

STOCK ASSESSMENT AND FISHERY EVALUATION  
FOR THE SPINY LOBSTER FISHERY OF THE  
SOUTH ATLANTIC AND GULF OF MEXICO

National Marine Fisheries Service  
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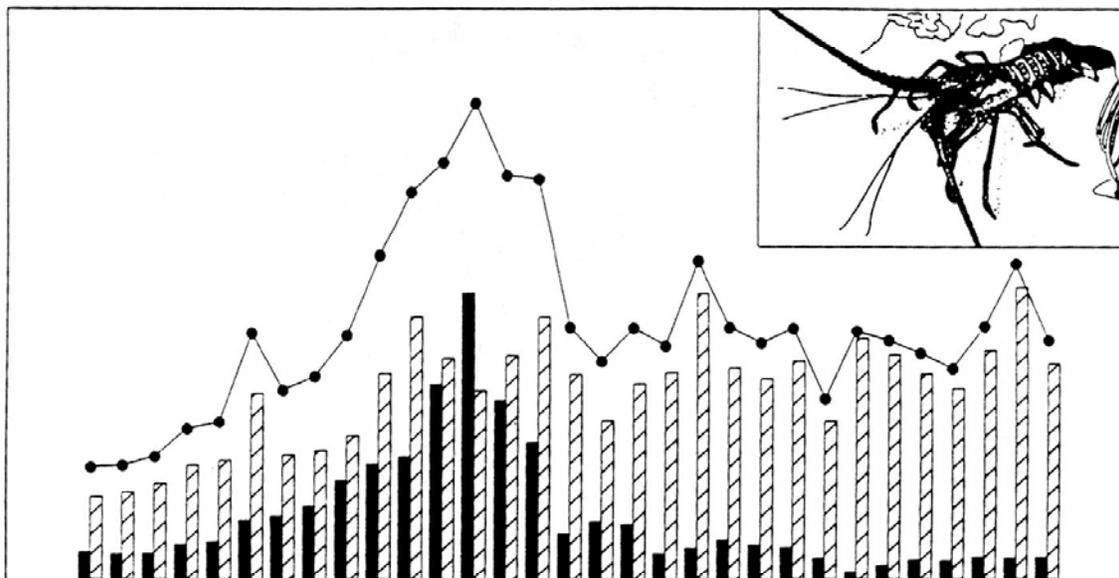
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TRENDS IN THE SPINY LOBSTER COMMERCIAL FISHERY OF FLORIDA,  
1960 - 1990



by

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INTRODUCTION

The Caribbean spiny lobster (Panulirus argus) is a valuable, highly exploited marine crustacean inhabiting shallow shelf waters off the southeastern United States, Bermuda, and throughout the Caribbean. From 1984 through 1989, the spiny lobster has consistently ranked as the second most economically important marine species landed in Florida being surpassed only by shrimp in commercial value. Based on National Marine Fisheries Service (NMFS) data, the 1984 through 1989 spiny lobster ex-vessel value landed in Florida ranged from \$13.9 million to \$22.5 million and averaged \$17.5 million. In Florida, the spiny lobster is also the target of an intense recreational fishery (Davis, 1987; Davis and Dodrill, 1980; Davis and Dodrill, 1989) which includes an annual two-day sport diving harvest that precedes the commercial season (Simmons, 1980). The magnitude of this recreational harvest is unknown but is estimated to be 10% of the total lobster catch (Moe, 1991).

In the United States, spiny lobster are principally caught by commercial trap fishermen using wooden slat traps, although some commercial harvest by SCUBA divers and bully nets occurs during the early part of the fishing season. Currently, joint responsibility for the management and regulation of the spiny lobster fishery is

shared by the Florida Marine Fisheries Commission (Florida territorial sea) and by the Gulf of Mexico and South Atlantic Fishery Management Councils (Exclusive Economic Zone, EEZ). The Federal fishery management councils generally tend to follow the lead of the Florida Marine Fisheries Commission in establishing spiny lobster fishery regulations since most of the harvest occurs within Florida waters. Current management regulations intended to provide for resource conservation are contained within Florida statutes and a federal spiny lobster fishery management plan. These regulations include but are not limited to the following: 1) setting a minimum size limit of 3 inches (76.2 mm) carapace length; 2) closing the fishing season April through July; 3) prohibiting the harvest of egg bearing females; 4) requiring that undersized lobsters which will eventually be used as bait or decoys in traps be maintained in a continuously circulating live well while aboard the vessel. The live well requirement (#4 above) was established beginning with the 1987 fishing season (Florida Statutes and Amendment Number 1 to the Spiny Lobster Fishery Management Plan for the Gulf of Mexico and the South Atlantic). In addition to the management regulations described above, several large areas along the south Florida coast have been designated as lobster sanctuaries in which no harvest of spiny lobster is permitted. Due to concern caused by the intensive exploitation of the resource, the spiny lobster fishery and biological data have been periodically re-examined by the National Marine Fisheries Service (NMFS), Southeast Fisheries Science Center (Powers and Bannerot, 1984; Powers, 1985;

Powers and Thompson, 1986; Thompson and Powers, 1987; Powers and Sutherland, 1989). The objectives of this report are to examine: (1) trends in commercial landings and effort; (2) catch per unit of effort (CPUE); (3) size of lobsters in the commercial catch; and (4) potential impacts of the expansion of the fishery into areas northwest of the Dry Tortugas.

#### DATA SOURCES AND METHODS

Spiny lobster commercial landings statistics are provided by two sources. From 1960 through 1985 the NMFS operated a voluntary program that included the majority of the dealers in the southeastern United States. This program, known as the General Canvass Landings System (GCLS), provides monthly summaries of the purchases (or landings) that dealers reported for every species of fish and shellfish. Beginning in November 1984, the Florida Department of Natural Resources (FDNR) initiated a mandatory trip ticket program within the state of Florida. This program, the Florida Marine Trip Ticket System (FMTTS), requires every seafood dealer to obtain a license and report the amount of fish and shellfish by species that were purchased for every fishing trip.

The two data collection systems were operated concurrently from November 1984 through December 1985 to assure that the two programs were providing consistent landings statistics. However, in January 1986, the NMFS discontinued their data collection

program, and has relied on FDNR for commercial spiny lobster landings. Due to inherent differences in the two commercial landings collection programs, caution needs to be exercised when comparisons are made between time periods (pre-1985 and post-1985). Because FDNR's trip ticket program is mandatory, landings from small dealers that were unknown or did not participate in the voluntary NMFS program are likely to be included in spiny lobster landings statistics after 1985.

Florida landings are often summarized by coastal area. The east coast includes Dade and other Atlantic coast counties while the west coast comprises Monroe and other Gulf coast counties. NMFS personnel estimate the total number of fishing vessels and traps in the fishery based on data obtained during an annual canvas of seafood dealers and fishermen. These estimates do not indicate actual usage, but only approximate maximum operating units (vessels and traps) in the fishery at the time of the survey. Total landings were divided by the estimated number of traps in the fishery to obtain an estimate of the catch per trap. FMTTS data was used to determine the mean catch per fishing trip by season and month for those trips in which greater than 75% of total landings were spiny lobster. This restriction was intended to eliminate from the analysis of effort those trips in which lobsters were harvested as bycatch from various types of gear (eg. fish traps, stone and blue crab traps, trawls, etc.).

"Landings" refer to the pounds of spiny lobsters (whole weight) that are sold by commercial fishermen to licensed seafood dealers. Powers and Sutherland (1989) described several types of unrecorded landings which are known to occur. These include: (1) recreational catch of legal and sub-legal sized or short lobsters; (2) commercial catch not sold through seafood dealers (commercial fishermen sometimes retail their own catch directly to consumers); and (3) commercial harvest of sub-legal sized lobster. It is also possible that some lobsters illegally caught in Bahamian waters and landed in the U.S. were included in Florida east coast landings (Powers and Bannerot, 1984).

Measurements of individual lobster carapace lengths were obtained from samples of commercial landings collected as part of the NMFS Trip Interview Program (TIP) and from FDNR biostatistical sampling surveys of lobster landed in the Florida keys. These data sets included information on area fished, lobster sex, and landing date for most measured lobster. These data elements facilitated the comparison of lobster size by the various parameters. NMFS collected data from August 1985 to February 1991 while the FDNR surveys occurred from July 1987 through March 1991. For the purposes of this report, it was decided not to pool the two datasets due to the differences in the coding of the area fished. It may be possible to pool most of the lobster measurements from these two datasets if a satisfactory partitioning of the areas fished element can be developed.

The opening date for the spiny lobster fishing season has changed several times since 1960 but has usually begun during the last week in July or the first week in August. The season since 1960 has extended through the last day in March of the following year. Information contained within this report will be summarized by month or fishing season. Fishing season will be referred to by the year beginning the season (eg. 1980 season encompasses the period from the season opening date in 1980 and extending through March 31, 1981). It should be emphasized that the data for the 1990 season is preliminary and therefore probably incomplete and subject to extensive revision.

## RESULTS AND DISCUSSION

### Landings and Effort:

Spiny lobster commercial landings in Florida increased from 2.8 million pounds in 1960 to a maximum of 11.9 million pounds in 1972. (Table 1, Fig. 1). Landings decreased from 1972 until 1975, with a dramatic decline of over 3.6 million pounds occurring in 1975 when compared to the previous season. Total Florida spiny lobster landings since 1975 have fluctuated, averaging about 6.1 million pounds through 1990 with a range of 4.5 to 7.9 million pounds. In recent seasons, an increase from 5.2 million pounds in 1987 to 7.8 million pounds in 1989 is noted. This increase may be

the result of a natural population fluctuation or reduced mortality of sub-legal sized lobster used as bait or decoys in traps brought about by the regulations requiring the use of live wells for holding the short lobster enacted for the 1987 season. The preliminary estimated harvest for the 1990 season is 5.9 million pounds, which very likely will be revised upward.

Florida west coast landings were greater than east coast landings for all seasons except 1972. West coast landings averaged about 5.4 million pounds with a range of 4.0 to 7.1 million pounds during 1975-1990. Florida east coast spiny lobster landings increased steadily from 1960 (0.7 million pounds) through 1972 (7.2 million pounds) and then decreased rapidly to about 1.2 million pounds in 1975. Increases in east coast lobster landings from 1965 to 1975 were for the most part due to increased U.S. fishing effort in the Bahamas. An estimated 17% to 57% of the entire Florida landings during 1965 to 1975 were taken from "international waters", principally the Bahamas (Labisky, Gregory, and Conti 1980). East coast landings declined during the early 1970's when the Bahamian Government began enforcing its fishery laws (Johnson 1973); in 1975 all foreign commercial fishing was prohibited on the Bahamian continental shelf. After the closure of Bahamian waters, spiny lobster landings on Florida's east coast averaged only 0.7 million pounds per season during 1975-1990.

Pounds landed and landing percentages by month for the August-

March periods from Florida's west coast during the 1960-1990 seasons are shown in Table 2. In general, west coast landings remained high (> 14% of total August-March landings) during the first 4 months (approximately 1/2 of the entire legal harvest period) of each season. On average, 73.9% of the total Florida west coast landings were harvested during the first four full months (August through November) of the seasons 1960-1990; this percentage increases to 78.3 if only the 1979 through 1990 seasons are considered. This suggests that the effective fishing season is only about one half as long as the legal fishing season in Florida.

The number of vessels in the fishery increased from 221 in 1960 to a peak of 823 in 1975, and then gradually declined to 465 by 1989 (Fig. 2, Table 1). The primary fishing gear for lobsters in the commercial fishery was the wooden slat trap. The number of traps in the fishery increased from about 74,000 in 1960 to a maximum of 675,000 in 1984; and averaged 591,700 traps during the 1985-1990 seasons (Fig. 3; Table 1). The number of traps per vessel tended to increase during the 1960 through 1990 seasons, with a sharp increase occurring from 454 traps/vessel in 1973 to 1,105 traps/vessel in 1981 (Fig. 4.). A brief leveling off of effort as measured by traps/vessel is apparent in the 1980 - 1988 seasons (average = 1,067; range = 1,006 to 1,135), followed by an increase to 1,368 traps per vessel in 1989.

### Catch Per Effort

Catch per trap exceeded 25 pounds, from 1960 to 1974 (Fig. 4). A sharp decline in pounds harvested per trap from 43.6 pounds to 10.2 pounds occurred from 1972 through 1978. Since 1978, catch per trap has fluctuated but remained relatively stable at around 11 pounds (range = 13.3 to 8.1). The inverse relationship between catch per trap and number of traps per fishing vessel (Fig 4.) indicates that fishermen increased the number of traps fished in the late 1970's after their landings per trap had greatly decreased, possibly in an attempt to compensate for the reduced income. Comparing the number of traps in the fishery to total landings (Fig. 5) indicates that increase number of traps did not result in production increases after 1972. Additional trap increases coincide with further declines in harvest after 1972. This suggests an excess of effort within the fishery when numbers of traps exceed the 1972 level (272,000).

Seasonal mean lobster catch per trip as reported by 179,780 trip tickets in the FMTTS is shown in Figure 6. The overall 1984 through 1990 mean catch per trip was 190.8 pounds although mean landings per trip have varied greatly between years. Mean pounds landed per trip increased 25.5% from 140.6 pounds in 1984 to 176.6 pounds in 1985, although this increase may be overstated because of low numbers of trips reported during the early months (August, September, and October) of 1984 on the FMTTS. Another increase

occurred in 1988 when mean pounds landed per trip increased to 219.9 pounds from 174.1 pounds in 1987 (a 26.3% increase). The magnitude of these increases cannot be explained by an increased number of traps being fished. The 26.3% increase recorded for 1988 season when compared to the 1987 season is perhaps another indication of the success in reduction of mortality of sub-legal sized lobster due to the live well holding requirement enacted for 1987. However, mean pounds landed per trip decreased to 214.6 (2.4%) in 1989 and to 183.4 (14.5%) in 1990.

Monthly mean lobster catch per trip and number of trips reported by month for the FMTTS data is shown in Figure 7. In general, the mean pounds landed per trip is higher during the first half of each season (July or August through November), followed by sharp decreases in both the number of trips and mean catch per trip noted for the second half of each season (December through March). The highest monthly mean pounds landed per trip for the 1984 through 1990 seasons was 318.1 pounds recorded during September 1988 for 5,268 reported trips.

#### Size of Lobster in Commercial Landings

Mean sizes based on carapace length (mm) of sampled lobster from commercial landings in the Florida Keys were examined (Table 3; Figs. 8 and 9). NMFS sampled 12,896 lobster from three areas (Fig. 10) during the 1985 through 1990 seasons and FDNR sampled

19,005 lobster from eight areas (Fig. 11) during the 1987 through 1990 seasons. The mean size of lobster in the commercial landings from the Florida Keys has been increasing since 1987 based on the unweighted trend lines to mean lobster carapace lengths for each season by area (Figs. 7 and 8). A Kruskal-Wallis test (nonparametric anova) was performed to test the null hypothesis that there was no difference between the mean lengths for each season by area (Table 3). The null hypothesis was rejected for 9 of 11 area comparisons. Only two of 11 area comparisons (FDNR data for areas 4 and 8) showed a non-significant result. However, the test for area 8 had little power based on a 1989 sample size of one lobster (Table 3). An increase in mean size suggests that more sub-legal lobster, used for attractants, may be escaping fishing mortality and entering the fishery at larger sizes. This adds further evidence for the success in reduction of sub-legal sized lobster mortality due to the live well requirement.

