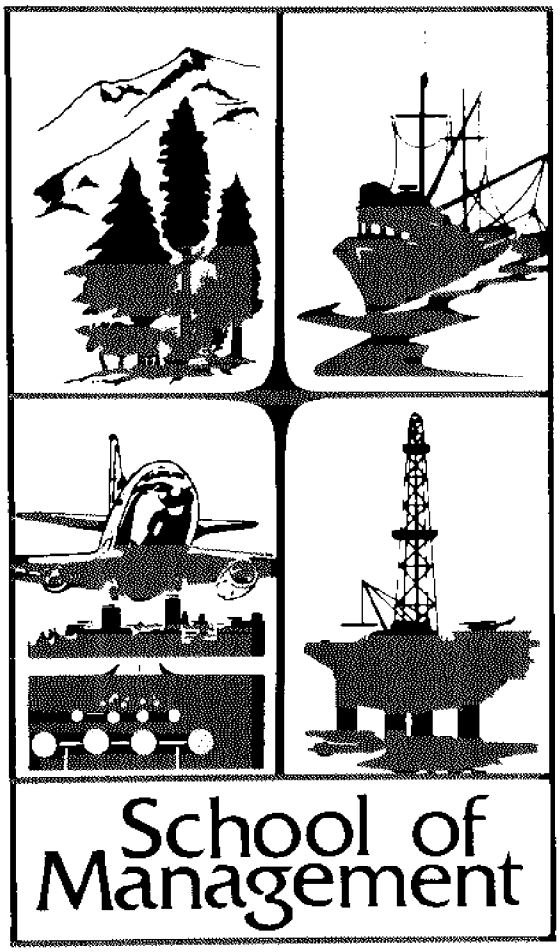

Alaska Sea Grant Program
University of Alaska
Fairbanks, Alaska

United States Market Demand and Japanese Marketing Channels for Tanner Crab

Abby H. Gorham
Franklin L. Orth

Sea Grant Report *78-12*
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UNITED STATES MARKET DEMAND AND JAPANESE MARKETING CHANNELS FOR TANNER CRAB

by:

Dr. Abby H. Gorham
and
Dr. Franklin L. Orth

Alaska Sea Grant Program
University of Alaska
Fairbanks, Alaska 99701

Sea Grant Report 78-12

Abstract

This report responds in part to the needs of management officials for basic economic information on the Alaska Tanner crab industry and its interrelationship with the Tanner crab industry of Japan.

The report contains three major sections. The first two sections, written by Frank Orth, describe the marketing channels for Tanner crab in Japan and Japanese investment in the U.S. (Alaska) shore-based processing industry. Implications of these marketing channels as they relate to the foreign-ownership information are discussed.

The third section formulates a general model, describing the domestic market demand relations for Tanner crab. The model was developed by Abby Gorham.

Information on domestic (U.S.) marketing channels will appear in another Alaska Sea Grant Report to be issued in the fall of 1978. Statistics on Japanese crab fisheries have been compiled by Clinton E. Atkinson. A copy of that table of contents appears in this report as a cross reference in the appendix. These three reports provide a comprehensive view of the Tanner crab industry, both in Japan and the United States.

ACKNOWLEDGEMENTS

There is a long list of people to thank for their contributions and support during this project.

Special thanks are due to Clinton Atkinson for his invaluable and untiring assistance during the trip to Japan. His expertise in translating, scheduling meetings, and his knowledge of Japan, made the trip both productive and memorable. The success of the trip to Japan is also attributable to the efforts of James Johnson, Fisheries Attaché for the American Embassy, and Yoshio Nasaka of the same office. Gratitude is also expressed to the following private firms and agencies in Japan whose frankness and courtesy were most appreciated:

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Nichiro Fisheries Co., Ltd.
Nippon Reizo Kabushiki Co.
Nippon Suisan Co., Ltd.
Osaka Uoichiba & Co., Ltd.
Taiyo Fishery Co., Ltd.

The information contained in table 5 (pages 16 through 20) was supplied to the authors by Clinton Atkinson. His sources are cited in the table.

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I. Marketing Channels for Tanner Crab in Japan

Frozen Sections

The Japanese Tanner crab distribution system in extremely complex. And, although the channels through which the product passed in the 1975-1977 period are reported to be stable, one gets the impression of great potential flexibility in the distribution system. Thus, if the underlying forces that have determined recent past channeling of product were to change, the channels themselves would adjust with little difficulty from an aggregate or societal point of view.

Outstanding features of the Tanner crab supply system are as follows (see table 1): 1) In 1976, Japan was supplied primarily from the Bering Sea (46 percent) and imports (32 percent). Coastal production was less than one-fourth of total supply. 2) Most Tanner crab is supplied by fishing companies. 3) Fishing companies carry out trading company activities through import-export offices; furthermore, these activities provided the second-most important source of supply for fishing companies and the Japanese market generally. 4) Trading companies are not important suppliers of Tanner crab products -- in 1976 trading companies provided only 3.2 percent of the Japanese supply. 5) Although data are incomplete, the Japanese appear to consume most of their Tanner crab at home from products acquired at small fish shops (approximately 28 percent), and supermarkets and consumer cooperatives (approximately 18 percent). They also consume a significant portion of their fresh/frozen Tanner crab products at restaurants (approximately 30 percent). One significant domestic supplier, Dogyoren, the Hokkaido Fisheries Co-op, refused to reveal product distribution information. Thus, the above estimates are reasonable only to the extent that Dogyoren supplies final consumption outlets in roughly the same proportion as the market generally.

Another outstanding feature of Japanese marketing channels is the recirculating (reselling) of product that takes place before the product reaches the consumer. The same crab can pass through consumption-area markets one or more times as shown in the flow diagram on this page:

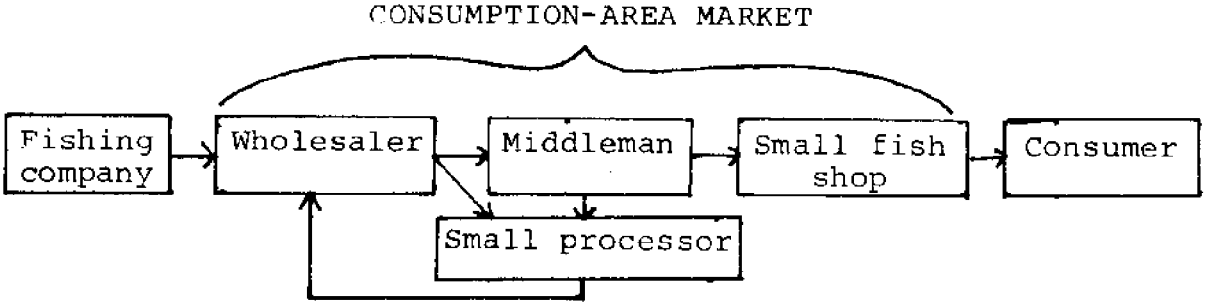

TABLE 1
JAPAN TANNER CRAB SECTION MARKET
1976 SUPPLIES BY SOURCE AREA AND TYPE OF SUPPLIER[1]

TYPE OF SUPPLIER	SOURCE AREA: BERING SEA	JAPAN[2]	IMPORTS	TOTAL	
Fishing Co.	4,050 (45.6)	1,960 (22.0)	2,881 (32.4)	8,891 (100.0)	(69.7)
Trading Co.	-0-	-0-	410 (100.0)	410 (100.0)	(3.2)
Other[3]	-0-	2,200 (63.8)	1,250 (36.2)	3,450 (100.0)	(27.1)
Total	4,050 (31.8)	4,160 (32.6)	4,541 (35.6)	12,751 (100.0)	(100.0)

[1]In metric tons of finished product clusters. Individual items may not sum exactly to totals due to rounding. Items in parentheses below entries are percent of row totals; those to the right of "total" column are percent of that column's total.

