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**U.S. Department of Commerce**

**National Oceanic and Atmospheric Administration**

**National Marine Fisheries Service**

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NOAA Technical Memorandum NMFS-SEFC-294

## **World Shrimp Situation 1990: Effects on Southeast Harvesting**

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by:

**John Vondruska  
National Marine Fisheries Service  
Southeast Regional Office  
9450 Koger Boulevard  
St. Petersburg, FL 33702**

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by: John Vondruska

U.S. Department of Commerce  
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National Oceanic and Atmospheric Administration  
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National Marine Fisheries Service  
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October 1991

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## WORLD SHRIMP SITUATION 1990: EFFECTS ON SOUTHEAST HARVESTING

This report assesses recent trends for major shrimp markets, selected producer-exporters, world supplies, and prices. U.S. shrimp landings and use fell slightly in 1990. Use was up slightly for Japan, Europe and the world. Prices and production problems continued to plague shrimp farms which accounted for most of the growth in world supplies over the past decade. Shrimp fishermen faced problems too. Whether the price strength of larger shrimp will be overcome by supplies of farmed black tiger shrimp over the long haul as in 1988-89 is unclear, but along with the long-term downward trend in real prices this could affect decisions by fishery and business managers.<sup>1</sup>

### U.S. Landings

U.S. landings of shrimp in the Gulf of Mexico region were 249 million pounds (heads-on) in 1990, up 9% from a year earlier, according to preliminary data. Exvessel prices (prices paid to fishermen) averaged \$2.54/lb (heads-off) in 1990, slightly less than the \$2.60 of 1989. Above average catch of brown shrimp was forecast and achieved for areas west of the Mississippi from July 1990 to June 1991.<sup>2</sup> Results varied among states, however, and 1990 landings for the west coast of Florida were about 40% below their 1985-89 average; they have been on a downward trend since 1984. While variation in landings is notable and reflects both resource and economic conditions, landings for the Gulf as a whole do have a slightly upward long-term trend, mostly because of increased fishing effort (Figure 1).<sup>3</sup>

Some boats are reportedly leaving the Gulf shrimp fleet. Besides downward trends in boat catch rates (since the 1950s) and real shrimp prices (since the late 1970s), and increased insurance costs (since the mid-1980s), there have been recurring shocks, such as the surge in fuel prices in August-December 1990. Also, fishermen have been concerned about regulations, such as the mandatory use of turtle excluder devices (TEDs) in shrimp trawl nets and the proposed use of fish excluder devices.

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<sup>1</sup>Prices in 1989 and early 1990, and the number of boats reportedly made shrimp fishing unprofitable in the Northern Territory of Australia, and an Australian Government buy-back plan is planned to reduce the number of boats from 215 to 120 by late 1992 (FAO, Infofish Trade News, no. 14/91, August 1, 1991).

<sup>2</sup>Neal Baxter and Ed Klima, ". . . Forecast of the 1990 Brown Shrimp Season..." and "Forecast of the 1991 Brown Shrimp Season . . .," National Marine Fisheries Service, 4700 Avenue U, Galveston, TX 77551-5997, June 27, 1990 and June 19, 1991.

<sup>3</sup>The trend may be expressed as  $\text{landings} = -3223.522 + 1.7432 \text{ year}$ , where landings are expressed in millions of pounds (heads-on) and year ranges from 1950 to 1990. Respective t-statistic values for the estimated parameters are -4.20 and +4.47; adjusted R-square = 0.32 and F = 20.

Figure 1.--U.S. landings of warm-water shrimp  
(Million pounds, heads-on weight)

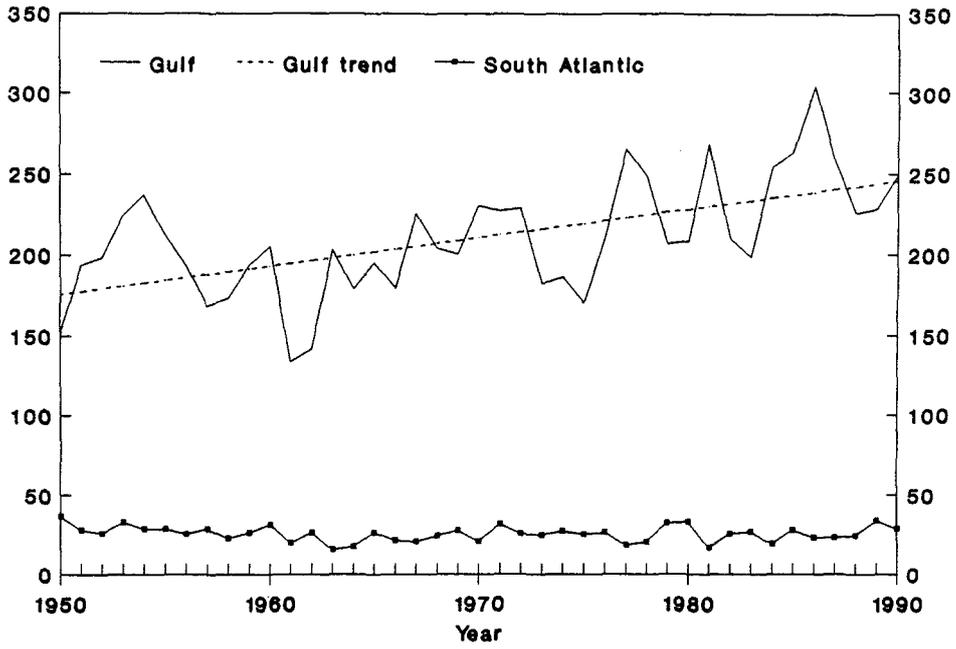
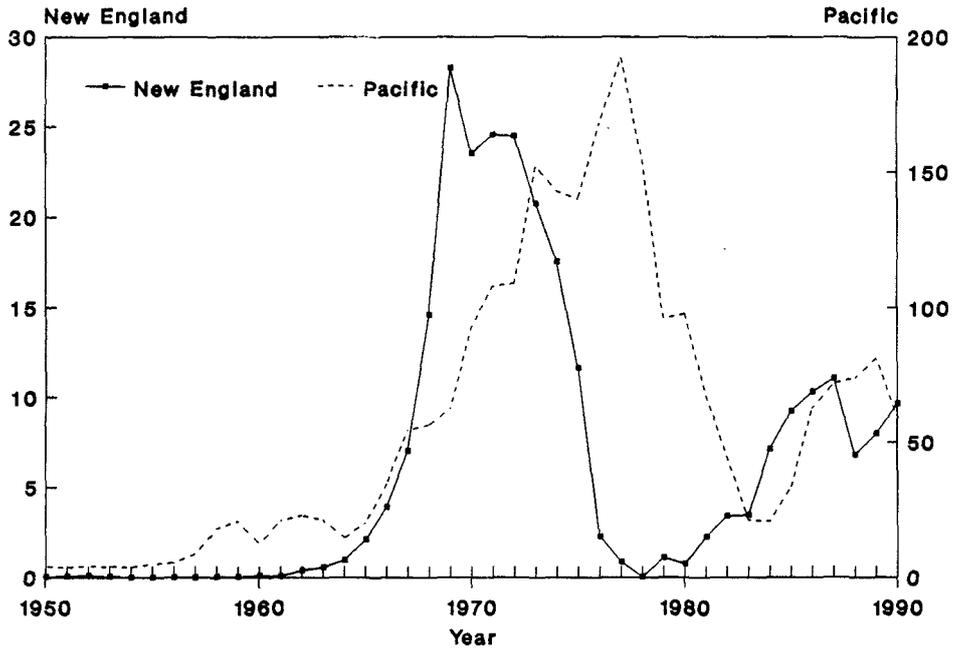


Figure 2.--U.S. landings of cold-water shrimp  
(Million pounds, heads-on weight)



The 1990 landings of shrimp in the South Atlantic region were 16% less than a year earlier at 28 million pounds (heads-on), according to preliminary data. Compared with results for most of the past decade, however, 1990 was a good year for the South Atlantic (Figure 1). Despite the drop in catch, the value was 3.5% higher, and exvessel prices averaged 22% higher at \$3.09/lb (heads-off), perhaps because of a shift in size composition and the rising prices of larger sizes of shrimp during 1990.

While most of this report concerns tropical or warm-water shrimp (mostly *Penaid* species), the United States is also a major producer, consumer, and sometimes trader of cold-water shrimp (mostly *Pandalid* species). In 1990, U.S. landings were 9.7 million pounds (heads-on) in New England, up 22% from a year earlier, and they were off 28% at 59 million pounds in the Pacific region, according to preliminary data. Annual catch is subject to wider variation than for warm-water shrimp (Figures 1 and 2). Exvessel prices averaged 27% lower than in 1989 (\$1.25/lb, heads-off) in New England and 32% higher (\$0.91/lb) in the Pacific. The differences in price behavior between the two regions may be attributed to season timing in an international market context for cold-water shrimp, harvest amounts, and shrimp size.<sup>4</sup>

At the wholesale market level for cold-water shrimp, the cooked and peeled (c&p) product dominates, though Europe and Japan also have significant demand for shell-on, head-on product. Norwegian cooked and peeled shrimp, 250-300/kg (roughly 110-130/lb), is a bench mark product in Europe, and it seems small when compared with U.S. market categories for warm-water shrimp, say un-16/lb to 71-90/lb, raw headless and shell-on. However, a good deal of shrimp from the southeastern United States and many Asian countries is comparable in product form, size and price to cold-water shrimp. Although New York wholesale price data indicate some Gulf raw peeled shrimp in the 36-40/lb count size, the more commonly reported sizes range from 61-70/lb to 200-300/lb. On other hand, New York prices indicate some Asian product as small as 300-500/lb.