#### Expansion of the Fishery Northwest of the Dry Tortugas

Anecdotal reports were received in 1990 that fishing effort for spiny lobster was being expanded into deeper water and specifically toward an area northwest of the Dry Tortugas from which exceptionally large lobster were being landed. The existence of a significant population of large lobster from these areas would imply that spawning potential ratios used in the spiny lobster management plan and earlier studies were underestimated (i.e. some

of the adult stock had not been fully exploited because of the depth or distance from ports). Because of these reports, examination of data to verify the extent of fishing and the size of lobster caught from these areas was attempted. Unfortunately, very little data for the spiny lobster fishery specifically from the area Northwest of the Dry Tortugas were available. Only six trips which were sampled between October 1990 and February 1991 in the NMFS TIP database could be identified as commercial samples from this area. The mean spiny lobster landings for these six trips was 3,357 pounds with a range from 2,100 to 6,000 pounds. The mean carapace length for all 314 lobster measurements from these six trips was 114.9 mm. Of these, 152 were male (mean carapace length = 120.1 mm) and 162 were female (mean carapace length = 110.1 mm). Figure 12 shows a length-frequency histogram for these lobster. Given the small amount and short duration of data available, it is impossible to predict what impact, if any, the expansion of the fishery into this area has or will have. However, a small number of sampled trips does indicated that mean lobster landings per trip are high, and mean lobster size is quite large, relative to traditionally fishing areas.

#### SUMMARY

Total Florida spiny lobster landings have averaged around 6.1 million pounds since 1975. The number of traps in the fishery has increased from an estimated 74,000 in 1960 to 662,000 in 1990.

Catch per trap has stabilized since 1978 at around 11 pounds which is down from high catches (>25 pounds per trap) attained during the 1960's and early 1970's. In recent years, mean catch per trip on a seasonal basis has generally increased from 140 pounds in 1984 to 214.6 pounds in 1989.

The spiny lobster fishery appears to be benefiting from a 1987 fishery regulation requiring the use of live wells for the storage and transport of sub-legal sized lobster used as bait or decoys in traps. Utilization of sub-legal sized lobster as attractants is a common practice within the fishery which increases the mortality rates of these lobster due to prolonged exposure to air and subsequent confinement (Hunt, et al., 1986). Powers and Sutherland (1989) calculated that mortality of sub-legal attractants greatly reduces the potential yield of the fishery and predicted that any mechanism that substantially reduces the sub-legal mortality will increase yield. Since the requirement for live wells was introduced in 1987, three lines of evidences suggest that mortality of sub-legal lobster has been reduced: (1) increased total landings in 1988 and 1989; (2) a sharp increase in catch per trip for 1988; and (3) an increasing mean size of sampled lobster from commercial catches in the Florida Keys since 1987.

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Table 1. — Landings (whole weight), number of traps and number of craft in the Florida spiny lobster commercial fishery by fishing season, 1960 – 1990.

Fishing Season	FLORIDA EAST COAST			FLORIDA WEST COAST			FLORIDA TOTAL			Total Vessels	Traps per Vessel
	Landings (1000's of lbs)	Trap No. (1000's)	Lbs per Trap	Landings (1000's of lbs)	Trap No. (1000's)	Lbs per Trap	Landings (1000's of lbs)	Trap No. (1000's)	Lbs per Trap		
1960	723	19	38.1	2,098	55	38.1	2,821	74	38.1	221	333
1961	664	13	51.1	2,199	39	56.4	2,862	52	55.0	195	268
1962	668	16	41.8	2,424	58	41.8	3,092	74	41.8	248	300
1963	903	20	45.2	2,881	60	48.0	3,783	80	47.3	246	326
1964	963	40	24.1	2,984	74	40.3	3,947	114	34.6	341	333
1965	1,501	49	30.6	4,650	90	51.7	6,151	139	44.3	332	418
1966	1,603	76	21.1	3,122	75	41.6	4,724	151	31.3	488	309
1967	1,840	94	19.6	3,233	92	35.1	5,073	186	27.3	528	352
1968	2,481	70	35.4	3,600	99	36.4	6,082	169	36.0	452	373
1969	2,899	68	42.6	5,141	97	53.0	8,039	165	48.7	440	374
1970	3,080	69	44.6	6,546	150	43.6	9,626	219	44.0	492	445
1971	4,869	79	61.6	5,505	147	37.4	10,374	226	45.9	520	434
1972	7,151	98	73.0	4,711	174	27.1	11,862	272	43.6	599	455
1973	4,472	133	33.6	5,575	172	32.4	10,047	305	32.9	671	454
1974	3,417	144	23.7	6,527	227	28.8	9,944	371	26.8	690	538
1975	1,155	92	12.6	5,116	428	12.0	6,271	520	12.1	823	632
1976	1,463	32	45.7	3,962	315	12.6	5,424	347	15.6	549	630
1977	1,386	47	29.5	4,873	408	11.9	6,259	455	13.8	635	717
1978	651	43	15.1	5,160	529	9.8	5,811	572	10.2	672	851
1979	793	29	27.3	7,115	564	12.6	7,908	593	13.3	666	892
1980	1,000	35	28.6	5,269	570	9.2	6,269	605	10.4	595	1,017
1981	870	31	28.1	5,007	591	8.5	5,877	622	9.4	563	1,105
1982	812	40	20.3	5,436	502	10.8	6,248	542	11.5	539	1,006
1983	547	35	15.6	3,958	520	7.6	4,504	555	8.1	550	1,009
1984	181	20	9.1	5,999	655	9.2	6,180	675	9.2	610	1,107
1985	351	23	15.3	5,597	541	10.3	5,948	564	10.5	517	1,091
1986	507	40	12.7	5,123	536	9.6	5,629	576	9.8	549	1,049
1987	474	40	11.9	4,772	515	9.3	5,246	555	9.5	489	1,135
1988	581	45	12.9	5,704	629	9.1	6,284	557	11.3	514	1,099
1989	545	47	11.6	7,261	536	13.5	7,806	636	12.3	465	1,368
*1990	570	35	16.3	5,376	627	8.6	5,946	662	9.0	501	1,322

\*Preliminary, incomplete data.

Table 2 - Reported spiny lobster commercial landings (lbs whole weight) and percentage by month (August - March) from the Florida west coast - 1960 through 1990 fishing season

Season	Aug		Sept		Oct		Nov		Dec		Jan		Feb	
	landings	%	landings	%	landings	%	landings	%	landings	%	landings	%	landings	%
1960	411,804	19.6	279,797	13.3	404,489	19.3	316,389	15.1	229,668	10.9	132,836	6.3	173,584	8.3
1961	394,132	17.9	327,353	14.9	310,625	14.1	372,857	17.0	240,634	10.9	189,763	8.6	118,053	5.4
1962	438,487	18.1	329,181	13.6	299,664	12.4	419,675	17.3	394,713	16.3	223,351	9.2	118,885	4.9
1963	504,439	17.5	417,970	14.5	416,763	14.5	458,927	15.9	430,106	14.9	246,783	8.6	214,706	7.5
1964	534,350	17.9	413,994	13.9	452,829	15.2	508,299	17.0	283,257	9.5	182,436	6.1	181,693	6.1
1965	777,651	16.7	584,868	12.6	1,157,480	24.9	639,829	13.8	434,209	9.3	221,827	4.8	388,619	8.4
1966	647,991	20.8	366,745	11.7	590,559	18.9	710,041	23.0	283,679	9.1	205,385	6.6	109,322	3.5
1967	530,562	16.4	389,328	12.0	407,453	15.4	465,146	14.4	340,980	10.5	342,983	10.6	287,188	8.9
1968	708,159	19.7	489,229	13.6	642,067	17.8	732,060	20.3	339,454	9.4	152,840	4.2	266,326	7.4
1969	971,184	18.9	894,683	17.4	709,306	13.8	752,894	14.6	635,298	12.4	451,006	8.8	303,520	5.9
1970	1,152,538	17.6	1,038,109	15.9	1,385,101	21.2	1,138,968	17.4	959,608	14.7	351,651	5.4	210,785	3.2
1971	1,126,292	22.1	735,401	14.4	875,685	17.2	767,801	15.1	411,155	8.1	454,293	8.9	400,239	9.0
1972	691,349	15.6	670,160	15.1	933,803	21.1	736,621	16.6	528,908	11.9	374,854	8.5	272,058	6.1
1973	967,647	18.7	995,355	19.3	1,006,544	19.5	780,385	15.1	649,884	12.6	259,325	5.0	184,216	3.6
1974	1,706,642	27.2	864,153	13.8	1,492,501	23.8	505,822	8.1	991,034	15.8	300,347	4.8	221,756	3.5
1975	1,467,456	30.8	897,203	18.8	839,038	17.6	567,712	11.9	350,943	7.4	263,630	5.5	134,278	2.8
1976	1,043,551	26.9	588,312	15.1	819,081	21.1	593,926	15.3	320,180	8.2	244,056	6.3	144,158	3.7
1977	1,025,330	21.5	859,928	18.0	1,228,184	25.7	695,970	14.6	437,454	9.2	307,752	6.4	122,289	2.6
1978	840,862	16.7	755,954	15.0	1,175,205	23.3	794,408	15.8	519,159	10.3	425,751	8.5	322,995	6.4
1979	1,424,862	20.5	1,299,748	18.7	1,266,342	18.2	1,165,102	16.7	757,671	10.9	497,622	7.2	330,513	4.7
1980	1,499,828	29.2	838,512	16.3	893,424	17.4	854,746	16.6	408,854	8.0	304,361	5.9	183,493	3.6
1981	1,401,675	29.2	686,708	14.3	879,248	18.3	764,058	15.9	508,992	10.6	252,783	5.3	166,788	3.5
1982	1,420,952	26.4	1,120,090	20.8	1,090,177	20.3	826,036	15.3	415,921	7.7	256,777	4.8	147,330	2.7
1983	990,941	26.4	710,539	18.9	555,708	14.8	558,158	14.9	284,609	7.6	287,989	7.7	156,233	4.2
1984	1,441,342	24.8	1,126,283	19.3	1,091,619	18.8	976,727	16.8	467,660	8.0	363,478	6.2	171,558	2.9
1985	1,322,237	24.4	1,187,115	21.9	787,032	14.5	604,291	11.1	648,431	11.9	414,704	7.6	248,912	4.6
1986	1,245,889	25.0	730,492	14.7	914,578	18.4	514,305	10.3	519,301	10.4	538,692	10.8	302,070	6.1
1987	1,321,732	27.7	884,779	18.6	1,122,055	23.5	637,366	13.4	358,429	7.5	172,108	3.6	162,343	3.4
1988	1,657,569	29.1	1,580,181	27.7	980,959	17.2	626,887	11.0	485,013	8.5	260,498	4.6	109,788	1.9
1989	1,892,173	26.1	1,576,512	21.7	1,385,217	19.1	1,060,611	14.6	556,196	7.7	295,642	4.1	184,756	2.5
*1990	1,482,319	27.6	1,144,060	21.3	951,811	17.7	677,154	12.6	296,308	5.5	257,564	4.8	268,001	5.0
MEANS														
1960-90	1,065,669	23.0	799,443	17.2	875,953	18.9	684,902	14.8	467,346	10.1	297,841	6.4	215,047	4.6
1979-90	1,425,127	26.2	1,073,752	19.7	993,181	18.2	772,120	14.2	475,615	8.7	325,183	6.0	202,649	3.7

\*Preliminary, incomplete data.

Table 3. - Lobster sizes (carapace length mm) sampled from commercial landings in the Florida Keys by area and fishing season. NMFS sampled landings for three areas from August 1985 through February 1991 and FDNR sampled landings for eight areas from July 1987 through March 1991. A Kruskal-Wallis test was performed for each area by fishing season.

NMFS DATA							KRUSKAL - WALLIS TEST (NONPARAMETRIC ANOVA)		
SEASON	AREA*	NUMBER	CARAPACE LENGTH (mm)				CHISQ	DF	p
			MIN.	MAX.	MEAN	STD			
1985	10	2,898	70	136	85.9	8.5			
1986	10	2,516	71	164	86.2	9.2			
1987	10	1,133	71	122	85.5	8.1			
1988	10	1,080	72	116	85.4	7.4			
1989	10	810	75	125	89.8	9.2			
1990	10	105	74	110	84.3	10.0	164.66	5	<0.05 **
1985	20	370	73	128	87.8	9.1			
1986	20	749	69	155	87.7	9.7			
1987	20	1,242	70	145	87.7	9.5			
1988	20	194	75	109	87.1	8.1			
1989	20	453	75	135	90.4	10.0			
1990	20	31	81	146	100.9	12.8	70.59	5	<0.05 **
1986	30	24	72	109	96.4	8.2			
1990	30	198	88	161	120.9	15.3	46.67	1	<0.05 **

FDNR DATA							KRUSKAL - WALLIS TEST (NONPARAMETRIC ANOVA)		
SEASON	AREA*	NUMBER	CARAPACE LENGTH (mm)				CHISQ	DF	p
			MIN.	MAX.	MEAN	STD			
1987	1	1,182	73	151	83.1	6.7			
1988	1	1,001	73	126	84.1	7.2			
1989	1	962	74	129	85.7	7.5			
1990	1	478	75	127	85.0	8.3	76.67	3	<0.01 **
1987	2	556	75	112	84.2	6.5			
1988	2	956	70	120	83.4	6.8			
1989	2	421	75	111	85.4	6.6			
1990	2	427	75	121	84.0	7.0	39.29	3	<0.01 **
1987	3	1,660	70	119	83.4	6.8			
1988	3	1,050	63	116	83.5	6.5			
1989	3	1,178	74	197	86.2	8.5			
1990	3	823	75	134	84.3	7.8	112.5	3	<0.01 **
1987	4	1,045	72	126	84.6	7.6			
1988	4	770	73	120	83.9	7.2			
1989	4	669	74	110	84.2	6.7			
1990	4	742	74	134	84.7	7.2	6.92	3	>0.05 ns
1987	5	348	74	110	83.7	6.4			
1988	5	756	75	126	84.1	7.1			
1989	5	609	72	116	84.9	7.4			
1990	5	644	75	116	86.3	7.7	38.62	3	<0.01 **
1987	6	531	75	119	84.2	7.5			
1988	6	502	74	110	83.6	6.5			
1989	6	461	74	112	84.4	7.0			
1990	6	161	72	112	86.8	7.5	27.59	3	<0.01 **
1987	7	477	70	134	85.8	9.0			
1988	7	603	74	143	88.2	10.6			
1989	7	585	70	151	90.7	12.1			
1990	7	191	70	153	95.1	14.5	98.12	3	<0.01 **
1989	8	1	82	82	82.0	NA			
1990	8	116	78	139	104.7	15.7	2.11	1	>0.05 ns

\*AREA 10 = approx. Middle-Lower FL Keys : area bounded by 25 & 24 degrees N. Lat. and 81 & 82 degrees W. Long.  
 20 = approx. Key West to W. of Dry Tortugas : area bounded by 25 & 24 degrees N. Lat. and 82 & 84 degrees W. Long.  
 30 = North of Florida Keys : area bounded by 26 & 25 degrees N. Lat. and 81 & 84 degrees W. Long.

