefly comment on each parameter.

The estimates of annual mortality for pups and 1+ seals are from Roff and Bowen (1983) and are based on an iterative simulation and estimation procedure designed to identify values of M_0 and M that were "most likely" to have produced independent estimates of the harp seal age-structure in 1967. Roff and Bowen consider two cases; where $M_0 = M$ and where $M_0 = 3M$, regarding the latter case (higher pup mortality) as more plausible.

The values for r and K are perhaps the most speculative. They are taken from Conrad and Bjørndal (1989) who selected them on the

basis that they (1) provided reasonable estimates of the 1+ population supporting maximum sustainable net pup production and (2), in conjunction with Roff and Bowen's estimates for M_0 and M, produced a projection for the population of 1+ seals consistent with projections from two (more complex) biological models. The zero-harvest equilibrium for the values of M_0, M, r and K in Table 1 occurs at $\tilde{X}$ = 3,032,258 and $\tilde{P}$ = 293,444, and is stable. [Return to equations (3), (4) and stability condition (5).]

The estimates for α and β are derived from an estimate for the overall production parameter for the Norwegian large-vessel fleet operating in Newfoundland for the period 1952-1970. It was calculated according to the formula

$$\alpha = -\sum_{1952}^{1970} [\ln(X_t - (H_t + Y_t))/X_t]/19 = 0.00719 \qquad (14)$$

with data coming from Tables 1 and 3 in Conrad and Bjørndal (1989). The value for α was increased slightly to 0.008 and the value for β was reduced to 0.0007 in order to provide more realistic estimates for the harvest of 1+ seals. These parameter estimates are admittedly *ad hoc* and will be the object of a more rigorous econometric inquiry.

The difficulty in estimating α and β is related to defining an overall measure of effort. The implication of using values even remotely related to the value of α obtained from the application of equation (14) is that the three other methods of killing seals can be measured in terms of "large-vessel equivalents". Calculation of the initial condition for large-vessel equivalents is discussed below.

The open access equilibrium and simulation reported in this paper presumes fixed prices and cost, approximating those values found in 1976. The cost of $50,000 represents the annual operating cost of a large vessel (Dunn 1977), while the prices of $17 and $20 are the average per pelt prices for whitecoats and 1+ seals. Prices and costs are in 1976 Canadian dollars.

The stiffness parameter, η, is estimated from data on the dynamics of large vessel at the harp seal grounds at Jan Mayen. Its use here presumes (1) that the investment response is similar at both locations, (2) that exit and entry is symmetric (exit occurs at the same rate as entry) and (3) that the dynamic response of other hunting methods, measured in large-vessel equivalents, responds according to the same stiffness parameter.

The initial condition on the population of 1+ seals is set at 2.5×10^6 which approximates the initial value used or obtained in

population modeling by Lett and Benjaminsen (1977) and Lett *et al.* (1979). Pup production in 1952 (determined by the population of 1+ seals in 1951) was set at 375,000; equal to the value obtained from the logistic when r = 0.4, K = 4.0×10^6 and X = 2.5×10^6. This level is less than some of the published estimates of pup production for 1952, but those estimates seem unrealistically high in light of the analysis by Lett and Benjaminsen (1977), Lett *et al.* (1979) and Conrad and Bjørndal (1989).

The initial condition for effort represents a guess as to the large-vessel equivalent in 1952. In that year, Norway sent 11 vessels to Newfoundland obtaining a total harvest of 130,037 seals. Canada harvested an estimated 190,255 seals. Proportionality would imply a Canadian large-vessel equivalence of 16.52 units. The total was rounded to up to $E_0 = 28$.

For the parameters in Table 1 the open access equilibrium was calculated to occur at X_∞ = 1,170,679 (1+ seals) and E_∞ = 73.75 (large-vessel equivalents). This would be the long-run equilibrium if the parameters were constant and prices and costs remained at their 1976 levels. The approach dynamics from the initial conditions, *circa* 1952, are shown in Figure 3. The movement of the seal population and effort traces out a convergent, counter-clockwise spiral

in X-E space. Some benchmark years are noted. It should be emphasized that this is a simulation based on an unchanging physical and economic environment. When run forward for 50 years (to the year 2002) the population is at 1,184,232 and effort is at approximately 80 (large-vessel equivalents).

The simulation provides some interesting comparisons to other models. Lett *et al.* (1979), in a model with three density-dependent factors, estimate the 1+ population to have reached a low of 1.0 million in 1972. When simulating equations (1) and (2) using estimates of pup and 1+ harvests from Bowen (1982), Conrad and Bjørndal (1989) also obtain the estimate of 1.0 million seals in 1972. The value in the open access simulation (which makes use of no harvest data) is 1.25 million. However, the 1+ population had declined from 2.5 million to a low of 0.9 million in 1964, before reaching a second peak of 1.36 million in 1976.

The open access simulation then continues a slow spiral to equilibrium. In reality, the bionomic parameters were changing and the Canadian authorities introduced quotas on Canadian and Norwegian harvests. Based on estimates of harvest through 1980, Conrad and Bjørndal (1989) estimate a 1+ population of 1.3 million in 1981 and a zero-harvest equilibrium of about 3.0 million.

A thorough sensitivity analysis of the open access model has not been done. From the limited analysis to date the model appears qualitatively robust for small parameter changes (plus or minus 10 percent) but for larger changes (particularly in η) the model appears to become chaotic and open access extinction can result.

V. Conclusions

This paper has attempted to model the post-war hunt for the harp seal in the northwest Atlantic. The period 1952-1971 saw an expansion of Canadian and Norwegian effort and an absence of government intervention or regulation. The pursuit of profit by commercial hunters would suggest an open access model as an appropriate paradigm for this period. A simple model, from both a biological and economic standpoint, was constructed. Parameter estimates were obtained from a variety of sources and the model was simulated for a 50 year period.

For unchanging parameters and economic prices *circa* 1976 it was possible to numerically solve for the open access equilibrium and to simulate the model forward in time from the conditions thought to have prevailed in 1952. The model revealed the classic counter-

clockwise spiral of an open access system. The simulation saw the population of harp seals reduced from 2.5 million in 1952 to about 0.9 million in 1964. This is below the minimum of 1.0 million seals reached in 1972 in the simulations by Lett *et al.* (1979) and Conrad and Bjørndal (1989). These latter simulations made use of the estimated harvests of pups and 1+ seals which were less that those implied under the open access simulation. Changing bionomic parameters and other impediments to entry and investment may account for the lower observed rates of harvest. Additional econometric work and refinements to model structure, such as time varying parameters, may bring the population and harvest estimates from open access into closer agreement with simulations using estimates of pup and 1+ harvest. The results presented here should be regarded as preliminary.

In a bit broader context, the economic theory of open access would appear to be a useful paradigm when analyzing the economic history of commercially exploited renewable resources. Whaling and sealing in the nineteenth century provide a rich set of data which can be analyzed using modern econometric methods to estimate the parameters of delay difference equations in open access models.

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Figure 1. The Southward Migration of the Harp Seal in the Northwest Atlantic

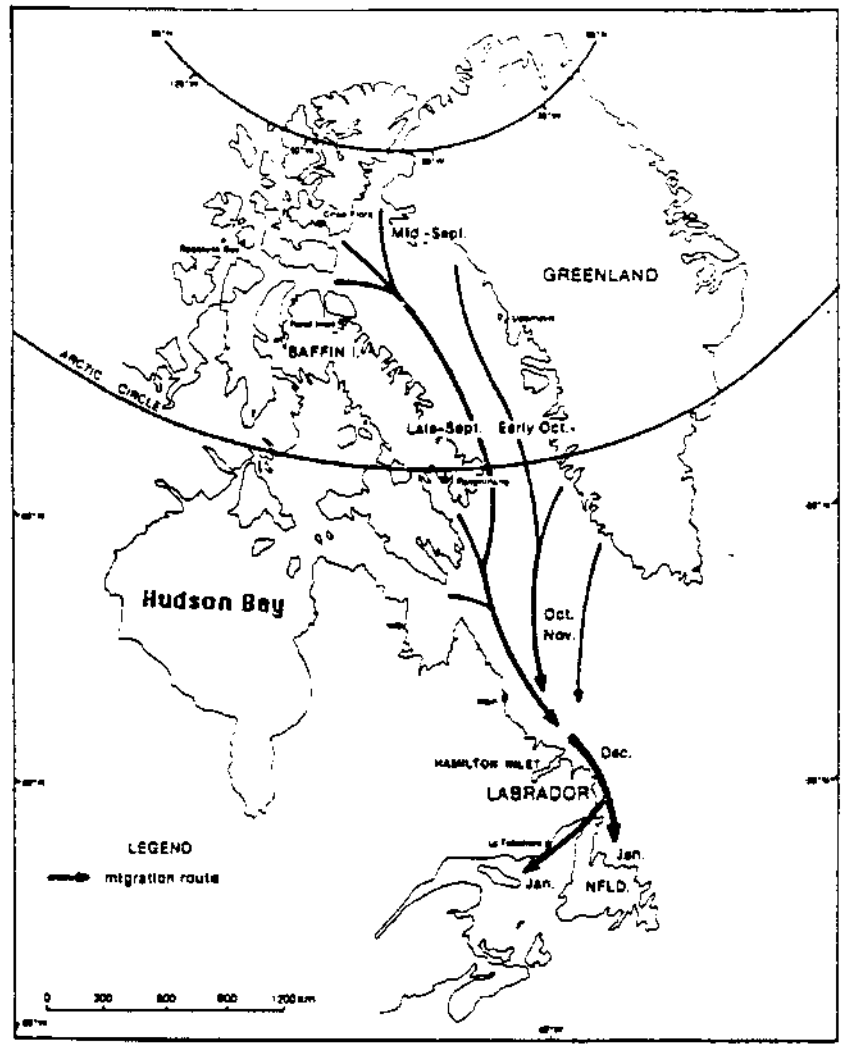

Figure 2. Zero-Harvest Equilibrium in the Harp Seal Model

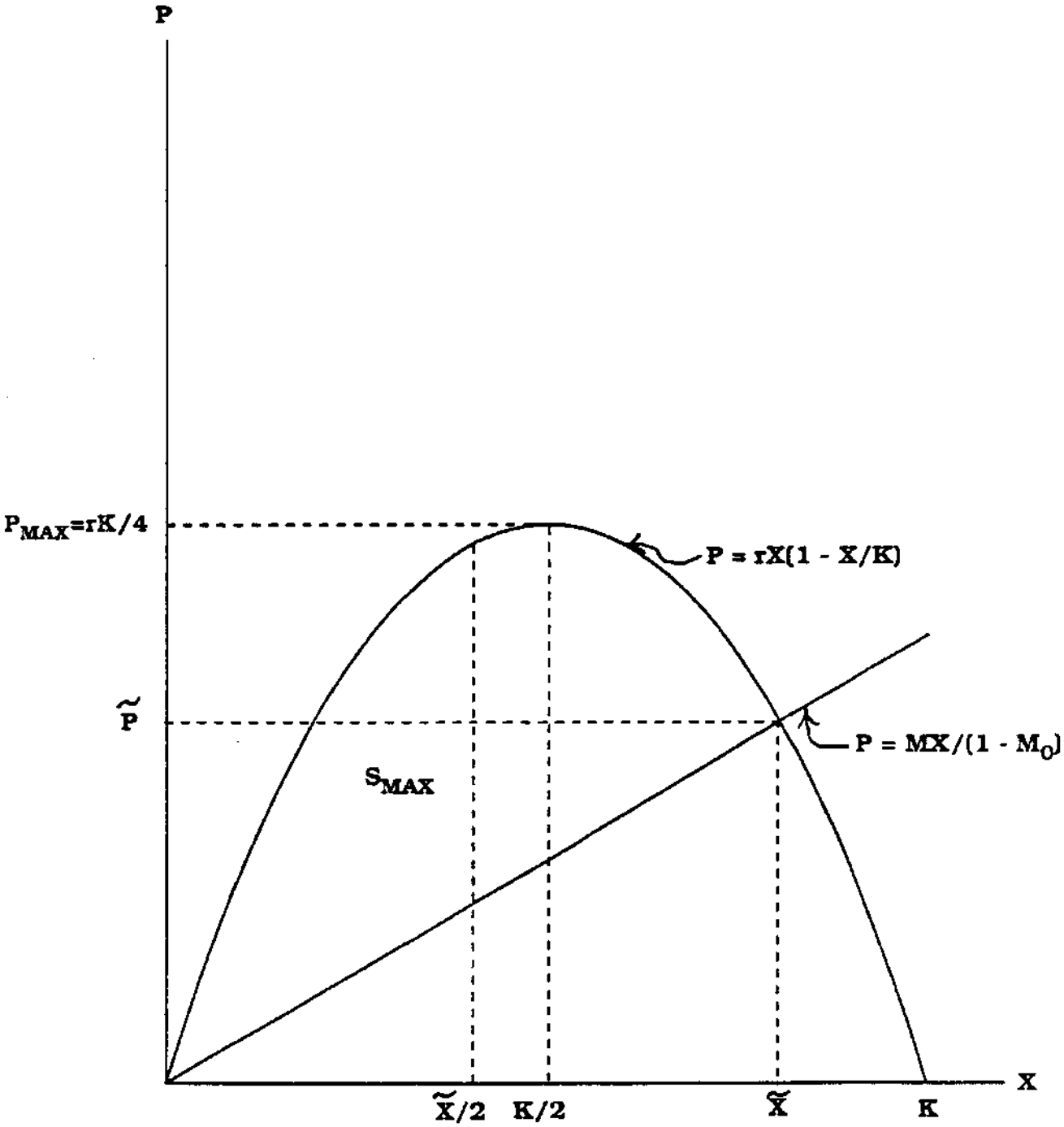

Figure 3. Open Access Dynamics in the Newfoundland Harp Seal Hunt

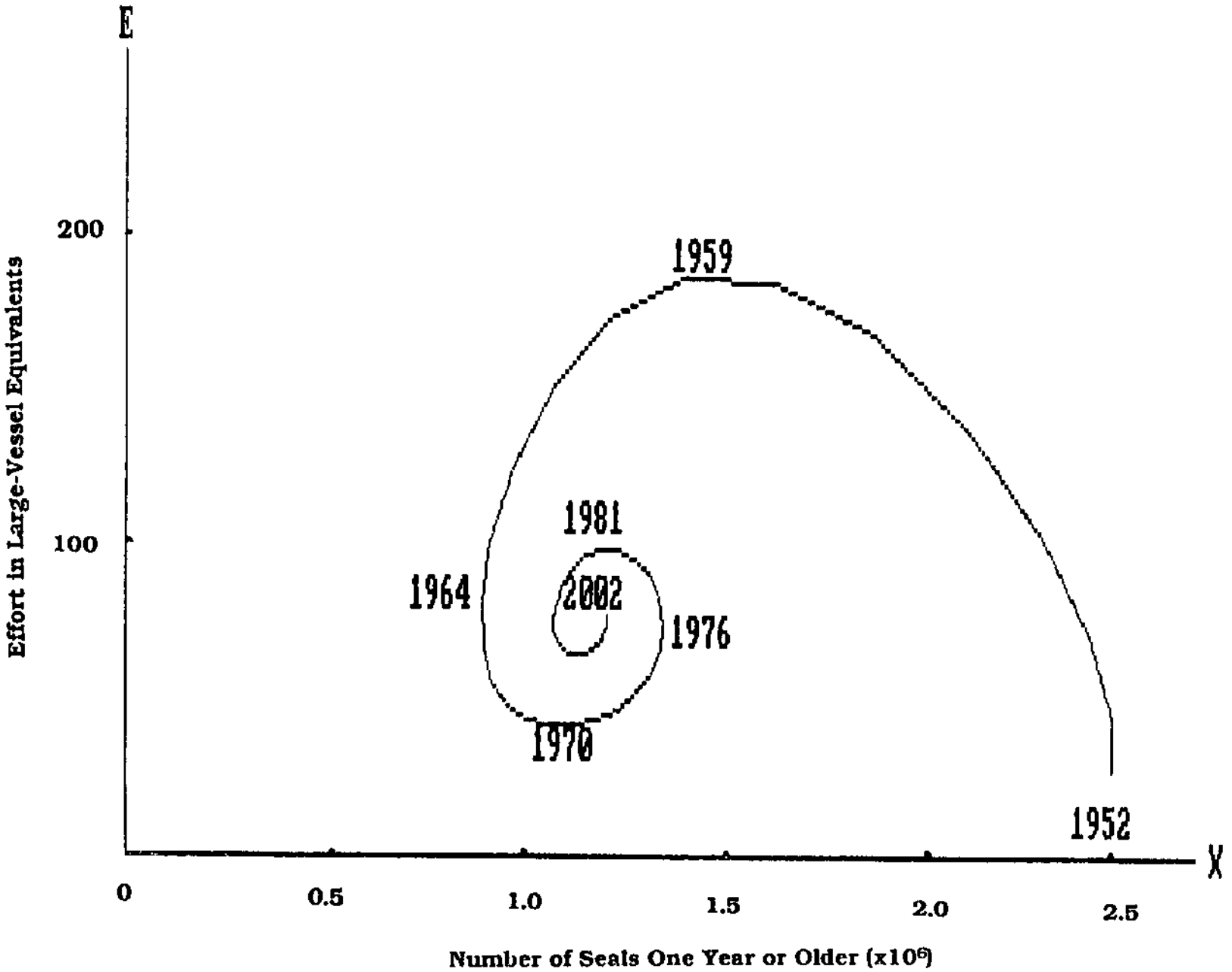

Table 1. Parameters and Initial Conditions in the Base-case Analysis of Open Access in Newfoundland Harp Seal Hunt