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<sup>4</sup>New England and Oregon catches in 1990 included relatively more large shrimp (older year-class shrimp). The December-May season of 1990 in New England coincided with lower international prices for cold-water shrimp than the 1989 season. The picture is mixed for the April-October season of the contiguous Pacific coast states, as the international prices rose in mid-1990 and then dipped sharply toward the end of 1990 because of high cold-storage holdings in Norway and other major producer-exporter countries.

See Stephen Clark, Paul Diodati, Douglas Grout and Daniel Schick, "Assessment Report for Gulf of Maine Northern Shrimp--1990," October 17-19, 1990. Oregon Department of Fish and Wildlife, Newport, Oregon, report cited in NMFS, Seattle Fishery Market News Report, SF-7, February 15, 1991. Prices in the United Kingdom of Icelandic and Norwegian shrimp are shown in FAO, Globefish Highlights, issues 4/90 and 1/91, December 15, 1990 and March 15, 1991. The high level of cold storage holdings for European supplier countries is noted in FAO, Globefish European Price Report, issues 12/90 (Dec. 10, 1990) and 05/91 (May 13, 1991).

## U.S. Imports and Processing

U.S. imports of shell-on (mostly raw headless) shrimp tripled from their 1963-81 plateau to a record 372 million pounds by 1989, though they declined 12% in 1990 to 327 million pounds (Figure 3). By contrast, imports of raw peeled shrimp rose from about 30 million pounds a year in the early 1960s to some 70-90 million pounds in the mid-1970s when growth slowed (3-year moving average, Figure 3). After falling off a bit, they began growing again in 1983, and increased 36% in 1990 to 149 million pounds.

Imported farmed raw headless and raw peeled shrimp are the most likely raw materials to allow U.S. shrimp processors to participate in market growth and avoid the constraints imposed by volatile and limited U.S. landings. Increased use of imports appears to have added stability to shrimp processing in the southeast, where it is concentrated.<sup>5</sup> Yet, it also appears that an increasing proportion of what is consumed does not move to end users via U.S. seafood processing plants.<sup>6</sup>

U.S. imports of other peeled (mostly cooked and peeled, excluding canned) shrimp seemed to vary in accord with U.S. landings of cold-water shrimp in the 1980s. They rose from 10 million pounds a year in 1976-81 to 33 million pounds in 1987-88 and then fell to 10-15 million pounds in 1989-90 (Figure 4).

U.S. imports of canned shrimp began to expand in 1983 from 1-6 million pounds to 16-17 million pounds in 1985-87. They fell to 10 million pounds by 1990, but the U.S. pack dropped from 10-25 million pounds in 1950-81 to 0.7 million pounds, and the country, once a net exporter, became a net importer. It appears that imports restored the U.S. market to some 16-20 million pounds from 8-14 million pounds and accelerated the ongoing change in use of U.S.-landed small shrimp.<sup>7</sup>

Finally, imports of breaded shrimp have been relatively small compared with other imports and U.S. output, about 0.2 to 3.9 million pounds in 1963-90. U.S. production increased rapidly from less than 20 million pounds in the early 1950s to 112 million pounds in 1973, fell off a bit, and dipped to 83 million pounds in 1980, a year of weakness in the national economy. Output reached a new record of 121 million pounds in 1989; it was 114 million pounds in 1990, according to preliminary data.

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<sup>5</sup>Walter R. Keithly and Kenneth J. Roberts, "The impact of imports, including farm-raised shrimp, on the southeast shrimp processing sector," Louisiana State University, Center for Wetland Resources, forthcoming (1991).

<sup>6</sup>John Vondruska, "Trends in U.S. markets for processed shrimp," presented at the annual meeting of the National Shrimp Processors Association, Lake Buena Vista, Florida, February 20-23, 1985.

<sup>7</sup>John Vondruska, "Trends in U.S. markets for canned shrimp," circa December 1984, unpublished report, National Marine Fisheries Service, 9450 Koger Blvd., St. Petersburg, FL 33702.

Figure 3.--U.S. imports of shell-on and raw peeled shrimp  
(Million pounds, product weight)

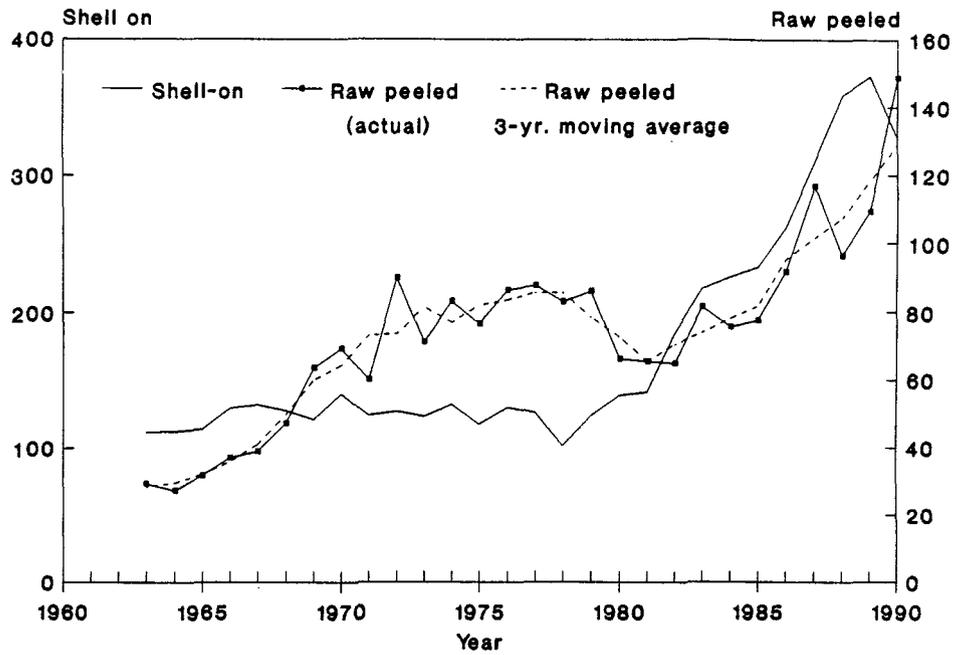
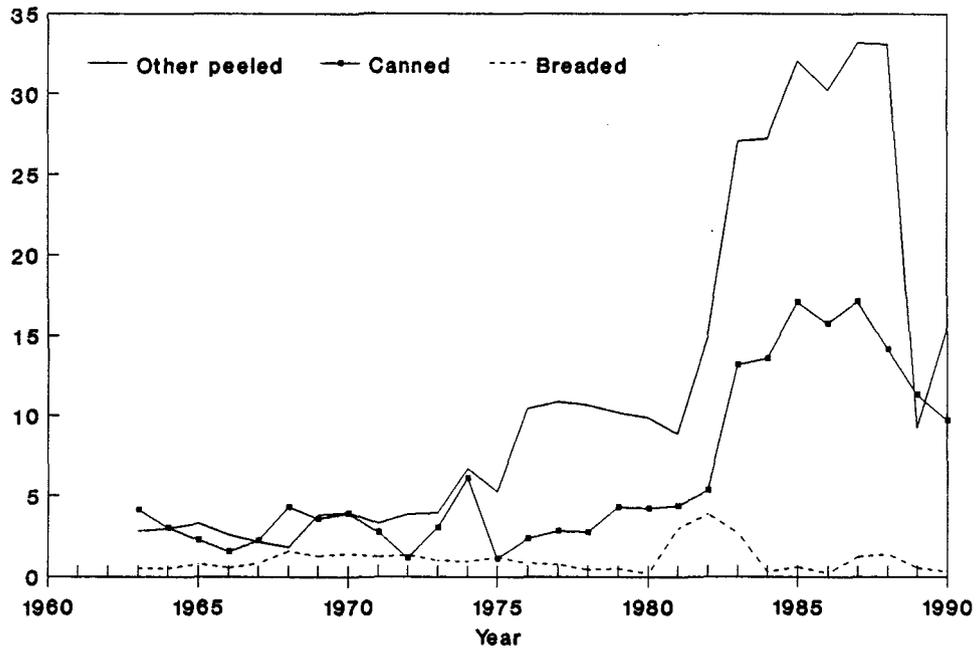


Figure 4.--U.S. imports of other shrimp  
(Million pounds, product weight)



## Major Shrimp Markets

Summing on a heads-off basis, U.S. imports of all product categories were 579 million pounds in 1990 compared with 563 million pounds in 1989.<sup>8</sup> While imports were up 3%, landings were down 1% to 214 million pounds, year-end holdings were up 5% to 59 million pounds and exports were up 65% to 60 million pounds. As a result, consumption was 731 million pounds in 1990, 2% less than in 1989 and 5.7% less than in 1988. Expressed in metric units, which will be used for other countries, the U.S. consumption for 1990 translates into 331 kilotons (heads-off, where 1 kt = 1,000 metric tons = 2.2046 million pounds).

Turning to Japan, shrimp consumption rose 2% in 1990 to a record 311 kt (heads-off). Imports of frozen shrimp rose 8%, or 20 kt, to 283 kt. Year-end holdings increased 4% to 81.5 kt, but they had been reduced by about 10 kt in 1989 when imports rose only 2% or 5 kt.