- 1 = Upper FL Keys - Bay Side : Key Largo to west of Long Key Bridge
- 2 = Upper FL Keys - Ocean Side : Key Largo to west of Long Key Bridge
- 3 = Middle FL Keys - Bay Side : West of Long Key Bridge to Big Pine Key
- 4 = Middle FL Keys - Ocean Side : West of Long Key Bridge to Big Pine Key
- 5 = Lower FL Keys - Bay Side : West of Big Pine Key to Key West
- 6 = Lower FL Keys - Ocean Side : West of Big Pine Key to Key West
- 7 = Key West to the Dry Tortugas
- 8 = West of the Dry Tortugas

# SPINY LOBSTER COMMERCIAL LANDINGS

## FLORIDA, 1960 - 1990 SEASONS

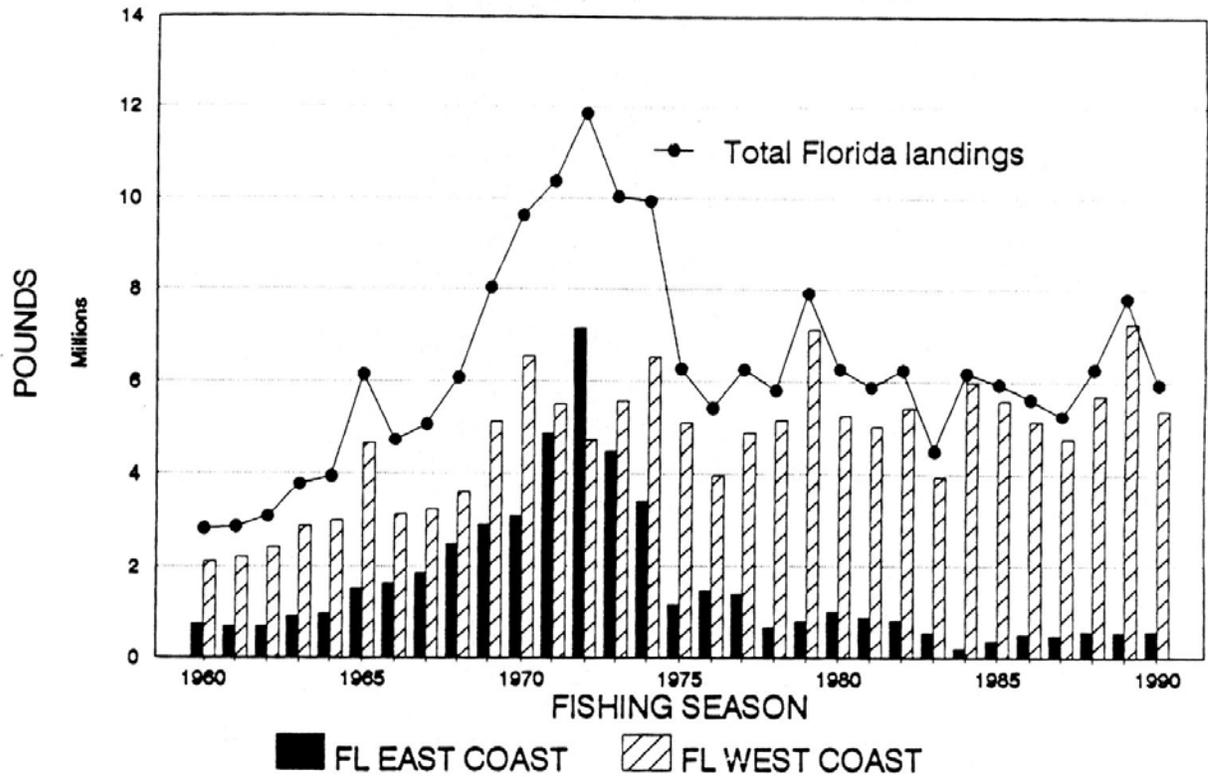


Figure 1. Spiny lobster commercial landings (whole weight) in Florida by fishing season. The line represents the total Florida landings while bars indicate landings by coast (east or west).

## NUMBER OF SPINY LOBSTER VESSELS FLORIDA, 1960 - 1990 SEASONS

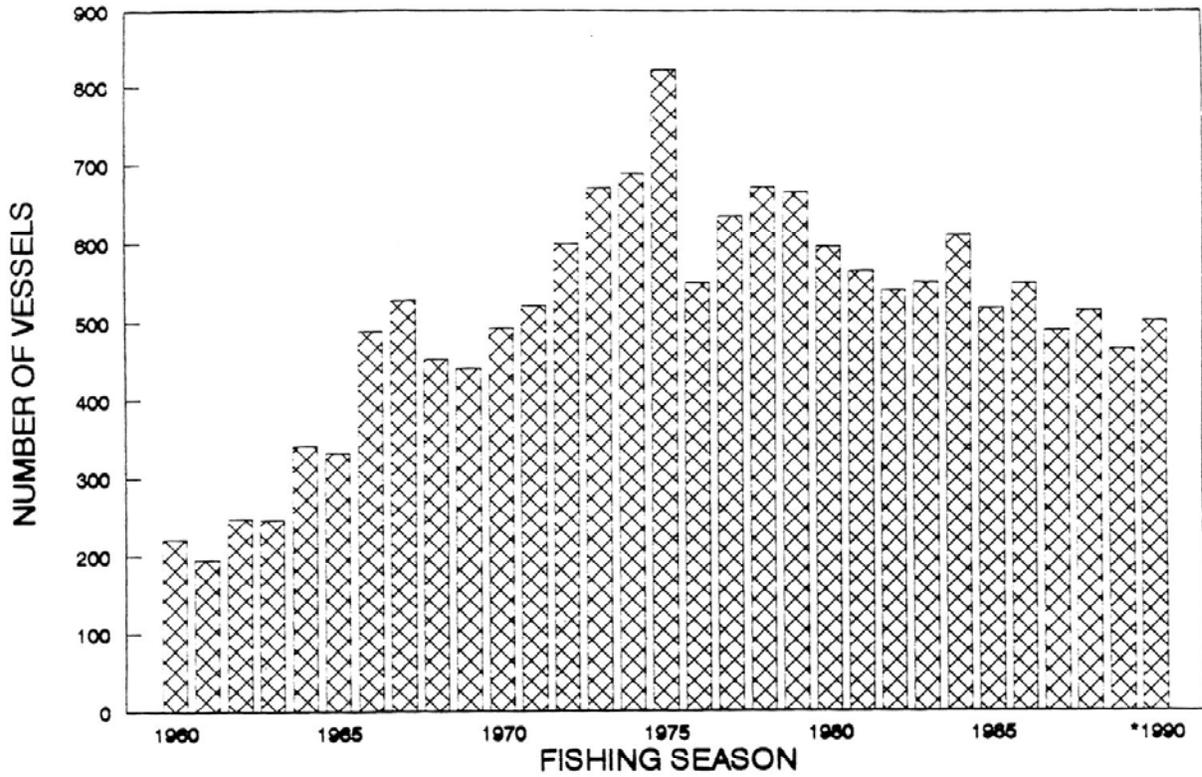


Figure 2. The number of commercial vessels by fishing season in the Florida spiny lobster fishery.

# NUMBER OF SPINY LOBSTER TRAPS FLORIDA, 1960 - 1990 SEASONS

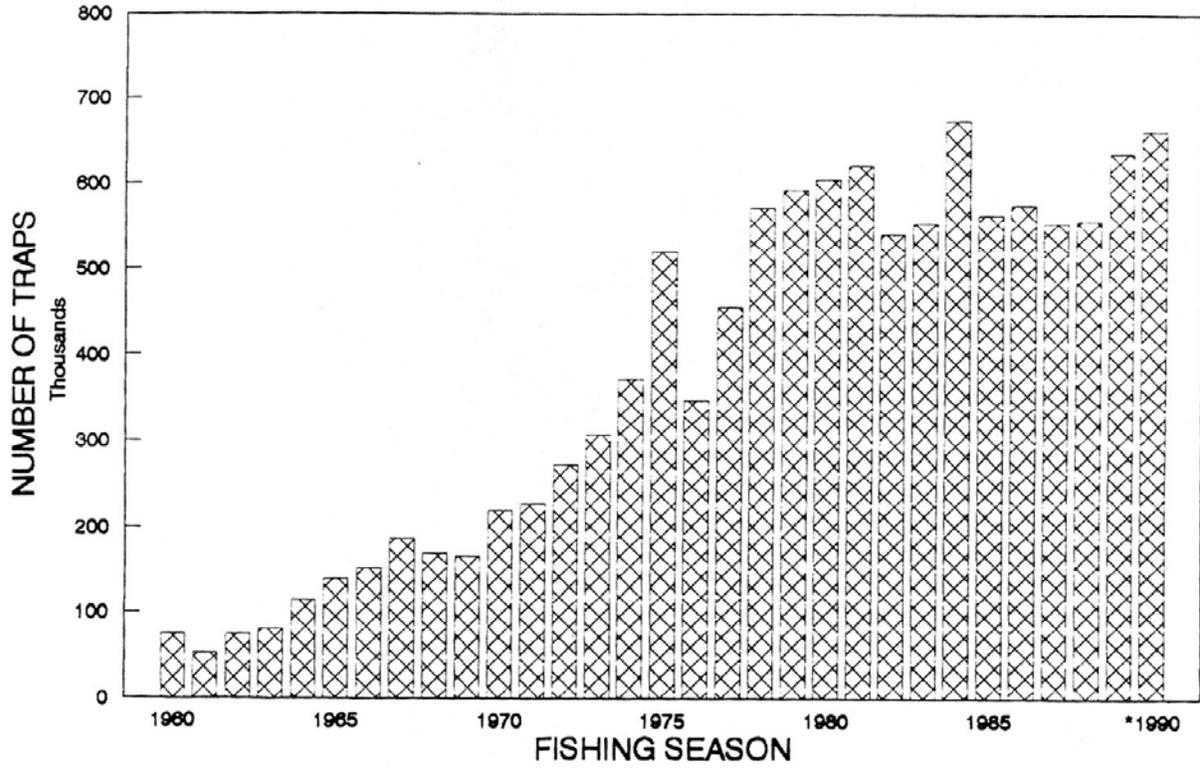


Figure 3. The number of traps by fishing season in the Florida spiny lobster fishery.

LOBSTER TRAPS PER FISHING VESSEL AND POUNDS LANDED PER TRAP  
 FLORIDA, 1960 - 1990 SEASONS

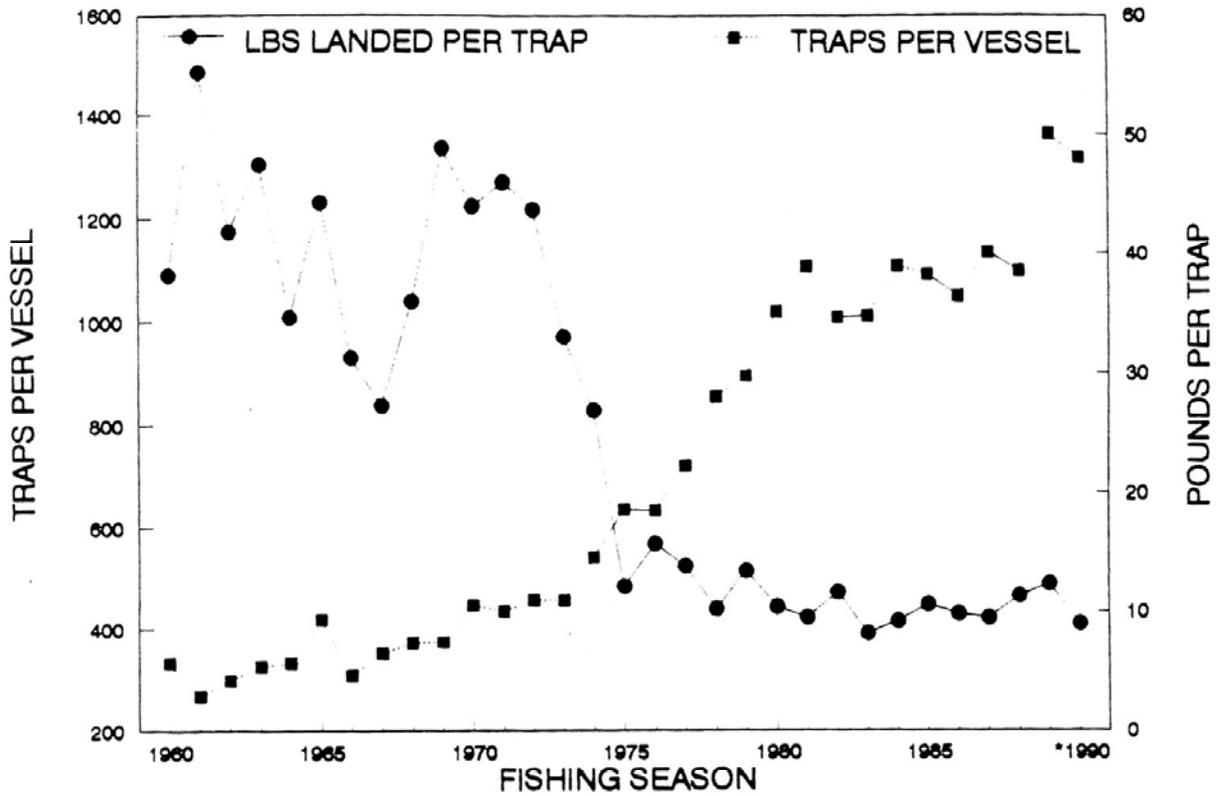


Figure 4. The number of spiny lobster traps per vessel and the average landings (pounds) per trap by fishing season in the Florida spiny lobster fishery.

# SPINY LOBSTER COMMERCIAL LANDINGS AND TRAPS FLORIDA, 1960 - 1990 SEASONS

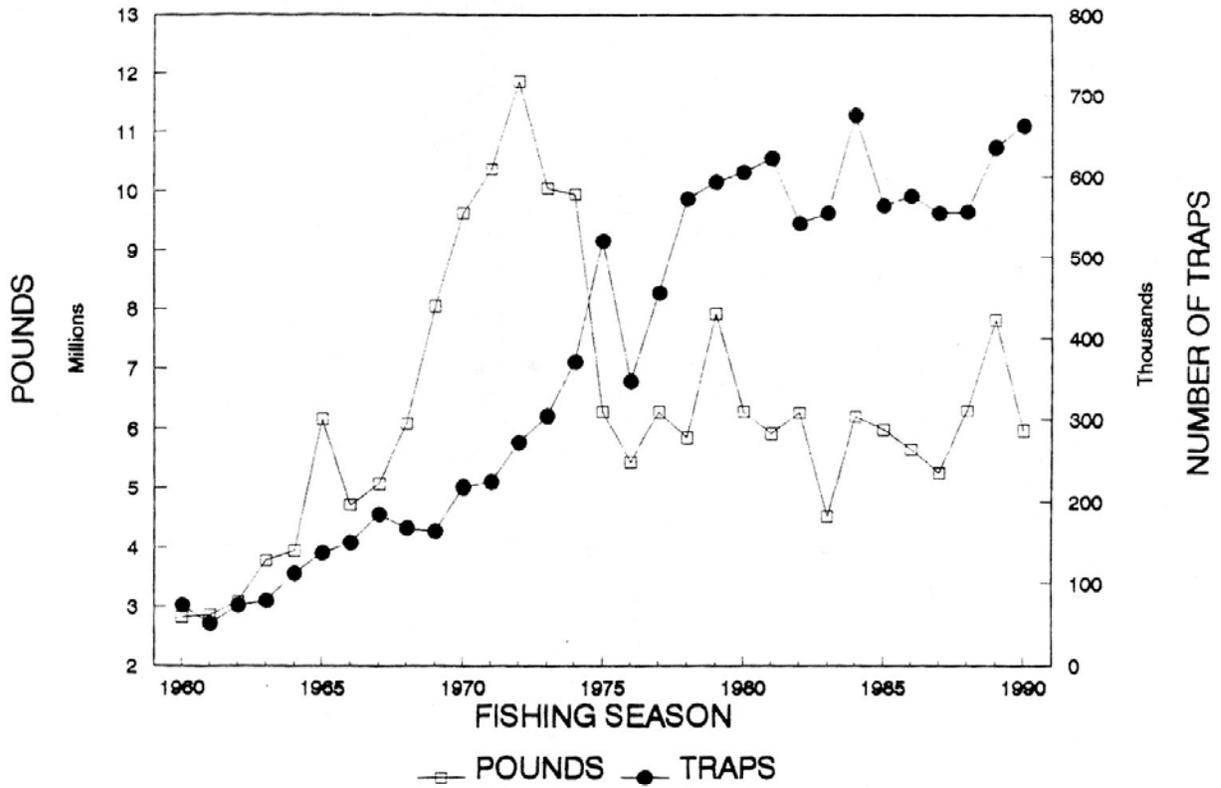


Figure 5. The Florida commercial spiny lobster landings and estimated number of traps in the fishery for the 1960 through 1990 fishing seasons.