Parameter or Initial Condition	Source and/or Method of Calculation
$M_0 = 0.225$	Roff and Bowen (1983)
$M = 0.075$	Roff and Bowen (1983)
$r = 0.4$	Conrad and Bjørndal (1989)
$K = 4.0 \times 10^6$	Conrad and Bjørndal (1989)
$\alpha = 0.008$	Calculation for Norwegian Large-Vessel Fleet
$\beta = 0.0007$	Calculation for Norwegian Large-Vessel Fleet
$C = \$50{,}000$	Dunn (1977)
$\eta = 2.0 \times 10^{-5}$	Preliminary regression result
$P_H = \$17$	Average pelt price for a whitecoat, 1976
$P_Y = \$20$	Average pelt price for a 1+ seal, 1976
$X_{1952} = 2.5 \times 10^6$	Lett *et al.* (1979)
$P_{1952} = 3.75 \times 10^5$	$P_{1952} = rX_{1952}(1 - X_{1952}/K)$; r and K given above
$E_{1952} = 28$	Number of Large-vessel equivalents, 1952

The historical legacy of industrial whaling and current problems in Japan's coastal fishery

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Introduction

The "whaling problem" is often held to follow the classic and inevitable tragedy of the commons model (Hardin 1968) in which an ownerless resource is relentlessly exploited for maximum profit by competitive, individualistic resource users without concern for the sustainability of the resource stock. Thus according to this model, and in many instances also in reality, commercial whalers moved from location to location and whale species to whale species fishing each stock and species close to economic extinction, and, in some cases, beyond that point.

In the 1970's, as more and more whaling enterprises found whaling unprofitable, continued whaling became less and less widely associated with the national interest of major industrial nations. This changing importance of whaling occurred at the time the newly emerging environmental movement adopted the whale as a symbol for their political and fund-raising campaigns. In time such campaigns came to influence the International Whaling Commission (Hoel 1985), which international, intergovernmental body regulated whaling of the large, commercially valuable whale species which were fished mostly outside, but also inside, various nations' territorial waters.

It will be suggested in this paper that environmentalist interest in whales, though providing a popular and effective means of garnering needed support for the environmental movement, has produced a number of unintended negative ecological consequences. The reason for such consequences results both from the uncritical and opportunistic simplification of a complex ecological issue (needing simplification in order to appeal to politicians and the public alike) and a widespread, yet incorrect, understanding by fishery biologists and managers of the nature of common-property management institutions into which category whales and other marine resources are placed for management purposes.

This paper will suggest the obvious, namely, that not all whaling is the same. It will suggest that the particular characteristics of Japanese coastal whaling and its relationship to other coastal fisheries management institutions require more ecologically-sensitive regulation of its practice than is presently being advocated by certain foreign nations.

The common-property resource paradigm

In western resource management orthodoxy, fishery resources are represented as the classic and ever-vulnerable 'common-property' (in fact, common-pool) resource. In this view, the individual fisherman pursuing his economic self-interest exploits the fishery to his maximum ability; profits from this activity will be invested in progressively more efficient and productive equipment to further increase his individual economic advantage. Other fishermen wishing to increase their own economic self-interest follow a similar path, the result of which is the inevitable collapse of the fishery stock due to the rate of exploitation exceeding the regenerative capacity of the now-depleted stock.

The basis of this classic view of fisheries is the notion of marine space being ownerless; being the property of everyone, it becomes a free-good, which everyone can use yet no-one has responsibility to manage. Though this position was first expounded in the writings of Hugo Grotius in Mare Liberum (The Freedom of the Seas, 1609) it prevailed as the accepted view even though only a few years later John Snedden, generalizing from Roman law, pointed to ways in which controls could be imposed on the ocean commons (Ruddle and Akimichi 1984:2).

More recent formal essays further embedded this particular view of the

inherent vulnerability of common property (sic) resources into the natural resource management point of view: economic analysis (Christy and Scott 1954) followed by ecological analogy (Hardin 1968) have certainly influenced the current generation of formally trained wildlife and fishery biologists and managers. However, more recently these orthodoxies face challenge, mostly on the grounds that empirical study indicates that it is not the 'common-property' nature of resources that invariably renders them vulnerable, but rather, it is the open or easy access to such resources that represents the danger to sustained use. Indeed, common property resources may be held, not only under open-access regimes, but also as private property, state property or communal property. Indeed, in some cases, a given resource may be held under more than one of these regimes depending on where it is located at any time and where it is harvested (Berkes 1989:9).

It follows from this confusion of common property resources with open-access to a resource pool that sound management of common pool resources will likely be problematic in practice. This difficulty results from both the flawed theoretical underpinnings of resource management dogma, and also because the users' own views of the problem and the best solutions will likely differ significantly from that held by the management authorities. It is commonly recognized that in practice coastal resources may be subject to different management regimes than can oceanic resources, because coastal users can have "rights" to sedentary resources say, or to specific, fixed, locations for catching migratory resources close to the land. What is less well understood by many resource managers is that in addition to private and public ownership conferring protection on common property resources, communal ownership (by co-operating groups of users) can also be most effective in ensuring

sustainable use of a common resource (Berkes et al. 1989). However, there are conditions under which communal ownership does not work, e.g., where individuals, despite common ownership become individualistic, competitive or otherwise depart from the earlier objective of protecting the resource (Grima and Berkes 1989:44ff). As these human characteristics, viz individualistic, competitive, and pursuing personal rather than collective goals, tend to be familiar societal norms for most western-trained, urban-based resource managers, the existence of alternative management models (based on communal and co-operative behaviour) often are overlooked as viable alternatives to centralized, authoritarian management regimes (Berkes 1989:71ff; also: Berkes et al. 1989; McCay and Acheson 1988; Pinkerton 1989 for mounting evidence of the efficacy of alternative approaches to management).

A brief history of Japanese whaling

There is evidence that whales have, since prehistoric times, been part of the diet and economy of the inhabitants of the Japanese archipelago. However before the development of the highly elaborated net whaling (amitoriho) late in the seventeenth century, most whaling has been regarded as "passive whaling", that is to say, utilizing drift whales, entanglements in fish nets and some low-intensity bow and arrow or spear-based whaling close to shore.

By the end of the sixteenth century, active whaling developed at selected locations in south and western Japan where whales came close to land. At these favorable sites, land stations for processing of whale carcasses were built, and crews rowed out to attack the passing whales with harpoons, a method of whaling call tukitori-ho. This means of whaling continued to be used for hunting various species of dolphins, porpoises and beaked whales but was

replaced as the method for catching large baleen whales when a whaler in Taiji developed net-whaling in 1675.

Net whaling (amitoriho) came to dominate Japanese whaling for the next two centuries and the technique spread to various locations in Japan suitable for spotting and catching large baleen whales.

The rich waters of the North Pacific Ocean and the Sea of Japan harbored sizeable populations of many economically-valuable whale species, including the blue, right, humpback and gray whales which attracted a large number of foreign whaling ships: in the 1850's for example about 300 American whaling vessels operated some seasons around southern Japan (Tønnesson and Johnsen 1982:124). The unfavorable reception foreigners experienced if landing on the Japanese islands in Tokugawa times (whether as shipwrecked mariners or to make repairs or obtain supplies) resulted in Commodore Perry's 1853 expedition to obtain concessions and ultimately to open Japan to outside influences.

The opening of Japan allowed access to American and, soon after, European whale-catching techniques, though it is important to note that Japanese methods of processing (and consuming) whales remained largely uninfluenced by these foreign encounters. One of the most important effects of foreign whaling activities in Japanese coastal waters was probably the severe depletion of these local stocks, for historic records (Table 1) indicate that net-whalers were required to shift attention from the more easily caught slow-moving species to faster-swimming and less-easily caught whales, such as the fin, sei and Brydes. These two facts, namely diminishing catches using the old techniques and the need to catch faster-swiming species doubtless encouraged the adoption of the modern whaling technology being developed (for similar reasons) at that time by European and American whaling industries.

	Right Whale	Humpback Whale	Gray Whale	Blue Whale	Fin Whale	Bryde's Whale
1800-41	346	587	225	4	—	7
1849-65	19	209	101	5	—	35
1875-96	21	126	64	55	23	81

Table 1. Number of whales taken in net-whaling fishery, Kochi, Kyushu. (Omura 1977).

Scale of pre-modern Japanese whaling

One of the most remarkable features of the traditional net-whaling enterprise was its large size. Whereas Euro-American whaling since the earliest time until its recent demise was principally based upon production and sale of whale oil, in Japan obtaining meat for food has always been the major purpose of the hunt, although Japanese whaling is perhaps best characterized as being based upon complete utilization of the whale carcass for the most part as food. Indeed, though the meat, skin, blubber, flukes and most internal organs were and continue to be extensively utilized in the Japanese cuisine, the use of whale oil as an insecticide in rice fields was so important in feudal times that in some fiefs, taxes from whaling were to be paid to the local authorities, at least in part, in whale oil rather than in cash. Notwithstanding this additional important use, the whale including the blubber, has always been valued as a source of nutritionally and symbolically important food in Japan.

The importance of the whale as food is one reason for the large scale of the pre-modern whaling enterprises, for whale meat starts to spoil within hours unless the carcass is quickly butchered, an event requiring a large and skilled work force. However, the whole whaling enterprise was very

labor-intensive, from the series of cliff-top lookouts or scouting boats in some places, to the 300 to 400 men crewing the fast chase-boats (seko-bune) from which the whales were driven into the nets and then harpooned, the net-laying boats (sokaisen and attendant amitsuke-bune) and the boats used to tow the killed whales to shore (mosso-bune).

Once winched ashore at the land station, the whale was rough cut and then fine cut into manageable-sized pieces of meat and blubber, which were carried to sheds for fine cutting, and where the meat, blubber and organs were variously further processed. Meat was prepared for use fresh, or was cooked or salted for transport to non-local markets. Blubber was mostly boiled (to extract the oil) though the cakes of de-oiled residue were then graded, boxed and sold for use as food. Whale internal organs was processed as food and bones were boiled for oil and then crushed for fertilizer, or for a variety of special uses (e.g. whale jaw bone was highly valued for practice weapons used in certain martial arts). Baleen, sinew and sperm whale teeth were prepared for use in many traditional crafts and manufactures.

The landing stations were situated in locations chosen for their relative proximity to whale migration or feeding grounds, often on small offshore islands or near the tips of isolated promontories. The small local fishing villages at such locales were unable to provide all the supplies and labor required for whaling, so the land stations had their own boatbuilders, net makers, smiths and coopers to make the required knives, harpoons, barrels and other equipment required during the whaling season. The large number of buildings at the whaling station also had to be maintained and repaired, and much firewood collected to ensure fuel for the boilers used to extract the oil. At one whaling station in 1802 for example, 61 artisans and an

unspecified number of women rope makers and firewood cutters worked in support of one net-whaling group (Kalland 1986:34).

In support of such large enterprises in the seventeenth century, capital was often borrowed from businesses in the major cities. Skilled workers were often recruited from distant villages, and in order to secure their services and loyalty for the whole season, they were paid a cash advance when recruited. In addition, money was paid to the local village authorities for each whale landed (unjo-gin) and as ground rent for look-out stations and the processing station buildings (tatami-gin), for the area of beach utilized for the whaling operations, and as compensation (Ura-gin) to the local community for the inconvenience or opportunity-costs associated with so much local activity during the several months of each whaling season (Kalland and Moeran, in press).

It is not surprising that pre-modern whaling businesses were considered to be the largest commercial enterprises in Japan until industrialization started to occur late in the nineteenth century.

The start of modern whaling in Japan

Declining whale stocks and the desire to modernize all industries during Meiji times caused the national government to agree to an ambitious proposal from Juro Oka, who came to be regarded as the father of modern Japanese whaling (Tønnessen and Johnsen 1982:135). Oka travelled to Norway, the Azores and Newfoundland to study modern whaling, and ordered modern equipment in Norway, for he considered Norwegian methods superior to those of other countries.

Though the few modern whaling companies that started operations in the

late 1890's employed skilled Norwegian harpooners and made satisfactory profit in their first few years of operation, it was only after the end of the Russo-Japanese was (1906) that modern whaling started expanding in Japan. During this period of rapid expansion large profits were made and regular dividends in excess of 50 percent were paid annually to shareholders of the companies (ibid:139). This notable success attracted more capital and more companies and catcher boats, so that in a few years the inevitable downward trend started, in product price (as the market became saturated), in number of companies (as less efficient operators failed) and in numbers of whales caught in the favored whaling grounds.

In 1908, Juro Oka again took an important initiative by calling together the whaling companies from which meetings the Japanese Whaling and Fishing Association was created. The Association adopted very strict rules governing all aspects of the Japanese whaling industry operating in home waters, and these were augmented by equally restrictive regulations promulgated by the national government in the following year. The goal of all this regulatory action was to rationalize the industry and conserve the nearby stocks of whales upon which coastal whaling's continued prosperity depended. As a result, the Japanese whaling industry, whilst operating in home water, has from that date been the most strictly controlled of all nations coastal whaling operations, according to the principal historians of modern whaling (Tønnessen and Johnsen 1982:141). These strict controls and reporting requirements have also resulted in a body of documentary material considered richer than that of any whaling industry elsewhere in the world (ibid:144). However, the strict regulations did not ensure the local sustainability of the fishery everywhere; therefore continued operations were maintained by

establishing new whaling grounds, though conservation of local stocks could not, in practice, be assured by national regulation given the continued whaling of these stocks by other countries.

The Japanese whaling culture

In recent anthropological studies a Japanese whaling culture has been identified and described in detail (Takahashi et al. 1989; Kalland and Moeran, in press). This distinctive culture complex results from the fact that Japanese whaling is, on the one hand in important and definable ways distinct from whaling as practiced in other national and cultural settings, and on the other hand, all forms of Japanese whaling have sufficient historical, operational and cultural characteristics in common to allow an integrated cultural complex to be unambiguously defined in social-anthropological terms.

The pre-modern harpoon and net-whaling adaptations together with the three forms of modern whaling together constitute the Japanese whaling culture. The three modern forms are known as small-type coastal whaling (STCW), large-type coastal whaling (LTCW) and pelagic whaling. Both STCW and LTCW operate from shore stations where processing of the carcass takes place[1], whereas in pelagic whaling processing of the carcass is carried out on board floating factory ships. The catcher boats in STCW are small (15-50 tons gross weight) and have a limited operational range ordinarily requiring the boat to return to port each night and catching whales within 60 miles of shore (average distance ca. 20 miles offshore). The catcher boats used in LTCW

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[1] Initial flensing of minke whales takes place at sea during STCW in Hokkaido coastal waters.

and pelagic whaling are larger ocean-going vessels (generally 300-600 tons) that may operate for weeks at sea and in LTCW catch whales up to 250 miles from land (on average 100 miles offshore).