[2]Japan includes Western Bering Sea (Olyutorskii and Navarin) and East Sakhalin; excludes Japan Sea, estimates of which range from 1,500-10,000 metric tons, round weight. The latter are sold mostly as fresh boiled whole crab.

[3]Other includes Dogyoren (Hokkaido Fisheries Cooperative) and Nippon Reizo, the largest independent domestic distributor of Tanner crab. Much of the latter's reported sales were excluded to avoid double counting with sales reported by primary suppliers.

Reselling is usually associated with reprocessing or repackaging operations. This characteristic of the market means that tracing marketing channels beyond the wholesaler-distributor level in quantitative terms is very tenuous, particularly since the primary source of data was large fishing and trading companies who have limited ability to trace the product beyond the point of sale (to the wholesaler-distributor level). In fact, each company was careful to point out that estimates of market distribution patterns beyond their point of sale were only educated guesses. These were sufficiently consistent, however, to warrant their use.

Primary suppliers sell to the market in individual shrink-wrapped clusters (50 to 60 percent). The latter are generally reprocessed by the fishing company or by small processors after sale in consumption-area markets. Most Tanner crab sections, roughly 70 percent, are sold through the consumption-area markets (see table 2). These markets have licensed wholesalers, middlemen, and retailers. Most sales by wholesalers are made through this market to middlemen, approximately 80 percent, although one or more rounds of sale and repurchase through small processors is common (see table 3). Roughly 46 percent of sales are made to retailers. These include licensed consumption-area market retailers, small independent fish shops and small restaurants (these are not shown separately in table 3). When sales by middlemen to supermarket-co-ops and institutions are included, it is estimated that middlemen in consumption-area markets service more than one half (roughly 57 percent) of the volume of sales of frozen Tanner crab to final retailers (see table 3).

Figure 1 depicts, in general terms, the flow of the product through the major marketing channels in Japan.[1] To facilitate use, it was decided not to depict relative quantitative flows through the marketing chain. This information is provided in table 3. It is stated to the degree of detail allowed by data availability and confidentiality requirements of individual companies.

Canned

The information presented in this section is in much less quantitative detail due to the difficulty of obtaining precise figures from Japanese companies. However, the marketing channels shown and discussed appear to be generally representative of those for canned Tanner crab products.

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[1]The author is indebted to Yuzuru Nakabe, Taiyo Gyogyo, for these descriptions. The latter were confirmed by the other companies as shown by the estimates in table 3.

FIGURE 1

JAPANESE FROZEN TANNER CRAB SECTIONS MARKETING CHANNELS

Figure 1a. IMPORTED & FACTORYSHIP PRODUCTS

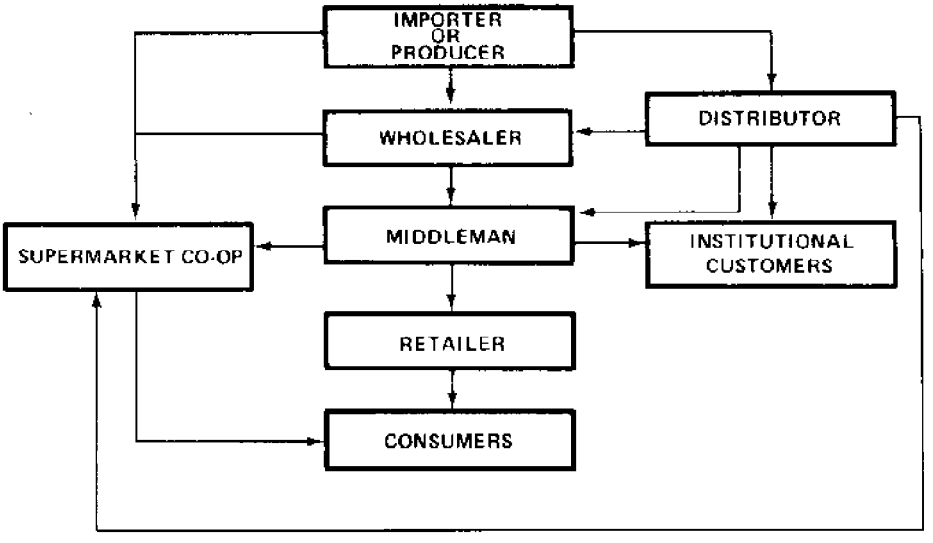


Figure 1b. COASTAL CATCH (OKHOTSK)

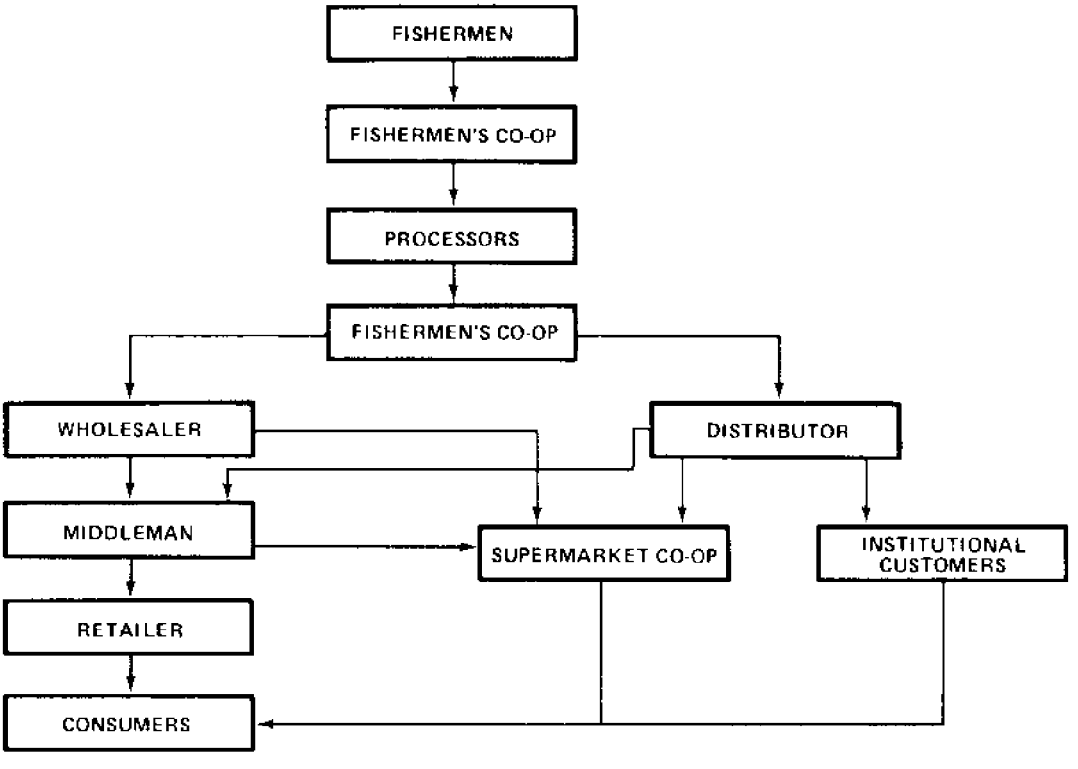


TABLE 2
JAPAN TANNER CRAB SECTION MARKET
1976 DISTRIBUTION BY PRIMARY SUPPLIERS[1]