European consumption grew more in 1990 than in 1989, judging by available data.<sup>9</sup> The 1990 expansion traces partly to greater use of farm-raised shrimp, notably in the more southern countries. Spain used more Ecuadorian whites than France in 1990 and appears to have had the largest increase in imports among European countries, while Italy switched from them to black tigers.<sup>10</sup> The United Kingdom and France together imported 105.6 kt (product weight) of shrimp in 1990 compared with 93.9 kt in 1989. In 1988, the two countries had imported 90.3 kt and the comparable 12-country European Economic Community (EEC) total was 271.3 kt, including 189.7 kt from non-EEC sources. However, if one tries to assess the EEC market using import data alone, cold-water shrimp appears to be more important than it is in consumption, because the EEC exports about half the amount it imports, a larger proportion than for warm-water shrimp.<sup>11</sup>

In 1982-88, use of shrimp in the EEC market rose by 96.2 kt. This included 25.8 kt for cold-water shrimp, which might have

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<sup>8</sup>U.S. imports of shrimp in 1990 were 501 million pounds on a product weight basis, virtually the same as in 1988 and 1989. Yet, there were changes among suppliers and products that translate into differences in the import totals for 1988-90 when the data are expressed on a common weight basis.

<sup>9</sup>FAO, Globefish Highlights, issues 1/91 March 15, 1991 provides tables of shrimp imports by product and country of origin for France and United Kingdom for 1986-90. Other data on imports in 1989-90 for France, Spain, Belgium, Germany, Portugal and United Kingdom are shown in FAO, Infofish Trade News, no. 14/91, August 1, 1991. More complete data for EEC countries is provided by H. Josupeit, The European Shrimp Market--Coldwater versus Warmwater, FAO/GLOBEFISH Research Programme, vol. 3., 1989.

<sup>10</sup>FAO, Globefish Highlights, issue 4/90, December 15, 1990, indicates that 8-month exports of Ecuadorian whites to Spain were 6,800 metric tons (mt), 1,100 mt ahead of the 1989 annual amount. If the 8-month rate prevailed during the last 4 months, the annual amount would be 10,200 mt, compared with shipments to all European countries of 16,000 mt (see footnote 13).

<sup>11</sup>Josupeit, op. cit., p. 12, shows EEC trade in 1988 (heads-on basis): cold-water shrimp imports of 132.4 kt and exports of 70 kt; tropical shrimp imports of 123.4 kt and exports of 7.0 kt; not specified shrimp imports of 45.5 kt and exports of 48.9 kt; total shrimp imports of 301.3 kt and exports of 125.9 kt.

accounted for a greater share of the overall increase in EEC consumption were it not for the sharp decline in Norway's harvest from 91 kt in 1985 to 42 kt in 1988 (since increased to 62 kt by 1990). Nevertheless, use of warm-water shrimp is increasing significantly in the EEC as a whole, as in the other two major world markets. Each of the world's three major shrimp markets has grown in the 1980s, and together they consumed 45% of the world harvest in 1982 and 49% in 1988:

Shrimp market	Shrimp consumption (kilotons, heads-on)	
	1982	1988
EEC	165.8	262.0
(cold-water)	(81.8)	(106.9)
Japan	297.0	445.9
United States	<u>334.9</u>	<u>558.9</u>
Three-mkt. total	797.8	1,266.8
World harvest	1,775.0	2,570.3

### World Market Supplies

The world harvest of shrimp, including farmed shrimp, was 2,496 kt (heads-on) in 1989, 2.9% less than in 1988, according to FAO data. Combined Japan-United States imports, a proxy for world exports and a more direct and timely indicator of market supplies, experienced a similar (2.6%) decline for 1989 and a 5.2% increase in 1990 to 869 kt (heads-on). Shrimp farming is a key element in the growth of both world total harvest and market supplies, and worldwide farm output was estimated at 96.5 kt in 1980, 565 kt in 1989 and 633 kt in 1990.<sup>12</sup> Since 1975-79 when farm output was relatively small, combined Japan-United States imports rose by 480 kt by 1990, and the world total harvest of shrimp rose by 921 kt by 1989. The amount of increase in total harvest would be closer to that for farm output if data for cold-water shrimp and akiami paste shrimp were not counted.

Turning to individual countries, long term growth in shrimp farm output has occurred for Panama, Ecuador, Brazil, Thailand, Indonesia, Philippines, China, Pakistan and Bangladesh. There

<sup>12</sup>Bob Rosenberry, editor/publisher, World Shrimp Farming, 1989 and World Shrimp Farming, 1990, Aquaculture Digest, 9434 Kearny Mesa Road, San Diego, CA 92123. Data from Rosenberry, op. cit., and FAO/Globefish for selected countries and the world as a whole for 1980 and 1985-90 are shown in Paul E. Niemeier and Mark Wildman, "Chinese Shrimp Culture," draft, National Marine Fisheries Service, Foreign Fisheries Analysis Branch, 1335 East-West Highway, Silver Spring, MD 20910. The following reports are available from the National Technical Information Service: (1) Paul E. Niemeier, "Thailand's Shrimp Aquaculture," International Fishery Report, IFR-89/95; (2) Todd T. Schneider, "Indonesian Shrimp Culture," IFR-90/40; (3) Brian McFeeters, "Philippine Shrimp Culture," IFR-90/61; (4) Todd T. Schneider and Mark Wildman, "Thailand's Shrimp Culture, 1990," IFR-91/20; (5) Todd T. Schneider, "Indian Shrimp Culture," IFR-91/18; (6) Dennis Weidner, "Honduran Shrimp Culture," IFR-91/21; (7) Dennis Weidner, "Mexico: Sinola Shrimp Situation, 1990," IFR-90/68; (8) Dennis Weidner, "Mexico: Sonora Shrimp Situation, 1990," IFS-90/76; and (9) Dennis Weidner, "Mexico: Sinola Shrimp Situation Update," IFR-91/05.

were some set backs in farm output among these countries in 1989-90, albeit not as severe as for Taiwan after 1987. Exports from wild and farm sources in Mexico and Taiwan fell sharply after 1987, though Mexico's decline is not traceable to farming. Recently, growth in farming has occurred in Mexico, Guatemala, Honduras, Colombia, Vietnam and Malaysia.

For this report, a warm-water shrimp producer-exporter's supplies were assessed using the country's estimated annual exports, total harvest, and farm harvest. These three variables may differ as international market supply indicators, partly because of the nature of available data and the sizeable apparent consumption for some countries. For those countries which harvest or farm warm-water shrimp, exports were estimated using combined Japan-United States imports. The data is shown on a heads-on basis to facilitate the estimation of apparent consumption as the difference between total harvest and exports. A possible emerging problem with this estimation approach is that exports of farmed shrimp to Europe are becoming more important, and the case for Ecuador is an example.

Ecuador is the leading cultured shrimp producer of the Western Hemisphere. Significant commercial output and farm-based exports to the United States began in the late 1970s. Combined Japan-United States imports from Ecuador averaged 5 kt (heads-on) in 1970-74, 8 kt in 1975-79 and 58 kt in 1985-89; they were 63 kt in 1990 (Table 2). Exports to Europe began in 1986 and roughly doubled each year during 1987-90 to 19 kt (heads-on) by 1990.<sup>13</sup> Adding shipments to the three markets, Ecuador's estimated exports were 68 kt in 1989 and 82 kt in 1990. Estimated farm output was 64.2 kt in 1989 and 73 kt in 1990, and fishery catch was about 11 kt in the late 1980s.<sup>14</sup> Ecuador's own use of shrimp appears to be relatively small, about 3-4 kt annually during the 1980s (Tables 1 and 2).

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<sup>13</sup>FAO, Globefish Highlights, issue 1/91, March 15, 1991, indicates that Ecuador's exports to Europe in 1990 exceeded 16 kt (product weight), but FAO, Globefish Highlights, issue 2/91, June 15, 1991, indicates that combined Ecuadorian and Peruvian exports to the EEC only were 12,000 metric tons (mt), 25% more than in 1989. Dennis Weidner, cites data from Ecuador's Subministry of Fisheries, as reported by the U.S. Embassy, Quito, in "Ecuador" (unpublished draft of mid-1990, National Marine Fisheries Service, Foreign Fisheries Analysis Branch, 1335 East-West Highway, Silver Spring, MD 20910). Exports to Europe were 1,236 mt (product weight) in 1987, 4,447 mt in 1988 and 7,303 mt in 1989. He also indicates that exports of shell-on shrimp to Europe are about two-thirds heads-on, whereas exports of shell-on shrimp to the United States are heads-off. Josupeit, op. cit., p. 8, shows a lower amount Ecuador's exports for 1987, 1.1 kt, 0.2 kt for 1986 and zero for preceding years.

<sup>14</sup>Rosenberry, op. cit.; Weidner, IFR-91/21, op. cit., and "Ecuador," op. cit.