Despite the technological, social, and cultural differences resulting from the contrasting scale of operation in the different forms of modern Japanese whale catching, the processing of the carcass for food is remarkably similar, due to the continuation of traditional methods of using whale meat in the Japanese cuisine. It is the high level of skill and specialization required of flensers (and also harpooners) that allows their occupational movement between STCW, LTCW and pelagic whaling, thus serving to integrate the different forms of Japanese whaling into a single whaling culture. Mobility of whalers, from whaling community to whaling community, has long been practised in Japan, as in pre-modern whaling skilled personnel were frequently recruited from established whaling communities when efforts were being made to open new whaling operations elsewhere (Kalland 1989; Takahashi et al. 1989).

The Japanese whaling culture exhibits important characteristics setting it apart from whaling in other countries. For example, the very varied and complete use of different parts of the whale in the Japanese diet, the highly ritualized gift exchanges in whaling communities involving whale meat, and a series of religious rituals and beliefs related to whaling are among the features distinguishing Japanese whaling from other non-aboriginal whaling cultures (Akimichi et al. 1988; Takahashi et al. 1989). Though in varying degrees these characteristics are shared by each of the three forms of modern whaling in Japan, their importance at the community level varies depending on whether STCW, LTCW or pelagic whaling is being considered. The main reason for this variability is because in STCW for example, the whalers work from their

home communities, so the focus of their ceremonial and gifting interactions or religious practices play an especially significant local role; LTCW workers however, are often recruited from outside of the landing-station community, and the larger and more impersonal scale of the operation (with absent corporate owners) does not allow the local-centered focus of ceremonial and ritual activity to become as strongly developed or as socially significant. This local connection is of course even less well developed in the case of pelagic whaling, where whalers are recruited nationally and where ties to a single whaling community therefore do not exist.

In the case of STCW the local dietary use of whale is heavily based upon consumption of fresh whale meat during those months when the whale fishery operates. As there is a limited distance meat can be distributed fresh, and the whales taken are relatively small and generally landed in small numbers at any one time, most of the meat is consumed within a limited distance from the landing port[2]. In LTCW on the other hand, catcher boats may bring ashore several whales at one time and each whale may weigh ten to thirty times the weight of a STCW-landed whale. Thus the meat is mostly processed by freezing, salting or canning for shipment to distant markets as the local market cannot absorb these huge quantities of edible product. The commercial distribution of STCW has thus been characterized as intra-regional and local-centered from the landing port out to a limited number of consumers relying on the fishery to supply them (in season) with fresh whale meat and other edible parts. The distribution of meat from LTCW and pelagic whaling on the other hand is

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[2] In the last few years, with distortions in the marketing of whale meat caused by restrictive quotas and eventually a moratorium on commercial whaling, some STCW has been shipped to non-local markets.

characterized as being inter-regional, serving a national market with whale products shipped in frozen or processed form to distant distribution and consumption areas where the products are available on a year round basis (Braund et al. 1989:16-17).

The local significance of shore-based whaling

Despite the fact that STCW and LTCW serve consumers to a varying extent resident outside of the landing port itself, both forms of whaling also satisfy important social, economic, cultural and nutritional needs within the small whaling communities from which they operate.

Over the past twenty years STCW has remained fairly constant in size, involving about nine catcher boats operating out of about six or seven landing ports. LTCW on the other hand has decreased in size as whale quotas established internationally have been successively reduced, resulting in the decommissioning of catcher boats (from 15 in 1967 to four in 1987) and the closure of shore stations (from nine to four). Japanese LTCW finally closed down in 1987, and the year following that the volume of STCW production was almost halved due to a zero-catch quota being imposed on the most important whale taken in the STCW fishery (the minke whale). As a result of this recent restriction, fewer STCW catcher boats operated in 1988 and 1989, and for those STCW communities in Hokkaido and Miyagi prefectures where fresh whale meat fulfills important social, ceremonial and dietary functions, a variety of negative impacts have been experienced (Government of Japan 1989).

However, for the purpose of the present paper, only those impacts that have a direct bearing on management of the local (non-whale) fishery economy will be considered; to introduce this analysis it is useful to briefly describe the basis of coastal fishery management in Japan.

Coastal fishery management in Japan

As in the case of whaling, where several centuries isolation (until late in the nineteenth century) facilitated the development of a very distinctive whaling culture, so this same isolation allowed elaboration of distinct fishery practices having long historical development and legitimation.

Japan may be unique among modern industrial countries in allowing such a high degree of local control over coastal zone management as it does. In most modern nations, as efficient means of communications and national wealth grew, so did increasing state control over the nation's natural resources including, inter alia, fishery stocks within territorial waters. Indeed, in the case of coastal resources, exerting such state control is generally seen as necessary in order to effectively demonstrate sovereignty over natural resources that other nations might wish to exploit.

In feudal Japan (as in most other nations during feudal times) control over coastal resources was vested in local (village-level) not national institutions. Doubtless these management arrangements had evolved over centuries, but when Japan modernized and established strong national and prefectural governments, rather than transfer management responsibility to non-local authorities, the central government merely enshrined into national law the pre-existing traditional coastal fishery management regimes. These 1901 fishery laws based on local practice were reconfirmed with some modification in 1949 during the post-WWII constitutional revisions that took place in Japan.

The details of Japanese coastal fishery management are not the purpose of this paper, and are described in other reports (e.g. Asada et al 1983; Kalland, 1984; Ruddle 1985, 1987). In essence, coastal fisheries management in

Japan is based on the communal ownership of marine resources in a defined sea territory associated with a particular land-based community, with legally-guaranteed equitable access by members of that community to particular resources occurring in that marine territory. The communal ownership of resources is vested in a formal village institution, the Fishery Co-operative Association (FCA) to which all fishermen belong as either members (with voting rights) or associate (non-voting) members. In cases where neighboring villages have overlapping fishing interests, each village's FCA co-operates with the other to exercize joint rights and joint management responsibilities.

Professional fishermen must belong to an FCA and membership requires compliance with decisions collectively taken. The FCA links the local fishermen with higher levels of fishery administration in the prefectural and national governments. The importance of the FCA is particularly apparent in the smaller fishing communities, where the FCA serves as a financial institution, e.g. making low-interest, often unsecured, loans to fishermen for equipment repairs or replacement, or loans for required ceremonial events on important social or religious occasions. The FCA maintains a range of fishery-related support services for local fishermen; e.g. it generally operates the fish market where fishermen sell their catch to authorized buyers, and it may locally provide such necessary supplies as fuel, ice, boxes, and items of fishing gear not otherwise locally available. The FCA often maintains a building providing meeting and recreational facilities and it provides bookkeeping and office services useful to fishermen who may have limited education and incomes yet are required to maintain records for management purposes on an ongoing basis. The FCA employs full-time officials who represent the local fishermen's interest in periodic meetings held with

prefectural and state fishery management officials, thereby professionally safeguarding the economic interests of the local fishermen.

The solidarity of the FCA is maintained by its local membership: not all local residents can become members and newcomers may be required to wait a full generation (i.e. 30 years) before becoming eligible to apply for membership; membership eligibility is usually assured by birth, appropriate years of on-the-job training, residence and full-time occupational involvement in fishing. Such restricted membership ensures that members share common concerns affecting the fishery and the community in which they and their families live; members share a common cultural and historical background and they have a long-term concern about the fate of the fishery as neither they nor their children can easily move their business to another location if forced from their present community by any selfish act that might jeopardize local balance and wellbeing.

In view of the functions and characteristics of the FCA, it is hardly surprizing that it has been described as the social and economic hub of the contemporary Japanese fishing community (Ruddle 1989:171). What is its relationship to the coastal whale fishery? Specifically, how has the recent decline of this whale fishery affected the FCA and through it, the status of the Japanese coastal fishery in whaling districts?

The whale fishery and the FCA

Where the STCW boat-operators sell their products in local markets, they may be members of the local FCA. The FCA finances its operation by charging a commission on sales made at the local market, as well as charging for various services supplied to local producers (e.g. ice or storage

facilities). In fact in some STCW communities a significant proportion of the annual revenues and hence operating capital of the FCA derives from whaling operations. Table 2 provides data from the Wada FCA in Chiba prefecture. Wada is a small fishing community (population ca. 2200) with a two-boat summer STCW fishery harvesting ca. 30-35 beaked whales each year, and until 1987, also a two-boat LTCW fishery landing sperm whale from October through March each year

FCA Revenue Sources	1984	1985	1986	1988
Non-whaling	¥3.62	¥3.70	¥4.41	n/a
Whaling	¥8.77	¥19.41	¥15.53	¥2.20
Total	¥12.39	¥22.11	¥19.94	n/a
Whaling revenue as a proportion of total	70.8%	84.0%	77.9%	15.1%*

Table 2. Wada FCA income 1984-86 expressed in million yen (¥).

* Whaling revenue in 1988 expressed as a proportion of the average of the preceding three years whaling revenues.
Source: Wada machi gyogyo kumiai (Wada Town FCA).

at the STCW flensing station. With an end to LTCW operations, in December 1987, the FCA lost about 85 percent of its annual revenue, going deeply into debt, reducing the number of office staff, and selling some of its principal assets (most significantly the land it owns) to avoid insolvency. A similar situation has been reported at Ayukawa, another of the whaling communities (population ca. 4400). In Ayukawa about two-thirds of the FCA revenue earned from commission on sales in the 1984-87 period was derived from whale products, and only one-third of revenues from all other fishery-product sales. In addition to commissions charged on sales, other FCA operations in Ayukawa have

derived a considerable proportion of their revenues from whaling-related activities: ice sales to whalers accounted for 53.5 percent of all ice sales in 1984-77, and 43.4 percent of cold-storage charges in 1986-87 were whale-product derived (Bestor 1989:25). In fact about 30 percent of overall FCA revenues were derived from whaling-related activities in 1986-87 (ibid:26) all based on STCW minke-whale operations that since the end of the 1987 season operate with a zero-quota and hence zero revenue to the FCA.

Commissions earned by FCA	1984	1985	1986	1987	Average 1984-87
whale produce sales	¥10.47	¥8.78	¥12.52	¥21.71	¥13.37
non-whale fishery product sales	¥7.32	¥9.16	¥10.56	¥5.85	¥8.22
total sales	¥17.79	¥17.94	¥23.07	¥25.56	¥21.59
whale commission as proportion of total commission	58.9%	48.9%	54.2%	78.8%	61.9%

Table 3. Commissions earned by Oshika Town FCA as sale of fresh whale and fish products, 1984-87, in million yen (¥). (After Bestor 1989: Table 6).

Some current contradictions and problems

It is ironic that the whaling moratorium which was promoted as a conservation measure by a fishery-regulatory body (the International Whaling Commission [IWC]), should have had such a profoundly negative impact on the continued operational viability of such effective coastal zone management institutions as the local Fishery Co-operative Associations in coastal whaling areas in Japan.

Though the local FCA does not play a management role in the coastal

whale fishery, it was nevertheless a major beneficiary of this fishery. At the local level, the fishermen and whalers co-operate and derive benefit from each others productive activities: fishermen alert whalers to the presence of whales, and in return receive gifts of whale meat. Fishermen believe that whales, being plentiful in their fishing grounds, would decrease fish catches if the number of whales was not controlled through whaling, and as the stomachs of minke whale generally contain such economically valued food fish as, for example, mackerel, herring, sardine and pollock, fishermen's concerns do not appear to be unreasonable. As discussed earlier, the FCA is a major institution in the economic life of the Japanese fishing community, and in some of the whaling communities the FCA derives a significant part of its annual operating budget from whaling-derived sales and commissions.

A second irony in the present dilemma is that the whaling moratorium was introduced by a number of non-whaling nations based upon their view of what constituted an appropriate whale conservation measure. However, what has been introduced is a blanket moratorium on a class of whaling (namely commercial whaling) without any regard for the population status of the whale stock. Thus although continued non-commercial whaling of a stock classed by IWC as a Protection Stock (and from which for conservation purposes no whales should be taken) is allowed, the controlled whaling of minke whales from a stock whose classification allows harvesting is nevertheless prevented due to the whaling being deemed for commercial purposes.

A third irony concerns the extension of the moratorium to inshore, small scale whale fisheries, which in a historical sense have been well-managed in Japan relative to the offshore, industrial-scale, whale fisheries. The depleted large baleen whale stocks which prompted the whaling moratorium,

resulted from the failure of an international regulatory body, namely the IWC, which resisted making needed changes to inappropriate rules allowing an unsustainable fishery to operate for too many years, with predictable results (e.g. see Tønnessen and Johnsen 1982:560ff). Indeed, as one commentator has observed in respect to recent behavior at the IWC meetings:

> "Each one of the original participating nations of the Commission had an almost unblemished record of voting based on self-interest and realization of short-term economic gain, until such time as they divested themselves of all or most of their whaling interests. Since such time some of those with the worst records in the early years... have found it expedient (and inexpensive) to support politically popular conservation measures...." (Gaskin 1982:363-364).

There is also a supreme historical irony in the situation the Japanese now find themselves in, with respect to whaling in their own coastal waters. In the nineteenth century, foreign whaling fleets, and especially those from the U.S., discovered the Japanese whaling grounds. The large number of foreign vessels undoubtably had an impact on the whale stocks, and as we earlier observed, negatively impacted the traditional Japanese inshore net-whaling fishery. American commercial interest in Japan's seaspace influenced Japan to the point of adopting Euro-American technology, including whaling technology, with which Japan eventually became a major whaling nation. Immediately after WWII the U.S. occupation administration encouraged a resumption of Japanese whaling in order to counter the serious food shortages threatening the population. The highly nutritious whale meat formed the basis of a national school-lunch program, ensuring most Japanese developed a high acceptance of whale meat, even in the non-whaling districts where previously whale meat was not readily available.

European industrial whaling was wasteful and hence increasingly economically non-viable; the principal commodity produced was oil, and much of

the meat was discarded or turned into low cost farm-animal food supplements or pet-food. In contrast to this, the Japanese whaled for human food, so processed the meat, blubber, flukes, internal organs and cartilage of the baleen whales for quality-conscious human consumers willing to pay premium prices for certain products. As the whale stocks were progressively depleted, and as alternative sources of edible oils became available thus lessening demand for whale oil, most of the main whaling nations found whaling less and less profitable each year. As a consequence, in the late 1960's and into the 1970's, Britain, the Netherlands, South Africa, Germany, Australia, New Zealand, Canada and the United States (formerly some of the major whaling nations) ceased whaling operations. However, none of these countries had a food culture that placed high value on whale meat, unlike Japan, and to a lesser extent Iceland and Norway.

The supreme irony is of an environmental nature: the opposition to whaling is now based less on whale conservation arguments (because some whale stocks are robust and could be sustainably harvested, see e.g. Aron 1988) and more on a new-found ideology based on a generalized concern for nature and for an increased concern of urban populations in particular for animal welfare issues. However, because of the important symbolic value of whales as an object of humankind's historic environmental excesses, it is now being promoted as unacceptable to kill the animal that has for many become the rallying point to so much of the environmentalists' consciousness-raising campaigns.

Yet people must eat: the alternative to sustainable utilization of a wild renewable resource as food is, presumably, to raise animals as food, whether on land or at sea. In an environmental sense both forms of 'farming' are non-ideal options: modern agriculture is not sustainable; it destroys soil

and natural habitat required to maintain biodiversity, it requires huge non-renewable fossil fuel subsidies, and it poisons ground water upon which human health depends. Some of these undesireable attributes (e.g. pollution and loss of natural habitat) also apply to aquaculture, whereas in contrast, sustainable utilization of wild animal populations incur almost none of the environmental dysbenefits associated with culturing domestic animals stocks.

Conflict and rivalry in management and science

The international regulation of whaling does not provide a good example of appropriate ocean resource management since it was first attempted in the twentieth century. Though part of the reason for this failure can be attributed to the great difficulty of obtaining good biological data needed to inform sound management, this only provides a small part of the reason management failed to sustain the whaling industry. The post-WWII history of the regulation of whaling clearly shows that until the 1970's, opinions preferred by scientists advising the IWC have, whenever unsavory in an economic sense, been modified or totally disregarded. It was therefore only after the nations having major economic interests in whaling abandoned their own industrial whaling that IWC could transform itself from a whaling trade-association to a management body with serious whale conservation objectives.