### SEASONAL LOBSTER CATCH PER TRIP FLORIDA COMMERCIAL LANDINGS, 1984 - 1990 SEASONS

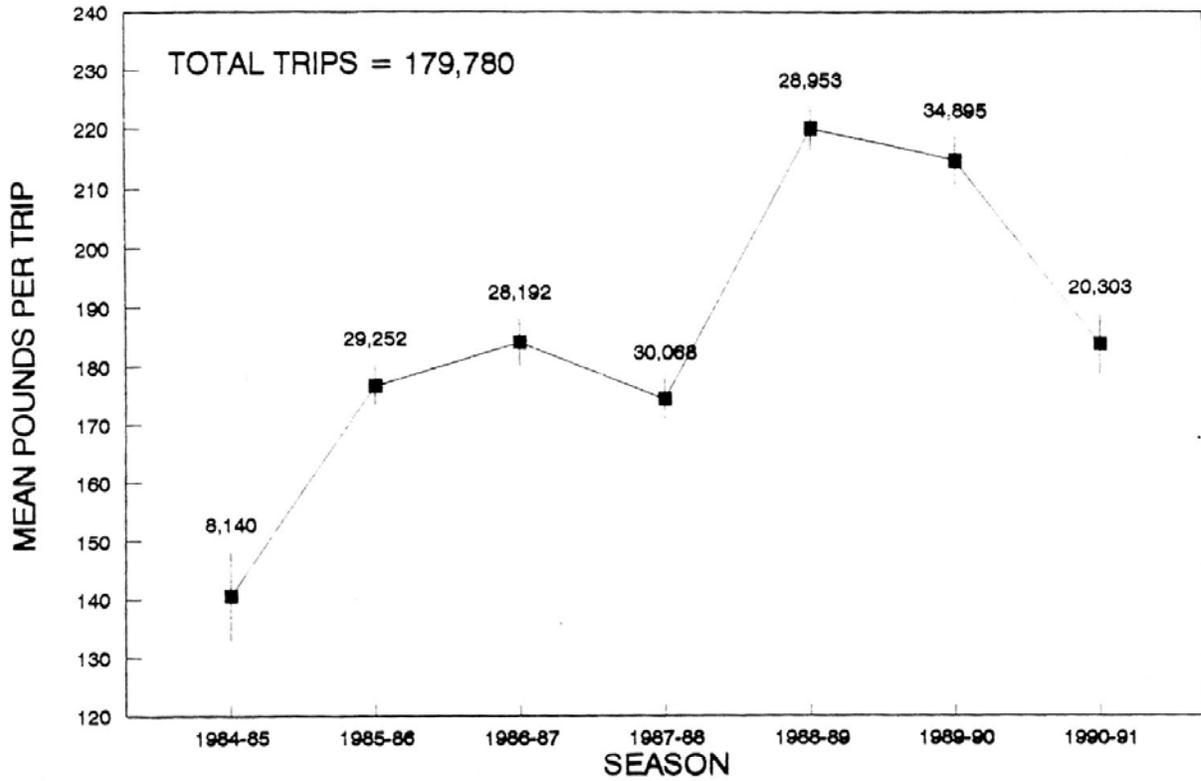


Figure 6. Mean catch (pounds landed) per trip by fishing season for 179,780 trips in the Florida spiny lobster fishery 1984 through 1990. Vertical lines for the 95% confidence interval and the number of trips is indicated for each seasonal mean.

# MONTHLY LOBSTER CATCH PER TRIP

## FLORIDA COMMERCIAL LANDINGS, AUGUST 1984 - MARCH 1991

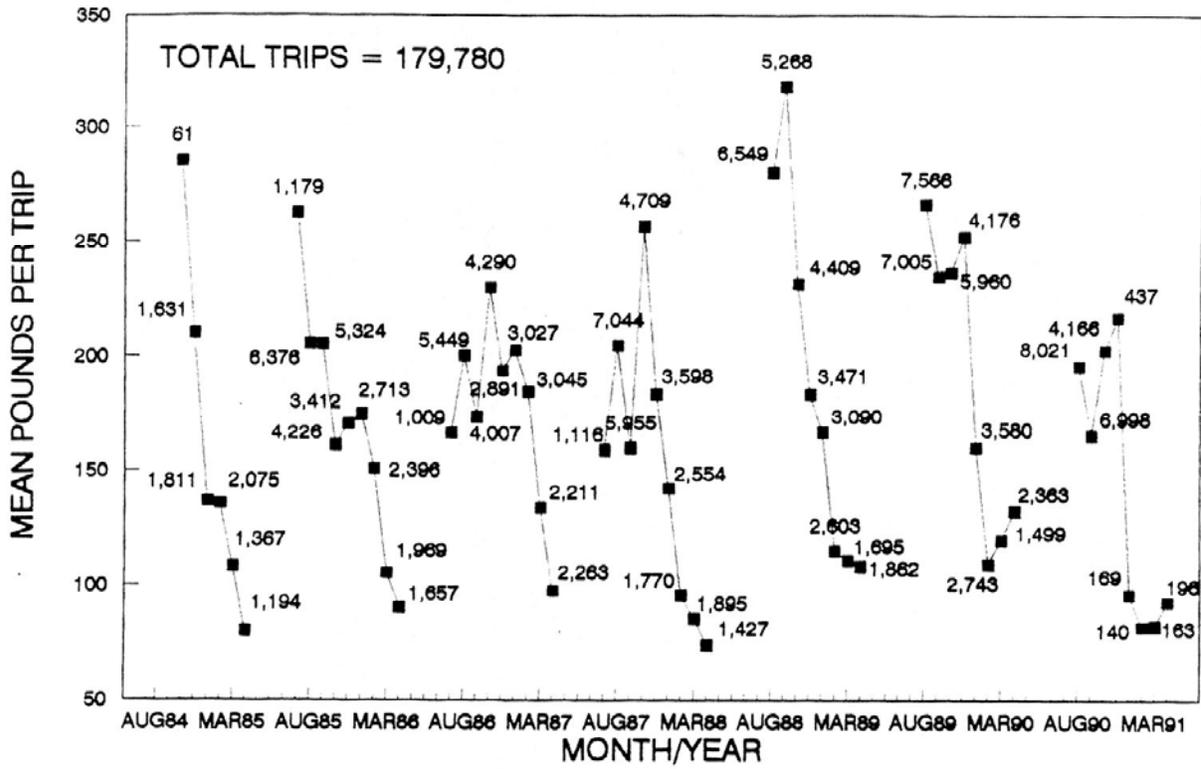


Figure 7. Mean catch (pounds landed) per trip by month for 179,780 trips in the Florida spiny lobster fishery August 1984 through March 1991. The number of trips is indicated for each monthly mean.

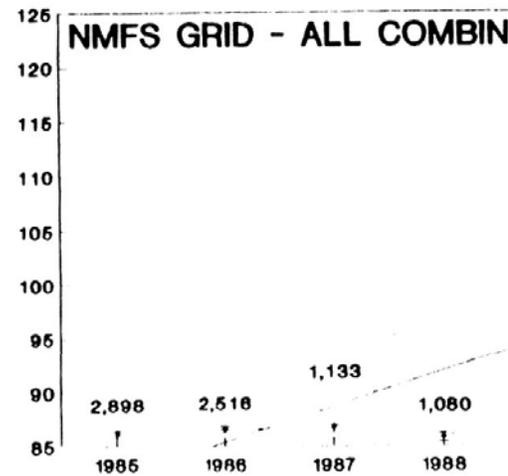
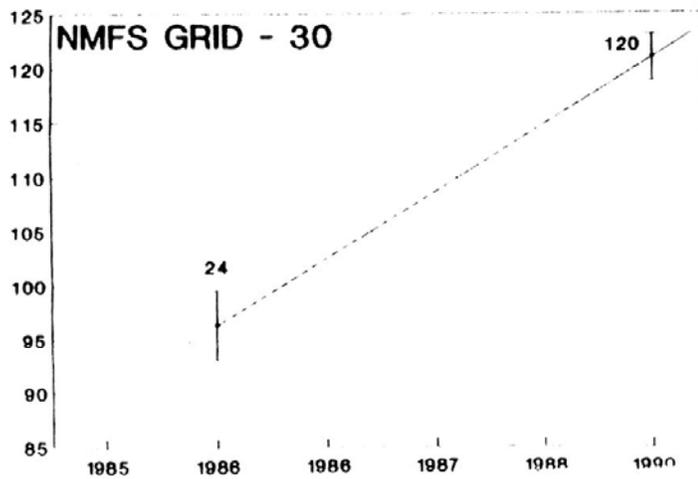
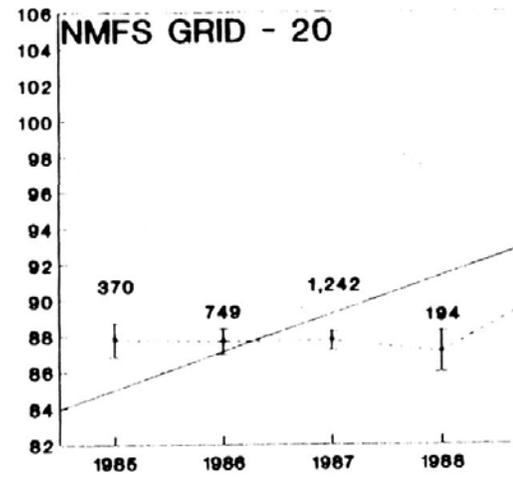
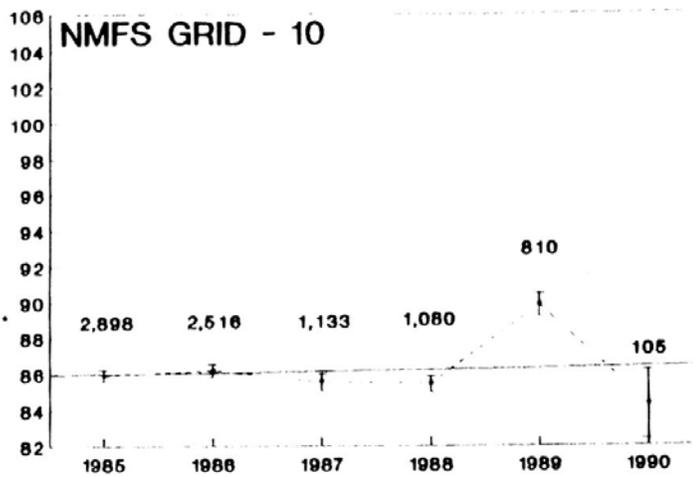


Figure 8. Mean lengths (carapace mm.) for spiny lobster sampled from by NMFS personnel 1985 through 1990. The lobster were areas in the Florida Keys. The 95% confidence interval i unweighted trend line was fitted to the seasonal mean fro

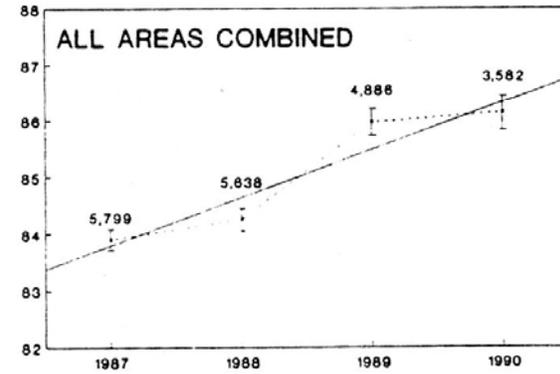
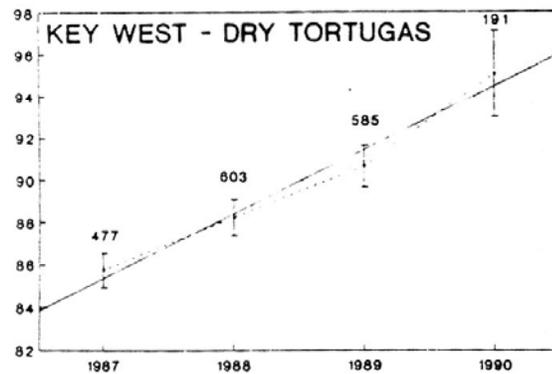
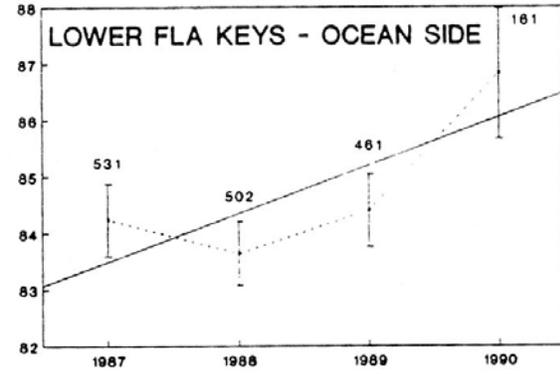
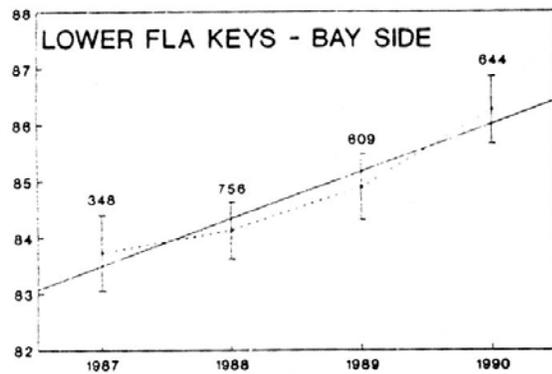
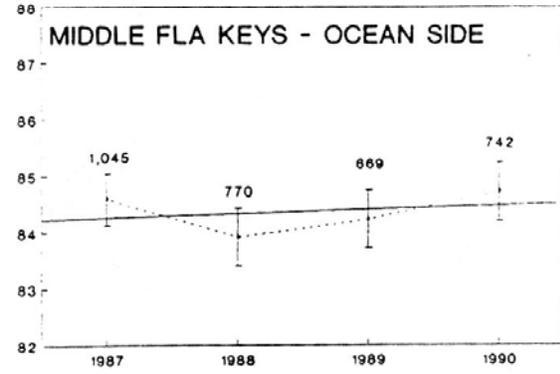
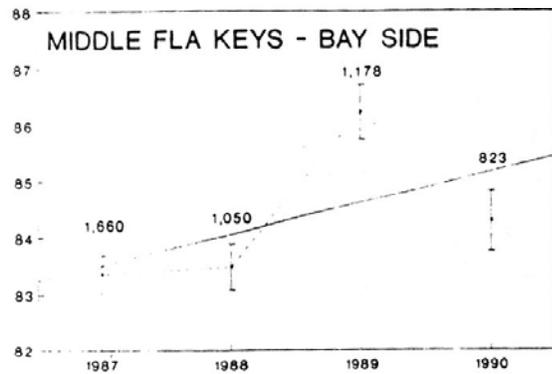
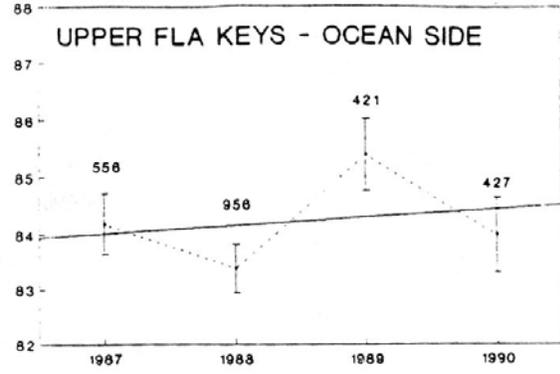
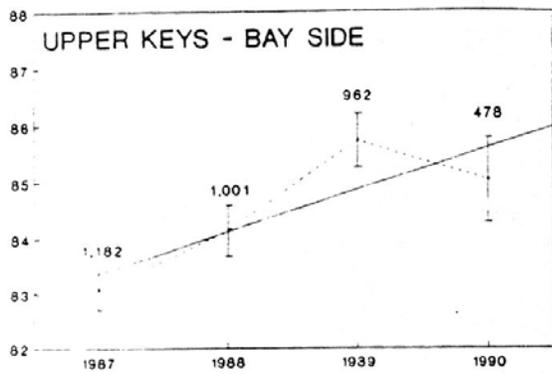


Figure 9. Mean lengths (carapace in mm.) for lobster sampled from commercial catches by FDNR personnel 1987 through 1990. The lobster were caught from eight areas in the Florida Keys. The 95% confidence interval is indicated for each season and an unweighted trend line was fitted to the seasonal means from each area.