Table 1.--World harvest of shrimp, including farmed shrimp, by country  
(Metric tons, heads-on weight)

Country	1970-74 average	1975-79 average	1980-84 average	1985-89 average	1987	1988	1989
United States	172,351	180,405	144,791	162,936	165,145	150,967	161,757
Greenland	8,609	14,076	39,066	61,185	64,389	60,019	65,086
Canada	2,883	9,011	12,813	25,188	25,424	34,479	38,005
Mexico	72,917	61,024	77,483	76,580	87,106	76,867	64,679
Panama	10,892	9,584	13,002	10,608	7,810	5,992	10,242
Cuba	8,140	8,507	4,828	4,573	4,954	4,445	4,029
Colombia	6,294	5,470	5,980	6,489	6,667	5,309	9,214
Venezuela	7,737	5,071	5,719	6,576	6,074	5,606	8,624
Ecuador	6,640	9,517	30,216	65,847	79,468	81,564	79,180
Chile	8,492	7,107	3,918	4,195	4,500	4,965	5,579
Brazil	54,627	60,683	60,796	63,356	62,666	54,846	56,212
Argentina	620	331	10,751	10,015	2,836	18,138	11,857
Iceland	5,983	6,995	12,953	31,157	38,636	29,637	26,785
Norway	10,757	27,360	60,017	57,853	42,153	42,171	56,285
Denmark	4,020	15,754	15,998	21,405	22,600	21,444	22,102
West Germany	28,971	20,351	15,000	15,854	16,971	14,260	13,268
Soviet Union	703	12,395	22,527	17,070	11,979	13,685	15,031
Spain	25,370	29,415	13,096	17,936	17,558	14,455	13,026
Italy	7,105	9,212	12,288	15,198	12,072	16,368	12,759
India	176,838	209,322	204,048	216,838	197,171	216,394	222,811
Pakistan	18,466	20,536	27,496	27,264	29,854	29,447	23,492
Thailand	83,720	128,984	157,938	185,711	162,845	240,430	240,430
Vietnam	44,000	39,620	45,320	55,300	56,000	56,000	55,000
Malaysia	61,819	67,660	78,536	72,260	72,958	73,021	73,081
Indonesia	62,536	133,484	141,248	185,965	194,858	210,710	208,720
Philippines	59,783	44,064	49,266	85,203	78,886	86,497	91,117
China	74,404	151,982	206,093	467,346	457,463	583,592	502,122
South Korea	13,275	28,753	30,463	46,961	48,394	49,799	51,441
Hong Kong	10,527	13,194	11,623	14,652	15,656	14,987	13,172
Taiwan	42,616	70,104	85,421	127,819	177,049	115,783	99,432
Japan	65,481	66,326	63,999	53,220	51,755	53,307	49,267
Australia	18,258	19,967	23,030	20,367	20,800	22,600	19,400
Cameroon	1,872	3,981	12,621	12,803	12,772	12,772	12,994
Senegal	4,382	4,065	4,873	7,130	6,791	6,831	9,280
Mozambique	2,968	5,148	9,263	5,836	5,570	5,753	5,800
Madagascar	4,400	5,458	5,361	7,964	9,020	7,707	9,000
Other countries	76,594	69,879	78,188	124,292	137,333	129,425	135,990
All countries	1,265,048	1,574,795	1,796,028	2,390,950	2,414,183	2,570,272	2,496,269

Source: FAO, unpublished data base (February 1991), obtained by NMFS, Fisheries Statistics Division, 1335 East West Highway, Silver Spring, MD 20910.

Table 2.--Combined imports of shrimp for Japan (frozen only) and United States  
(Metric tons, heads-on weight)

Country of origin	1970-74 average	1975-79 average	1980-84 average	1985-89 average	1987	1988	1989	1990
Greenland	56	1,315	1,719	18,783	20,641	22,203	25,782	21,575
Canada	423	1,500	5,174	7,474	8,693	8,200	8,247	7,308
Mexico	71,169	67,223	64,825	56,326	68,200	52,313	47,949	30,364
Guatemala	2,102	2,792	3,016	3,031	2,535	3,105	4,672	4,732
El Salvador	5,166	4,871	4,909	5,105	5,217	5,895	4,448	3,898
Honduras	2,765	2,804	4,415	5,114	5,725	6,590	5,500	7,102
Nicaragua	5,169	4,695	2,216	111	.	.	.	656
Panama	7,887	7,865	11,665	13,120	12,025	10,476	12,362	8,775
Colombia	4,310	4,656	2,942	5,129	5,317	5,380	6,371	8,244
Venezuela	7,300	2,883	2,186	6,268	4,374	6,528	8,964	5,719
Guyana	7,234	4,837	4,227	3,752	4,037	3,860	4,416	3,926
Suriname	1,564	3,608	2,925	2,496	3,228	2,581	1,677	1,909
Ecuador	5,323	7,870	27,014	57,744	74,969	76,234	59,156	62,902
Brazil	3,861	3,528	11,311	16,799	13,351	15,902	16,364	10,312
Norway	25	1,807	13,525	13,891	11,477	7,677	3,764	6,642
India	50,263	85,196	85,509	82,740	87,454	84,872	72,672	85,313
Pakistan	7,681	6,932	12,890	17,520	23,023	18,270	10,672	13,206
Bangladesh	967	4,002	7,622	17,081	17,418	19,279	17,282	18,478
Thailand	14,840	19,499	28,863	62,119	47,619	64,156	111,668	128,902
Vietnam	1,790	3,244	4,755	19,236	18,672	26,195	25,341	35,727
Malaysia	2,424	3,784	3,146	12,974	12,249	14,229	14,543	13,750
Singapore	1,426	1,253	1,905	5,894	7,422	5,758	6,747	6,392
Indonesia	22,437	45,821	40,305	58,511	51,930	64,797	89,627	99,352
Philippines	2,762	4,815	6,757	26,115	23,686	35,811	40,297	37,426
China	9,787	14,083	19,523	86,989	81,580	145,022	139,694	167,327
South Korea	2,482	5,394	4,050	4,326	4,222	4,508	2,990	3,279
Hong Kong	6,129	11,915	7,040	3,874	3,837	4,027	3,181	2,513
Taiwan	10,167	12,798	26,896	71,398	120,151	55,188	22,112	20,205
Australia	8,727	12,458	18,524	16,110	16,813	15,644	14,123	10,582
Madagascar	3,098	3,136	3,857	4,944	5,741	5,048	4,433	3,309
Botswana	1,826	2,635	3,323	2,504	2,824	3,185	.	.
Other countries	38,002	29,223	47,305	53,200	51,416	54,316	40,211	38,748
All countries	309,164	388,443	484,341	760,678	815,844	847,246	825,265	868,575

Source: U.S. Bureau of the Census, unpublished data base maintained by NMFS, Fisheries Statistics Division, 1335 East West Highway, Silver Spring, MD 20910 for 1972 onward and Census publications for earlier years; Government of Japan, annual trade reports, and secondary reports.

While Mexico's 1987 harvest set a record, recent harvests have been low, despite increasing farm output,<sup>15</sup> and exports have fallen sharply, from 68 kt in 1987 to 30 kt in 1990 (Tables 1 and 2). Supplies may have been affected by a 1988 change in credit policy for fishermen, alleged poaching of shrimp during closed seasons, and other factors.<sup>16</sup> Before the 1980s, Mexico exported virtually all of its shrimp and was the leading supplier to the United States. However, in more recent years, Mexico's domestic consumption has expanded, while U.S. imports of farmed shrimp from other countries increased.

Taiwan's exports of shrimp had increased several fold during the 1980s, but they were reduced by high shrimp mortality and a cost-price squeeze in 1988-89 in the intensive farming of black tiger shrimp. Estimated farm output fell from 75 kt in 1987 to 20 kt in 1989 and rose to 30 kt in 1990.<sup>17</sup> Exports declined more than total harvest in 1987-89, because of Taiwan's own use, some 60 kt a year in the 1980s. The decline in exports tapered off in 1990.

China became the world's leading producer and exporter of shrimp in the late 1980s. Exports averaged 20 kt in 1980-84 and 87 kt in 1985-89, when total harvest averaged 467 kt and domestic use of shrimp per se averaged 189 kt (excluding Akiami paste shrimp).<sup>18</sup> The 1990 exports of 167 kt surpassed those of 1988 and 1989, implying a recovery in farm output, but a sharp decline in China's exports in early 1991 (from the fall 1990 crop) suggests otherwise. Farm output was an estimated 2 kt in 1980, 165 kt in 1989 and 150 kt in 1990.<sup>19</sup>

China's market reputation is now based largely on a farmed white shrimp, *P. chinensis*, for which only one crop per year is harvested in the country's northern temperate climate. The black tiger shrimp allows more crops in a warmer climate. While it is farmed along with other species in southern China, black tiger shrimp dominates farming in other Asian countries, where disease problems were reportedly exacerbated in many instances in 1988-89 by shrimp stress associated with water pollution and high shrimp densities in semi-intensive and intensive growout ponds. Diseases of black tiger shrimp were presumably limited to that

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<sup>15</sup>Mexico's total shrimp harvest as previously reported by FAO is shown in Table 2, but a more recent FAO report suggests that it was 73,751 mt in 1988, 77,622 mt in 1989 and 67,259 mt in 1990. These annual totals include for shrimp farming 551 mt in 1988, 2,857 mt in 1989 and 4,960 in 1990. See FAO, Infofish Trade News, issue 14/91, August 1, 1991. The Pacific coast harvest is expected to be lower in the 1990/91 season than in the previous season (Weidner; IFR-91/05 and IFR-91/21, op. cit.).

<sup>16</sup>Weidner, IFR-91/05 and IFR-91/21, op. cit.

<sup>17</sup>Rosenberry, op. cit.

<sup>18</sup>Estimated domestic use = total output - exports (approximated as combined Japan-United States imports from China) - output of Akiami paste shrimp; i.e., 189,445 mt = 467,346 mt - 86,989 mt - 190,912 mt.

<sup>19</sup>Rosenberry, op. cit.; Niemeier and Wildman, op. cit.

species, but "red tides, high salinities (caused by a drought)" and a cost-price squeeze reportedly reduced China's farm output of white shrimp in 1989 and the white shrimp total fell by 17% to 211 kt (FAO data).<sup>20</sup> China's harvest of other *Penaid* shrimp also increased in the mid-1980s and fell in 1989 (down 47% to 74 kt), suggesting significant farm output of species other than China white shrimp. On the other hand, the harvest rose 14% in 1989 to 217 kt for akiame paste shrimp, *Acetes japonicus*, which is used to make shrimp paste or powder, a use that one should note when assessing supplies of shrimp per se.