This transformation occurred at the same time as the growth of a vigorous environmental concern, especially in the western industrialized nations (but globally also following the 1972 UN Conference on the Human Environment held in Stockholm). This concern focussed upon industrial threats to the environment coupled with peoples' growing awareness of the finiteness of

many resources hitherto plundered without thought for future generations' needs. The governments of the western industrial nations, in the eyes of the environmental movement to blame for allowing this global destruction found in the whale issue a matter they could now wholeheartedly support (Freeman, in press). Indeed, it was especially fortunate that the main holdouts for continued large-scale industrial whaling were Japan and the Soviet Union, both to a large extent, convenient outsiders of the Euro-American anti-whaling bloc.

The notion of ocean resource rivalries and industrial competition which underlies our present discussions is particularly appropriate when considering Japanese whaling. The international competition for whales in Japanese waters in the nineteenth century led directly to Japan's modernization and subsequent expansion. But despite these transformations having occurred, Japan nevertheless remains a nation deeply rooted in and continuing to embrace its non-western traditions as they pertain to, e.g., its business culture, its emphasis on home-place (furo-sato) and its spiritual orientation.

The IWC has adopted a classification of whaling, as either subsistence whaling practised by aboriginal people alone, or whaling practised by all other for purely commercial purposes. Unfortunately this classification poorly serves those non-aboriginal whalers whose economic transactions involve social, cultural and religious dimensions quite alien to the economies of western nations. Indeed, such economic exchanges (whether using cash or not) practised in the local-centered coastal whaling communities of Japan exhibit characteristics more typical of non-industrial societies the world over (Akimichi et al. 1988).

The rivalries that this paper speaks to are not purely economic rivalries: Japan's whaling meat production was directed to its home markets

(though oil was sold in Europe) whereas non-Japanese whaling enterprises for the most part were unable to sell into the Japanese market because of their quite different commercial objectives and the lack of the requisite skill in producing a sufficiently high quality food product for Japanese consumers.

Although rivalries existed in the immediate post-WWII years when Japanese efforts to expand into the Antarctic fishery were opposed by the then great whaling nations (Tønnesson and Johnsen 1982:529-532), for the purpose of this paper I only wish to address the current rivalries in respect to Japanese whaling and most of these same earlier whaling rivals. This present rivalry is in respect to an ideological, rather than commercial conflict, over whales, and more especially, how to manage whale resources and for what purpose.

This rivalry takes place in the same form a the old commercial rivalries, namely in the meetings of the IWC. In very simplified terms the ideological conflict involves two sets of fundamentally contrastive positions (Table 4).

Position A: (Non-Japanese)	Position B: (Japanese and others)
Favoring a goal of purely non-consumptive use of whales	Favoring goals involving consumptive and non-consumptive use of whales
Management based on single species approach	Management based upon ecosystem approach
Research based upon non-lethal research only	Research based upon non-lethal and lethal research methods
Management based upon refined modelling exercises without verification of predicted outside in the field	Management based on modelling with verification and improvement of models following observation of real outcomes
Management goal is maximum rate of recovery of depleted stocks to some presumed pristine level (or to carrying capacity)	Management goal is recovery of stocks to some level where a viable fishery can be sustained

Position A represents the view of those countries who actively supported the imposition of a moratorium on commercial whaling in 1982 and since that date have opposed all whale research involving catching whales for post-mortem examination. These are the countries that regard scientific whaling (by countries supporting Position B) as being a guise for continued commercial whaling (however, see Beverton and Anderson 1987; Gulland 1988; Swithinbanks 1987).

Position B is advanced by several countries interested in continued whaling and who advocate that comprehensive research on whale stock dynamics within the context of an ever-changing marine environment must inform subsequent management decisions.

Thus in conclusion, it might be noted that commercial rivalries for whale resources of the past several centuries have, in the past decade, been transformed to ideological rivalries in respect to marine conservation issues. These opposed ideologies exist in respect to the appropriate manner of managing marine renewable resource stocks. The outcome of this rivalry likely depends less on the resolution of conflicting notions of the appropriateness of the conflicting scientific approaches to estimating the biological status of the stocks, and more on a political decision as to whether ecological or whale-centered concerns will assume predominance in intergovernmental negotiations relating to environmental and cognate discussions among nations.

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PART III:

ENVIRONMENTAL POLICIES AND OCEAN REGIMES

Territory, Resources, and Environment

- Designing of International Institutions for Antarctica -

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1. Introduction

The southern most continent of the earth, which was given the name the Antarctic, i.e., "*Ant-arktikos,*" meaning "opposite the Bear (the northern constellation which contains Polaris)" has intrigued the human imagination since the days of Aristatle. Indeed, various attempts were made especially in and after the Age of Great Discovery of the sixteenth century, helped notably by the development of navigation and shipbuilding technologies, to find new lands and oceans and straits, to test the hypothses, and to prove the theories. It is interesting to notice that the names of the ships used for these early expeditions were somewhat paralleled with those of spaceships in today's Space Shuttle Program exploring the frontier of the age. Examples. Two ships, *Adventure* and *Resolution* carried the famous British navigator James Cook's party when they circumnavigated the Antarctic continent for the fist time ever in 1770s. It was the HMS *Challenger* which became the first steam ship to cross the Antarctic Circle in 1894. And the ship called *Discovery* brought the team of Robert Scott twice to the continent for their attempt to reach the South Pole in the beginning of this century.

This land, which was merely a concept known as *"Terra Australis Incognita"* in ancient past, has now, in the twentieth century, became the "Laboratory Antarctica" where the extensive interdisciplinary research has been conducted to learn more about the Earth's geosphere-biosphere system. [1] The natural environment of the polar region is extremely inhospitable. In fact, laboriously accumulated scientific data proved that the Antarctic is the coldest, windiest, driest place on this planet. It is a remote, isolated continent, but this very remoteness and isolation helped preserve an ideal setting for scientific study of global importance. It was undoubtedly true that the 1957-58 International Geophysical Year stimulated the formerly Arctic-oriented polar research programs to extend to the Antarctic.

Another twentieth century development in Antarctica was the formal expansion of international politics even to this remote continent. And it began with a series of unilateral announcement of the governments decision to claim a territorial sovereignty over the sectors of the continent and Southern Ocean with the sub-Antarctic islands. The United Kingdom was the first to made the claim by the letters of patent in 1908 and six other countries, Argentina (1943), Australia (1933), Chile (1940), France (1924), New Zealand (1923), Norway (1939), followed. The bases for these claims includes discovery, occupation, geological affinity, proximity, symbolic acts. They are unilateral

government actions in a sense that all of the claims are not necessarily mutually recognized, and, furthermore, other countries, including the United States and the Soviet Union, do not recognize them in the first place. Therefore, the next came the stage to consider some kind of international management of this part of the world.

In this paper, we will focus on the post-World War II development of international relations with regard to the management of the Antarctic affairs from the viewpoint of international institutions design. The study primarily intends to give an explanation for the underlying ideas or imperatives of the state actors involved in this process which will help us understand the development of the Antarctic politics and the changing (and/or unchanging) nature of actors' interests involved in it over time.

For this purpose, this paper takes up, *inter alia*, the three major initiatives to internationally institutionalize the Antarctic affairs to compare and contrast. They were all presented formally for inter-governmental considerations, but it was only one of them which resulted in an established treaty system, i.e., the Antarctic Treaty of 1959 and its system comprised with the subsequent agreements. The other two initiatives, one, led by the United States, was an abortive plan to internationalize Antarctica in 1948, and the other, initiated by the developing countries to re-formulate the current Antarctic regime at the United Nations, is on-going since 1983. Besides characterizing the recent debate between the Antarctic Treaty parties and the non-Treaty parties at the UN, we will also touch upon the current discussion among the key Treaty members over the future status of the Antarctic. Given the generally recognized scientific value of Antarctica, the study will highlight how the actors' involved have attempted to manage the other three fundamental values of the region, i.e., territory, resources, and environment, in each of the above-mentioned initiative.

2. Designing Institutions for Antarctica

(1) Institutions in International Relations

If we define "institutions" as "persistent and connected sets of rules (formal and informal) that prescribe behavioral roles, and shape expectations," as Keohane does, we will be able to assume the emergence of some kind of institutions among actors that are interested in coordinating their interests, settling the real or potential disputes, and reducing the level of uncertainty and unpredictability even in the society of sovereign states which has frequently been characterized as anarchic. State actors do create new institutions of multilateral fashion and utilize existing ones to generate further institutional arrangements. In fact, we have seen a number of inter-governmental organizations, like the United Nations, which are bureaucratic entities most formally systematized, by their statute and rules of procedure, with the office (secretariat) and the often hierarchically structured voting bodies (committees, councils, and a general assembly).

But not all institutions are formal organizations. Theoretically speaking, we can assume more informal institutions, rules of which are rather implicit than explicit but still induce mutual understandings and promote coordinations among actors. It is also possible to assume some institutions which are formal but do not equipped with physical organizational entities. Therefore, Keohane further assumes that international institutions, as defined above, may take one of following three forms, i.e., (a) "formal intergovernmental or cross-national nongovernmental organizations" as those mentioned above, (b) "international regimes," like the post-War Bretton Woods monetary regime, which can be defined as "institution with explicit rules, agreed upon by governments, that pertain to particular sets of issues in international relations," and (c) "conventions," like the principle of reciprocity, which are "informal institutions with implicit understandings, that shapes the expectations of actors."[2]

Another theorist, Young, explains the actors' practices of collectively establishing, and then transforming institutions from sociological viewpoint. His definition of institutions, or "social institutions," being "identifiable practice consisting of recognized roles linked by clusters of rules or conventions governing relations among the occupants of these roles." [3]

These formulations were especially helpful for us to understand one of,

in fact, the pervasive phenomena in international relations, the genesis of cooperation among individual state actors in collective fashion. Conflicts are indeed pervasive, too. But it would be also true that even if states were in conflict in one area, for example, it would not totally preclude the possibility for them to manage cooperations in other areas when certain common ground could be found. The point here is that the distinction between cooperative or conflictual relationship is more attributive to context-specific choice by the actors involved than we would usually think it to be determined by their general underlying differences (ideological, historical, traditional, etc.) This would represent how diplomatic overtures begin to seek some form of institutions which give a certain orderliness and instrumentality to the member states.

One important element to be considered in this process of institutions building through actors' choice is a political transaction called negotiation.[4] All initiatives do not always come true. And for any overture to be materialized, it requires a level of common ground. Thus, the study of international institutions invites us to pursue a question: how the sovereign actors reach and expand their common ground through negotiation.

When analyzing these political processes of negotiation, it has often been cited that the specific power configuration, be it military or non-military, becomes a fundamental independent variable in a given issue-area. One of this line of thoughts may be found in the theory of hegemonic stability which "assumes that a liberal economic system cannot be self-sustaining but must be maintained over the long term through the actions of the dominant economy." [5] But there are also certain *ideas,* as presented in the form of initiatives, involved in any attempt to manage an affair of international nature by means of multilateral institutions. The latter approach is just as important as the former one, and the applicability of power factor and ideas factor may vary in case by case bases. Because just as the ideas of the powerful cannot always succeed in creating a institution without any compromise, even a "good idea" will not always result in an intended institution design. Thus a study is required which analyses both power and ideas factors without prejudice to each other.

For the purpose of closely looking at the origin of international institutions, the present paper uses the concept of "conventionalization" as the initial negotiation process among directly involved actors in which they attempt to converge their individual expectations around identifiable rules

or practice for the purpose of establishing an institution. [6] In other words, it is a process in which leading actors of an initiative persuade others to join by putting forward an institution design.

Also, the general study of how actors have attempted to persuade others and to conventionalize a certain set of ideas into mutually recognizable understandings will help explain the transition from internationally non-institutional stage to more institutionalized stage. Moreover, since the general process of institutionalization is often incremental, even the failed initiatives would create certain convergence of ideas. [7] Therefore, regardless the success or failure of an initiative, it would bring us to hypothesize that the more the actors increase the level of conventionalization, the more are they able to solidify the orderliness and instrumentality of a given international institution.

With this general theoretical framework in mind, we will take up the case of international relations on Antarctica in the next section to see the evolution of international institutional arrangement. There, the three initiatives in the post-War period are discussed.

(2) Designing Institutions for Antarctica

In this section, we will look back the history of international relations surrounding the Antarctic area in the twentieth century from the viewpoint of "international institutions" formation and describe three major initiative: (a) the United States' initiative of 1948 to internationalize Antarctica, (b) another US initiative of 1959 to conclude the Antarctic Treaty, and (c) the initiative of Malaysia and other non-Alined countries to raise the "Question of Antarctica" in the United Nations.

All of above three are formally introduced for some sort of multilateral consideration. And, of course, all of them deal with the question of Antarctica. They are the initiatives which were proposed to establish intergovernmental institutional arrangements among their respective member states. In this sense, putting forward an institution initiative is the act of designing a possible scheme of institutions for their establishment, enhancement, and abolishment. There's no guarantee that every initiative comes true. Actors preferences change over time. And the particular international context will affect the outcome of the given initiative. Ideas cannot be materialized if the time were not right. In other words, the same

ideas can be realized when the time is ripe.

Now, let's look at these three initiatives (potential institution designs) briefly to find out who envisioned what kind of institution when for what reason and how was the outcome.

(a) Initiative of 1948

Once the land of total unknown which had attracted a number of adventurous heros and their voyages and explorations, Antarctica attracted another attention in the early twentieth century. This time, it was political. The United Kingdom, which had the extensive background of the Antarctic expeditions and commercial sealing as well as whaling, took the lead in 1908 in claiming the territorial sovereignty over the Antarctic Peninsula and the sub-Antarctic islands. It was the beginning of a type of international competition triggered by one of the most explicit manifestations of national sovereignty, the territory. There was no intergovernmental institution existed for the management of this continent at the time. Thus, all the Antarctic politics in this stage was practiced primarily in unilateral fashion. Or, it might be said that the sheer absence of an institutional scheme had contributed in encouraging the interested countries to take these unilateral actions. And the resulting picture was the emergence of not-all-mutually-recognized-claims by seven governments (Argentina, Australia, Chile, France, New Zealand, Norway, and the United Kingdom) which was further complicated by the fact that other states which had traditionally been engaged in the Antarctic activities, most notably the United States and the Soviet Union, whose policy being never to recognize such claims.

In June 1948, the United States government, one of the "non-claimants," internally prepared a policy paper (PPS 31 dated June 9) recommending that the government "support the establishment of an international status for Antarctica; that upon agreement by the other interested governments to negotiate and international settlement, the United States in order to make its status uniform with that of other nations concerned, announce a claim." [8] The paper was approved and identical *aide-memoires*, dated August 9, were handed to the missions in Washington, D.C. of the seven claimant countries, suggesting that "a solution of the Antarctic territorial problem be discussed on the basis of internationalization (condominium)."[9] Also transmitted, which was done orally, was the United States' intention to announce an Antarctic claim "in the near future." [10]

In retrospect, this American initiative did reflect some of the prevailing ideas of the time. First and foremost, reflecting the cold war sentiment after World War II, the proposal was designed to explicitly excluded the any form of Soviet participation in this scheme.[11] In fact, this point was clearly expressed in the comment made by the Joint Chiefs of Staff in approving the above policy paper, which stated "that control of the Antarctic area should be maintained in the hands of friendly powers and that possible enemies of the United States should be excluded from possession of any part of the area and from participation in any international administration."[12] While it was not considered to be the main potential value of Antarctica (the U.S. believed the *potential* worth of the continent being scientific), some level of military and strategic thinkings were at work. For example, an idea to demilitalize the region, which later conceived of as one of the major objectives of the Antarctic politics, was raised in the internal discussion of the proposal but dropped later on anticipating the military use of the continent.[14]

Reacting to this proposed initiative, only the United Kingdom accepted it as a basis of discussion. New Zealand was rather favorable to the proposal but indicated that they prefer the involvement of the United Nations. Both of the adamant claimants, Argentina and Chile, rejected the proposal even as a basis for discussion on grounds of national sovereignty. Although all of them acknowledge the importance of scientific cooperation, the other countries, Australia, France, and Norway, were, in a sense, skeptical about the necessity of internationalization with this institutional design. And the one outside party to this game, the USSR, publicly protested against this U.S. initiative and asserted the Soviet right to participate in this type of discussions, warning the USSR would not recognize as valid any solution of the territorial problem in which it did not take part.[15]

Having reviewed the U.S. intention to build an institutional arrangement for Antarctica in 1948, we can *generally* say that the initiative ended in failure, and the very idea of condominium disappeared totally as the United States became engaged in the major foreign policy challenge in the early 1950s, the Korean War. However, it would be worthy of note that the very failure of this proposal contributed for the United States to realize the rigidity of existing territorial claims in Antarctica while recognizing the benefit of avoiding numerous disputes and rivalries that had been characteristic in the region as well as promoting scientific cooperation. Thus, an alternative line of thought, which based on the Chilean

counterproposal, came to gain more currency among the U.S. administration. What the Chilean government suggested was the consideration of a *modus vivendi* which would contains a freeze of the status quo as to claims for a period of 5-10 years and an agreement for scientific cooperation. As we will see, this idea of "freezing" the existent territorial claims becomes instrumental in the next major initiative for the international management of Antarctica, namely the conclusion of the Antarctic Treaty of 1959.