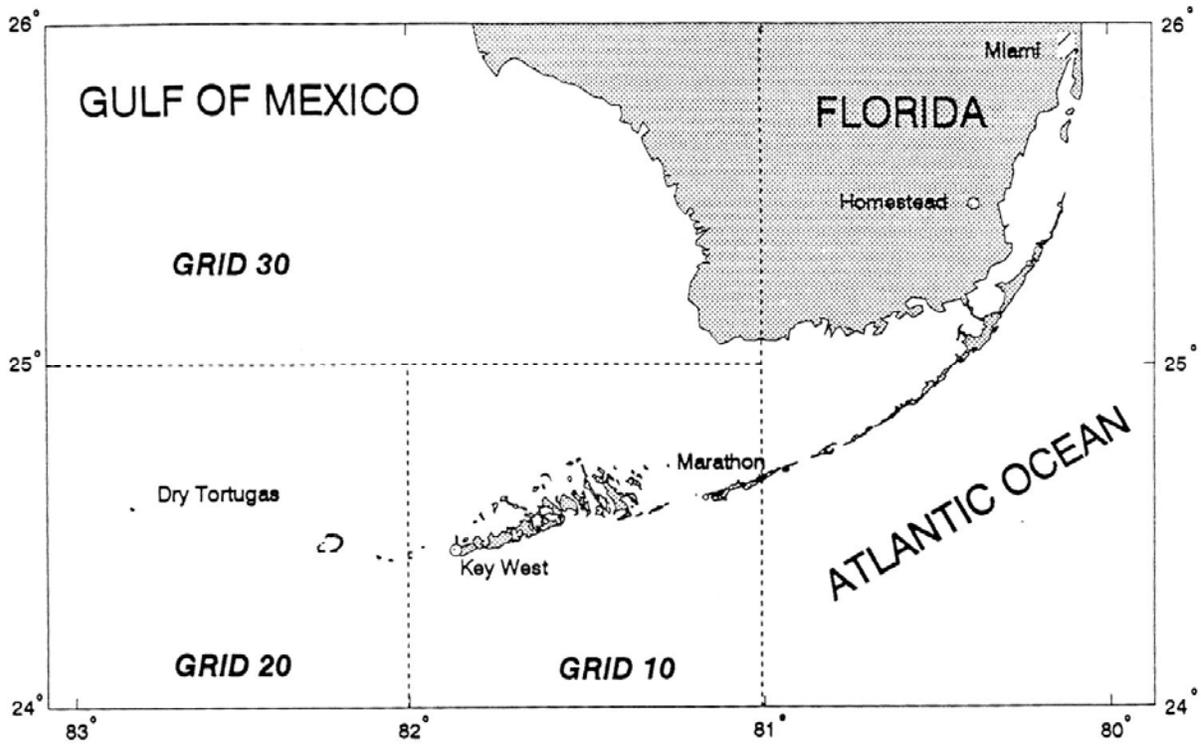


Figure 10. Approximate location of NMFS areas (grids) used to identify fishing areas for Trip Interview Program (TIP) samples in the Florida Keys.

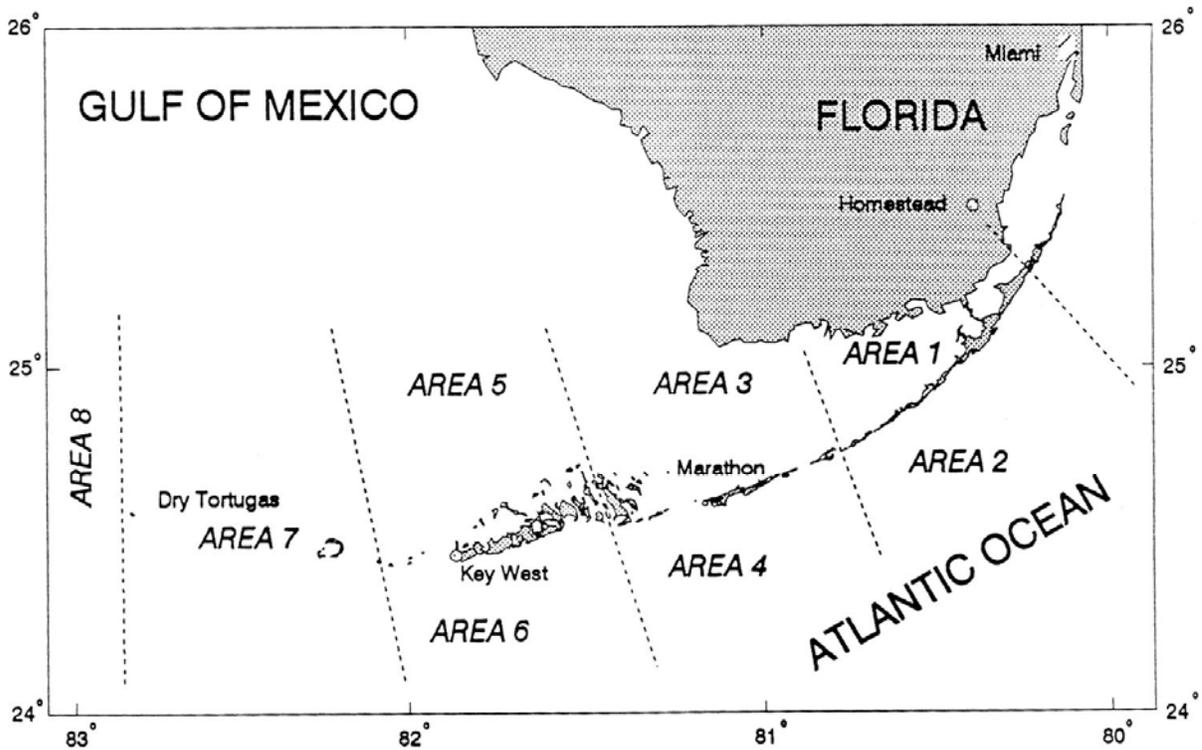


Figure 11. Approximate designation of biostatistical sampling areas used by the Florida Department of Natural Resources in the Florida Keys.

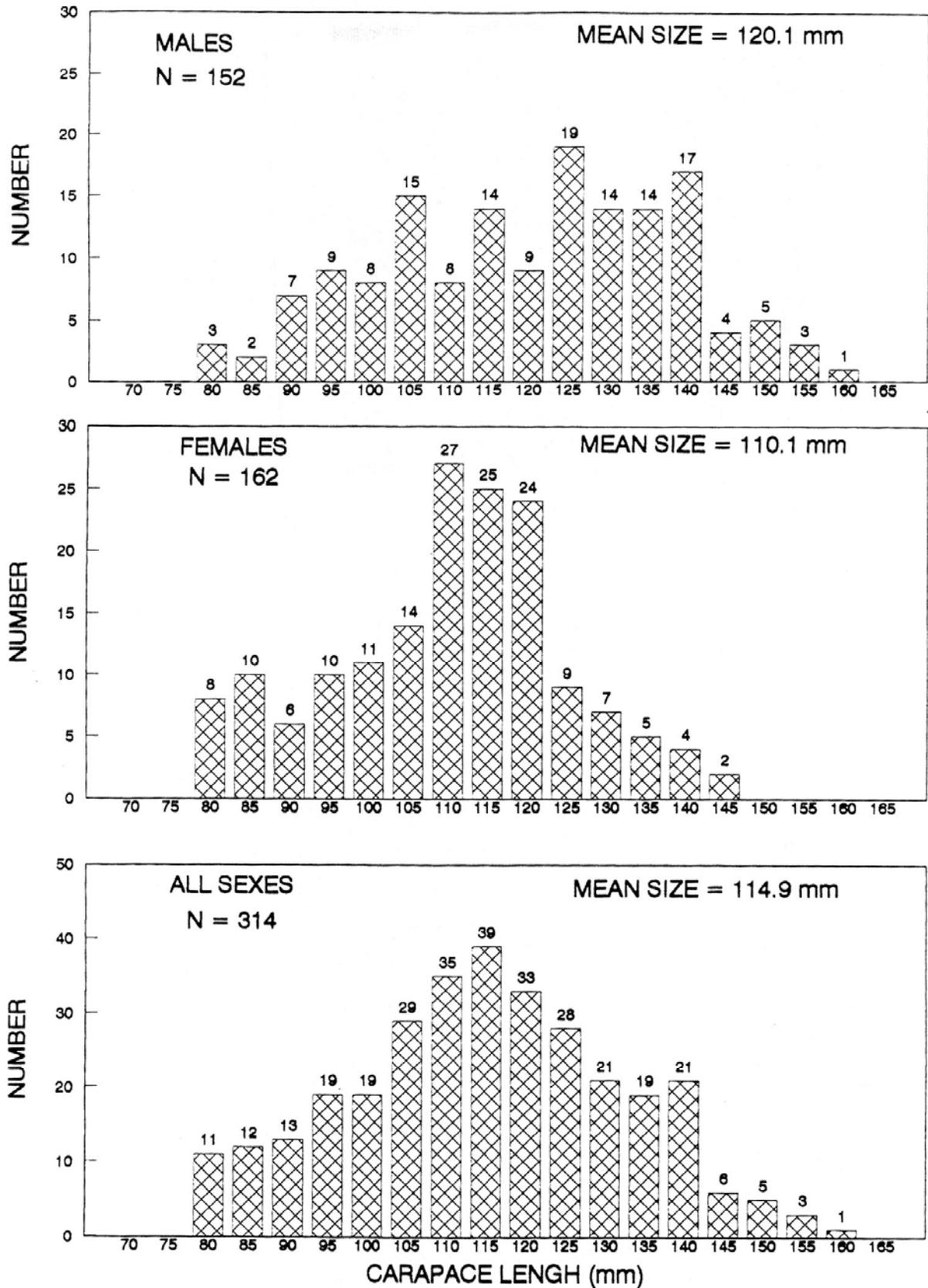


Figure 12.

Length-frequency histograms for spiny lobster (males, females, and both sexes) sampled from six TIP trips from the area northwest of the Dry Tortugas between October 1990 and February 1991.

**ECONOMIC ASSESSMENT, FLORIDA SPINY LOBSTER FISHERY**

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## ECONOMIC ASSESSMENT, FLORIDA SPINY LOBSTER FISHERY<sup>1</sup>

This report updates previous economic assessments of the spiny lobster fishery of the southeastern continental United States, which now occurs mostly on the southern tip of Florida. The assessment is for the commercial fishery. Data on the sport fishery is scant, but a 1991 survey suggests that its catch is more significant than once thought.

### Fishery Production

Florida's landings of spiny lobster rose from 2-3 million pounds in the early 1950s to 11 million pounds in 1972-74, but then fell and averaged 6.2 million pounds in 1976-91 (Figures 1-4 and Tables 1-2). In 1964-75, the spiny lobsters landed mostly in east coast ports (Miami area, Dade County) and caught largely in waters off the Bahama coast often accounted for about half of the Florida total. This boost was short-lived.<sup>2</sup>

The now dominant fishery of the Florida Keys had begun to grow with the U.S. postwar economy in the late 1940s, well before the day of the Bahama grounds. Problems of the Florida Keys economy had been addressed and freezing replaced ice packing of cooked lobster tails for the trade in major markets (Labisky, Gregory and Conti, 1980). Strong growth in Florida west coast landings (mostly in the Florida Keys, Monroe County) subsided by the 1970s, as shown by the *semi-log scale* of Figure 3.<sup>3</sup>

The volatility in real exvessel value for the Florida spiny lobster fishery tends to reflect that of its landed weight, though price extremes sometimes add their own component, as in the case of the price peaks of 1987 and 1991 (Figures 1 and 4). While the average rate of increase in real prices has been much lower since the early 1970s, their long-term effect is notable. They were less than a dollar a pound (in 1990 dollars) in the 1930s and early 1950s, but three to four dollars recently. The landed weight in 1991 was 4.4 times that of 1950 and the real value of \$27 million was about 23 times what it was in 1950.

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<sup>1</sup> Helpful suggestions about the fishery from Ed Little and Richard Raulerson are acknowledged, along with help from Bob LaFollette, Richard Schween, Guy Davenport, Ed Little and Linda Hardy in obtaining data.

<sup>2</sup> The Bahama Government extended its jurisdiction from 3 to 12 miles in 1969, closed its continental shelf to foreign lobster fishermen in 1975, and established a 200-mile fishing zone in 1977, thereby precluding finfish catch (Labisky, Gregory and Conti, 1980; Austin et al., 1980; Weidner, 1985). All three actions affected the largely Miami-based Cuban expatriate fishermen, whose catch was not restricted just to lobster, as is the case for fishermen who catch lobster in U.S. waters.

<sup>3</sup> A straight line of any given slope wherever located on the semi-log scale of Figure 3 indicates a constant annual percentage rate of growth; thus, the annual percentage rate of growth in (slope of the line for) west coast landings has been declining on average since the 1940s to a low, near-zero rate since the late 1960s.

## Resource Status and Regulations

While the trend in landings from U.S. waters has been comparatively flat since the mid-1970s and the stocks are said to be overexploited, Harper (1991) reports indications of possible improvement that trace to a new live well regulation. In an effort to reduce their mortality, the 1987 regulation requires that undersized lobsters that will be used as bait or decoys in traps must be kept in a continuously circulating live well while aboard the fishing craft. Longer-standing regulations have included notably a season closure since 1919 (now roughly April-July), a minimum harvest size since 1929 (now 3 inches or 76.3 mm carapace length), and since 1965 a prohibition on the harvest of egg-bearing females and a requirement that traps and buoys be marked (Labisky, Gregory and Conti, 1980).