Thailand was the world's second leading exporter of shrimp in 1990 at 129 kt, following China at 167 kt. Exports averaged 62 kt in 1985-89 compared with an overall shrimp harvest of 186 kt, leaving 124 kt for domestic use. Thailand is reported to be coping with a number of problems related to shrimp farming, such as pond location (distance from shore and density), water and land use and pollution, and shrimp diseases.<sup>21</sup> Because of such problems and declining prices in 1989, there was a major shift in farming from eastern and central to southern provinces, but total output and exports did not decline. Exports were 64 kt in 1988, 112 kt in 1989 and 129 kt in 1990. Thai farm crops totaled 10 kt in 1980, 70 kt in 1988, 90 kt in 1989 and 110 kt in 1990.<sup>22</sup>

Indonesia was the world's third leading shrimp exporter in 1990 at 99 kt, and it had the second leading farm crop. Exports averaged 59 kt in 1985-89 compared with an overall harvest of 186 kt, leaving 127 kt for domestic use, roughly the same numbers as for Thailand. While there was considerable investment in semi-intensive and intensive farming in 1989-90, the extensive method of aquaculture of milkfish and shrimp has a long history in Indonesia and it is reported to have been used by 80% of the country's pond managers in the late 1980s.<sup>23</sup> Farm output of shrimp increased from 35 kt in 1980 to 120 kt in 1990.<sup>24</sup> There was a slight set back in farm output and total harvest in 1989, but not in exports, which, however, grew less in 1990. Exports were 65 kt in 1988, 90 kt in 1989 and 99 kt in 1990.

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<sup>20</sup>Quoting Rosenberry, World Shrimp Farming, 1989, p. 8.

<sup>21</sup>Schneider and Wildman, IFR-91/20, op. cit.

<sup>22</sup>Rosenberry, op. cit.; Niemeier and Wildman, op. cit.

<sup>23</sup>Schneider, IFR-91/21, op. cit.

<sup>24</sup>Niemeier and Wildman, op. cit.

## Prices

Real prices of most sizes of raw headless shrimp averaged lower in 1990, especially the prices of 26-30/lb and larger shrimp (the upper 4 of 8 price lines in Figure 5A). Through the late-1970s, the prices had fluctuated about mostly upward trends. Since the late 1970s, they have fluctuated about mostly downward trends, because supplies of shrimp have grown faster than demand in the world's major shrimp markets. Given the volatility of shrimp prices, the trends are easier to visualize when some of that volatility is "smoothed out," such as by the use of 3-year moving averages in Figures 5B.

While prices of all sizes of shrimp move more or less together over the long term, there has been a tendency for prices of 26-30/lb and larger raw headless shrimp to be stronger. Whether this strength will be overcome by supplies of farmed black tiger shrimp in the 1990s as in 1988-89 is unclear, but this would concern business and fishery managers who can affect the size composition of their harvest.

There was a rebound in monthly prices in 1990-91 from the sharp drop in 1988-89 for 26-30/lb and larger raw headless shrimp (represented by 21-25s in Figure 6). The 1988-89 price drop appears to trace to a sudden increase in major market supplies of farmed black tiger shrimp (mostly larger shrimp) that coincided with a decline in supplies for other shrimp. For smaller sizes of shrimp, monthly prices turned upward later and less dramatically in 1990; they remained within the range of fluctuation that has characterized them since 1986 when market supplies of farmed white shrimp from Ecuador and China increased sharply (prices of smaller sizes represented by prices of 41-50/lb raw headless shrimp in Figure 7).

Estimated market supplies rose 26 kt in 1988-89 for black tiger shrimp, as increases for other producing countries offset the sharp drop for Taiwan (98 kt), but supplies of all shrimp rose only 9 kt (refer back to Table 2).<sup>25</sup> That is, estimated market supplies of shrimp other than black tigers declined by 19 kt in 1988-89. In 1990, estimated market supplies advanced 32 kt for black tigers and 39 kt for all shrimp.

Besides the more balanced increase in supplies among types of shrimp, other factors may have contributed to the rebound in prices of larger shrimp in 1990 and early 1991. Perhaps, the 32 kt advance in estimated market supplies of black tiger shrimp in 1990 involved a shift away from larger sizes, so that it had less of an effect on prices of larger shrimp than the smaller 26 kt increase of 1988-89. Also, the sharp, 38-kt drop in 1988-90 in Mexico's exports could have helped boost prices of larger shrimp.

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<sup>25</sup>The change in supplies of black tiger shrimp was estimated using data on combined Japan-United States imports from Thailand, Vietnam, Indonesia, Philippines and Taiwan (see Table 2).

Figure 5A.--Real wholesale prices of raw headless shrimp  
(Annual data)

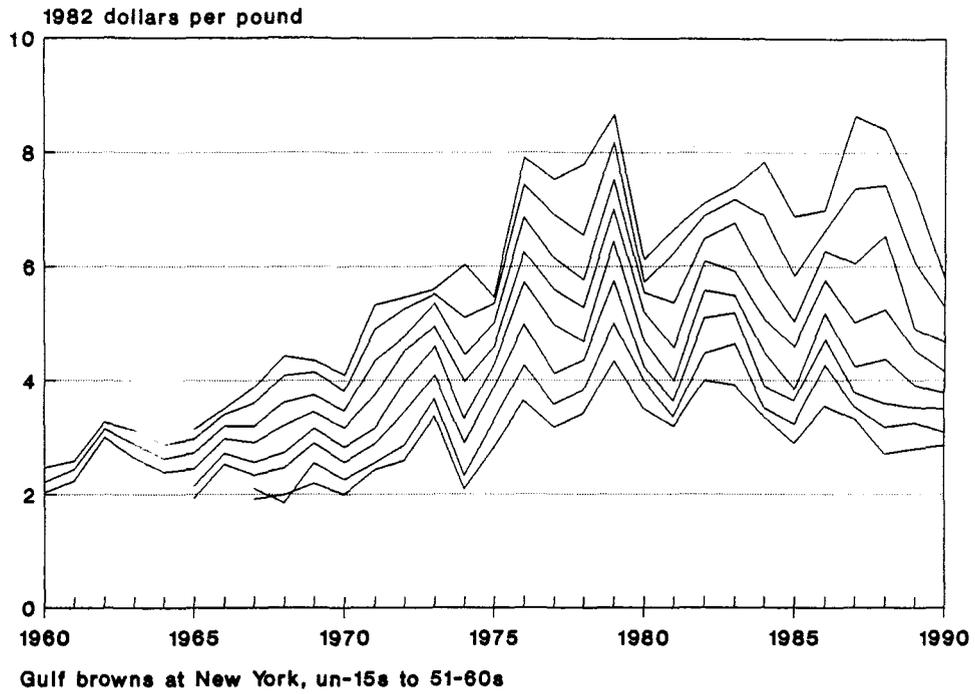


Figure 5B.--Real wholesale prices of raw headless shrimp  
(Three-year moving averages)

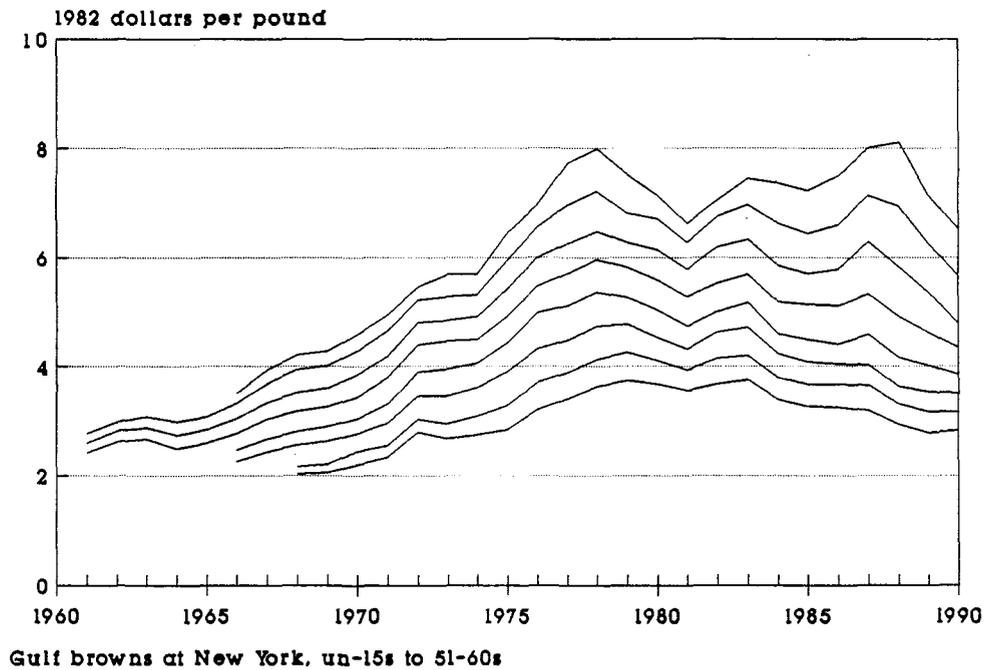


Figure 6.--Monthly wholesale prices of raw headless shrimp  
(21-25s, at New York, except as noted)