(b) The initiative of 1959

The scientific community has long recognized the importance of the polar regions for the study of weather and climate as well as Earth's magnetism, and especially international cooperation conducted during the past two International Polar Years of 1882-83 and 1932-33 proved to be a wide success. It was base on this recognition that the International Council of Scientific Unions (ICSU) decided to launch another polar year in the late 1950s, 25 years before the original schedule of organizing it in 1982-83. This time, the scope was not just the Arctic but expanded to include the entire globe, in which Antarctica was one of the focused areas. The year was called the International Geophysical Year (IGY) which took place from June 1957 to December 1958. For the Antarctic portion of the joint research activities, 12 states established 50 stations. Cooperative spirit was high, and it was from this spirit that the growing demand for more permanent institutional framework was perceived for the continuation of the same quality of freedom in scientific research and cooperation even after the project ended.

Once again, the United States took an international initiative, and in May 1958, President Eisenhower invited the eleven other participating states in the IGY projects, namely, Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, the Soviet Union, and the United Kingdom, to the conference in Washington, D.C. to conclude a treaty which would manage the general activities in Antarctica. The question of territorial rivalries was the first one to be taken care of. In fact, the issue had foreshadowed during the IGY project as well, so that in order to avoid the trouble arising from this lingering question, the participating parties to the IGY had arranged "the gentlemen's agreement" stating that any scientific activities would not affect the status quo of the territoriality of the Antarctic. [16] And the same idea of maintaining the legal status quo, a "freeze" of territorial sovereignty, was included in the President's invitation letter as one of the three basic points of agreement that had been reached in the preceding informal

discussion, from the very beginning, hoping that it would serve as an catalysis for further agreements. [17]

The resulting treaty, which was signed on December 1, 1959, after nearly two months of high level deliberation, stipulated, above all, the exclusively peaceful use of Antarctica for "the interest of all mankind," prohibiting any measures of its militalization and nuclearization (preamble, Article 1 and 5), and the continuation of the freedom of scientific investigation in Antarctica and cooperation toward this end as applied during the IGY (Article 2).[18] Moreover, these provisions were reinforced by other innovative ideas such as the right of on-site inspection of all areas of Antarctica including stations and other installations (Article 7) and the sharing of scientific data, programs and personnel "to the greatest extent feasible and practicable" (Article 3). The question of territorial sovereignty was explicitly stated in Article 4, based on the original premise of its "freeze," to reach a compromise. And finally, the Treaty provided a mechanism for substantial decision-making by organizing meetings by the so-called Antarctic Treaty Consultative Parties (ATCPs) to address new issues and circumstances in Antarctica (Article 9).

This time, the initiative by the U.S. government was a major success, and as we recall, the outcome of which was not limited to a single treaty but more extensive institutional system composed of a number of relating treaties and other agreed measures. The number of the Treaty party has also grown to 39 countries (among which original 12 signatories and 10 more states have gained the consultative status)[19]. These additional agreements are the products of the past nearly thirty years of its operation, which have been created on occasions of both the regular and special consultative meetings. To list a few major ones, the Antarctic Treaty System includes the Agreed Measures for Conservation of Antarctic Fauna and Flora (1964), the Conventions for the Conservation of Antarctic Seals (1972), the Convention on the Conservation of Antarctic Marine Resources (1980), the Convention on the Regulation of Antarctic Mineral Resource Activities (1988, not yet in force) in addition to other rules pertaining to the Antarctic expeditions, scientific drilling, protection of specified areas such as Sites of Special Scientific Interest (SSSIs) or historic sites, tourism, waste disposal etc.

In sum, it can be said that the initiative taken by the United States government has provided the foundation for both the claimant and the non-claimant countries, as well as two superpowers, to negotiate an international

management of Antarctica by proposing to put aside the territorial issue while the Treaty is in force, and to conventionalize ideas governing the use of the Treaty area as shown above in fairly explicit terms. But it should be noted that this institution, which is embodied in the Treaty System, is by no means universal nor complete in terms of both its membership and scope. And it is with this backdrop that the Antarctic politics have been developing most recently to address these two challenges to the current Treaty System.

(c) Initiative of 1983 and beyond

The current Antarctic Treaty System today is confronted by mainly two kinds of challenges, one from the non-treaty parties over the universality issue of the Treaty System, and the other from some of its core members over the future of mineral resource activities in Antarctica. The former line of argument came when Malaysia proposed that "the Question of Antarctica" be included in the agenda of the 38th United Nations General Assembly in 1983. The latter development became especially clear when Australian Prime Minister Hawke announced on May 22, 1989 that their government decided not to sign the Antarctic Minerals convention, but instead would pursue the urgent negotiation of a comprehensive environmental protection convention with in the framework of the Antarctic Treaty System.

The Malaysian initiative emerged in 1983. These were the days when the United Nations Convention on the Law of the Sea was concluded earlier in Kingston, Jamaica (December 1982), while the uncertainty about the future of world resources was growing in the wake of a series of oil crises in the Middle East. And the initiative mainly challenged the universality of the current Treaty System in terms of its decision-making procedure (the right of Antarctic Treaty consultative parties (ATCPs)) in general, and the way they conduct the negotiation of the Minerals Convention (CRAMRA) in particular.

An Malaysian official summarizes their criticism to the ATCP system in that they have the exclusive right to make decisions pertaining to Antarctica ("exclusiveness"), that these decisions will cover all activities in Antarctica ("totality"), and that these decisions are not subject to review or to discussion by any other body ("unaccountability"). [20] As the official emphasizes, the sole aim of the Malaysian initiative would not be the dismantling of replacement of the Antarctic Treaty System, but rather the establishment of a forum, such as a proposed U.N. Committee on Antarctica, in which "all participants would be on an equal footing and that would examine

in depth issues that are not discussed in the current system."[21] The ATCPs, on the other hand, squarely reject such charges by citing their substantial first-hand engagement in Antarctica in decision-making as well as their pointing out that it is they who would be bound by the obligations that would arise from those decisions. [22] The ATCPs also stress the opportunity for any member states of the United Nations to accede the Treaty System, and even to attain a consultative status.

During the past years of debate on this universality-opportunity issue at the United Nations, it became evident that the primary concern of Non-Aligned countries had been centered around the issue of the Antarctic resources, and particularly the legitimacy of the Minerals Convention, which were then being negotiated among the ATCPs. In this context, many of the developing countries, inspired most immediately by the Law of the Sea Convention, came to mention the concept of "the Common Heritage of Mankind" and its applicability to Antarctic territories and resources. As one manifestation, the resolutions, which were drafted and favored by Malaysia and other Non-Aligned members at the U.N. General Assembly, put forth the principles that should be ensured in the event of any resources exploitation, of which "the non-appropriation and conservation of (Antarctic) resources and the international management and equitable sharing" as well as "the maintenance of international peace and security" and "the protection of its environment."[23] They further called for the imposition of "a moratorium on negotiations to establish a minerals regime until such time as all members of the international community can fully participate in such negotiations."[24] The ATCPs had not been voting either yes or no to these resolutions under consideration, but had chosen not participating in the vote. And then in June 1988, the ATCPs adopted the Convention on the Regulation of Antarctic Mineral Resources Activities (CRAMRA). Reacting to this setback, Malaysia and other Non-Aligned countries, which had tried to pursue an alternative institutional design, registered their frustration by expressing "its deep regret" at the UNGA that followed.[25]

The other type of institutional initiative that is currently put forward by Australia, later joined by France, the two of the core ATCPs. And it took the form of designing a further institutionalization, within the Antarctic Treaty System, for comprehensive environmental protection of Antarctica in contrast to the idea of "regulating minerals activities" as embodied in the just concluded treaty. Australian Prime Minister Hawke first announced their decision of not signing CRAMRA in May 1989, with the conviction that "it was both desirable and possible to seek stronger protection for what remains the

world's last great wilderness." [26] In August, French Prime Minister Rocard visited Mr. Hawke in Canberra and the two Prime Ministers announced that they "agreed on a joint initiative to promote the protection of the environment in the Antarctic" in their joint statement. They indicated in the document that "mining in Antarctica is not compatible with protection of the fragile Antarctic environment." [27] In order for the Convention to take effect, it must be ratified by at least 16 of the 20 ATCPs which participated in the negotiation. Moreover, since the 16 states must include all of the seven "claimant" states, in which both Australia and France are counted, the total withdrawal of the two government means the collapse of the Convention.

As its name represents, the Convention on the Regulation of Antarctic Mineral Resource Activities (CRAMRA) is a resource management treaty which "regulates" the possible commercial explorations of Antarctica's oil and other mineral resources, not prohibiting these activities. But as one study says, "it is fair to characterize that the Convention is weighted more toward restricting development than assisting it." [28] In this sense, it is to be noted that, in its Article 2 (1), the Convention is defined to be an institutional mechanism for: (a) assessing the possible impact on the environment of Antarctic mineral resources activities; (b) determining whether Antarctic mineral resource activities are acceptable; (c) governing the conduct of such Antarctic mineral as may be found acceptable; and (d) ensuring that any Antarctic mineral resource activities are undertaken in strict conformity with this Convention. Also, the Article 2 (3) stipulates "the special responsibility" of the ATCPs for the stringent protection of the Antarctic environment. In addition, one active participant in the 6 years if painstaking negotiation for the Convention recall that the origins of the discussions were "essentially political rather than economic," based on a belief that "the unregulated exploitation of Antarctic minerals, if it ever occurred, would present a threat to the Antarctic Treaty" and "the stabilizing effect" it has had on the entire area south of 60° S latitude. [29]

With regard to the latest Australian move, Prime Minister Hawke pointed out that it was the world and "its perception of a whole range of issues, including environmental issues" that had changed since the beginning of 1980. He underscored the fragility of the Antarctic environment by specifically reminding us of the case of major oil spill in Alaska's Prince Williams Sound as well as mentioning the depletion of stratospheric ozon over Antarctica. And during his visit to Washington, D.C. in June 1989, Mr. Hawke spelled out ideas which he proposed to be the key elements of a *comprehensive* Antarctic

environment protection convention. Included in these are, among others, (a) an agreement to protect Antarctica's environment and ecosystems, fully respect its wilderness qualities, respect its significance for regional and global environmental and protect its scientific value, (b) a ban on mining, (c) in regard to other activities, arrangements which will let us assess the impact of proposed Antarctic activities or facilities. [30]

To summarize the current state of play with regard to the institution designs for Antarctica, the Antarctic Treaty System has still served as the most dominant institutional framework in general by presenting common ground *(inter alia.*, "exclusively peaceful use of Antarctica for the interest of mankind as a whole" and "the freedom of scientific investigation") and a compromise (a "freeze" of the territorial sovereignty issue). Concerning the universality question as initiated by Malaysia *et al.* at the United Nations, it has not gained sufficient momentum. Its "Common Heritage" concept, for instance, stops short of being conventionalized widely because its territorial implication ("internationalization" of Antarctica) has not been acceptable to the traditional claimants,[31] plus its exploitive implication ("equitable sharing" of the resources) is perceived by the ATCPs as incompatible with either partial ("regulation" of mineral resource activities) or comprehensive ("a ban on mining") environment protection.

Then, with regard to a more specific institutional framework for possible mineral resource activities in Antarctica, the ATCPs, at the 15th Consultative Meeting (XV ATCM) held in Paris in October 1989, agreed to convene in 1990 two meeting, one to consider comprehensive measures for the protection of the Antarctic environment, and the other to consider the Article 8 (7) of CRAMRA, i.e., the elaboration of a protocol on liability for mineral resource activities. [32] Most ATCPs are now pursuing these two fronts by linking each other. Despite the opposition of Australian and France, there seems to exist certain wish among other ATCPs to retain the Minerals Convention as a component of any future agreement(s) on comprehensive measures. [33] Having seen the deadlock among the ATCPs over the ratification of CRAMRA and an "Antarctic wilderness park" proposal, New Zealand announced in February 1990 their decision to set aside the consideration of the ratification of the Convention, but instead they called for "a creative solution."[34] It is not certain by the time of this writing how long it will take for this creative solution to actually take shape. But whatever institutional designs follow, we will see the rise of an idea stressing even more stringent environmental safeguards in Antarctica as its central value.

3. Continuity and Change in Institutional Designs for Antarctica

Designing an institution for a particular issue area is a purposive action among actors to create a common social order, which, once recognized, then constrain their behavior while serving as their policy instrument. At the core of a design exists an initiative (a proposed set of basic ideas which are expected to provide common ground and compromise). Of course, it involves politics (negotiations) for any initiative to increase the level of its legitimacy. Powerful ideas, when sustained by sufficient political momentum, can change the world. In fact, not all initiatives would be successful. But even those which are generally considered to be a failure often explain the reality as well. In this sense, actors' ideas, and their changes over time, do matter in this process of international institutions formation to follow the development of human preference on the issue concerned.

Based on these understandings, this paper have taken up three different groups of initiative to design institutional arrangements for Antarctica which were formally presented for intergovernmental discussion in multilateral fashion in this century. As we have seen, the first among them, a U.S. initiative in 1948, the designing of a condominium in the Antarctic, ended in failure. The second initiative by the U.S. government, the creation of a treaty system to manage the general Antarctic affairs, resulted in the Antarctic Treaty of 1959 and the system composed of relevant conventions, agreements, and recommendations. The third development on Antarctica, which is indeed the latest and still on-going, was the two parallel movements, one, initiated by Malaysia and other mostly Non-Aligned countries since 1989, sought to envision the status of "the Common Heritage of Mankind" for Antarctica, the other, promoted by Australia and other core ATCPs, seeks to create a comprehensive environment protection convention which excludes the possibility of commercial mining in Antarctica.

(1) Institution Designs for Antarctica: A Summary

To compare and contrast the above initiatives, especially the level of convergence of actors' expectations in their respective institution design, it can be summarized as Table 1.

As this Table shows, there have been a broad consensus in every initiative that the primary value of Antarctica, both potential and real, is scientific. Also, it should be noted that since the conclusion of the

Antarctic Treaty of 1959, the idea of "peaceful use" of the treaty area, accompanied by its provisions of demilitalization and denuclearization, has strongly been conventionalized to gain broad international acceptance beyond the members of the Antarctic Treaty System.

Table 1. Institutional Designs for Antarctica

Initiatives	Objectives	Common Ground	Compromise
1948 [Internationalization]	Territory (Condominium)	Scientific Coop. (Potentiality)	N/A
1959 [Antarctic Treaty]	Scientific Cooperation Peaceful Use (Demilitalization and Denuclearization)		Territory ("Freeze") Dec. Making (ATCPs)
1983 [Internationalization]	Resources (CHM)* Territory (CHM) DM (universal)	Scientific Coop. Peaceful Use	N/A
1989 [Comp.Env.Protection]	Environment	Scientific Coop. Peaceful Use	
		Territory ("Freeze") Decision Making (ATCPs)	

(Note) CHM stands for the concept of the "Common Heritage of Mankind."

(2) Territory, Resources, and Environment

Against this background, it would be of interest to see how actors have attempted to manage the other three fundamental values of the Antarctic, namely, its territory, resources, and environment. The argument on these issues are hardly closed. Rather, by looking back how actors' have attempted to converge their expectations on these three areas, we will be able to understand the reality of the Antarctic politics more fully.

First, territory. Generally speaking, territory is a fundamental manifestation of its sovereignty for any state actor in international life.