## Fishery Inputs

The numbers of craft, fishermen and traps in the Florida spiny lobster fishery rose in 1950-75, but then fell along with landings because of the loss of access to resources that are now mostly in Bahama waters (Tables 4-6, Figures 5-9). Later, after the fishery adjustment in the mid-1970s, growth in the number of traps and in the number and proportion of vessels resumed, albeit at a much slower pace.

Comparing trends graphically, there has been more notable growth in traps than in fishing craft overall since the mid-1970s, as in the past, and the shift from *boats* to *vessels* has continued (Figures 5-8).<sup>4</sup> The trend in total fishermen has become much flatter, more so than the total number of craft. Finally, there have been sharper increases in traps per fisherman and per craft (Figure 9).

Current trends in aggregate input use seem to reflect in part a continuation of what began in the 1950s as technological change and innovation. Perhaps of more importance, there appear to have been changes in strategy since the mid-1970s by operators of the 500-800 small-business firms who are trying to survive. Partially anecdotal explanations are offered, but fishery behavior cannot be adequately understood in terms of trends in aggregate data on inputs and outputs. More insights into trends and what could be a grim future for some Florida spiny lobster commercial fishermen may be gotten from survey-based studies, such as that of Johnson (1987) which has both social and economic dimensions. More detailed current economic data to complement what was obtained in surveys by Noetzel and Wojnowski (1975),

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<sup>4</sup>Vessels are fishing craft of 5 net tons or more that must be enrolled or documented by the U.S. Coast Guard, and boats are fishing craft of less than 5 net tons in capacity, where one ton is equivalent to 100 cubic feet of capacity.

Prochaska and Williams (1976), and Prochaska and Landrum (1981) is needed.

### The Bahama Grounds: Boom and Bust

Because of displacement of U.S. fishermen from the Bahama grounds after 1975, Florida east coast landings of spiny lobster declined from a peak of 6.3 million pounds in 1972 and averaged 0.7 million pounds in 1976-91, about as they had in 1956-63. During 1964-75, the Bahama grounds often accounted for about half of Florida's landings, production of the Florida Keys nearly doubled, and the state's vessel total rose sharply, from 34 in 1963 to a peak of 402 in 1973.

Consequently, there was concern about the potential effect of relocation from the Bahama grounds to the Florida Keys grounds of a high proportion of some of the largest, most enterprising vessel-based lobster fishing firms. The 1964-72 expansion on the Bahama grounds involved Cuban expatriate fishermen who knew the grounds and larger vessels with freezer holds (Labisky, Gregory and Conti, 1980). Among other things, the Cuban Alien Act exempted these fishermen from the requirement of U.S. citizenship for vessel ownership. They fled Cuba because of the 1959 revolution and accession of the government of Fidel Castro.

In retrospect, most of the displaced vessels did not transfer to the Florida Keys. That is, the east coast vessel count fell by 193 between 1973 and 1977, that of the west coast rose by 69, and the state total fell by 124 (Figures 6-7 and Tables 4-6). Apparently, investment incentives in the Florida Keys fishery had fallen prior to the dislocation from the Bahama grounds.<sup>5</sup> Added to this, there were government efforts to help deflect displaced fishermen away from the Florida Keys fishery, notably low-interest loans by the U.S. Economic Development Administration and exploratory searches for unfished lobster stocks (Labisky, Gregory and Conti, 1980; Austin et al., 1980).

For the most part, the trend in the number of Florida spiny lobster boats was less affected than the trend in the number of vessels by the rise and fall of catch in 1964-76 from off foreign coasts, notably from the Bahama grounds, as one would expect. In 1964-67, however, the number of boats landing lobster in east coast ports did rise above the long term trend (Figures 6 and 8), perhaps reflecting participation in the initial expansion of Florida-based fishing for lobster on the Bahama grounds. Yet, regular crossing of the Gulf stream between Miami and Bahama would have been dangerous for the smaller and less seaworthy

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<sup>5</sup>Roughly half of the sharply expanded vessel fleet of the late 1960s was already in the west coast fishery, trap productivity had fallen compared with the east coast by 1971, and the rate of growth the west coast's number of vessels had begun to decline in 1969-70.

boats. Furthermore, even if boats remained to work the Bahama grounds and had gotten vessels with freezer holds to store and transport their catch back to U.S. ports, the 1969 extension by the Bahama Government of its jurisdiction from 3 to 12 miles from shore would have adversely affected their fishing.

### Current Trends

Since the adjustment to the loss in 1975 of legal access to lobsters on the Bahama grounds, there has been a resumption of growth, albeit slower growth, in the number and proportion of vessels in the Florida spiny lobster fishery. Also, vessels now average 18 gross tons, up from 10 tons in the 1950s and early 1960s, but less than the 23-27 ton averages that prevailed in the late 1960s and early 1970s when fishing on the Bahama grounds had involved larger vessels with freezer holds. An average of 18 gross tons is close to that for the smallest 45% of the vessels in the southeastern U.S. shrimp fleet.<sup>6</sup>

Modern vessels, 30-55 feet in length, with fiber glass hulls, diesel engines, electronic navigation, depth recorders, and hydraulic trap hauling systems came into prominence in the Florida spiny lobster fishery in the 1960s (Labisky, Gregory and Conti, 1980). Trap haulers became prevalent by the late 1960s. Even so, a side-mount unit, which allows the operator to drive the craft as traps are being worked, thereby adding further to labor efficiency, would require a larger craft than an aft-mount unit (Noetzel and Wojnowski, 1975).

Because they tend to be more seaworthy, vessels are more likely to be used farther from port, for deeper water lobstering, and for longer fishing trips. Compared with boats, vessels allow more traps to be hauled per craft, per day and per man. In this vein, their crews are now larger than for boats on average, allowing fishermen to rotate the more arduous tasks. The boat crew average has been mostly 1.5 to 2 members since the 1950s, including part-time fishermen, whereas the vessel crew average rose from 2 to 2.9 full-time fishermen in 1979-82 and declined a bit since then (Table 5).

Boats tend to be a less costly means of entry into fishing than vessels, more part-time fishermen are involved, crews are smaller, and fishery entry and exit is more frequent, judging by the greater volatility in the number of boats than in the number of vessels (Tables 4-6 and Figures 6-8). There may be many causes for this greater volatility. For Florida west coast spiny lobster boat fishing, one cause appears to be the cyclical variation in general employment conditions, an influence which

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<sup>6</sup>The 5,221 vessels that fished for shrimp in the South Atlantic and Gulf states in 1977 averaged 56 tons and the 2,356 vessels, or 45%, in the lowest three size classes averaged 20 gross tons, based on the number in each class and the class mid-point tonnage (NMFS, Fishery Statistics of the United States for 1977).

seems not to have affected boat fishing on the east coast or vessel fishing on either coast as noticeably (Table 4). Times of cyclical decline in the nation's economy and employment roughly in 1970, 1975, 1979-80 and 1982-84 may not have exact counterparts in the Florida Keys, but they do coincide with times of increase in the the numbers of boats, full-time boat fishermen, and/or part-time boat fishermen in the west coast fishery.<sup>7</sup> Earlier cyclical downturns in the national economy in 1957 and 1960 did not have as noticeable an effect.

There has been a relatively flatter trend in the volatile number of Florida lobster fishing boats since the mid-1970s, while the number of vessels has grown more steadily and exceeded the number of boats for most of the past decade (Figure 6, Table 5). This shift from boats to vessels accompanied a sharply higher number of traps per craft and fisherman since the early 1970s (Figure 9). This twofold change seems to imply the pursuit of a profit oriented, defensive fishing strategy from the viewpoint of some 500-800 individual, small business owners and/or operators. The approximate number of firms is obtained by assuming that each is a proprietorship operating one craft. Several arguments have been advanced to help explain the use of more traps and the gradual shift to vessels:

First, having more traps and buoys per line in the water may make it easier to delineate fishing territory and to relocate traps. "Territories" are dynamic and not necessarily of fixed geographic location, because of weather and lobster movements (Johnson, 1987). Despite the required color coding of buoys since 1965, soak time (time in the water) may be long, and water currents or rough seas can move them. Although the median soak time for traps is 7-10 days, the range is 10 hours to 30 days, according to samples for the three fishing years 1985/86 to 1987/88 (Waters, 1988, Table 5).

Second, having a greater number of traps in the water, many with no lobsters in them, should help thwart theft. According to this argument, lobster theft by diving requires dealing with more traps under difficult circumstances, and bringing more than a few traps aboard a fishing craft requires considerable physical strength and stamina, unless the craft has a hydraulic trap hauler, for each trap weighs about 80 pounds wet (Little, 1992). Reportedly, trap and lobster theft increased markedly in the Florida Keys about 1970, and lobster theft continues to be a problem, more so as one moves closer to the mainland, away from Key West (Wolfferts, 1974; Little, 1992). However, interviews with fishermen (in early 1986) suggest that other factors, such as prices, regulations, weather, movement of lobsters and zoning laws were at the time more pressing to many of them (Johnson,

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<sup>7</sup> Cyclical indicators of employment and unemployment shown in graphs of a monthly publication, U.S. Dept. of Commerce, Bureau of Economic Analysis, Survey of Current Business.

1987). Also, loss of traps from hurricanes, weather and other natural events is more likely as one fishes more open areas of the Gulf of Mexico and Atlantic Ocean (Johnson, 1987).

Third, another indication of a change in fishing strategy may be the greater harvest from Florida west coast waters more than 12 miles from shore since 1984. The harvest from these waters was also greater in the early 1970s than in the intervening years 1976-83 (Table 2).

Fourth, judging by data for the 1952/53 to 1990/91 fishing years, a year's catch has tended to be taken in a shorter period of time since the early 1970s, as discussed in more detail in the section of this paper on average productivity. This is quite important to most firms in the fishery, for it allows them to more fully use their time and resources by participating in other seasonal fisheries (Noetzel and Wojnowski, 1975; Prochaska and Williams, 1976; Prochaska and Landrum, 1981; Johnson, 1987; Little, 1992).

Finally, as effort increases in common property fisheries, they mature and average productivity declines, causing firms to react. Individual businesses attempt to offset the adverse effect of declining productivity on their survival and financial returns by doing whatever they can, such as increasing traps, size of vessel or days fished, so long as it is perceived as being profitable. The cycle recurs. Not to mention related works, there are three key, survey-based studies of economic optimization of the spiny lobster fishery: Williams (1976), Keithly (1981), and Waters (1987). Given their caveats, these studies typically indicate the optimal number of traps for the firm or fishery, and/or the optimal number of firms for the fishery.

### Fishery Productivity

Average productivity of inputs of the Florida spiny lobster fishery has changed in varying degrees since the 1950s, depending on which of the commonly used ratios is chosen (Table 6 and Figures 10-12). For example, the volatile productivity of firms (fishing craft) declined from an average of 17,493 pounds in the 1950s to 9,632 pounds in the 1980s, but the real value (in 1990 dollars) rose from \$16,159 to \$28,865.

These commonly used ratios are obtained by dividing fishery output in pounds or value by the number of units of a fishery input, fishermen, craft or traps. Despite their simplicity, these average productivity ratios can be misleading. They do not take into account the actual amount of use of an input during the year (days fished, number of trips, etc.), the input's separate contribution to production or its use to harvest other fish.

Some impressions about the use of inputs during the year can be gained from data on the percentage of landings by quarter of the fishing years from 1952/53 to 1990/91, as shown in Tables 7-8 and Figures 13-16. For Florida's east coast, landings in the fourth quarter (April-June) were more often important than for the west coast, and its pattern among quarters differed when the Bahama grounds were being worked (1964-75). Apart from years when these differences prevailed, the first two quarters of the fishing year (July-September and October-December) have accounted for some 70%-90% of a year's landings on both coasts since the early 1950s.

Since 1975, the first quarter of the fishing year (July-September) has accounted for a greater proportion of the now dominant west coast landings, about 45% versus 33% (foot of Table 8). This increase occurred at the expense of landings in the third quarter, which are relatively more variable and have accounted for about 13% rather than 23% of the year's landings on average (Figures 14 and 16).

#### Comparison with Survey Results

By way of comparison, Noetzel and Wojnowski (1975) reported average vessel revenue of \$19,900 from spiny lobster in their survey in Florida Keys for the 1972/73 and 1973/74 seasons, and \$11,100 for boats, plus off-season revenue from finfish of \$2,100 for vessels and \$1,700 for boats. They found variation in gross revenue, costs, net returns (losses), returns to investment and other factors of production, and dependency on spiny lobster by size of boats and vessels. In current dollars, the west coast average craft's gross revenue from spiny lobster was a comparable \$15,320 in 1973 (Tables 1 and 4). Prochaska and Williams (1976) reported a similar average revenue per craft from lobster of \$13,848 from their Florida Keys survey for the 1973/74 season, with a total of \$21,952, also counting stone crab and fish. They too analyzed revenue, costs and returns by size of craft.

For their Florida Keys sample of the 1978/79 season, Prochaska and Landrum (1981) reported average gross revenue of \$40,912 per craft from spiny lobster, plus an additional \$12,459 from secondary fisheries. From Tables 1 and 4 of this report, the average gross revenue in current dollars for west coast craft in 1979 was much lower at \$22,386. Prochaska and Landrum (1981) analyzed revenue, costs and returns by size of craft. The gross revenue for spiny lobster alone rose from \$20,862 for craft less than 27 feet in length to \$61,961 for craft greater than 42 feet in length, but return on investment declined.

Johnson (1987) did not collect cost and returns data for 1985 in his survey of spiny lobster operations in the Florida Keys, but did obtain much useful data on social and economic characteristics, some of which can be compared with measurements

of the fishery, including those in Tables 4-6.<sup>8</sup> Given Florida legislation that would limit and possibly reduce the number of traps, such comparisons are interesting, for various estimates of the amount an input may lead to different impressions, whether or not they are actually used to compute an input's average productivity.

Johnson's estimate (using the sample median, not mean) for Monroe County is 540,100 traps for 1985 which compares reasonably with the NMFS estimate of 662,100 traps for Florida's west coast in Table 4. Johnson's estimate for *full-time* fishermen's use of traps in Monroe County is 506,700 traps. He indicates that Bob Muller of the Florida Department of Natural Resources had used trap data from that agency's Saltwater Products Licence file directly, obtained an estimate for full-time fishermen (those fishing more than 500 traps) of 569,708 traps for Monroe County. Johnson repeated Muller's discussion of possible sources of error in this approach, and added one of his own. Suffice it to say that estimates vary and that each may be criticized. The NMFS estimate for 1985 for Florida, 713,850 traps for all operations (Table 5), is lower than Muller's estimate of 935,501 traps for Florida full-time operations.

### Fishery Markets

Expected spiny lobster prices are an important factor in fishing business decisions about operations (whether or not to go on a fishing trip), investment, industry exit-entry and other matters. More properly, expected returns to the firm's inputs must be considered, after deducting appropriate costs from gross revenue for the firm or from price, if the calculations are on a per unit of output basis. While they do not consider costs and other factors, Figures 17-18 do suggest a rather strong influence of real exvessel prices on the use of two inputs, fishing craft and traps in the Florida spiny lobster fishery during 1950-89, although traps have increased in number despite the relatively flat trend in prices since the early 1970s (Figures 2 and 21).