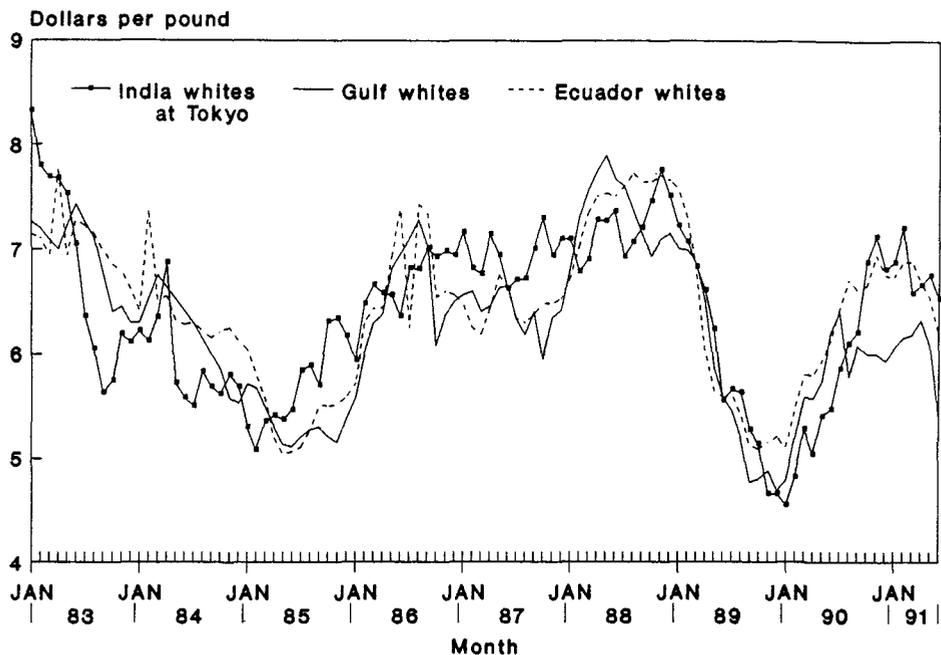


Figure 7.--Monthly wholesale prices of raw headless shrimp  
(41-50s, at New York, except as noted)

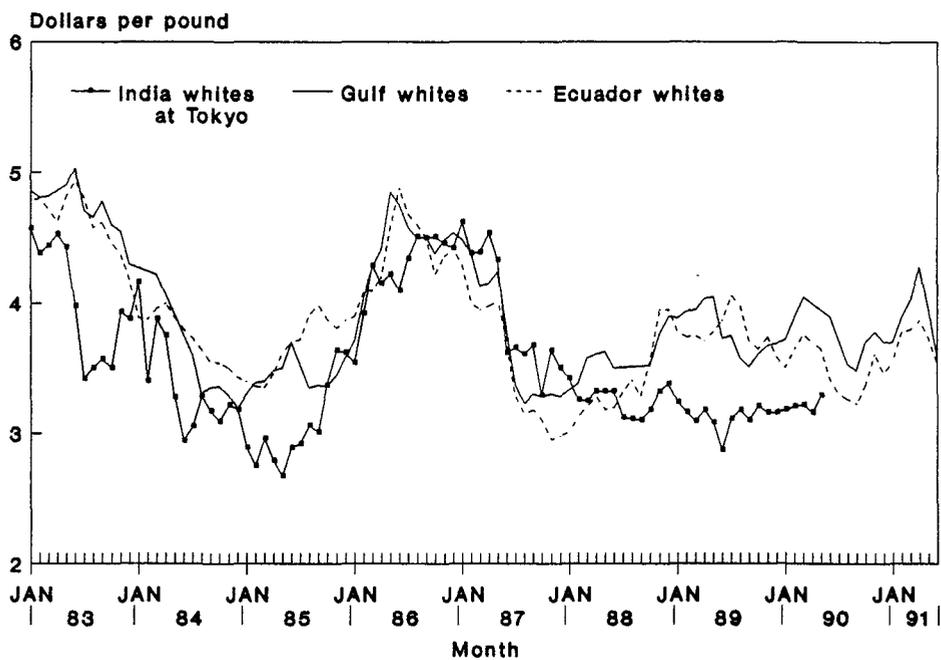


Table A1.--United States supply and use of shrimp  
(Thousand pounds and pounds per person, heads-off weight)

Year	Initial holdings	Landings	Imports	Exports	Ending holdings	Consumption, total	Consumption, per capita
1950	16,469	120,715	44,218	5,088	25,652	150,661	1.00
1951	25,652	141,421	46,006	7,039	27,552	178,488	1.18
1952	27,552	143,292	42,318	6,950	15,390	190,822	1.24
1953	15,390	164,246	47,410	5,748	26,390	194,908	1.24
1954	26,390	169,307	45,671	7,745	32,184	201,438	1.26
1955	32,184	154,310	59,585	9,036	22,665	214,377	1.32
1956	22,665	140,927	75,480	7,318	23,389	208,365	1.25
1957	23,389	128,827	76,705	7,290	31,225	190,406	1.13
1958	31,225	133,450	93,933	7,144	41,684	209,780	1.22
1959	41,684	149,855	117,211	9,683	48,438	250,628	1.43
1960	48,438	156,167	124,760	11,999	54,354	263,012	1.48
1961	54,354	108,541	138,896	17,614	28,295	255,882	1.41
1962	28,295	118,830	155,301	11,489	39,744	251,194	1.37
1963	39,744	149,973	170,082	22,203	59,116	278,479	1.49
1964	59,116	132,314	171,576	24,829	48,516	289,662	1.53
1965	48,516	151,927	180,570	25,252	41,461	314,300	1.64
1966	41,461	148,093	195,330	26,342	46,685	311,857	1.61
1967	46,685	189,972	203,943	36,125	83,058	321,416	1.65
1968	83,058	344,065	211,806	31,721	60,566	386,642	1.96
1969	60,566	195,002	221,923	51,847	68,607	357,037	1.79
1970	68,607	224,271	249,066	61,990	78,690	401,264	1.99
1971	78,690	238,073	216,443	62,713	73,036	397,457	1.94
1972	73,036	235,852	255,096	57,385	98,090	408,509	1.97
1973	98,090	228,643	232,338	74,587	82,711	401,773	1.92
1974	82,711	225,529	270,517	53,100	82,482	443,176	2.09
1975	82,482	209,151	231,521	52,299	54,336	416,519	1.95
1976	54,336	245,597	271,895	52,502	71,697	447,629	2.07
1977	71,697	288,295	271,811	57,919	93,950	479,933	2.20
1978	93,950	256,882	240,414	66,607	64,555	460,083	2.09
1979	64,555	205,588	269,240	51,079	88,496	399,809	1.79
1980	88,496	207,868	258,070	41,059	77,587	435,788	1.93
1981	77,587	218,900	259,112	43,723	64,638	447,237	1.96
1982	64,638	175,614	319,596	37,198	58,176	464,475	2.02
1983	58,176	155,592	421,179	35,936	71,482	527,528	2.27
1984	71,482	188,132	422,340	26,590	61,207	594,157	2.53
1985	61,207	207,239	452,232	26,940	61,694	632,044	2.67
1986	61,694	244,409	492,030	30,450	59,275	708,407	2.96
1987	59,275	223,514	583,030	33,813	66,704	765,302	3.17
1988	66,704	203,350	598,208	34,783	58,502	774,977	3.17
1989	58,502	215,825	563,524	36,059	56,713	745,078	3.02
1990	56,713	213,899	579,425	59,707	59,488	730,842	2.93

Landings data for 1978 onward from NMFS, Fisheries of the United States is subject to revision. Holdings from NMFS (formerly BCF), Fishery Statistics of the United States and Frozen Fishery Products, Annual Summary for various years. See following tables on trade data. Population data from NMFS, Fisheries of the United States.

Table A2.--U.S. landings of shrimp  
(1,000 pounds heads-on weight, except as noted)

Year	New- England	Pacific	South- Atlantic	Gulf	Other	Total	Total- heads off
1950	7	3,954	36,481	151,153	100	191,695	120,715
1951	58	3,622	27,771	193,651	86	225,188	141,421
1952	104	4,077	25,671	198,268	90	228,210	143,292
1953	38	3,944	32,933	224,503	86	261,504	164,246
1954	0	3,700	28,646	237,153	18	269,517	169,307
1955	0	4,825	28,539	212,402	13	245,779	154,310
1956	0	5,400	25,518	193,621	18	224,557	140,927
1957	0	8,545	28,509	168,453	28	205,535	128,827
1958	5	17,891	22,584	173,354	9	213,843	133,450
1959	17	20,652	26,006	193,503	4	240,182	149,855
1960	90	12,418	31,214	205,725	5	249,452	156,167
1961	68	20,912	19,749	133,795	6	174,530	108,541
1962	388	22,906	26,078	141,726	7	191,105	118,830
1963	561	21,260	15,529	203,116	7	240,473	149,973
1964	932	14,497	17,341	179,032	2	211,804	132,314
1965	2,093	20,091	26,191	195,237	6	243,782	151,927
1966	3,894	34,438	21,475	179,230	0	239,037	148,093
1967	6,991	54,462	20,598	225,731	0	307,782	189,972
1968	14,572	56,406	24,285	204,024	0	299,287	344,065
1969	28,272	62,527	27,306	200,429	0	318,534	195,002
1970	23,522	92,859	20,609	230,474	0	367,464	224,271
1971	24,536	107,790	31,200	227,376	0	390,902	238,073
1972	24,460	108,811	25,248	228,941	1	387,461	235,852
1973	20,734	152,220	24,557	182,206	5	379,722	228,643
1974	17,515	142,759	27,091	186,208	0	373,573	225,529
1975	11,655	140,067	24,926	170,083	0	346,731	209,151
1976	2,254	167,865	26,108	210,167	0	406,394	245,597
1977	840	192,433	18,021	265,158	0	476,452	288,295
1978	7	154,403	20,138	248,327	0	422,875	256,882
1979	1,072	96,019	32,295	206,564	0	335,950	205,588
1980	731	97,697	32,996	208,280	0	339,704	207,868
1981	2,271	67,496	16,514	268,190	0	354,571	218,900
1982	3,383	44,738	25,580	209,926	0	283,627	175,614
1983	3,469	21,124	26,615	198,457	0	249,665	155,592
1984	7,114	20,807	19,179	254,254	0	301,354	188,132
1985	9,247	33,509	27,970	262,908	0	333,641	207,239
1986	10,328	62,686	23,120	304,051	7	400,185	244,409
1987	11,081	72,000	22,905	257,148	0	363,142	223,514
1988	6,786	74,054	24,244	225,789	0	330,873	203,350
1989	7,950	81,493	33,703	228,368	0	351,514	215,825
1990	9,668	58,912	28,453	249,461	0	346,494	213,899

Data for 1978 onward are preliminary. Source: NMFS, Fisheries of the United States (historical summary in 1987 issue; annual issues for 1988 onward).