Therefore, it is little wonder that actors' initial political action to this remote continent was, despite of its remoteness, was centering around the claiming of territorial sovereignty or disapproval of these claims. This territorial imperative among the so-called "claimant" governments is so strong that every attempt to internationalize the Antarctic territory, be it by condominium, trusteeship, common heritage concept or whatever, has ended in failure. In this sense, an idea of "freezing" the issue, which was originally presented as a Chilean counterproposal to the 1948 U.S. initiative and later included in the Article 4 of the Antarctic Treaty, was instrumental for the original ATS parties in formulating an extensive international management scheme for Antarctica. But the legal status question of Antarctica has not completely been settled by any means, and has always a chance to flare up contingent to the changes in the present arrangement.

Just as it has often been associated with national sovereignty, the question of territory was also taken seriously from another viewpoint, i.e., that of natural resources (both living and non-living).

Indeed it was sealers, as well as explorers, who first came to this southern most ocean as early as the late eighteenth century, whose unregulated capture brought the fur seal stocks into near extinction. We can see another classic experience of this kind of overexploitation and the drastic reduction of its population in the whaling industry at the beginning of the this century.[35] With these lessons in mind, the current Antarctic Treaty parties made a series of effort to conclude separate Conventions, within the framework of the ATS, such as the ones for conservation of Antarctic seals (1972) and more generally of Antarctic marine living resources (CCAMLR) (1980). Scope of the latter convention is especially ambitious in the sense that it envisions the conservation (defined to mean rational use) of all marine living resources (except for whales and seals which were already regulated by existing treaties) in the Antarctic eco-system.

Concerning the Antarctic mineral resources, a convention (CRAMRA), which was drawn up in 1988, has been a source of serious controversy even during its 6 years of tough negotiation. As we noted earlier, the controversy has had two fronts, one relates to the allocation of the expected benefit from the future mineral exploitations and the other relates to their possible impact on the Antarctic environment. In spite of its stringent environmental safeguard provisions, CRAMRA is now facing a more fundamental challenge from within the original negotiating parties like Australia and France, who totally

oppose any future mineral resource activities in Antarctica. The very shift of the position by these core members of the ATS is instructive in understanding the general trend of human interests in Antarctica which is getting more conscious about the protection of the Antarctic environment.

Whether they like it or not, people traveling Antarctica would not possibly be unconscious about its distinctive environment. And considering its contribution to the wide-ranging scientific research programs in this white continent, the delicate Antarctic environment has been treated with special care in the current Antarctic Treaty System by, for example, setting a series of codes of conduct, designating special sites for preservation, or formulating resource management rules as mentioned above. Contrary to these environmental commitments in the 1959 initiative, there was little if any mention of environment in the institutional design of 1948. It would be fair to say that, at that time, the U.S. policy-makers were more concerned about eliminating international friction and settling the problem of claims, while preserving its scientific and military interest in Antarctica, than anything else. [36]

Today, the environmental concern came to occupy the centerpiece of the initiative. There's no telling, by the time of this writing, how far the Australian 1989 proposal of pursuing a comprehensive environment protection convention would go in conjunction with the existing minerals agreement and contingent on this year's two scheduled meetings. Much debate is expected to take place regarding the form and scope of an environmental framework. But behind this prominence of environment issue for Antarctica, we can clearly detect that the actors' general perception has been shifting from their concern to the preservation of local Antarctic environment to its global implication whatever decisions they will make in days to come.

(3) Conclusion

Antarctica is an area which is still under extensive exploration. Same spirit of challenge and discovery, which brought many heroic navigators into unknown southern seas, is still intact. Politically, this part of the globe has come to be seen widely, as a result of a series of institutional initiatives, as the land of peace and for scientific study without any military installations and nuclear devices.

By reviewing a set of ideas presented in the form of initiatives (or

institution designs), we have also seen who wanted to realize what values in Antarctica and how they succeeded (or not succeeded) in reconciling the differences and in expanding their common ground. In general, there has been a shift in actors' dominant concerns from territory to resource and further to environment during the past forty year history of international relations on Antarctica.

Political realists may try to explain this kind of shift by pointing out the underlying change in distribution of power among actors concerned or by the shift of dominant actors' interests themselves or by general international political situation (Cold War, post-Cold War, etc.). However, we believe it would be more important and indeed necessary to interpret it also as a process of broadening of human understanding on Antarctica. Or there appears to have been a general shift in actors' conception of "threat" and "security" from sheer military one to the one which include environment as it can be found, for instance, in the recent remark by Australian Prime Minister, who termed the issue a matter of "environment security."[37] These processes of changing nature of actors' preference can be characterized as, to use the terminology of Haas, actors' "learning" or "adaptation."[38]

International institutions generally provide a legitimate social order among the participating actors in the given issue area while also serving as members' policy instrument. Furthermore, they, once established, will serve as a forum for the member states to collectively supplement the system of rules and practices. The current institutional arrangement for Antarctica, the Antarctic Treaty System, has often been praised as highly successful in its operation during the past thirty years history. Given its level of common ground and compromise, the ATS will continue to be preserved or even expanded unless the transaction cost of maintaining it becomes higher than replacing it to a new framework. But the Treaty System is by no means perfect and requires ever lasting learning and adaptation if it were to be effective. Moreover, in terms of membership, since every institution is an order and/or policy instrument primarily for its participating members, it is likely that the legitimacy and the scope of the given institution will be confronted from outside unless it becomes truly an universal one. And the ATS, to which its accountability has been challenged by the non-Treaty parties, is certainly not an exception.

Caldwell says that we live in two realities, one of which is "the Earth" defined as the this planet, and the other, "the World" defined as a creation

of human mind, that is, "the way humanity understands and has organized its occupancy of the earth: an expression of imagination and purpose materialized through exploration, invention, labor, and violence." [39] To use his dichotomy, men's activities in Antarctica, whether they be exploratory, scientific, or political, are certainly on the interface between these two realities. As we have seen, in designing international institutions for Antarctica, which is a type of men's political activities, actors' three main imperatives (territorial, resource, and environmental) have been expressed with different definitions over time, and gained their respective prominence at the different time in history. There have indeed been a growing shift in human interests from military-strategic to non-military ones, or from local to global ones. But certain motivations remain unchanged. Therefore, our challenge will continue to be to balance our imperatives in the changing world in search for a design which will best serve human welfare. In this process, ideas do matter because it is they that constitute the basic blueprint of a potential institution. And "wise" ideas matter most especially in the case like this, which affect the future of the entire Earth and the World together.

Notes

1. Gunter Weller et. al., "Laboratory Antarctica: Research Contributions to Global Problems," *Science*, Vol.238,4 December 1987, pp.1361-1368
2. Robert O. Keohane, *International Institutions and State Power* (Boulder: Westview Press, 1989) pp.3-5
3. Oran R. Young, *International Cooperation: Building Regimes for Natural Resources and the Environment* (Ithaca: Cornell University Press, 1989) p.5
4. Kumon further distinguishes the three basic forms of political transaction which characterize the type of a negotiation among actors, i.e., (1) threat, (2) bargaining, and (3) persuasion. Shumpei Kumon "*Sekai Sistemu no Henka to Nihon no Yakuwari* (Changes in the World System and the Role of Japan)," *International Affairs* (Tokyo: Japan Institute of International Affairs) No. 315, June 1986, pp.49-50
5. Robert Gilpin, *The Political Economy of International Relations* (Princeton, N.J.: Princeton University Press, 1887) p.74
6. As we are interested in the convergence of actors' expectations into a certain set of ideas, this paper will focus on the creation of "negotiated order" while acknowledging that some kind of order would come about sponteneously or by imposition of dominant actors. See Young *op. cit.* On this point, it is instructive that Watanabe, by contrasting the two theoretical approaches, realism and institutionalism, in his discussion of the possibility of future integration of the East-West economies, alerts that the realist-like considerations will indeed be dominant even when some kind of new international economic institution emerges as instituionalists would predict. Akio Watanabe "Nihon no Keizai-Gaiko ni Motomerareru Koso-ryoku," (Strategic Conceptions that are required of Japan's Economic Diplomacy) *Chuo Koron*, May 1989, pp.96-109
7. In relation to this discussion of level and incremental nature of institutionalization, we would note that Keohane stresses the importance of taking "conventions" in mind when we consider the role of institutions in international society, and points out that international regimes depend on the existence of conventions that make such negotiations possible. Keohane *op. cit.*, p.4
8. The United States Department of State, *United States Foreign Relations*, 1948, Vol.1, p.997
9. For text of the *aide-memoire*, see *Ibid.*, p. 996
10. See also, *Ibid.*, 1949, Vol.1., p.800
11. The original U.S. plan would have organize an eight-power trusteeship under the United Nations, although this idea was soon rejected partly

because there were no people, only penguines, living in what would be the territory held in trust, and partly because any kind of U.N. scheme was thought to have opened the possibility for the Soviet Union to intervene as a member of the organization.

12. *Ibid.*, 1949, Vol.1., p.800. Reinforcing this position, one U.S. policy paper lists three prerequisites for any solution of the territorial probelems. They are, (1) to deny our (U.S.) most probable enemies participation in the control of all or any part of Antarctica, (2) to insure that such control would be exercised by friendly powers, and (3) not to constitute a precedent adversely affecting U.S. interests in the Arctic. The third condition points out the differential treatment for the two polar regions mainly from strategic considerations. See *Ibid.*, 1951, Vol.1, p.1726
13. Vicuna reminds us that German submarines operated in Antarctic waters during World War II and that the German and Japanese interest in Antarctica during the war were influential in the development of territorial claims to the continent. Francisco Orrego Vicuna, "Antarctic Conflict and International Cooperation," National Research Council, *The Antarctic Treaty System: An Assessment*, 1986, p.59
14. The United States Department of State, *United States Foreign Relations*, 1948, Vol.1, pp.971-974
15. This Soviet position was expressed in a memorandum which is reprinted in Peter Toma, "Soviet Attitude Towards the Acquisition of Territorial Sovereignty in the Antarctic," *American Journal if International Law*, 1956
16. Concerning this "gentlemen's agreement," see F.M. Auburn, Antarc*tic Law and Politics* (London: C. Hurst & Company, 1982) Despite this agreement, Some politics did play a part in deciding the location of scientific stations. For instance, both the U.S. and the Soviet Union deliberately established their stations in areas claimed by others.
17. The other two basic points of agreement at the stage of informal discussion are the principles of "continuation of scientific cooperation" and "the use of continent only for peaceful purposes." United States Arms Control and Disarmament Agency, *Arms Control and Disarmament Agreements: Texts and Histories of Negotiations (1982 Edition)*, p.20
18. It is commonly understood that the Antarctic Treaty is the first post World War II arms control agreement.
19. 10 countries which were given consultative status to date were; Brazil, China, the Federal Republic of Germany, the German Democratic Republic, India, Italy, Poland, Spain, Sweden, and Uruguay. As a condition for any acceding state to be considered as a candidate for ATCP, Article 9 of the

Treaty provides the demonstration of its interest in Antarctica "by conducting substantial scientific activities there, such as the establishment of a scientific station or the dispatch of a scientific expedition."

20. Zain Azraai, "The Antarctic Treaty System from the Perspective of a State Not Party to the System," National Research Council, *op. cit.*, pp.305-306
21. *Ibid.* p.311
22. Richard A. Woolcott, "The Interaction Between the Antarctic Treaty System and the United Nations System," National Research Council, *op. cit.*, pp.382-383
23. The principles were first introduced, and then passed, in the U.N. Resolution A/40/156 B of December 16, 1985
24. The U.N. Resolutions A/41/88 B of 1986 and A/42/46 B of 1987
25. The U.N. Resolutions A/43/911 A of December 7, 1988
26. Announcement made by Australian Prime Minister Hawke on May 22, 1989
27. Joint Statement on Antarctica by Australia and France, August 18, 1989
28. U.S. Congress, Office of Technology Assessment, *Polar Prospects: A Minerals Treaty for Antarctica*, OTA-O-428 (Washington, D.C., U.S. Government Printing Office, September 1989) p.15
29. Christopher D. Beeby, "The Antarctic Treaty System as a Resource Management Mechanism - Nonliving Resources," National Research Council, *op. cit.*, p.271
30. Address made by Australian Prime Minister Hawke on June 26, 1986 at National Press Club, Washington, D.C.
31. Despite the lack international consensus on the legal status of Antarctica, Woolcott stresses, the long-standing territorial claims "remain a fact of international life." Woolcott, *op. cit.*, p.385
32. For the summary of discussions at the 15th Antarctic Treaty Consultative Meeting, see Lee A. Kimball, "Report on Antarctica," (Washingoton, D.C., World Resources Institute, November 1989)
33. Kimball, *ibid.*, p.16
34. Statement by New Zealand Prime Minister Palmer on February 26, 1990
35. Whaling in the Antarctic is regulated not by the Antarctic Treaty System but by a separate institutional arrangement, namely, the International Whaling Commission (IWC). The IWC was originally established in 1946 in accordance with the International Convention for the Regulation of Whaling mainly to set quotas for permissible level of whaling. But more recent developments includes the Commission's imposition of a worldwide moratorium on commercial whaling in 1986.
36. The United States Department of State, *op. cit.*, 1951, Vol.1, pp.1725-1726

37. Speech by Australian Prime Minister Hawke, National Press Club, Washington, D.C., June 26, 1989.
38. Ernst H. Haas, *When Knowledge is Power: Three Models of Change in International Organizations* (Berkeley: University of California Press, 1990) p.3 Haas argues that one of the two processes, "adaptation" and "learning," is at work in "the change in the definition of the problem to be solved by a given organization." While I share the same interest in the role of these two processes for the collective problem-solving within certain institutions, this paper also deals with the "learning" or "adaptation" process that actors employ collectively when they create an organization (or more generally international institutions) for the problem-solving. Thus, my emphasis here will be placed on *both* the change in the definition of the problem once an institution is organized *and* the questions of "what was the problem" when an initiative was taken and "what kind of initiatives has been introduced in an issue area for multilateral discussion over time" and "which set of ideas has actually resulted in an institution for what reasons"
39. Lynton Keith Caldwell, *International Environmental Policy* (Durham, N.C.: Duke University Press, 1984) p. 8

* I wrote this paper with personal capacity and it does not in any way represent or reflect the opinion of the organization to which I currently belong.

OCEAN NON-LIVING RESOURCES: HISTORICAL PERSPECTIVE ON EXPLOITATION, ECONOMICS, AND ENVIRONMENTAL IMPACT*

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The study of the development of the use and exploitation of non-living ocean resources requires a complex consideration of economic and historical factors, of legal and environmental issues, and, in contemporary settings, of communication theory and use-conflicts dilemmas. Emphasis in economic, albeit economic-geographic, studies pertaining to the marine domain has traditionally been placed on fisheries--including, lately, mariculture--and on hydrocarbons extraction.

Yet numerous other "products" are exploitable, and several have been exploited, such as energy extraction, tourism and recreation, therapy, ores, minerals, and water itself.1

MINERALS

Mineral resources of the ocean are either dissolved in sea water, resting on the ocean floor, or found underneath

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*This paper is produced in preliminary format only and has not been proofread by the authors.

1Charlier, R. H., and Gordon, B. L., 1978. Ocean Resources: An Introduction to Economic Geography. Washington DC: University Press of America.

Cronan, D. S., 1980. Underwater Minerals. London: Academic Press.

Mero, J., 1965. The Mineral Resources of the Sea. Amsterdam: Elsevier.

Charlier, R. H., 1978. Other ocean resources. In: Borgese, E. M., and Ginsburg, N., eds., Ocean Yearbook I. Chicago: University of Chicago Press, pp. 160-210.

Charlier, R. H., 1984. Water energy and non-living ocean resources. In: Borgese, E. M., and Ginsburg, N., eds., Ocean Yearbook IV. Chicago: University of Chicago Press, pp. 75-120.

Resource	1930	1960	1990	1990 as % of 1960
Iron & Steel	288	406	535.25	132
Copper	7	10.7	14.1	132
Alumin(i)um	0.7	9	31	349
Zinc	3	5	8	161
Magnesium	4.3	6	7.9	132
Lead	4.3	5.4	6	113
Chrome	1.0	2.6	4.3	164
Nickel	0.2	0.6	1.2	215
Tin	0.5	0.4	0.4	100
Petroleum	7.5	17.7	25	141

Table 1. Historical and projected U.S. per capita annual consumption of typical metals (in kg) and petroleum (in barrels)

Notes (a) % (last column) based upon not rounded off amounts for '60 and '30.
(b) all consumption increased (except tin) from 1930 to 1990.