U.S. landings of spiny lobster account for just a fraction of the trade in the U.S. and world seafood markets where prices are determined. Therefore, fluctuations in U.S. landings, which consist mostly of Florida landings, are not likely to have much influence on exvessel prices (prices at the dock). That is, as indicated earlier, the real exvessel value for Florida spiny lobster varies more or less in accord with the landed weight, though price extremes, such as the price peaks of 1987 and 1991,

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<sup>8</sup>For example, the average number of traps fished was 1146 for the broadest (Monroe County) sample, and this compares reasonably with the 1224 average for Florida in Table 5. The estimated number of full-time fishing firms (for Monroe County) was 563 (90% confidence interval, 321 to 814), and part-time firms, 167 (90% confidence interval, 42 to 369). The number of firms from Table 4 is 521 for 1985 (311 vessels and 210 boats, with boats involving 450 full-time and 57 part-time fishermen).

can add their own component to volatility (Figures 1 and 4). In general, there is little most fishermen can do to influence prices in the output and input markets upon which they depend; in both, they are "price takers," so to speak.

### The U.S. Market

U.S. landings of spiny lobster peaked at about 10-12 million pounds in the early 1970s at the height of the Florida-based fishing on the Bahama grounds. Yet, this amount would be just a fraction of the U.S. consumption of spiny lobster products, even at today's reduced level. Consumption was once as much as 162 million pounds (in 1975), depending on one's view about which items to include in its import component for analysis (Table 9 and Figure 18).<sup>9</sup> The narrowest view of the market, including in its import component only lobster tails, puts the consumption peak at 111 million pounds (in 1970). By either of the two measures of consumption, the U.S. market has declined greatly since the 1970s, to some 79-80 million pounds in 1991.

The 1991 U.S. consumption of lobster tails of 79 million pounds represents some increase from the most recent low of 73 million pounds of 1987-88, but it is less than consumption in all other years since 1956. The pattern of decline since 1984 is steeper than what prevailed for most of the time since the peak of 1970.

The generally larger consumption of *all spiny lobster products* was surprisingly low at 80 million pounds in 1991, having dropped more precipitously than consumption of lobster tails since the mid-1980s. The broader view of the market includes in the import component of consumption not only spiny lobster tails, but live, canned, and other spiny lobster products, of which the latter fell sharply in 1990-91 (Table 9).

U.S. imports largely determine U.S. consumption of spiny lobster tails, and they rose from 13 million pounds (product weight) in 1950 to a peak of 37 million pounds in 1969 and then declined at a slower pace to a low point of 22 million pounds in 1989. The long, gradual decline may be associated with increased shipments by the world's major spiny producer-exporters to Japan

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<sup>9</sup>Respecting the product breadth of the spiny lobster market, Table 9 of this report is consistent with the approach in the NMFS annual report Fisheries of the United States; it excludes amounts for American (northern) lobster, which is produced only on east coast of Canada and northeast coast of the United States. Conventional wisdom based on appearance suggests that market competition between the leading seafood products of the two lobsters is insignificant. In this vein, competition is more likely for canned and/or frozen lobster meat, regardless of species.

As they move to the point of preparation for human consumption, the dominant American lobster product is the ready-to-cook live lobster, whereas the leading spiny lobster menu item in the United States is the lobster tail with shell on. In Japan, whole spiny lobster is the leading item, though it is also produced and marketed in the United States. In developing acceptable empirical price and market models for spiny lobster, possible competition between in-shell shrimp tails, lobster tails, king and snow crab sections or legs, and other seafood menu items may need to be evaluated, depending on available data.

and Europe at the expense of shipments to the United States, which is still the leading market, as suggested in Figure 20.

The United States itself has become an exporter of spiny lobster products in recent years, mostly from Marathon, Florida (Table 9; Little, 1992). The product is reported to be mostly whole cooked lobster. In 1990, the peak year, the leading buyers were (in descending order) Sweden, Canada, France, Taiwan and Japan.

Figure 21 suggests that price increases for cold-water spiny lobster tails beginning in 1984 have led the more recent price rise for warm-water tails. Traditionally, U.S. imports of cold-water tails have come mostly from Australia, New Zealand, South Africa and Namibia. The lower-priced, but by no means inexpensive warm-water tails are considered to be more competitive with those produced in the United States and imported notably from Brazil, Honduras, Bahama, Cayman Islands, and other countries in tropical and semi-tropical climate zones. The various species of lobsters, the identification of tails (with colored pictures), and production by species, country, and FAO fishing area are discussed by Williams (1986).

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Table 1.--Florida spiny lobster landings, by coast (whole, live, round weight basis)

Year	East coast		West coast		Florida total		Real values in 1990 dollars		
	Quantity	Value	Quantity	Value	Quantity	Value	Total value	Price \$/lb	Deflator 1982=100
1930	108,309	12,331	180,000	14,400	288,309	26,731	208,645	0.72	14.9
1931	303,800	30,882	152,107	10,648	455,907	41,530	383,328	0.84	12.6
1932	347,207	26,177	98,340	5,901	445,547	32,078	333,096	0.75	11.2
1934	182,800	10,426	168,500	6,740	351,300	17,166	175,123	0.50	11.4
1936	210,600	14,290	116,000	5,800	326,600	20,090	181,121	0.55	12.9
1937	224,700	17,844	67,800	3,777	292,500	21,621	180,901	0.62	13.9
1938	265,200	20,217	63,200	3,160	328,400	23,377	182,466	0.56	14.9
1939	234,100	16,377	125,100	8,005	359,200	24,382	210,046	0.58	13.5
1940	256,000	19,051	207,500	12,450	463,500	31,501	275,456	0.59	13.3
1945	572,100	116,427	205,000	41,000	777,100	157,427	1,005,976	1.29	18.2
1949	NA	NA	1,481,800	188,704	NA	NA	NA	NA	26.3
1950	931,500	167,670	628,200	113,070	1,559,700	280,740	1,195,973	0.77	27.3
1951	2,020,200	383,838	1,077,200	204,668	3,097,400	588,506	2,251,423	0.73	30.4
1952	655,700	163,975	956,700	239,175	1,612,400	403,150	1,583,998	0.98	29.6
1953	1,121,200	224,240	874,200	174,852	1,995,400	399,092	1,589,534	0.80	29.2
1954	1,223,300	269,126	724,000	159,280	1,947,300	428,406	1,700,465	0.87	29.3
1955	1,079,400	248,262	1,216,000	279,680	2,295,400	527,942	2,095,551	0.91	29.3
1956	798,800	227,818	2,314,200	597,238	3,113,000	825,056	3,166,799	1.02	30.3
1957	651,300	200,112	3,388,500	923,433	4,039,800	1,123,545	4,188,086	1.04	31.2
1958	622,800	183,726	2,331,500	652,820	2,954,300	836,546	3,078,807	1.04	31.6
1959	543,000	176,476	2,636,600	777,798	3,179,600	954,274	3,501,012	1.10	31.7
1960	719,400	280,566	2,129,100	819,703	2,848,500	1,100,269	4,036,634	1.42	31.7
1961	702,000	248,507	2,101,400	720,780	2,803,400	969,287	3,567,344	1.27	31.6
1962	672,400	259,546	2,434,600	927,581	3,107,000	1,187,127	4,355,296	1.40	31.7
1963	814,600	327,469	2,770,600	1,080,534	3,585,200	1,408,003	5,181,986	1.45	31.6
1964	785,700	350,587	2,845,400	1,211,576	3,631,100	1,562,163	5,749,353	1.58	31.6
1965	1,329,000	751,851	4,385,100	2,467,390	5,714,100	3,219,241	11,591,261	2.03	32.3
1966	1,686,100	809,852	3,664,100	1,659,117	5,350,200	2,468,969	8,622,856	1.61	33.3
1967	1,676,600	1,058,290	2,737,000	1,674,724	4,413,600	2,733,014	9,516,453	2.16	33.4
1968	2,234,100	1,580,386	3,920,800	2,828,183	6,154,900	4,408,569	14,991,713	2.44	34.2
1969	2,928,600	1,932,852	4,652,600	3,324,689	7,581,200	5,257,541	17,175,618	2.27	35.6
1970	3,017,800	1,830,199	6,851,700	4,088,280	9,869,500	5,918,479	18,653,634	1.89	36.9
1971	3,417,900	2,932,268	4,788,100	4,124,268	8,206,000	7,056,536	21,540,030	2.62	38.1
1972	6,267,500	6,254,188	5,149,300	5,517,237	11,416,800	11,771,425	34,397,405	3.01	39.8
1973	5,621,600	5,747,531	5,550,100	5,913,610	11,171,700	11,661,141	30,137,571	2.70	45.0
1974	4,147,200	5,067,670	6,735,400	8,325,016	10,882,600	13,392,686	29,113,446	2.68	53.5
1975	2,319,300	3,025,700	5,089,100	6,837,287	7,408,400	9,862,987	19,641,531	2.65	58.4
1976	987,300	1,733,896	4,358,300	6,852,416	5,345,600	8,586,312	16,343,504	3.06	61.1
1977	1,500,700	2,526,014	4,843,400	7,899,434	6,344,100	10,425,448	18,682,274	2.94	64.9
1978	893,900	1,698,467	4,711,400	10,253,406	5,605,300	11,951,873	19,885,591	3.55	69.9
1979	840,400	1,783,006	6,987,900	13,409,473	7,828,300	15,192,479	22,450,893	2.87	78.7
1980	998,516	2,237,688	5,696,296	11,845,025	6,694,812	14,082,713	18,238,525	2.72	89.8
1981	879,537	2,211,200	5,014,468	12,319,095	5,894,005	14,530,295	17,243,605	2.93	98.0
1982	857,171	2,209,295	5,639,633	13,357,040	6,496,804	15,566,335	18,103,648	2.79	100.0
1983	653,746	1,654,163	3,663,254	9,092,811	4,317,000	10,746,974	12,338,332	2.86	101.3
1984	205,264	539,565	6,046,653	15,142,986	6,251,917	15,682,551	17,588,049	2.81	103.7
1985	294,883	776,240	5,444,510	13,126,891	5,739,393	13,903,131	15,667,966	2.73	103.2
1986	621,350	1,715,363	4,407,690	11,568,576	5,029,040	13,283,939	15,418,384	3.07	100.2
1987	569,386	2,064,575	5,522,583	19,923,290	6,091,969	21,987,865	24,875,376	4.08	102.8
1988	514,070	1,646,245	5,795,688	15,758,846	6,309,758	17,405,091	18,935,567	3.00	106.9
1989	516,266	2,267,193	7,163,367	20,266,019	7,679,633	22,533,212	23,356,618	3.04	112.2
1990	564,143	2,020,863	5,420,097	18,283,655	5,984,240	20,304,518	20,304,518	3.39	116.3
1991	933,636	3,212,017	5,976,994	23,902,475	6,910,630	27,114,492	27,067,944	3.92	116.5

Sources: NMFS (and predecessor agencies), Fishery industries of the United States, 1930-38, Fishery statistics of the United States, 1939-61, and Florida landings file, 1962-91; Bureau of Labor Statistics, Producer Price Index for all commodities.

Table 2a.--Landings of spiny lobster from international waters (waters now under the jurisdiction of foreign countries) with comparable totals (thousand pounds)

Year	Florida			S. Atlantic		Gulf		Southeast		United States	
	Int. (1)	Total	% Int.	Int. (2)	Total	Int. (2)	Total	Int.	Total	Int. (2)	Total
1964	999	3,631	28%	NA		NA					
1965	994	5,714	17%	NA		NA					
1966	2,199	5,350	41%	NA		NA					
1967	2,498	4,414	57%	NA		NA					
1968	3,274	6,155	53%	NA		3,813	3,921	NA			
1969	3,495	7,581	46%	NA		4,406	4,653	NA			
1970	3,117	9,870	32%	NA		3,176	7,064	NA			
1971	3,537	8,206	43%	2,856	3,418	1,183	5,293	4,039	8,711		
1972	4,804	11,417	42%	5,265	6,433	1,717	5,379	6,982	11,812		
1973	5,659	11,172	51%	4,377	5,622	1,054	5,572	5,431	11,194		
1974	3,979	10,883	37%							3,979	11,078
1975	2,056	7,408	28%							2,055	10,299
1976	NA	5,346	NA							16	5,643
1977	NA	6,344	NA							763	6,660
1978	NA	5,605	NA								
1979	491	7,828	6%								
1980	546	6,695	8%								
1981	489	5,894	8%								
1982	469	6,497	7%								
1983	353	4,317	8%								

(1) NMFS, Miami, as reported in Williams and Prochaska (1976, p. 12) for 1964-71; NMFS, Miami, unpublished data of the Florida landings file, as obtained for this report in June 1992.

(2) For 1964-77, NMFS, Silver Spring, MD, Fishery Statistics of the United States.

Table 2b.--Florida landings of spiny lobster (Thousand pounds, round or live weight basis) (By coast and distance in miles from shore)

Year	Florida, east coast						Florida, west coast						Florida total
	NA	0-3	3-12	>12	Int. water	Coast total	NA	0-3	3-12	>12	Int. water	Coast total	
72	.	934	530	.	4,804	6,268	.	1,346	3,564	240	.	5,149	11,417
73	.	500	.	190	4,932	5,622	.	1,715	2,581	526	728	5,550	11,172
74	.	941	.	.	3,206	4,147	.	2,243	3,199	520	773	6,735	10,883
75	.	834	.	.	1,485	2,319	.	1,466	2,406	647	570	5,089	7,408
76	987	.	.	.	.	987	4,358	.	.	.	.	4,358	5,346
77	1,501	.	.	.	.	1,501	4,843	.	.	.	.	4,843	6,344
78	894	.	.	.	.	894	4,711	.	.	.	.	4,711	5,605
79	.	91	177	82	491	840	.	3,472	3,503	13	.	6,988	7,828
80	.	121	241	91	546	999	.	2,147	3,512	38	.	5,696	6,695
81	.	106	204	81	489	880	.	1,894	3,086	35	.	5,014	5,894
82	.	115	196	78	469	857	.	2,122	3,477	41	.	5,640	6,497
83	.	86	157	59	353	654	.	1,368	2,246	49	.	3,663	4,317
84	.	120	17	68	.	205	.	1,646	3,006	1,395	.	6,047	6,252
85	.	162	21	112	.	295	.	1,601	3,560	284	.	5,445	5,739
86	.	580	42	.	.	621	22	1,117	2,246	1,022	.	4,408	5,029
87	.	532	38	.	.	569	10	1,357	2,753	1,403	.	5,523	6,092
88	.	386	128	.	.	514	1	1,529	3,255	1,010	.	5,796	6,310
89	.	307	200	10	.	516	6	2,369	3,820	967	.	7,163	7,680
90	.	348	216	.	.	564	1	1,654	3,048	718	.	5,420	5,984
91	.	672	179	.	.	851	.	1,419	4,075	.	.	5,494	6,345

Data for 1991 is preliminary and 1991 data shown under 3-12 miles is for 3-200 miles.