TYPE OF PRIMARY SUPPLIER	TYPE OF BUYER				
	WHOLESALER[2]	SUPERMARKET/ CO-OPS	INDEPENDENT DISTRIBUTORS	NOT REPORTED	TOTAL
Fishing Cos.	8,602	139	150	-0-	8,891
	(96.7)	(1.6)	(1.7)		(100.0)
Trading Cos.	153	-0-	175	82	410
	(37.3)		(42.7)	(20.0)	(100.0)
Other	255	-0-	245	2,950	3,450
	(7.4)		(7.1)	(84.5)	(100.0)
Total	9,010	139	570	3,032	12,751
	(70.7)	(1.1)	(4.5)	(23.8)	(100.0)

[1]In metric tons. Individual items may not sum exactly to totals due to rounding. Items in parentheses below entries are percent of row totals.

[2]Wholesalers are distributors licensed to sell through consumption-area markets. See Table 3 for further distribution by wholesalers and independent distributors.

TABLE 3
JAPAN TANNER CRAB SECTION MARKET
ESTIMATED 1976 DISTRIBUTION BY TYPE OF SUPPLIER AND BY TYPE OF FINAL CONSUMER[1]

TYPE OF SUPPLIER	TYPE OF BUYER						NOT REPORTED	TOTAL
	WHOLESALERS[2]	MIDDLEMEN[2]	DISTRIBUTORS	CO-OPS	INSTITUTIONS[3]	RETAILERS		
Primary suppliers	9,010 (70.7)	-0-	570 (4.5)	139 (1.1)	-0-	-0-	3,032 (23.8)	12,751 (100.0)
Secondary suppliers wholesalers	--	7,230 (80.2)	425 (4.7)	728 (8.1)	475 (5.3)	-0-	152 (1.7)	9,010 (100.0)
Middlemen		--	-0-	1,150 (15.9)	2,730 (37.8)	3,352 (46.4)	-0-	7,230 (100.0)
Independent distributors			--	241 (24.2)	511 (51.4)	168 (16.9)	75 (7.5)	995 (100.0)
Total by Type of Final Consumer				2,258 (17.7)	3,716 (29.1)	3,520 (27.6)	3,259 (25.6)	12,751 (100.0)

[1] In metric tons. Individual items may not sum exactly to totals due to rounding. Items in parentheses below entries are percent of row totals.

[2] Wholesalers and middlemen are licensed to sell through consumption-area markets.

[3] Institutions are primarily restaurant and hotel chains and independent restaurants and hotels.

Figure 2 shows the distribution system for canned Tanner crab in Japan. Exports of this product are required to be made through the Japan Joint Sales Company (controls exports of canned tuna, salmon, crab, and mandarin oranges). Based on very limited observation, the percent of the total supply of canned product going to export varies by year according to relative prices and total supply (the percent exported increasing as supply falls).

The domestic market is much less complex than is that for frozen sections. Consumers acquire canned Tanner (and king) crab primarily through supermarkets and department stores. These retailers are supplied primarily through large national or regional wholesale distributors, some of whom even market their own brand. Large wholesale distributors are supplied in turn by fishing companies, trading companies and co-ops (through Dogyoren). At least one large fishing company negotiated directly with these large retailers for the sale of most of its canned product, but the sale is still treated as though made by the wholesaler.

Hotels, restaurants, and retail food and liquor stores provide the remaining consumer outlets for canned Tanner crab. They are supplied by local wholesalers who acquire their merchandise from the large wholesale distributors. Hotels and restaurants are relatively unimportant suppliers of canned product to consumers, as would be expected. Apparently Chinese restaurants, which are very popular in Japan, use some however.

II. Japanese Investment in Alaska Seafood Processing

One of the prerequisites to economic development is mobility of capital. The fishing industry is no exception. Viewed from this perspective, Japanese investment in Alaska fisheries has been a healthy, if not essential, ingredient. However, there are market power implications associated with foreign ownerships that have probably made it the most controversial area of domestic fisheries policy toward foreign countries.

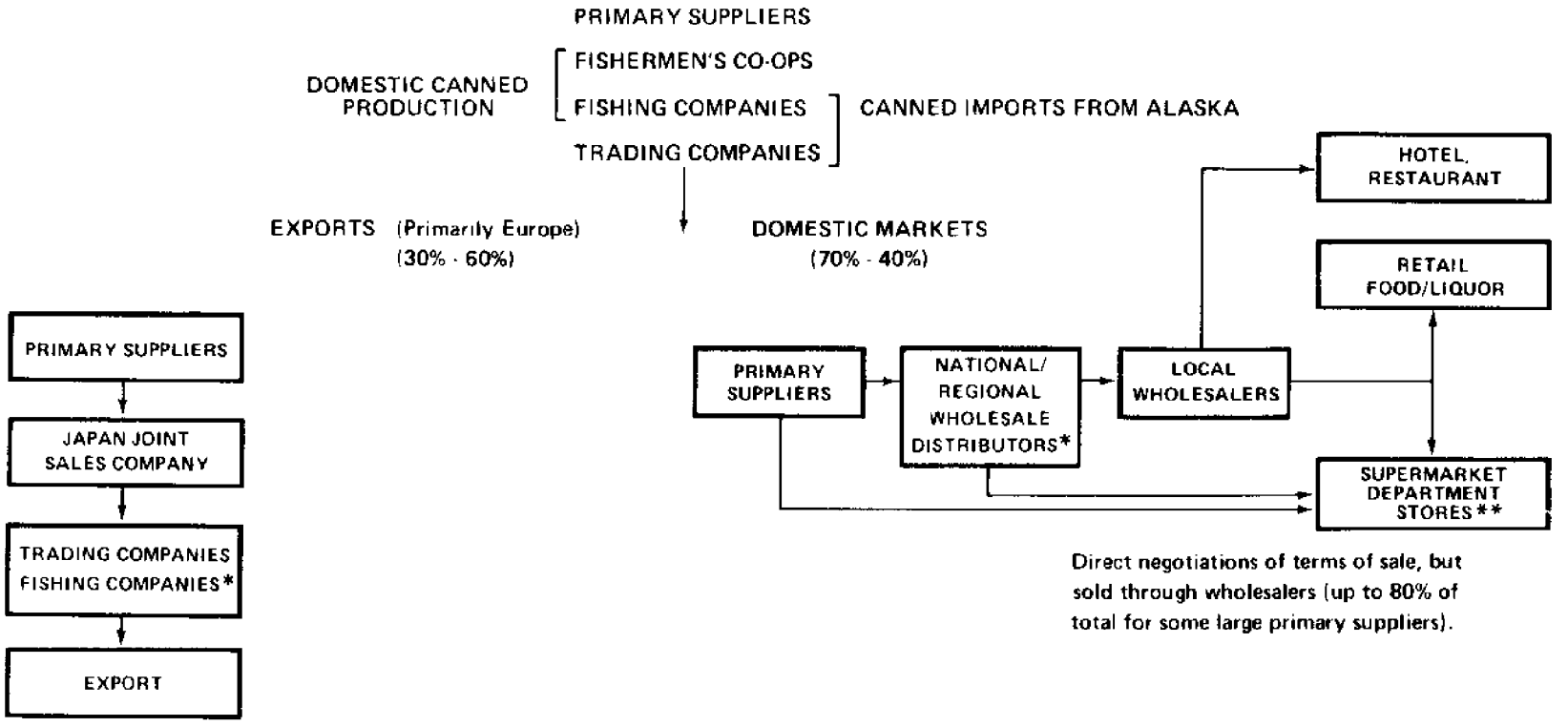
The potential for enhanced market power from foreign investment derives from three situations:

1) Explicit concentration in the domestic seafood processing industry is already high in some areas of the state. Ownership interties among domestic firms increases actual concentration to much higher levels. Add investments

FIGURE 2

JAPANESE CANNED TANNER CRAB MARKETING CHANNELS

(Roughly 650 M.T. drained weight in 1976, or 200,000 cases @ 25 cans per case/135 gr per can)



Direct negotiations of terms of sale, but sold through wholesalers (up to 80% of total for some large primary suppliers).

*Through foreign trade departments

*Some large wholesale distributors have own brand

** Most canned Tanner crab sold through supermarkets and department stores

by a large Japanese fishing or trading company in several Alaska companies, and the potential for market power is further enhanced. This fact has not been lost on the Alaska fisherman.

2) The Japanese seafood industry is highly concentrated. This implies that vertical integration into Alaska, once initiated, became part of the competitive strategies of Japanese companies. It further implies that the behavioral patterns associated with the concentrated structure of the Japanese industry would be transmitted in part to the Alaska seafood industry.

3) Japan represents a significant market for several important Alaska seafood products. The powerful bargaining power bestowed upon Japanese companies as buyers by the concentrated Japanese market was enhanced by the added leverage of ownership in domestic companies; the latter being less free to compete independently for product to serve alternate market channels.

There is another side to this question which has received far less attention.

1) Japanese ownership has resulted in the injection of financial and technological innovation into the Alaska industry. This has resulted in both a larger capacity to compete for product and increased employment. The increased competition for product has raised exvessel prices.

2) Accompanying investment in Alaska companies has been the opening of new markets. Thus it could be argued, for example, that although the market power of Japanese companies kept Tanner crab prices lower than Alaska fishermen thought equitable (in view of prices to Japanese fishermen, retail market prices in Japan, etc.), such investment at least created opportunities to fish at a profit where none existed before. It was, of course, this differential in raw product prices that created the incentive to invest in the first place.

There is no "right" side to the above arguments. Which set of forces have been the most pervasive has differed by fishery, location, and time.

The following table shows Japanese investment as of November, 1977. Two sources of irritation which have faced users of such information in the past have been that it remains current for only a very short period of time, and it is always possible to find another set of figures that are different. The figures shown in table 4 are the most current available but they do not solve these problems totally. They were obtained directly from Japanese companies and are

TABLE 4
REPORTED JAPANESE INVESTMENT IN ALASKA, NOVEMBER, 1977

COMPANY	INVESTMENT	LOCATION	%	OTHER INVESTORS	%
Taiyo Gyogyo K.K. (Fishing Co.)	Taiyo American, Inc.	New York	100		
	Western Alaska Enterprises, Co.[1]	Seattle	100	(91% Taiyo Gyogyo and Taiyo American 9%)	
	B & B Fisheries, Inc.	Kodiak	100	(100% Western Alaska Enterprises)	
Kyokuyo Co., Ltd.	Kyokuyo, U.S.A.[2] Inc.	Seattle	100		
	Whitney Fidalgo[3]	Seattle, Alaska	99		
	Mokuhana Fisheries	M/V Mokuhana	25 (Whitney-Fidalgo)	Individual	75
	Nefco-Fidalgo Packing Co.	Ketchikan Cannery	50 (Whitney-Fidalgo)	NEFCO	50
	Atlas Fish Products, Inc.	Seattle	100	(Whitney-Fidalgo)[4]	

[1]Engaged in import-export of fishery products.

[2]Engaged in import and export of fishery products.

[3]Plants located in Seattle (H.Q.), Anacortes, Anchorage (2), Cordova, Kodiak, Dutch Harbor, Homer, Ketchikan, Naknek, Petersburg, Port Graham, Unalaska, Uyak Bay, and Whittier.

[4]Bait salmon egg production -- eggs supplied by Whitney Fidalgo.

TABLE 4, Continued

COMPANY	INVESTMENT	LOCATION	%	OTHER INVESTORS	%
	Emerald Fisheries, Inc.		50		
	Whitney International				
Nichiro Gyo-gyo, Ltd. (Fishing Co.)	Orca Pacific Packing Co.	Cordova	30[5]	Mitsubishi NEFCO	20 50
	Sand Point Packing Co.[6]	M/V Smokwa	30	Mitsubishi NEFCO	20 50
	Hilton Seafoods Co.		40	Mitsubishi NEFCO	10 50
	Adak Aleutian Processors	Adak	30[7]	Hawaiian Fish Co. Individual Alaska Food of Tokyo	20 30 20
	Nichiro Pacific, Ltd.[8]	Seattle	100		
Nippon Suisan (Fishing Co.)	Universal Seafoods, Ltd.	M/V Unisea (Dutch Harbor)	47	Two individuals[9,10,12] Individual	47 6

[5]22% Nichiro, 8% Nichiro Pacific.

[6]Merged into Orca Pacific Packing Co; first moved floater from Sand Point to Cordova, then sold, 1975.

[7]Sold to Whitney-Fidalgo in September, 1977, crab production only; did not retain identity.

[8]A wholly owned subsidiary engaged in import-export of fishery products.

[9]Associated with Vita Seafoods.

[10]Associated with Intersea Fisheries, Ltd., New York.

TABLE 4, Continued

COMPANY	INVESTMENT	LOCATION	%	OTHER INVESTORS	%
	Dutch Harbor Seafoods, Ltd.	M/V Galaxy (Dutch Harbor)	25	Two individuals[9,10,11] Two individuals[10,11] and one individual[12] Investing group	20 30 (ten each) 25
	Intersea Fisheries, Ltd.	New York	30	Individual[11,12] Two individuals[9,11,12] Individual[11,12]	21.67 44 5
	Morpac, Inc.	Cordova	46	Mitsui Individual	46 8
	Nippon Suisan, U.S.A.[13]	Seattle	100		
Marubeni K.K. (Trading Co.)	Marubeni Alaska Seafoods, Inc.	Juneau	100	Subsidiary for NEFCO J/V Egegik	
	North Pacific Processors[14]	Seattle[15]	50	Individual	50
	Kodiak King Crab[14]	Kodiak	49.9	Wash. Fish & Oyster	50.1[16]

[11]Associated with Universal Seafoods

[12]Associated with Dutch Harbor Seafoods

[13]Engaged in import-export

[14]About 1/3 of Marubeni Tanner crab supplied through these sources.