Table 2. Estimated and Projected Primary Economic Value of Selected Ocean Resources to the United States by Type of Activity 1972/1973–2000, in Terms of Gross Ocean-Related Outputs (in billions of 1973 dollars)[a]

Activity	1972	1973	1985	2000
Mineral resources				
Petroleum		2.40	9.60	10.50
Natural gas		0.80	5.80	8.30
Manganese nodules			0.13	0.28
Sulfur		0.04	0.04	0.04
Fresh water		0.01	0.02	0.04
Construction materials		0.01	0.01	0.03
Magnesium		0.14	0.21	0.31
Other			0.01	0.02
Total		3.40	15.82	19.52
Living resources				
Food fish	0.74		0.95–1.58	1.37–4.01
Industrial fish	0.05		0.05–0.08	0.05–0.14
Botanical resources	[b]		[b]	[b]
Total	0.79		1.00–1.66	1.42–4.15
Nonextractive uses				
Energy			0.58–0.81	3.78–6.03
Recreation	0.70–0.97		1.12–1.50	1.64–2.53
Transportation	2.57		4.40–6.21	6.88–11.41
Communication	0.13		0.26–0.36	0.44–0.85
Receptable for waste	[c]		[c]	[c]
Total	3.40–3.67		6.36–8.88	12.74–20.82
Grand total	7.59–7.86		23.18–23.36	33.68–44.49

[a]Source: United States Senate Committee on Commerce (1974).
[b]Insignificant.
[c]Potentially significant but unmeasurable.

TABLE 3: CLASSIFICATION OF MARINE MINERAL RESOURCES

	Unconsolidated			
Dissolved	Continental Shelf (0-200 m)	Continental Slope (200-3,500 m)	Deep Sea# (3,500-6,000 m)	Consolidated
Seawater: Freshwater* Metals and salts of: Magnesium* Sodium* Calcium* Bromine* Potassium Sulfur Strontium Boron Uranium+ Other elements Metalliferous brines:# Concentrations of: Zinc Copper Lead Silver	Nonmetallics: Sand and gravel+ Lime sands and shells+ Silica sand+ Semiprecious stones+ Industrial sands+ Phosphorite Aragonite Barite* Glauconite Heavy minerals: Magnetite+ Ilmenite+ Rutile+ Monazite+ Chromite Zircon+ Cassiterite* Rare and precious minerals: Diamonds* Platinum Gold+ Native copper	Authigenics: Phosphorite# Ferromanganese oxides and associated minerals Metalliferous mud with: Zinc Copper Lead Silver	Authigenics: Ferromanganese nodules and associated Cobalt Nickel Copper Sediments: Red clays Calcareous ooze Siliceous ooze	Disseminated, massive, vein, tabular, or stratified deposits of: Coal Ironstone Limestone Sulfur Tin Gold Metallic sulfides Metallic salts Hydrocarbons

Source: M. J. Cruickshank, Marine Mining: SME Mining Engineering Handbook, Sec. 20 (New York: Society of Mining Engineers of Aime, 1973).

*Currently recovered commercially offshore.

+Recovered in coastal areas; may include some offshore activity.

#Under research and development.

it. Hence ocean mining technologies include water processing, dredging, and conventional mining (Tables 1-3).

Dissolved Minerals

Problems associated with chemical extraction of minerals from sea water are low concentration and technical difficulty of selective extraction. If we consider chlorine as having a concentration factor of 1, then gold has a factor of 57 and tin of 26. The stake is not small: a conservative estimate puts a $200 million yearly tag on marine-extracted minerals. A dissolved minerals recovery plant if operated in series with a saline water conversion plant could prove economically profitable while other advantages could accrue as well: single energy sources, consolidation of services and utilities, relief for water discharge (Table 3).

Salt

Of the minerals dissolved in sea water, salt has been extracted for more than 30 centuries. It is mentioned in Chinese writings of 2200 B.C. and still represents 30% of world salt production today. In fact land operations have been rapidly declining while marine production is steadily increasing. Though not negligible, the economic significance is not on top of the list of marine products.

Bromine and Magnesium

The discovery of bromine is credited to the Frenchman A. J. Balard who identified it in the bitterns of the marais salants of the Midi region of France about 150 years ago. Over 99% of the lithospheric bromine is dissolved in ocean waters. It owes its commercial importance to the demand for "no-knock" gasoline. Bromine and magnesium compounds are extracted simultaneously. Seventy percent of the total production of bromine and 60% of the magnesium used are of marine origin. Bromine has been extracted "at sea" by direct precipitation from unconcentrated water. A plant working with an efficiency of 70% could produce about 29,000

kg per month. The process involves the use of highly corrosive reagents. Land-based plants would resolve many of the problems encountered with an offshore-based operation.

Magnesium occurs in a slightly higher concentration than bromine in sea water (1.3%). Extraction from sea water is less costly than on land. The process requires only 1/20th as much water as for bromine [ED: Line missing].

Commercial sea water bromine was produced from San Francisco Bay bitterns in 1926. Important operations are conducted today in Texas. Potassium chloride was recovered from Dead Sea waters in 1921, and in 1922 bromine was recovered from the residual liquors of the potassium plant. Heavy demand from 1933 on led to the construction of the Kure Beach plant, in North Carolina. That plant produced five years later 18,000 tons per year. By 1944 a second plant near Freeport, Texas, was putting 27,000 tons per year on the market.

The first commercial magnesium to be extracted from the sea came from the Gulf of Mexico, from a plant in Freeport, Texas, in 1941, and amounted to 8,100 tons. A U.S. Government plant went into operation shortly thereafter in Velasco, Texas, and its production reached 3,300 tons per year by 1942. Although the Kure Beach and Velasco plants were closed down at the end of World War II, major magnesium production remains of marine origin. It has been estimated that it is 30% cheaper than from any land source; recovery can attain 90%.

Iodine

Iodine has been recovered from algae ashes. It is also on record as having been recovered from the petroleum fields' brackish solutions. A patent was taken out in 1949 to extract it from sea water.2

2Vienne, G., 1959. Extracting Iodine from Sea Water. Paris: French Patent Office, 945, 347.

Potassium

Potash deposits in salt basins are large enough, though not as frequent as salt and gypsum. Reserves of potassium oxide run into tens of billions of tons and large deposits exist in the North Sea. The mineral may be precipitated by selective chelation. Crude soda and potash are known to have been extracted from seaweed ashes in Scotland in 1720.

Magnesia was prepared in the 19th century along the Mediterranean coast, and in 1923 magnesium chloride and gypsum were produced from the bitterns of solar evaporation in San Francisco Bay. Currently it is produced as a byproduct of petroleum and well-brines.3

Brines

Hot brines were discovered in the Red Sea in the seventies. Estimations--which might quite well be exaggerated--place the metals contained therein at 1.5 million dollars. The amount has been increased to "several billions". Due to the difference in density with water, the brines can be located by seismic reflection. Since 1976 problems relating to their extraction and the subsequent pollution and disposal of wastes have been studied. Concentrations of some elements in the Red Sea are, according to sites, from 1,000 to 50,000 times greater than elsewhere. In the early eighties fourteen promising sites had been identified and extraction methods successfully tested, leading to a claim that 10,000 tons per day of mud could be processed. A mass of mud and water is liquefied; it grows during flotation, reaching about 3 times its volume. Ninety-six thousand tons of dredged material could then be reduced to a concentrate of 1,650, containing

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3Petterson, D. O., 1928. Production of Gypsum and Magnesium from Sea Water. Stockholm: Swedish Patent Office, 65, 434.
Seaton, M. J., 1931. Magnesium chloride and gypsum from San Francisco Bay. Metallurgical Engineering 38, 638-641.

copper, zinc, iron, and many other metals, some of them even precious.4

Suspended Matter

In 1927 economically strapped Germany was crushed under its war debts, and it was suggested to pay them off by mining the ocean for gold. However, filtering sea water to recover such suspended particulate matter as gold, lead and iron is economically not possible. Concentrations are too small and filter-fouling by organisms is a foregone conclusion. It would take 416 km^3 of sea water to recover one ton of gold and 40 tons of silver!5

Minerals From the Sea Floor

The oldest industry is the quarrying, if one may say, of sand and gravel, but tin and phosphorus have also been obtained from the marine domain.

Sand, Gravel, Shells

Aggregates may be mined for themselves or for the metals they contain. Already in value and in quantity, except for hydrocarbons, dredging of sand and gravel surpasses all other sea-floor mining operations.6 Sand has

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4Bishoff, J. L., 1969. Red Sea geothermal deposits: their mineralogy, chemistry and genesis. In: Degens, E. T., and Ross, A., eds., Hot Brines and Recent Heavy Metal Deposits in the Red Sea. New York: Springer-Verlag.

Blissenbach, E., and Nauwab, Z., 1982. Metalliferous sediments of the sea-bed: the Atlantis II-Deep deposits of the Red Sea. In: Borgese, E. M., and Ginsburg, N., Ocean Yearbook III. Chicago: University of Chicago Press, pp. 77-104.

Degens, E. T. et al., 1967. Red Sea: detailed survey of hot brines area. Science 156, 514-516.

Tooms, J. S., 1970. Metal deposits in the Red Sea. Underwater Science and Technology Journal 28, 29.

5Mero, J., op. cit.

6Bartlett, P. M., 1987. Republic of South Africa coastal and marine minerals potential. Marine Mining 6, 4, 359-383.

Williams, S. J., 1986. Sand and gravel deposits within the U.S. EEZ: resources assessment and uses. 18th Ann. Offshore Technol. Conf. Proc., 377-386.

been removed from beaches and gravel as long as salt has been extracted, but these "artisanal" operations caused little impact upon the environment. St. Augustine's (Florida) San Marcos Castle is built of coquina (17th century). Today the situation is different. Sand is used for landfill, cement production, pre-stressed concrete manufacture, artificial beach nourishment, erosion reduction, and building material. France feared, in 1977, that by the advent of the 21st century it would run out of construction material from land sources; it appears that the deadline is much nearer: it is considering tapping the Channel at greater depths to supply Paris, Normandy and the North.7 Not only siliceous sands but also black and calcareous sands are being removed from beaches. In 1969 it was decided to exploit the deposits of aragonite in the Bahamas (Ocean Cay) where reserves are estimated at 575 million tons; by 1971 two million tons a year were being removed. Gravel deposits along coasts are being depleted; when the deposits are part of the coastal defensive system the consequences become dramatic: during the recent severe storms along the coasts of France, areas near the Somme River were flooded. Removal of coralliferous deposits for construction and ornamental purposes on Bali resulted in impressive beach erosion. Studies carried out by French teams concluded that depths of 35 m should not be exceeded, particularly for gravel, and offshore sand mining should not take place at less than 5 km from the shore.8 In the United States shells recovery has been carried out along the Gulf

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7Charlier & Gordon, op. cit., p. 104.

Charlier, R. H., 1990. Mining potential of the Inner Continental Shelf. Proc. Earth Science for Environmental Planning. Santander 1-6 Nov. 1989 (in press).

8De Byser, J., et al., 1976. Les Granulats Marins Siliçieux et Calcaires du Littoral Breton. Paris: CNEXO Techn. note 52, 7/76, pp. 1-16.

Cruickshank, M. H., 1988. Marine sand and gravel mining and processing technologies. Marine Mining 7, 1-2, 149-162.

of Mexico coast, near Baltimore, Maryland, and San Francisco, California. Some of these operations date back more than a hundred years. Longtime exploitation has been known off the Isle of Man, in Faxa Bay (Iceland) and in the Wadden Zee (Netherlands).

The Japanese have retrieved some 30,000 tons per month of iron ore in Ariake Bay since 1963. Barite is extracted near the Alaskan coast. Ilmenite is recovered in Australia and South Africa.9 Gambia is likewise producing ilmenite, while its coast and that of Senegal hold promise for zircon and chrome. All three minerals have been identified on the Oregon coast.10 Titaniferous sands are mined off Kyushu (Japan), Luzon (Philippines), Java and New Zealand. The list of minerals is long, and the number of sites being either mined or identified is impressive. Their economic and strategic significance is not small: the U.S. Pacific Northwest has locations with deposits containing over 50% of heavy minerals.11 Gold and platinum placers occur preferentially in a gravel matrix, but silt-size deposits have been encountered. Economically valuable deposits are usually of alluvial origin. They have been exploited in Goodnews Bay (Alaska); recently gold has been identified along the Oregon coast as well.10

Placers of other mineral nature have been found among many coasts and even diamonds have been mined. Operations were started in 1962 on the coast of Namibia in 1962, between the mouth of the Orange River and Deay Point. In 1964 one company extracted 16,118 carets from a single marine deposit. However, market conditions brought dredging

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9Coetzee, C. B., 1957. Ilmenite-bearing sands along the west coast in the Vanrhynsdorp District. Un. of So. Afr. Dept. of Mines Geol. Surv. Div. Bull. 25, 1-17.
10Kulm, L. D., 1986. Potential heavy mineral placers on the Oregon continental shelf. Marine Mining 7, 4, 361-395.
11Petterson, D. O., and Binney, S. E., 1988. Compositional variations of coastal placers in the Pacific Northwest, USA. Marine Mining 7, 4, 397-415.

to a halt, though storm damage to the equipment contributed also to the decision. However, in the eighties a flurry of "tolerated" artisanal gathering picked up momentum and has led, since 1979, to a resumption of limited industrial operations. A ton of gravel yields, on the average, one diamond.12

Tin

Cassiterite has been mined since 1907 in Thailand, near Tongkah. Though tin is also recovered at some Atlantic European locations (Great Britain, France), the largest operations are located in Southeast Asia (Thailand, Malaysia, Java). The mining has considerable negative impact on the environment.13 Mining of tin represents a major economic activity in Asia and it will be quite difficult to reconcile extraction and environment safeguarding. Not only does the dumping of tailings pose severe problems for filter-feeding organisms, but the dredging endangers beach quality and threatens shorelines.

Phosphorus

Phosphatic mudbanks, sands, pellets and oolithes occur in shallow water. Sands off Baja California have a 12% phosphatic content, thus a bit low for commerical exploitation. Phosphorite nodules are found on the deeper

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12Bartlett, op. cit.; Collins, J. V., and Keeble, P., 1962. Diamonds from the sea bed. In: Strykowski, J. G., ed., Underwater Yearbook, 1962. Chicago: Underwater Society, pp. 12-14.

Hodgson, D. L., 1977. Mining the beach for diamonds at Consolidated Diamond Mines. Engng. and Min. J., 145-151.

13Charlier, R. H., 1987. Marine mineral resources extraction in coastal areas and its impact on the environment, and consequences for land use. In: Arndt, P., and Lüttig, G. W., Mineral Resources Extraction, Environmental Protection and Land-Use Planning in the Industrial and Developing Countries. Stuttgart: Schweizerbart, pp. 53-70.

Waldichuk, M., 1987. Mineral extraction from the sea and potential environmental effects. Marine Pollution Bull. 18, 7, 378-379.

Zaalberg, P. H. A., 1970. Offshore Tin Dredging in Indonesia. London: Institute of Mining and Metallurgy.

regions of the continental shelf, the upper reaches of continental slopes, and on ridges and submarine banks at depths varying from 30 to 300 m. Their discovery dates back to the Challenger Expedition, some 110 years ago, when they were brought up off the Cape of Good Hope.14

Sulfur

Offshore salt domes in the Gulf of Mexico were already exploited in 1955 at a depth of 30-60 m over 29,140 ha. Onshore technology had been easily adapted to ocean mining. In 1974 marine sulfur accounted already for 81,300 tons or 10% of total U.S. production; some salt domes may provide large quantities: on the Louisiana continental shelf two of them had a yearly production of 2 million tons.

Polymetallic Nodules

Twenty years ago great hopes had been vested in the recovery of polymetallic nodules from the deep ocean floor. Industrializing nations saw in them a bonanza that would uplift them to higher standards of living. The nodules would be a major source of manganese, copper, cobalt, nickel, and some other metals. Darwin had already brought up some nodules during the Challenger voyage. Doubtlessly the expectations gave an additional impetus to the passing of the "Law of the Sea" and the creation of a marine mining authority. But the potato-shaped concretions did not turn out to be such a bonanza after all. Technologies were designed, varied, ingenious, but mass mining and production of manganese, among others, would have doomed land-operations which provided considerable income for some of the same less-developed nations.