Table A3.--Exvessel prices of shrimp landed in U.S. ports  
(Dollars per pound, heads-off)

Year	New- England	Pacific	South- Atlantic	Gulf	All
1950	0.25	0.11	0.44	0.35	0.36
1951	0.30	0.14	0.42	0.36	0.37
1952	0.30	0.12	0.41	0.39	0.38
1953	0.32	0.14	0.48	0.47	0.47
1954	.	0.13	0.38	0.36	0.36
1955	.	0.13	0.39	0.41	0.40
1956	.	0.19	0.49	0.51	0.50
1957	.	0.14	0.51	0.60	0.57
1958	0.70	0.11	0.56	0.59	0.55
1959	0.52	0.11	0.40	0.41	0.39
1960	0.39	0.11	0.43	0.45	0.43
1961	0.36	0.09	0.56	0.52	0.48
1962	0.26	0.10	0.69	0.68	0.62
1963	0.21	0.10	0.54	0.50	0.47
1964	0.21	0.11	0.61	0.56	0.53
1965	0.21	0.09	0.62	0.58	0.54
1966	0.25	0.10	0.80	0.74	0.65
1967	0.22	0.10	0.70	0.64	0.54
1968	0.19	0.11	0.92	0.75	0.33
1969	0.22	0.10	0.94	0.80	0.64
1970	0.35	0.10	0.88	0.75	0.58
1971	0.33	0.09	1.07	0.95	0.70
1972	0.33	0.13	1.16	1.14	0.83
1973	0.48	0.19	1.72	1.50	0.96
1974	0.56	0.23	1.08	1.18	0.80
1975	0.46	0.17	1.93	1.67	1.08
1976	0.59	0.21	2.13	2.08	1.35
1977	0.96	0.35	2.15	1.78	1.25
1978	0.25	0.40	2.44	2.05	1.50
1979	0.55	0.52	3.21	2.91	2.29
1980	1.14	0.77	2.77	2.31	1.94
1981	1.11	0.72	3.13	2.38	2.12
1982	1.04	0.83	3.73	3.22	2.90
1983	1.17	1.20	4.17	3.34	3.24
1984	0.86	0.83	2.82	2.75	2.59
1985	0.77	0.81	3.09	2.41	2.28
1986	1.11	0.94	4.09	2.94	2.71
1987	1.92	1.22	3.22	2.90	2.59
1988	1.94	0.77	3.39	2.92	2.49
1989	1.72	0.69	2.53	2.60	2.17
1990	1.25	0.91	3.09	2.54	2.30

Data for 1978 onward are preliminary. Prices for all include small amounts landed in Middle Atlantic and Chesapeake ports in some years.

Table A4.--U.S. imports of shrimp  
(1,000 pounds product weight, except as noted)

Year	Raw headless	Peeled raw	Peeled other	Breaded	Canned	Total	Total heads off	Fresh & frozen heads off
1950	.	.	.	.	1,403	40,198	44,218	40,681
1951	.	.	.	.	1,460	41,824	46,006	42,326
1952	.	.	.	.	1,343	38,471	42,318	38,933
1953	.	.	.	.	1,505	43,100	47,410	43,617
1954	.	.	.	.	1,450	41,519	45,671	42,017
1955	.	.	.	.	1,892	54,168	59,585	54,818
1956	.	.	.	.	2,396	68,618	75,480	69,441
1957	.	.	.	.	2,435	69,732	76,705	70,569
1958	.	.	.	.	2,982	85,394	93,933	86,419
1959	.	.	.	.	3,721	106,555	117,211	107,834
1960	.	.	.	.	3,961	113,418	124,760	114,779
1961	.	.	.	.	4,409	126,269	138,896	127,784
1962	.	.	.	.	4,930	141,183	155,301	142,877
1963	111,717	29,460	2,826	484	4,120	151,530	170,082	156,513
1964	112,149	27,385	2,989	508	3,004	154,577	171,576	154,695
1965	114,177	31,961	3,290	778	2,248	162,942	180,570	163,473
1966	129,919	37,233	2,565	527	1,547	178,549	195,330	184,065
1967	131,927	38,959	2,133	830	2,225	186,073	203,943	187,437
1968	128,042	47,451	1,809	1,567	4,307	189,455	211,806	194,108
1969	121,293	63,792	3,814	1,259	3,583	193,741	221,923	212,894
1970	139,978	69,501	3,946	1,415	3,875	218,715	249,066	239,301
1971	123,926	60,136	3,279	1,212	2,742	191,295	216,443	209,533
1972	126,771	90,143	3,866	1,323	1,123	223,226	255,096	252,266
1973	123,256	71,419	3,925	978	3,027	202,605	232,338	224,709
1974	131,962	83,187	6,702	953	6,107	228,911	270,517	255,127
1975	117,247	76,660	5,243	1,190	1,118	201,457	231,521	228,705
1976	129,742	86,448	10,440	831	2,350	229,810	271,895	265,973
1977	125,805	87,818	10,860	726	2,809	228,017	271,811	264,733
1978	101,266	83,126	10,656	427	2,739	198,214	240,414	233,511
1979	123,447	86,069	10,214	486	4,288	224,504	269,240	258,435
1980	138,750	66,270	9,891	172	4,224	219,308	258,070	247,424
1981	140,953	65,540	8,890	2,995	4,383	222,761	259,112	248,066
1982	184,873	64,889	14,916	3,859	5,332	273,869	319,596	306,161
1983	216,950	81,562	27,056	2,685	13,176	341,429	421,179	387,976
1984	225,696	75,662	27,239	319	13,580	342,496	422,340	388,118
1985	232,642	77,532	32,046	598	17,088	359,906	452,232	409,169
1986	262,069	91,843	30,228	233	15,757	400,130	492,030	452,323
1987	310,073	116,708	33,181	1,211	17,132	478,306	583,030	539,858
1988	358,765	96,520	33,087	1,368	14,138	503,878	598,208	562,581
1989	372,455	109,417	9,232	545	11,315	502,965	563,524	535,009
1990	327,122	148,606	15,564	322	9,735	501,348	579,425	554,894

Data other than "total, product weight" estimated for 1950-62. Source: U.S. Bureau of the Census, unpublished data base maintained by NMFS, Fisheries Statistics Division, 1335 East West Highway, Silver Spring, MD 20910 for 1972 onward and NMFS (formerly BCF), Fishery Statistics of the United States for earlier years.

Table A5.--U.S. exports of shrimp  
(1,000 pounds product weight, except as noted)