[15]Plants in Kodiak, Cordova, and Seattle.

[16]As reported in other sources, 8.4 percent of this figure is owned by Ocean Beauty Seafoods, Inc., a company wholly owned by American interests.

TABLE 4, Continued

COMPANY	INVESTMENT	LOCATION	%	OTHER INVESTORS	%
	Juneau Cold Storage	Juneau	Division of Kodiak King Crab (thus 49%)		
	Wards Cove Packing[17] Co.	Ketchikan Bristol Bay	10[16]		
	Alaska Pacific Seafoods	Kodiak	(Subsidiary of North Pacific Processors, thus 50%)		
	Kodiak Fishing Co.[18]	Kodiak	25	Washington Fish & Oyster	75
	Bering Sea Fisheries	M/V Bering Sea	24	Individual	76
	Togiak Fisheries, Inc.	Bristol Bay	100[19]		
	Cordova Bay Fisheries[20]	Cordova	(Subsidiary of Kodiak King Crab, thus 49%)		
Mitsubishi Shoji K.K. (Trading Co.)	Orca Pacific Packing Co.	Cordova	20	Nichiro Gyogyo, Ltd. NEFCO	30 50
	Sand Point Packing[21]	M/V Smokwa	20	Nichiro Gyogyo, Ltd. NEFCO	30 50
	Hilton Seafoods Co.		10	Nichiro Gyogyo, Ltd. NEFCO	40 50

[17]Main purpose of investment is to secure salmon roe production.

[18]Fishing and tender boat operation.

[19]Reported in other sources that Marubeni percentage ownership is 49.9 percent.

[20]In Southeast Alaska, near Hydaburg, Alaska.

[21]Merged into Orca Pacific Packing Co.

TABLE 4, Continued

COMPANY	INVESTMENT	LOCATION	%	OTHER INVESTORS	%
Mitsui Bussan K.K. (Trading Co.) Co.)	Morpac	Cordova	46	Nippon Suisan Morgan	46 8
Itoh Chu Shoji K.K. (Trading Co.) or C. Itoh	New Northern Processors	Kodiak Dutch Harbor	50	(Sold interest in 1977)	

SOURCE: Interviews with Japanese companies, or as noted.

only as representative of the actual investment situation as the process of collection allowed. However, the timing of the survey coincided with the Council's deliberations on foreign allocations of Tanner crab, and the companies appeared to be going out of their way to be cooperative. In several cases where a Japanese company could not be interviewed, information was included from other sources, which are noted.

In addition to the question of ownership interties between Japanese and Alaskan companies, there remains the question of interties among Japanese companies themselves. To gain insight into this area, Clinton Atkinson was requested to review pertinent government statistics and the annual reports of major Japanese companies. Table 5 shows the resultant information. The overriding impression from these statistics is that ownership interties do exist but they appear to represent financial rather than primary or controlling type investments. The implication is that management participation at the level of detail necessary to overtly or tacitly collude would be nonexistent or minimal.

III. Market Demand Relations for Tanner Crab

This section will present a fifteen-equation model describing the important determinants of the domestic market demand for Tanner crab. Only two of the fifteen relations could actually be specified and estimated. The other thirteen suffer from a severe lack of data. Not only are they deficient in basic time series data with which to estimate the relationships once they are established, but the relationships themselves could only be guessed at because of the domestic industry's delays in complying with questionnaire requests. With these deficiencies recognized, the model is nonetheless presented and discussed so that management officials can gain a feel for the informational needs involved in economic modeling.

Retail Demand

Retail demand is generally formulated as a function of the prices of substitute goods and consumer income. In the general case of retail fish product demand, beef, pork, and poultry are considered alternative animal protein sources and thus included as explanatory variables. In the case of Tanner crab, where its price ($9.50 for a five-pound block of legs, New York price) places it in the luxury good category, the inclusion of beef, pork, and poultry as substitute goods become a tenuous hypothesis except perhaps in the case of certain prime cuts of beef. Retail demand for Tanner crab

TABLE 5
MAJOR OWNERS OF THE LEADING JAPANESE FISHING AND TRADING COMPANIES (NOVEMBER 1977)

Name of Shareholder	Type of Company	Percent Shares Owned									
		Fishing Companies					Trading Companies				
		Taiyo Gyogyo	Nippon Suisan	Nichiro Gyogyo	Kyoku-yo	Hokoku Suisan	Maru-beni	Mitsui	Mitsu-bishi	C. Itoh	Itoh-man
Asahi Kasai Kogyo KK	Chemicals										2.29
Asahi Seimei Hoken Sogo Kaisha	Life Insurance	2.33								3.71	
Dai-ichi Kangyo Ginko	Bank		3.22						2.45	8.68	2.50
Dai-ichi Seimei Hoken Sogo Kaisha	Life Insurance		2.80				3.00				
Daitatsu Kogyo KK	Manufac-turing					0.50					
Daito Tsusho KK	Trading	8.84									
Daiwa Ginko	Bank				7.54						
Daiwa Shoken KK	Securities		2.96								
Fuji Ginko	Bank		2.22				7.26	4.96		3.25	
Hayakane Sangyo KK	Industrial	4.84									
Hayakane Zosen	Shipyard	3.40									
Hikasekune Ichiro	Individual					0.40					
Hitachi Zosen	Shipyard				3.37						
Hokkaido Takushoku	Bank			3.77							
Itoh Hiroshi	Individual										1.77

TABLE 5, Continued

Name of Shareholder	Type of Company	Percent Shares Owned								
		Fishing Companies					Trading Companies			
		Taiyo Gyogyo	Nippon Suisan	Nichiro Gyogyo	Kyoku-yo	Hokoku Suisan	Maru-beni	Mitsui	Mitsu-bishi	C. Itoh	Itoh-man
Iwatani Kagaku Kogyo KK	Chemicals					1.75					
Iwatani Naoji	Individual					2.50					
Marubeni	Trading				5.27						
Meiji Seimei Hoken Sogo Kaisha	Life Insurance			3.37					4.49		
Mitsubishi Denki	Electric Industry								1.96		
Mitsubishi Ginko	Bank								7.61		
Mitsubishi Jukogyo	Heavy Industry								5.20		
Mitsubishi Shintaku Ginko	Bank	2.00	2.00	2.74					3.78		
Mitsubishi Shoji KK	Trading		2.53								
Mitsui Bussan Jugyoin Shintaku	Employee's Mutual							1.78			
Mitsui Ginko	Bank							6.29			
Mitsui Seimei Hoken Sogo Kaisha	Life Insurance							3.30			
Mitsui Shintoku Ginko	Bank		1.89		3.17			2.79			
Nakabe Kenkichi	Individual	3.46									
Nakabe	Individual	2.40									