14Cronan, op. cit.
Marvasti, A., and Riggs, D.,, 1987. Potential for marine mining of phosphate within the U.S. EEZ. Marine Mining 6, 3, 291-300.
Mero, op. cit.
Baturin, G. N., 1982. Phosphorites on the Sea Floor. Amsterdam: Elsevier.

Nodules are found in some lakes--then considered bog iron--and even in some EEZs: around Clipperton Island (France), Clarion Island (Mexico), Hawaii, Florida and South Carolina. About 1978 two U.S. and one Belgian company tested a recovery system. Exploitation was and is of interest to the United States because already then its imports of the metals cost over $2 billion for 99% of its manganese and cobalt, 70% of its nickel, and 15% of its copper. About $100 million had already been invested. Large-scale operations had been predicted for 1985 with a "profitable" recovery of 5,000 tons per day. But 1985 is long gone....

Cost of transportation has been given as an argument against nodule dredging. Yet the United States' imports of manganese include 40% for such costs.15

Only experimental mining has been undertaken: 40 tons of nodules were brought up from the South Carolina and Florida coasts. A German company likewise tested some equipment in the early eighties.

Minerals Beneath the Ocean Floor

Hydrocarbons

In the late nineteenth century, land-based operations were actually extended into the marine domain and for the first time drilling through the ocean floor was attempted; depths were initially modest but rapidly increased. These operations along the California coast remained rather unique until, in 1937, wells were drilled in the Gulf of Mexico. Besides offshore wells--which dot the map on every continent today--fifteen years ago optimistic estimates of oil shale reserves mentioned one trillion barrels, and another 200 billion barrels in tar sands. Since the late seventies at least 70 nations have conducted drilling operations. Some scientists believe that substantial reserves of petroleum

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15Charlier, op. cit., 1978.

can be found at greater depths.16 Natural gas is certainly present in organic-matter-rich sediments in such seas as the Baltic, Black, Aegean and Adriatic.

Coal and Others

Even before the Christian era, coal mines were exploited by the Greeks beneath the sea at Laurium. Coal, iron, tin, copper, nickel and limestone have been extracted offshore of Europe, Asia, and America. A shaft was sunk in 1530 in an artificial island off the Scottish coast to reach coal deposits. There are still today over 100 mines in operation beneath the sea.

Water

The oceans are an important source of fresh water through desalination and, to a far lesser extent, through fresh water sources on the ocean floor. Springs and aquifers on the continental shelf could provide coastal settlements with fresh water, e.g. in the Mediterranean, Atlantic and Pacific. Such springs were already tapped by Phoenician fishermen, others near Argolis (Greece) and near Bahrain. Icebergs were used at the end of the 19th century to provide water for Valparaiso, Chile. Small tugboats would haul them to their destination. Proposals were made to tow icebergs to Saudi Arabia. However, several problems arise such as anchoring for transport, taking a radiography to ascertain the absence of fractures and internal cavities, and removal of extruding parts. During the towing itself the convoy runs risks of collision, melting and calving, and upon arrival arise problems of port access, cutting remains and storing. The environmental impact is far from

16Wood, P. W. J., 1979. New slant on potential world petroleum resources. Ocean Industry 14, 4, 59-70.

Emery, K. O., 1980. Continental margins: classification and petroleum prospects. Am. Assoc. Petrol. Geol. Bull. 64, 3, 297-315.

Dow, W. G., 1978. Petroleum source beds on continental slopes and rises. Amer. Assoc. Petrol. Geol. Bull. 62, 6, 1584-1606.

understood as such movements may [set off] climatic modifications. A conservative estimate of the costs of capturing and delivering an iceberg from Antarctica to Saudi Arabia would exceed $50 million, but the remaining water after the voyage would still be half the price of the same quantity produced by desalination.

Thelassotherapy is again in vogue and centers in Europe are thriving. Wide medical claims are made. Algal and mud material are used. Electrical improvements have been made and even acupuncture is used.

ENERGY FROM THE OCEAN

Electrical current could be generated by tapping ocean energies. Sources include thermal differences, waves, tides, winds and a few others. OTEC is still among the most talked-about alternatives; tidal power has been tapped for many centuries.

OTEC

Only four plants ever functioned, albeit for quite short periods: an experimental facility was briefly in use on the River Meuse in Belgium during 1928; a land-based electrical station with an output of 22kW, using a 14°C difference of temperature and a cold-water adduction pipe extending 2 km offshore, functioned from 1930 to 1932 at Cape Matanzas, Cuba; another one constructed on a ship produced electricity off the coast of Brazil later on. All these plants had been established by Georges Claude. A fourth attempt was another land-based facility constructed by the Société de l'Energie des Mers at Abidjan (Republic of the Ivory Coast).

OTEC, an acronym for Ocean Thermal Exchange Converter, uses the differences of potential created by the difference in temperature between the warm surface waters and the deep cold waters in tropical areas. The open cycle technology uses no intermediate fuel but requires very bulky turbines; some consider it as having less environmental impact. An

intermediate fuel, such as ammonia, propane or freon, is called for in a closed cycle. Ammonia can be evaporated using the warm sea water; an evaporator and a condenser transfer heat between water and ammonia; a generator is connected to the turbine. Various systems have been discussed in a prior paper on the topic.17

A closed-cycle experimental plant, anchored offshore, was tested near Hawaii in 1979 and 1980. Mini-Otec, mounted on a barge, a 50-kW_e facility, actually turned a small profit in August 1980. It has been funded by three corporations and the State of Hawaii. There is repeated talk about converting a T-2 tanker into OTEC-1 which would test units of 1 MW_e; heat exchangers for OTEC-1 are undergoing tests in Japan and at Argonne Laboratories (Illinois). Transmission to shore would be by cable; energy-intensive industries could be implanted aboard such "platforms". Two United States Public Laws mandated building of demonstration plants of 100 MW by 1986. In fact, a 40 MW demonstration plant was to have been designed in 1981 under the OTEC Pilot Plant Program Opportunity Notice (PON). Directives established a national goal of 10,000 MW_p on line by 1999 from OTEC facilities.

D'Arsonval attested to the possibility of extracting energy from the tropical ocean by noting that a heat engine could be built to operate on the temperature differences between surface and deep sea water.17a The American

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17Charlier, R. H., 1978. Non-living resources. In: Borgese, E. M., and Ginzburg, N., eds., Ocean Yearbook I. Chicago: University of Chicago Press, pp. 160-210.

Charlier, R. H., and Justus, J. R., 1990. Handbook of Ocean Energy Technologies. Amsterdam: Elsevier.

d'Arsonval, A. Utilisation des forces naturelles: avenir de l'electricité. La Revue Scientifique, Sept. 17, 1881: 370-372.

Claude, Georges. Power from the tropical seas. Mechanical Engineering, v. 52, no. 12, December 1930: 1039-1044.

17aCharlier, R. H., 1978. Non-living resources. In: Borgese, E. M., and Ginzburg, N., eds., Ocean Yearbook I. Chicago: University of Chicago Press, pp. 160-210.

engineer Campbell, in the August 7, 1913, issue of Engineering News, proposed the utilization of ocean thermal energy to produce power, employing the vapors of a liquefied gas (e.g. ammonia, carbon dioxide, methyl chloride) as an intermediate working fluid.

In 1930, a French engineer, Georges Claude (a student and friend of d'Arsonval), used this very scheme: that of boiling surface sea water in a vacuum, expanding the vaporized steam through a turbine and condensing the exhaust steam on cold sea water pumped up from the depths. Claude had run a successful experiment near Ougrée, Belgium, using the difference of 20°C (36°F) of temperature between the colder waters of the Meuse River and the warm wastewaters of siderurgical facilities commonly discharged into the river. His steam turbine, at 5000 rpm, produced 60 kW_e in the early 1920s.

On the coast of Matanzas Bay, 100 km (62 miles) east of Havana, Cuba, he built a power plant that by the fall of 1930 was producing 22 kW from a sea water temperature difference of 14°C (25°F). In contrast to a conventional steam-turbine power plant operating with high pressures and large temperature differences, the warm sea water available for Claude's plant required a vacuum to evaporate. The turbine needed was an order of magnitude larger in diameter than those used in a conventional power plant. Since Claude had only a 1-m (3.28 ft) diameter turbine available, he deliberately oversized his cold water pipe by a factor of 10 in cross-sectional area.17b As a result, he put more power

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Charlier, R. H., and Justus, J. R., 1990. Handbook of Ocean Energy Technologies. Amsterdam: Elsevier.

d'Arsonval, A. Utilisation des forces naturelles: avenir de l'electricité. La Revue Scientifique, Sept. 17, 1881: 370-372.

Claude, Georges. Power from the tropical seas. Mechanical Engineering, v. 52, no. 12, December 1930: 1039-1044.

17b.Charlier, R. H., 1978. Non-living resources. In: Borgese, E. M., and Ginzburg, N., eds., Ocean Yearbook I. Chicago: University of Chicago Press, pp. 160-210.

into the vacuum pump than he got from the turbine. Operations were terminated in the last quarter of 1930 when the cold water intake pipe failed. Claude hoped to overcome some of the engineering and environmental problems he had encountered at Matanzas by deploying a floating power plant. Claude stationed the 10,000-ton cargo ship La Tunisie, equipped as a refrigeration vessel, in deep water off the coast of Brazil in 1934, where he planned to make ice to sell in Rio with the 800 kW of power he hoped to produce. After a lengthy series of technical and personnel problems, Claude finally operated history's first ocean-going OTEC power plant. Unfortunately, the system operated poorly, and the heavy cold water pipe was lost repeatedly. Claude, who by this time was working with his own funds, was obliged to give up his project. The La Tunisie was scuttled.18

During the Second World War, the French Government showed interest in ocean thermal energy conversion, and Claude made plants for a 40,000 kW power plant to be built on the African Ivory Coast near Abidjan. After numerous problems and Claude's death, further research led to the formation in 1948 of the Société des Mers, a society founded for the explicit purpose of conducting this project. French scientists hoped that their shore-based power plant would utilize a temperature differential of 20°C (36°F) to produce both power and potable water. But the economics looked better than before because it had been found that pumping nutrient-rich water from the deep sea caused an increase in the local population of fish, and the value of the fish was

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Charlier, R. H., and Justus, J. R., 1990. Handbook of Ocean Energy Technologies. Amsterdam: Elsevier.

d'Arsonval, A. Utilisation des forces naturelles: avenir de l'electricité. La Revue Scientifique, Sept. 17, 1881: 370-372.

Claude, Georges. Power from the tropical seas. Mechanical Engineering, v. 52, no. 12, December 1930: 1039-1044.

18[ED: Note to be provided.]

conditioning and the extraction of salt and industrial chemicals were also discussed as byproducts. Construction was begun in the early 1950s, and several subsystems were built and installed, but the project was beset with many of the same problems that hindered Claude in Cuba. At the close of tests carried out in 1956, the project was finally abandoned in favor of a cheaper hydroelectric power project at La Bia, not far from Abidjan.

In 1958, Electricité de France studied the possibility of siting an OTEC power plant in Guadeloupe (Lesser Antilles) to produce electricity and fresh water. Similar to the plant contemplated by l'Energie des Mers for Abidjan, it was never built because the fresh water which the plant was to have produced would have been too expensive for Guadeloupe, and because seasonal variations in the quality of the thermal resource would have led to large variations in power output. Although other projects were planned, e. g. Curaçao, Rio de Janeiro, none was ever constructed by l'Energie des Mers.18a However some projects, for instance the one on Curaçao, have recently been revived (1984).

WAVES

Power extracted from ocean waves has been utilized on a small scale since the beginning of this century: a pier used wave-power for its light bulbs in Pacifica, California; a house was similarly lit near Royan, France; Monaco's Musée Océanographique got the sea water for its aquarium, for many years, lifted from the Mediterranean by a wave-powered pump; and many buoys and lighthouses get their electricity from the waves.

There are many systems which propose to harness the energy of the waves and hundreds of patents have been taken out. The simplest system consists in letting the energy of the wave be released as an uprush of water on a steep ramp

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18a [Note to be provided.]

that falls into a reservoir. The scheme can be improved upon by concentrating the waves into a narrow ramp.

Besides devices discussed in a prior paper, recent developments include the Japanese Kaimei platform which, though it has encountered some problems, provides the power for a Japanese community at 5 km distance.

Cockerell rafts have been disregarded because they are too expensive. But actual implementation of a pilot facility is due the Scandinavians who placed into service a wave-powered electrical central three years ago. Norwegian researchers devised a system that focuses the waves and concentrates them on a rather narrow ramp and reservoir. This results in wave height increase.19

TIDES

The ancient Greeks had already attempted to take advantage of the Euripus Channel tides. Near Chalcis water mills put currents to use, and near Agostoli, on Cephalonia, mills got their energy from tides. Tide mills were in use in England and Wales, on the Danube and in Russia, on Long Island (New York) and in New England. Bernard Forest de Bélidor published a treatise on "tidal power" in the mid-18th century. A flurry of proposals were made after World War I and at least two plants were started: one in Brittany (1928), another in the United States (1935).20 Modern tidal power plants have been built in France (1966), the Soviet Union (1969), and the People's Republic of China. China apparently was the first country to build a plant, in 1959, using an existing earthen dam. According to scant information, at least 104 such plants would have been built in China, all small and with not too sophisticated technology; some plants would be out of commission because

19Budal, K., and Faines, J., 1981. Wave Power Conversion by Point Absorbers: A Norwegian Project. Trondheim, Norway: Inst. of Technol. Div. of Exper. Physics.
20Charlier, R. H., 1982. Tidal Energy. New York: Van Nostrand-Rheinhold.

of sediments deposition. Canada placed in service in 1984 a small pilot plant.

Several variations of the basic concepts exist. The incoming tide is, or is not, forced to pass through a barrage containing turbines. In all cases beyond the barrage a retaining pond holds the water until the tide goes out and then the water runs the turbines. Closest to realization is a new tidal power plant in the Canadian Bay of Fundy which has a production exceeding 1700 million kWh. A small plant has also been built by native Americans in Maine.

BIOMASS

An experimental kelp farm was built off San Clemente Island (California) five years ago. It was to provide the biomass to be used for substitute natural gas production. The experiment is being continued near Corona Del Mar, California. Because large expanses of ocean are needed, it is possible that bioconversion plants will be limited to regional, and thus smaller, facilities. Bulgaria apparently has conducted some experiments with biomass conversion in the Black Sea.

TOURISM

Tourism and recreation, today a natural part of the way of living, is a development that is not even a century old, at least for the non-wealthy. Social progress and paid holidays first, later the lowering of the cost of public and private transportation, made the maritime domain accessible to the largest segments of population. It is not the place here to digress over the depredations made by holidaygoers in the land part of the coastal zone or their impact on the quality of water in that area. Tourism and recreational activities are rather incompatible with nearby industrial development; though often seasonal, they nevertheless require the preservation of the area's aesthetic character,

are handicapped by pollution of whatever sort, and are often unaesthetic themselves if not a source of pollution. The employment they generate must be weighed against that provided by industry, transportation, and fisheries. Fortunately tourism is becoming an active agent of scientific protection of the environment, making paradox father to reason.

CONCLUSION

A renewed interest in ocean mining, going well beyond extraction of hydrocarbons and the old salt recuperation activity, has recently manifested itself. Various countries, notably Great Britain, Japan, West Germany and the USSR, have already taken steps to secure a share of the developing markets. Marine mining will expand its range of products and its geographical sphere by necessity as well as by choice. In its search for alternate, non-controversial energy sources, it is probable that industry will tap the huge ocean potential. In their quest for better living and recreational sites, people will increasingly turn to the ocean. For the United States alone, it is estimated that by the year 2000 the economic value of marine recreation will have at least doubled since 1972, and that of the ocean mineral resources will be six times what it was.

This growth, however, will [entail] environmental consequences of considerable magnitude. Most of them have hardly been assessed while the new economic benefits are already gingerly touted. The impact will not only affect the ocean itself and its denizens, but will be felt on land as well, and particularly in the coastal zone. Here additionally, use-conflicts have already emerged which become steadily acuter. The economic historians who will assess the 1990-2015 quarter of a century will undoubtedly face a scene that will have undergone far greater changes than their colleagues studying the period 1800-1990. Whether the picture they will paint will be a pleasant one

will depend a great deal on the education and information of the current actors, and on the effectiveness of communication among experts of all fields involved.