Year	Domestic canned	Domestic fresh & frozen	Domestic salted, pickled & dried	Foreign canned	Foreign fresh & frozen	Foreign salted, pickled & dried	Total	Total heads off basis	Fresh & frozen heads off basis
1950	1,085	651	417	0	68	9	2,231	5,088	836
1951	1,550	762	580	19	159	0	3,070	7,039	1,058
1952	1,685	1,016	453	4	146	1	3,304	6,950	1,344
1953	1,729	961	197	3	157	1	3,048	5,748	1,291
1954	1,973	1,153	466	11	121	0	3,724	7,745	1,482
1955	2,832	1,689	236	0	140	9	4,906	9,036	2,133
1956	2,451	1,550	70	8	180	0	4,259	7,318	2,009
1957	2,296	1,780	48	12	241	10	4,387	7,290	2,341
1958	2,161	1,648	52	12	508	10	4,391	7,144	2,453
1959	2,876	2,090	85	19	904	9	5,983	9,683	3,370
1960	3,482	2,989	108	34	809	5	7,426	11,999	4,336
1961	2,503	4,771	103	25	4,742	336	12,480	17,614	10,371
1962	2,212	3,457	72	44	1,992	102	7,879	11,489	6,072
1963	3,199	8,078	80	33	5,733	2	17,124	22,203	15,265
1964	3,692	7,852	157	25	7,254	6	18,986	24,829	16,519
1965	4,510	6,837	.	34	7,989	0	19,369	25,252	16,056
1966	4,479	4,927	.	33	11,397	.	20,836	26,342	17,211
1967	5,255	8,112	.	19	15,890	.	29,276	36,125	25,462
1968	4,467	12,147	.	20	8,314	.	24,948	31,721	22,647
1969	5,682	25,219	.	39	10,513	.	41,453	51,847	40,271
1970	6,075	29,570	.	50	14,700	.	50,395	61,990	49,593
1971	8,334	30,003	.	0	10,475	.	48,812	62,713	45,879
1972	8,450	28,984	.	8	6,095	.	43,537	57,385	40,296
1973	9,949	37,434	.	42	10,212	.	57,637	74,587	54,384
1974	6,885	27,728	.	36	6,383	.	41,032	53,100	39,102
1975	6,223	28,078	.	4	6,586	.	40,891	52,299	39,718
1976	7,769	23,296	.	72	9,138	.	40,275	52,502	36,627
1977	8,966	26,089	.	48	8,902	.	44,005	57,919	39,687
1978	5,984	34,801	.	58	13,308	.	54,151	66,607	54,373
1979	5,469	28,934	.	25	5,826	.	40,254	51,079	39,968
1980	5,832	15,913	.	371	9,566	.	31,682	41,059	28,343
1981	4,545	17,608	.	31	13,687	.	35,871	43,723	34,464
1982	3,002	15,551	.	18	12,738	.	31,309	37,198	31,088
1983	3,749	18,454	.	11	6,560	.	28,774	35,936	28,336
1984	2,712	13,526	.	33	5,069	.	21,340	26,590	21,030
1985	1,564	15,007	.	134	5,735	.	22,440	26,940	23,444
1986	1,964	20,043	.	113	2,548	.	24,668	30,450	26,199
1987	2,334	21,981	.	85	2,947	.	27,347	33,813	28,885
1988	2,014	22,116	.	173	4,184	.	28,486	34,783	30,280
1989	2,043	20,803	.	85	5,889	.	28,821	36,059	31,717
1990	2,463	29,177	.	207	12,074	.	43,921	59,707	54,210

Source: U.S. Bureau of the Census, unpublished data base maintained by NMFS, Fisheries Statistics Division, 1335 East West Highway, Silver Spring, MD 20910 for 1975 onward and NMFS (formerly BCF), Fishery Statistics of the United States for earlier years.

Table A6.--Japan supply and use of shrimp  
(Metric tons, heads-off weight--landings, heads-on weight)

Year	Initial holdings	Landings, freshwater	Landings, marine	Landings, total	Imports, frozen	Exports, frozen	Ending holdings	Consumption
1950	.	.	31,600	31,600	.	.	.	19,876
1951	.	.	36,400	36,400	.	.	.	22,896
1952	.	.	43,900	43,900	.	.	.	27,613
1953	.	.	41,300	41,300	.	.	.	25,978
1954	.	.	51,100	51,100	.	.	.	32,142
1955	.	.	48,700	48,700	.	.	.	30,632
1956	.	.	50,300	50,300	.	.	.	31,639
1957	.	.	48,900	48,900	1,482	.	.	32,240
1958	.	.	55,600	55,600	1,886	1,600	.	35,258
1959	.	.	59,700	59,700	240	3,270	.	34,521
1960	.	.	60,400	60,400	624	1,400	.	37,216
1961	.	.	73,500	73,500	4,057	970	.	49,319
1962	.	.	79,300	79,300	3,642	1,714	.	51,808
1963	.	2,000	86,700	88,700	11,707	1,100	.	66,399
1964	.	2,400	77,800	80,200	17,086	1,200	.	66,332
1965	.	2,500	66,500	69,000	21,010	1,600	.	62,811
1966	.	2,600	68,800	71,400	36,156	2,500	.	78,567
1967	.	2,300	61,000	63,300	44,465	1,286	.	82,995
1968	.	2,322	66,278	68,600	35,203	2,312	.	76,040
1969	.	2,845	58,255	61,100	48,885	3,219	.	84,098
1970	.	3,277	53,523	56,800	57,145	3,100	.	89,772
1971	.	4,982	50,018	55,000	78,874	3,952	.	109,517
1972	.	5,272	57,328	62,600	88,120	3,939	.	123,556
1973	.	6,441	61,559	68,000	117,474	4,086	.	156,160
1974	.	5,739	79,268	85,007	103,310	3,906	.	152,873
1975	.	6,840	69,167	76,007	113,672	2,674	.	158,806
1976	.	5,301	60,882	66,183	123,334	2,014	20,138	162,949
1977	20,138	6,151	53,534	59,685	124,780	1,748	20,435	160,277
1978	20,435	9,276	59,763	69,039	143,962	1,966	20,534	185,323
1979	20,534	7,639	53,077	60,716	158,672	2,143	25,039	190,214
1980	25,039	5,846	50,986	56,832	143,256	1,900	18,215	183,927
1981	18,215	6,004	54,653	60,657	161,725	2,841	39,232	176,020
1982	39,232	5,875	59,911	65,786	151,369	2,833	42,327	186,820
1983	42,327	5,321	64,360	69,681	148,628	2,171	41,208	191,405
1984	41,208	4,120	62,917	67,037	169,080	2,207	45,696	204,551
1985	45,696	4,816	54,991	59,807	182,912	1,970	50,432	213,825
1986	50,432	4,040	47,926	51,966	212,805	1,743	58,615	235,566
1987	58,615	3,968	47,787	51,755	245,892	1,379	78,074	257,608
1988	78,074	3,908	49,399	53,307	258,232	888	88,465	280,483
1989	88,465	4,267	45,000	49,267	263,422	876	78,136	303,864
1990	78,136	.	.	50,000*	283,448	799	81,505	310,730

\*Landings for 1990 estimated. Landings for 1970-89 from FAO, unpublished data base (February 1991), obtained by NMFS, Fisheries Statistics Division, 1335 East West Highway, Silver Spring, MD 20910; FAO, Yearbook of Fishery Statistics, various issues for earlier years. Holdings, imports and exports from NMFS, Foreign Fishery Information Release, various issues (NMFS, 300 South Ferry Street, Terminal Island, CA 90731); some earlier export data from FAO, Yearbook of Fishery Statistics.

Table A7.--Real wholesale prices of raw headless Gulf brown shrimp at New York  
(1982 dollars per pound; deflator = Producer Price Index, Finished Consumer Goods, 1982=100)

Year	UN-15	16-20	21-25	26-30	31-35	36-40	41-50	51-60	61-70	71-80	Deflator
1960	.	2.47	2.21	2.03	.	.	.	.	.	.	33.60
1961	.	2.58	2.43	2.23	.	.	.	.	.	.	33.60
1962	.	3.26	3.14	3.00	.	.	.	.	.	.	33.70
1963	.	3.12	2.88	2.63	.	.	.	.	.	.	33.50
1964	.	2.87	2.62	2.39	.	.	.	.	.	.	33.60
1965	3.14	2.97	2.72	2.45	2.14	1.93	.	.	.	.	34.20
1966	3.50	3.40	3.20	2.97	2.71	2.52	.	.	.	.	35.40
1967	3.88	3.60	3.20	2.91	2.56	2.33	2.11	1.92	.	.	35.60
1968	4.42	4.08	3.61	3.21	2.72	2.46	1.84	1.98	.	.	36.50
1969	4.34	4.14	3.75	3.44	3.15	2.89	2.55	2.19	.	.	37.90
1970	4.10	3.82	3.47	3.16	2.83	2.56	2.25	2.00	.	.	39.10
1971	5.32	4.90	4.34	3.74	3.15	2.88	2.55	2.42	.	.	40.20
1972	5.45	5.25	4.77	4.52	3.97	3.43	2.86	2.59	.	.	41.50
1973	5.60	5.51	5.34	4.94	4.59	4.09	3.67	3.37	.	.	46.00
1974	6.03	5.10	4.44	3.97	3.32	2.89	2.32	2.08	.	.	53.10
1975	5.46	5.34	4.99	4.59	4.28	3.87	3.29	2.81	.	.	58.20
1976	7.89	7.42	6.85	6.24	5.71	4.97	4.25	3.63	.	.	60.40
1977	7.52	6.91	6.14	5.59	4.97	4.12	3.58	3.17	.	.	64.30
1978	7.79	6.56	5.77	5.28	4.68	4.35	3.83	3.41	.	.	69.40
1979	8.66	8.17	7.52	7.01	6.45	5.75	4.99	4.33	.	.	77.50
1980	6.12	5.73	5.53	5.19	4.68	4.22	3.98	3.50	3.18	.	88.60
1981	6.65	6.23	5.36	4.57	3.98	3.64	3.36	3.19	2.90	.	96.60
1982	7.11	6.88	6.48	6.09	5.57	5.09	4.47	3.98	3.44	.	100.00
1983	7.40	7.17	6.76	5.91	5.48	5.18	4.63	3.91	3.48	.	101.30
1984	7.83	6.88	5.79	5.07	4.49	3.89	3.52	3.37	2.83	2.38	103.30
1985	6.88	5.84	5.03	4.59	3.84	3.65	3.23	2.89	2.69	2.32	103.80
1986	6.99	6.62	6.28	5.76	5.17	4.72	4.27	3.55	2.95	2.39	101.40
1987	8.64	7.37	6.05	5.01	4.23	3.78	3.53	3.32	2.99	2.55	103.60
1988	8.40	7.42	6.54	5.23	4.37	3.59	3.17	2.70	2.36	2.21	106.20
1989	7.29	6.05	4.90	4.52	3.91	3.52	3.25	2.79	2.44	2.32	112.10
1990	5.77	5.28	4.67	4.15	3.78	3.50	3.09	2.86	2.57	2.18	118.20

Source: NMFS, Fishery Market News Report, New York; U.S. Bureau of Labor Statistics for producer price index.