TABLE 5, Continued

Name of Shareholder	Type of Company	Percent Shares Owned									
		Fishing Companies					Trading Companies				
		Taiyo Gyogyo	Nippon Suisan	Nichiro Gyogyo	Kyoku-yo	Hokoku Suisan	Maru-beni	Mitsui	Mitsu-bishi	C. Itoh	Itoh-man
Nakamura	Individual					0.39					
Nippon Choki Shinyo	Financial			1.70	4.21						
Nippon Chozen Kinyu KK	Bank			2.79							
Nippon Kasai Kaijo Hoken KK	Fire/Marine Insurance						2.82			3.18	
Nippon Kogyo Ginko	Bank	2.00	4.00	1.89							
Nippon Seimei Hoken Sogo Kaisha	Life Insurance	2.38	3.15	4.07			2.71	1.64		3.96	
Nippon Suisan KK	Fisheries					73.32					
Nippon Yusen KK	Steamship Company								2.37		
Nisho Boseki KK	Textiles										3.14
Nissan Jidosha	Automobiles						4.41				
Nissan Kasai Kaijo Hoken KK	Fire/Marine Insurance		6.00								
Osaka Shosen Mitsui Senpaku	Steamship Company							1.38			
Osakaya Shoken KK	Securities					0.29					

TABLE 5, Continued

Name of Shareholder	Type of Company	Percent Shares Owned: Fishing Companies: Taiyo Gyogyo	Nippon Suisan	Nichiro Gyogyo	Kyoku-yo	Hokoku Suisan	Trading Companies: Maru-beni	Mitsui	Mitsu-bishi	C. Itoh	Itoh-man
Sanko Kisen KK	Steamship Company									2.54	
Sanwa Ginko	Bank		2.22						1.46		
Shin Nippon Seitetsu KK	Iron	1.60									
Sumitomo Ginko	Bank						3.19	1.18		8.68	6.37
Sumitomo Kaijo Kasai Hoken KK	Marine/Fire Insurance				2.83					2.97	
Sumitomo Seimei Hoken Sogo KK	Life Insurance					0.30					4.54
Taisho Kaijo Kasai Hoken KK	Marine/Fire Insurance				2.83			3.42			8.96
Taiyo Kobe Ginko	Bank						4.44				1.75
Teikoku Sangyo KK	Industrial					1.00					
Teinin (?) KK											3.54
Tokyo Ginko	Bank							3.72	2.69	4.64	
Tokyo Kaijo Kasai Hokken KK			2.54	5.64			3.58		7.06	3.49	
Tonen "Tanka" KK	Tanker Company					0.75					
Toshoku KK	Trading Company				2.74						

TABLE 5, Continued

Name of Shareholder	Type of Company	Percent Shares Owned: Fishing Companies: Taiyo Gyogyo	Nippon Suisan	Nichiro Gyogyo	Kyoku-yo	Hokoku Suisan	Trading Companies: Maru-beni	Mitsui	Mitsu-bishi	C. Itoh	Itoh-man
Toyo Seikan KK	Canning Company	1.60		2.44	2.87						
Yamaguchi Ginko KK	Bank	2.00									
Yasuda Kasai Kaijo Hoken KK	Fire/Marine Insurance						5.39				
Yasuda Shintaku Ginko KK	Bank						2.65				
"Yunichka" (Unique) KK											1.94
Total percent shares owned by ten leading investors in each company		34.85	31.00	30.20	37.57	81.20	39.45	30.46	39.07	45.10	37.43

Source: (Publications) Suisan Nenkan: Showa 51 (1976); Kaisha Recod (1976 - 1977); Yuka Shoken Hokoku Shorsoran (1976 - 1977).

is more likely a function of product prices of its own alternative product forms[2] (at least between the frozen meat and frozen section product forms) and the retail prices of king and dungeness crab.

A rough indication of final buyer breakdown is given in the Snow Crab Market Survey California Region. The table is reproduced here for reference (see table 6). In the Southern California Region, 67.6 percent of frozen section sales go to retail outlets and 36.2 percent of frozen meat sales go to restaurant buyers. It is unclear from the market breakdown categories used how much institutional trade, if any, is involved in either of these product forms. A large institutional trade would indicate use of wholesale prices as a more appropriate explanatory variable. Further, given the large restaurant trade in frozen meat, it must be assumed that the relative restaurant prices of frozen meat and sections of Tanner crab and those of king and dungeness crab are comparable to the retail price ratios. This assumption will eliminate dealing with problems of discrepancies between retaurant and retail price trends due to divergent increases in the cost of restaurant service.

The retail demand equations follow:

1. $RDFM = f_1 (RPFM\ RPK\ RPFS\ RPFDM\ Y\ D_1)$

2. $RDFS = f_2 (RPFS\ RPFM\ RPK\ RPFDS\ Y\ D_1)$

3. $RDCC = f_3 (RPCC\ RPCK\ Y\ D_1)$

Table 7 contains the complete definition of all variables in the model as well as the sources of data where available.

Retail Price Determination

The formulation of the retail price relations rely on a NOAA report by Edwin Penn in which he observes that retail prices for finfish and shellfish exhibit a stability absent in wholesale and exvessel prices. He believes this stability arises from the pricing practices of retail stores, those practices reflecting the real costs of frequent price changes. Retail prices then, reflect the longer term price trends of wholesale and exvessel prices in some time-lagged manner but avoid the frequent oscillations common in wholesale and exvessel price series. Until primary data on retail prices of Tanner crab become available, this hypothesis will have to be accepted on faith, and the retail price relations will be formulated tentatively as follows recognizing some type of distributed lag specification would be appropriate.

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[2]Colinearity problems in estimation may occur here.

TABLE 6

PERCENT OF DISTRIBUTION OF FROZEN SNOW CRAB
CATEGORIZED BY TYPE OF MARKET AND PRODUCT FORM
1975 and 1976

(Southern California)

	1975	1976
Restaurants	0.3	2.0
Retail outlets	88.4	67.6
Intermediate distributors	11.3	30.4
Total	100.0	100.0
Restaurants	11.6	36.2
Retail outlets	9.5	8.1
Intermediate distributors	78.9	55.7
Total	100.0	100.0

Source: University of Alaska, Alaska Sea Grant Program The Bering Sea Tanner Crab Resource: U.S. Production Capacity and Marketing, May 1977, Sea Grant Report No. 77-5.

TABLE 7
DEFINITION OF VARIABLES TANNER CRAB MARKET DEMAND MODEL

VARIABLE	DEFINITION	SOURCE
RDFM	Monthly per capita consumption of frozen tanner crab meat	Unavailable
RDFS	Monthly per capita consumption of frozen tanner crab sections	Unavailable
RDCC	Monthly per capita consumption of canned tanner crab	Unavailable
RPFM	Monthly weighted average retail price for frozen tanner crab meat	Unavailable
RPFS	Monthly weighted average retail price for frozen tanner crab meat	Unavailable
RPCC	Monthly weighted average retail price for canned tanner crab	Unavailable
RPK	Monthly weighted average retail price of king crab, frozen sections and frozen meat combined	Unavailable
RPFDM	Monthly weighted average retail price of frozen dungeness crab meat	Unavailable
RPFDS	Monthly weighted average retail price of frozen dungeness sections	Unavailable
Y	Average weekly earnings per worker, private non-farm	Survey of Current Business -- U.S. Dept. of Commerce/Bureau of Economic Analysis
RPCK	Monthly weighted average retail price of canned king crab	Unavailable
WPFM	Monthly weighted average wholesale price of frozen meat	Seafood Price-Current Urner Barry Publications, Inc.

TABLE 7
DEFINITION OF VARIABLES TANNER CRAB MARKET DEMAND MODEL (Page two)

VARIABLE	DEFINITION	SOURCE
WPFS	Monthly weighted average wholesale price of frozen sections	Seafood Price-Current Urner Barry Publications, Inc.
IMFM	Monthly imports of frozen tanner crab meat from Japan	Unavailable
IMFS	Monthly imports of frozen tanner crab sections from Japan	Unavailable
IMCC	Monthly imports of canned tanner crab from Japan	Unavailable
WPCC	Monthly weighted average wholesale price of canned tanner crab	Fishery Market News Report "Pink Sheets"
HFM	First of the month cold storage holdings of frozen meat	NMFS, Washington, D. C.
HFS	First of the month cold storage holdings of frozen sections	NMFS, Washington, D. C.
HCC	First of the month holdings of canned tanner crab	Unavailable
DIFM	Twleve month moving average of disappearance rates of frozen meat inventories	NMFS, Washington, D. C.
DIFS	Twelve month moving average of disappearance rates of frozen section inventories	NMFS, Washington, D. C.
DICC	Twelve month moving average of disappearance rates of canned tanner crab inventories	NMFS, Washington, D. C.
AWQCC	Average weekly gross product weight of canned tanner crab output	Unavailable
AWQFM	Average weekly gross product weight of frozen meat output	Unavailable
AWQFS	Average weekly gross product weight of frozen section output	Unavailable

TABLE 7
DEFINITION OF VARIABLES TANNER CRAB MARKET DEMAND MODEL (Page three)

VARIABLE	DEFINITION	SOURCE
EXDJFS	Monthly weighted average Japanese per capita consumption of U.S. exported frozen sections	U.S. exports, tanner crab, Unavailable
FOBPFS	Monthly weighted average F.O.B. price frozen sections tanner crab	Primary data collected in Japan
INPCJ	Japanese monthly personal income	Presently unavailable*
DLTC	Monthly weighted average Japanese domestic landings of tanner crab	Primary data collection in Japan
SUSQ	Monthly weighted average quotas imposed by the Soviet Union and the United States on Japanese tanner crab fishermen	American Fmbassy, Tokyo
OIMTC	Monthly weighted average quantity of imports of tanner crab from other countries by Japan	Primary data collected in Japan
PBJ	Index of retail beef prices	Bureau of Labor Statistics Consumer Price Index
PPJ	Index of retail pork prices	Bureau of Labor Statistics Consumer Price Index
PCJ	Index of retail poultry prices	Bureau of Labor Statistics Consumer Price Index
AP5LFP	Monthly weighted average price of five leading seafood substitutes on the retail market for tanner crab in Japan	Primary data collected in Japan
LNDG	Monthly landings of tanner crab	Monthly Shellfish Report ADF&G

*National income figures available quarterly in Annual Report on National Income Statistics

TABLE 7
DEFINITION OF VARIABLES TANNER CRAB MARKET DEMAND MODEL (Page four)

VARIABLES	DEFINITION	SOURCE
EXDT (LNDG)	Monthly landings of tanner crab	Monthly Shellfish Report ADF&G
EXST (LNDG)	Monthly landings of tanner crab	Monthly Shellfish Report ADF&G
PLD	Monthly average pounds per landing	Monthly Shellfish Report ADF&G
EXPT	Monthly averaged spot prices for tanner crab	NMFS "Pink Sheets"
WPKC	Monthly weighted average wholesale price of king crab (all product forms	Unavailable for time period of model
EXDC	Monthly weighted average exvessel price of dungeness crab on the west coast	Unavailable for time period of model
ER	¥/$ Exchange rate	International Financial Statistics International Monetary Fund
AT	Tanner crab abundance index in crabs per pot unstandardized for pot size and soak time	ADF&G, Kodiak
TRK	Total revenue earned in previous king crab season	ADF&G Alaska Catch and Production Statistics
CPI	Consumer price index	U.S. Board of Governors' Federal Reserve Bulletin
D1	Intercept dummy variable reflecting major tanner crab harvesting months January - June	
KSTC	Capital stock size index for tanner crab - number of boats which actually fished during tanner crab season each year	
INVT	Total monthly frozen holdings of all crab	NMFS, Washington, D. C.

4. RPFM = f_4 (WPFM D_1)

5. RPFS = f_5 (WPFS D_1)

6. RPCC = f_6 (WPCC D_1)

Wholesale Price Determination

There are twenty-two major processor-distributors of Tanner crab in Seattle who are integrated with Alaska packers. These twenty-two companies distribute crab nationwide as well as export it to Japan. It is generally accepted that a major aspect of wholesaler behavior arises from the desire by wholesalers to keep a certain appropriate level of inventory. The wholesaler can accomplish inventory adjustment by adjusting his price, shifting his demand curve for Alaska packed Tanner crab or by shifting his demand for imported crab. The demand shift for Alaska crab can be proxied by a landings variable with an attached slope dummy variable. The dummy variable reflects the fact that increased demand for Tanner crab can be satisfied only during the harvesting season.

7. WPFM = f_7 (HFM DIFM D1 LNDGD2 IMFM)

8. WPFS = f_8 (HFS, DIFS D1 LNDGD2 IMFS)

9. WPCC = f_9 (HCC, DICC D1 LNDGD2 IMCC)

Product Form Allocation

At the processing level, decisions are made in some cases on a daily basis concerning the product form the Tanner crab will be processed into. These decisions are usually made with price information supplied by phone from the wholesaler.

10. AWQCC = f_{10} (WPCC/WPFM D1 WPFS)

11. AWQFM = f_{11} (WPFM/WPCC D1 WPFS)

12. AWQFS = f_{12} (WPFS/WPCC WPFM D1)

Japanese Export Demand for Frozen Sections of Alaska Tanner Crab

Japanese demand for Alaskan Tanner crab has historically been centered on frozen sections of the species Chionoecetes bairdi, a larger sized species than C. opilio and desirable for restaurant and gourmet shop type use.

The relationship for Japanese demand follows:

13. EXDJFS = f_{13} (F.O.B.PFS INPCJ DLTC SUSQ OIMTC PBJ PPJ PCJ AP5LFP)

Exvessel Demand Model

The relationships describing demand at the exvessel level were formulated into two equations:

14. EXDT = f (PLD EXPT WPKC EXDC INPCJ Y CPI INVT EXRA)

15. EXST = f (EXPT AT TRK KSTC)

Price and quantity data were available for the port of Kodiak so that an exvessel demand model could be specified and estimated for that port using monthly data from November, 1972, through April, 1977. It should be recognized that much of the current expansion taking place in the Tanner crab industry is centered geographically on the Bering Sea resource. A model formulated with data from Kodiak alone will only reflect a certain percentage of the entire exvessel demand picture for Tanner crab in Alaska. Nevertheless, coefficients generated in this model should provide useful information in an area of fisheries economic research which until now has been essentially unexplored.

Model Description

Data for three of the variables in the original formulation were unavailable. These were the wholesale price of king crab, the exvessel price of Dungeness crab, and the monthly per capita Japanese income variable. The choice of a wholesale price rather than an exvessel price for king crab was originally justified by the fact that the king crab season does not correspond to the Tanner crab season so that the comparison price in terms of demand at the exvessel level is most probably a wholesale price.

As presently specified, equations 14 and 15 are a simultaneous system. Estimation using two-stage least squares was attempted but the results were unsuccessful. This was undoubtedly due to problems relating to data reporting frequency. Decision-making in this market is done on a weekly or sometimes daily basis. Estimation of these relationships using monthly data, assuming elements of simultaneity, will not capture the interrelationships present in the model. Consequently, the model was respecified as two independent equations and estimated using ordinary least squares procedures. Price was formulated as the dependent variable to avoid colinearity problems between price and the exchange rate.

14a. EXPT = f (1/LNDG INVT EXRA PLD Y CPI)

15a. EXST = f (EXPT AT TRK KSTC)

Exvessel Price

Exvessel price is formulated as a function of the inverse of landings, total crab frozen holdings, the (¥/$) exchange rate, the number of pounds per landing, income and the consumer price index. Landings were expressed in an inverse functional form to reflect the presence of a pricing floor established at the beginning of each season, in the log form regression. Pounds of crab per landings were included to ascertain any processing capacity constraint effects on exvessel price.

Exvessel Supply

The supply of Tanner crab is hypothesized to be a function of exvessel price, an index of Tanner crab abundance, the total revenue earned in the previous king crab season, and an index of the size of the capital stock present in the industry. The total revenue earned in the previous king crab season variable seeks to describe the work-leisure phenomenon present, especially during the earlier years of the Tanner crab fishery. The Kodiak fleet involved in the Tanner crab fishery is essentially the same as that which fishes for king crab. Since the king and Tanner crab seasons do not overlap, a fisherman who earns a large return during the king crab season is less likely to take on added risk fishing for Tanner crab to expand his already substantial income. His leisure time is essentially worth more to him.

Estimation Results

The ordinary least squares regression results, along with the test statistics, are indicated in Table 8.

The estimated coefficients will be evaluated using the t-statistic. Coefficients for which the t-statistic exceeds the lower bound of a one-tail 95 percent confidence interval will be considered significant. R^2 is indicated as a measure of the goodness of fit, and the Durbin-Watson statistic is included to evaluate the presence of autocorrelation. Both equations were better specified using the log form.[3]

In the price equation, the inventory variable is the only explanatory variable not of the expected sign. Cold storage holdings for Tanner crab alone are only available on a monthly basis beginning in 1976, so for the time frame of this model, total crab holdings were used. The positive coefficient may simply be an indication of the strength of the overall crab market. The t-statistic for that variable is, however, insignificant. The inverse of landings variable

[3]See Theil (1971) for a comparison test.

TABLE 8
REGRESSION RESULTS

OLSQ -- LOG FORM
PRICE EQUATION DEPENDENT VARIABLE -- FXPT

VARIABLE	CONSTANT	INVT	1/LNDG	EXRA	PLND	Y	CPI
COEFFICIENT	-72.73	.1087	-.0237	.0565	-.0842	12.42	3.379
T-STATISTIC	(-5.19)*	(.702)	(-1.47)	(.067)	(-1.98)*	(6.40)*	(4.73)*

TEST STATISTICS

R^2 = .915
DURBIN - WATSON STATISTIC = 1.12
F (6,16) = 28.5

OLSQ -- LOG FORM
SUPPLY EQUATION DEPENDENT VARIABLE -- EXST

VARIABLE	CONSTANT	EXPT	AT	TRK	KSTC
COEFFICIENT	11.28	1.675	-.2588	-3.410	9.805
T-STATISTIC	(1.48)	(1.54)	(-0.21)	(-3.40)*	(3.28)*

TEST STATISTICS

R^2 = .645
DURBIN - WATSON STATISTIC = 1.74
F (4, 18) = 8.18

*T-Statistic significant at .05 level

TABLE 9
SURVEY OF CURRENT BUSINESS
U.S. DEPT. OF COMMERCE,BUREAU OF ECONOMIC ANALYSIS

Average Weekly Earnings per Worker; Private Non-farm;
1967 Dollars; Seasonally Adjusted.

November	1972	109.28
December	1972	109.05
January	1973	108.79
February	1973	109.22
March	1973	108.83
April	1973	109.29
May	1973	108.95
June	1973	108.57
July	1973	109.80
August	1973	107.48
September	1973	108.72
October	1973	108.05
November	1973	108.02
December	1973	107.93
January	1974	106.19
February	1974	105.97
March	1974	105.17
April	1974	104.47
May	1974	105.20
June	1974	105.24
July	1974	104.86
August	1974	104.37
September	1974	103.85
October	1974	103.64
November	1974	102.07
December	1974	102.26
January	1975	102.01
February	1975	101.67
March	1975	101.40
April	1975	101.12
May	1975	101.06
June	1975	101.10
July	1975	100.76
August	1975	101.62
September	1975	101.57
October	1975	101.89
November	1975	102.65
December	1975	102.37
January	1976	102.82
February	1976	103.35
March	1976	102.96
April	1976	102.68
May	1976	103.65
June	1976	102.87
July	1976	103.02
August	1976	103.17
September	1976	102.74
October	1976	103.29
November	1976	104.32
December	1976	104.32
January	1977	103.37
February	1977	104.21
March	1977	104.18
April	1977	104.09

and the exchange rate variable are of the expected signs,[4] but the t-statistics are insignificant. The lack of explanatory power in all three of these variables is most likely due to the effects of national price controls in operation during this period. There does appear to be a significant negative relationship between number of pounds per landing and exvessel price, indicating that processing capacity constraints do effect price at the exvessel level, at least on a per-landing basis. Overall seasonal capacity in Kodiak for handling crab is quite large. Income has a very large attached coefficient of 12.42 providing strong evidence for the contention that Tanner crab is a luxury type good. As expected, exvessel price is positively related to the consumer price index. The R^2 is quite high and the Durbin-Watson (D.W.) Statistic is in the inconclusive range.

Looking at the supply equation, exvessel price is not a significant determinant of supply, again possibly due to the effects of price controls during this period. The crab abundance variable somewhat surprisingly explained little of the variation in supply. The sign on the coefficient was contrary to expectation, and the t-statistic was insignificant. The supply of Tanner crab is highly correlated with the total revenue earned in the previous king crab season. The work-leisure phenomenon as discussed earlier has a strong effect on the decision to fish for Tanner crab each season. The size of the capital stock is also significantly correlated with the supply of landings. The R^2 indicates the goodness of fit is marginal. This is likely, due to the poor performance of price as an explanatory variable and the unexplainable poor performance of the abundance index. The D.W. Statistic is in the inconclusive range.

Policy Implications and Suggestions for Future Data Collection

It is difficult to suggest policy implications for an entire industry based on data from one area of landing. This regression analysis should illustrate quite graphically the need for the mandatory reporting of exvessel price on fish tickets. This will allow choice of appropriate time frames for the particular analysis involved and provide the closest correspondence possible between quantity and price.

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[4]It is intuitively suspected that the (¥/$) exchange rate is positively related to exvessel price contrary to the results reported in a September, 1976, study on Tanner crab by the National Marine Fisheries Service.

APPENDIX

STATISTICS OF THE CRAB FISHERIES
OF JAPAN
by Clinton E. Atkinson
TABLE OF CONTENTS

Part a.

King Crab

Part b.

Tanner Crab

Part d.

Other Crab (including Hair Crab, Hanasaki Crab, etc.)

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