Table 3a.--U.S. landings of spiny lobster in southeastern states  
(Thousands of pounds, round or live weight basis)  
(By region and state)

	South Atlantic			Gulf of Mexico			
	FL ec	GA	SC	AL	FL wc	MS	TX
77	1,501	.	.	.	4,843	.	.
78	891	.	.	.	4,711	.	.
79	840	.	.	.	6,988	.	.
80	999	0	1	.	5,696	.	.
81	880	0	0	.	5,014	.	.
82	857	.	0	.	5,640	.	.
83	654	.	0	.	3,663	.	.
84	205	.	.	.	6,047	.	.
85	295	.	.	.	5,445	.	.
86	621	0	0	.	4,408	.	.
87	569	0	0	1	5,523	.	0
88	514	0	0	3	5,796	.	.
89	516	0	0	1	7,163	0	.
90	563	.	.	0	5,348	.	0

Table 3b.--Real exvessel prices of southeastern U.S. landings of spiny lobster  
(1990 cents per pound, round or live weight basis)  
(By region and state)

	South Atlantic			Gulf of Mexico			
	FL ec	GA	SC	AL	FL wc	MS	TX
77	309	.	.	.	300	.	.
78	323	.	.	.	652	.	.
79	324	.	.	.	293	.	.
80	299	334	334	.	277	.	.
81	308	309	367	.	301	.	.
82	305	.	142	.	280	.	.
83	295	.	141	.	290	.	.
84	301	.	.	.	287	.	.
85	300	.	.	.	275	.	.
86	322	145	.	.	307	.	.
87	414	145	380	341	412	.	337
88	356	280	371	195	303	.	.
89	463	351	347	307	298	316	.
90	358	.	.	250	337	.	444

Table 4.--Inputs (operating units) of the Florida spiny lobster trap fishery, by coast

Year	Fishermen on vessels		Boat & shore fishermen				Number of vessels		Gross tonnage of vessels (1)		Boats		Number of traps		
	East	West	East coast		West coast		East	West	East	West	East	West	East	West	
			Full time	Part time	Full time	Part time									
1950	2	4	68	0	90	0	1	2	10	12	38	69	5,795	5,715	
1951	2	2	109	2	60	0	1	1	10	8	73	38	12,312	4,625	
1952	0	0	95	0	71	0	0	0	0	0	48	54	10,350	4,500	
1953	4	0	173	2	70	0	2	0	18	0	90	55	19,274	6,500	
1954	0	4	142	15	83	28	0	2	0	13	84	71	18,755	11,690	
1955	10	4	124	10	61	10	4	2	35	14	99	61	26,342	12,700	
1956	10	28	57	0	80	18	4	14	33	104	53	57	16,150	16,775	
1957	8	49	79	6	138	10	3	25	25	206	50	83	14,915	21,720	
1958	11	33	87	3	106	8	4	17	31	142	78	88	11,095	23,221	
1959	11	30	107	5	174	20	4	17	31	134	74	159	18,100	33,612	
1960	11	29	89	2	192	18	4	16	38	171	49	152	18,990	54,640	
1961	13	32	88	0	170	11	5	16	48	166	50	124	13,360	38,990	
1962	13	40	88	9	192	7	5	20	56	212	72	151	16,140	58,250	
1963	25	44	83	8	233	12	10	24	148	261	50	162	20,240	60,050	
1964	41	68	143	14	238	104	13	34	204	358	80	214	40,100	73,553	
1965	50	56	163	26	306	24	18	28	347	308	98	188	49,200	89,700	
1966	128	104	233	24	300	12	54	58	800	824	166	210	76,420	74,550	
1967	156	143	291	3	330	24	65	75	974	1,189	164	224	94,125	91,800	
1968	367	323	74	11	214	12	128	137	2,675	3,433	52	135	69,890	98,500	
1969	325	184	92	9	255	20	113	92	2,557	2,185	59	176	67,700	96,955	
1970	311	287	110	3	331	17	103	123	2,396	3,534	52	214	69,050	150,050	
1971	383	364	98	6	259	39	128	142	3,038	4,184	55	195	78,825	147,037	
1972	552	350	46	4	333	37	169	155	4,751	4,006	37	238	98,005	174,490	
1973	735	399	92	0	319	30	227	175	5,486	3,924	58	211	132,900	171,590	
1974	595	446	145	8	404	50	181	197	5,228	4,351	62	250	144,050	227,250	
1975	470	612	54	7	774	150	151	242	4,562	4,693	41	398	92,075	428,250	
1976	120	665	45	11	338	28	37	258	1,206	4,306	34	220	31,500	314,500	
1977	105	655	135	21	559	56	34	244	938	4,308	79	278	47,160	407,950	
1978														43,000	529,000
1979	69	785	85	16	625	175	25	274	628	4,914	40	325	28,800	565,250	
1980	53	861	51	9	250	50	19	298	458	5,298	28	232	43,600	523,525	
1981	56	845	65	24	250	50	20	293	483	5,199	36	232	26,700	513,925	
1982	64	831	58	14	214	200	22	289	553	5,132	31	273	27,300	580,950	
1983	67	865	69	24	415	58	23	305	583	5,451	37	274	46,000	578,300	
1984	69	865	66	26	234	45	24	305	586	5,446	36	283	19,625	662,100	
1985	70	824	67	27	450	57	25	311	595	5,583	37	210	34,000	679,850	
1986	72	835	68	28	403	41	26	326			38	229	21,750	710,500	
1987	66	766	69	6	480	20	24	306			39	269	40,000	737,400	
1988	71	795	84	2	385	60	26	327			43	276	45,000	742,280	
1989	71	934	74	16	600	32	26	347			45	323	65,050	851,130	
1990															

(1) Net tons rather than gross tons prior to 1960; 1957 west coast tonnage assumed to be 206 rather than 26 as published; data for 1986-89 not available. Sources: NMFS (formerly BCF), Fishery statistics of the United States, annual issues for 1950-77, and NMFS (Beaufort, NC), unpublished data from the operating units file for 1979-89. Data for 1986-89 is preliminary and subject to revision.

Table 5.--Inputs (operating units) of the Florida spiny lobster trap fishery

Year	Traps	Boats	Vessels	Craft	Vessel gross tons (1)	Fisher- men	Traps per		Fishermen per		
							craft	man	craft	boat	vessel
1950	11,510	107	3	110	27	164	105	70	1.49	1.48	2.00
1951	16,937	111	2	113	22	175	150	97	1.55	1.54	2.00
1952	14,850	102	0	102	0	166	146	89	1.63	1.63	
1953	25,774	145	2	147	22	249	175	104	1.69	1.69	2.00
1954	30,445	155	2	157	16	272	194	112	1.73	1.73	2.00
1955	39,042	160	6	166	60	219	235	178	1.32	1.28	2.33
1956	32,925	110	18	128	168	193	257	171	1.51	1.41	2.11
1957	36,635	133	28	161	283	290	228	126	1.80	1.75	2.04
1958	34,316	166	21	187	212	248	184	138	1.33	1.23	2.10
1959	51,712	233	21	254	202	347	204	149	1.37	1.31	1.95
1960	73,630	201	20	221	209	341	333	216	1.54	1.50	2.00
1961	52,350	174	21	195	214	314	268	167	1.61	1.55	2.14
1962	74,390	223	25	248	268	349	300	213	1.41	1.33	2.12
1963	80,290	212	34	246	409	405	326	198	1.65	1.58	2.03
1964	113,653	294	47	341	562	608	333	187	1.78	1.70	2.32
1965	138,900	286	46	332	655	625	418	222	1.88	1.81	2.30
1966	150,970	376	112	488	1,624	801	309	188	1.64	1.51	2.07
1967	185,925	388	140	528	2,163	947	352	196	1.79	1.67	2.14
1968	168,390	187	265	452	6,108	1,001	373	168	2.21	1.66	2.60
1969	164,655	235	205	440	4,742	885	374	186	2.01	1.60	2.48
1970	219,100	266	226	492	5,930	1,059	445	207	2.15	1.73	2.65
1971	225,862	250	270	520	7,222	1,149	434	197	2.21	1.61	2.77
1972	272,495	275	324	599	8,757	1,322	455	206	2.21	1.53	2.78
1973	304,490	269	402	671	9,410	1,575	454	193	2.35	1.64	2.82
1974	371,300	312	378	690	9,579	1,648	538	225	2.39	1.95	2.75
1975	520,325	439	393	832	9,255	2,067	625	252	2.48	2.24	2.75
1976	346,000	254	295	549	5,512	1,207	630	287	2.20	1.66	2.66
1977	455,110	357	278	635	5,246	1,531	717	297	2.41	2.16	2.73
1978	572,000			672			851				
1979	594,050	365	299	664	5,542	1,755	895	338	2.64	2.47	2.86
1980	567,125	260	317	577	5,756	1,274	983	445	2.21	1.38	2.88
1981	540,625	268	313	581	5,682	1,290	931	419	2.22	1.45	2.88
1982	608,250	304	311	615	5,685	1,381	989	440	2.25	1.60	2.88
1983	624,300	311	328	639	6,034	1,498	977	417	2.34	1.82	2.84
1984	681,725	319	329	648	6,032	1,305	1,052	522	2.01	1.16	2.84
1985	713,850	247	336	583	6,178	1,495	1,224	477	2.56	2.43	2.66
1986	732,250	267	352	619		1,447	1,183	506	2.34	2.02	2.58
1987	777,400	308	330	638		1,407	1,218	553	2.21	1.87	2.52
1988	787,280	319	353	672		1,397	1,172	564	2.08	1.66	2.45
1989	916,180	368	373	741		1,727	1,236	531	2.33	1.96	2.69
1990											

(1) Net tons for 1950-59 converted to gross tons using ratio of east coast tons for 4 vessels for 1959-60, 38/31. Source: Table 4.

Table 6.--Productivity and other measures for the Florida spiny lobster fishery

Year	Landings in pounds per			Value of landings in 1990 dollars per			Landings in pounds/trap		Average gross tons per vessel (1)		
	Trap	Craft	Man	Trap	Craft	Man	East	West	State	East	West
1950	136	14,179	9,510	104	10,872	7,293	161	110	9	12	7
1951	183	27,411	17,699	133	19,924	12,865	164	233	11	12	10
1952	109	15,808	9,713	107	15,529	9,542	63	213			
1953	77	13,574	8,014	62	10,813	6,384	58	134	11	11	
1954	64	12,403	7,159	56	10,831	6,252	65	62	8		8
1955	59	13,828	10,481	54	12,624	9,569	41	96	10	11	9
1956	95	24,320	16,130	96	24,741	16,408	49	138	9	10	9
1957	110	25,092	13,930	114	26,013	14,442	44	156	10	10	10
1958	86	15,798	11,913	90	16,464	12,415	56	100	10	10	10
1959	61	12,518	9,163	68	13,784	10,089	30	78	10	10	10
1960	39	12,889	8,353	55	18,265	11,838	38	39	10	10	11
1961	54	14,376	8,928	68	18,294	11,361	53	54	10	10	10
1962	42	12,528	8,903	59	17,562	12,479	42	42	11	11	11
1963	45	14,574	8,852	65	21,065	12,795	40	46	12	15	11
1964	32	10,648	5,972	51	16,860	9,456	20	39	12	16	11
1965	41	17,211	9,143	83	34,913	18,546	27	49	14	19	11
1966	35	10,964	6,679	57	17,670	10,765	22	49	15	15	14
1967	24	8,359	4,661	51	18,024	10,049	18	30	15	15	16
1968	37	13,617	6,149	89	33,168	14,977	32	40	23	21	25
1969	46	17,230	8,566	104	39,035	19,407	43	48	23	23	24
1970	45	20,060	9,320	85	37,914	17,614	44	46	26	23	29
1971	36	15,781	7,142	95	41,423	18,747	43	33	27	24	29
1972	42	19,060	8,636	126	57,425	26,019	64	30	27	28	26
1973	37	16,649	7,093	99	44,914	19,135	42	32	23	24	22
1974	29	15,772	6,604	78	42,193	17,666	29	30	25	29	22
1975	14	8,904	3,584	38	23,608	9,502	25	12	24	30	19
1976	15	9,737	4,429	47	29,770	13,541	31	14	19	33	17
1977	14	9,991	4,144	41	29,421	12,203	32	12	19	28	18
1978	10	8,341		35	29,592		21	9			
1979	13	11,790	4,461	38	33,812	12,793	29	12	19	25	18
1980	12	11,603	5,255	32	31,609	14,316	23	11	18	24	18
1981	11	10,145	4,569	32	29,679	13,367	33	10	18	24	18
1982	11	10,564	4,704	30	29,437	13,109	31	10	18	25	18
1983	7	6,756	2,882	20	19,309	8,237	14	6	18	25	18
1984	9	9,648	4,791	26	27,142	13,477	10	9	18	24	18
1985	8	9,845	3,839	22	26,875	10,480	9	8	18	24	18
1986	7	8,124	3,475	21	24,909	10,655	29	6			
1987	8	9,549	4,330	32	38,990	17,680	14	7			
1988	8	9,390	4,517	24	28,178	13,554	11	8			
1989	8	10,364	4,447	25	31,520	13,524	8	8			
1990											

(1) Net tons for 1950-59 converted to gross tons using ratio of east coast tons for 4 vessels for 1959-60, 38/31. Source: Tables 1 and 4.

Table 7.--Florida east coast landings in pounds of spiny lobster, monthly

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	12-month sum	
													Year	Fishing year (1)
1952	131697	74181	283	3150	0	0	48740	215548	199268	219285	218806	44698	1155656	1359636
1953	181876	230778	637	0	0	0	120388	250892	206458	203149	71203	155821	1421202	1314946
1954	61499	78877	144758	21901	0	0	0	234339	121677	165971	187787	206504	1223313	1313618
1955	165022	59018	130242	43058	0	0	0	186551	101576	160184	151819	81889	1079359	883707
1956	50769	72348	76899	1672	0	0	0	200698	203352	71332	54869	66810	798749	819914
1957	73126	49666	100061	0	0	0	0	140780	83428	100178	58449	45608	651296	569331
1958	22090	56279	43533	18986	0	0	0	125680	109341	131870	71247	43761	622787	580573
1959	33114	42193	23367	0	0	0	0	122062	81876	83309	105288	51769	542978	560502
1960	35905	43885	36180	228	0	0	0	175287	120603	142193	107573	57490	719344	722735
1961	46212	30995	42382	0	0	0	0	166903	121833	134490	105722	53504	702041	663764
1962	39230	20774	21308	0	0	0	0	218252	112814	85526	97079	77292	672275	667793
1963	33877	22514	20439	0	0	0	0	183687	178292	131379	111854	132562	814604	905243
1964	84158	40608	40003	0	0	0	0	129337	139190	172079	96119	84224	785718	962992
1965	85495	83342	173206	0	0	0	0	266596	215707	128060	146310	230282	1328998	1500616
1966	133100	182345	198216	0	0	0	0	315847	253767	171888	236445	194530	1686138	1602719
1967	115075	116690	198477	0	0	0	0	301424	176320	187293	290301	291015	1676595	1840073
1968	121106	176791	295823	0	0	0	0	345852	226629	270350	455783	341843	2234177	2481344
1969	149817	284275	406795	0	0	0	0	461954	533336	382430	393459	316503	2928569	2898733
1970	178583	234353	398115	0	0	0	0	416231	440590	375039	503073	471761	3017745	3080270
1971	206097	224581	442898	0	0	0	0	582858	490106	456825	559044	455358	3417767	4572050
1972	378322	564346	800238	40665	123516	120772	296868	746513	861681	835714	752791	746054	6267480	7108413
1973	483623	560216	765941	252449	364687	441876	339536	453750	522990	381727	458378	596463	5621636	4530044
1974	266557	250674	657348	185625	171335	245661	270287	523746	385064	439979	355337	386898	4138511	3462794
1975	132745	208888	256045	93789	206661	203355	225037	315318	144719	211251	171421	150126	2319355	1331174
1976	16980	16572	50128	13176	8094	8352	49162	202607	161443	190563	155253	114926	987256	1389003
1977	97142	58585	126837	53718	86212	92555	122698	159795	130651	249217	161598	161733	1500741	1419997
1978	40929	85542	93633	27812	74479	111910	88824	146090	57417	36449	67564	59870	890519	704586
1979	68984	91440	67270	1169	6111	13398	35150	119174	83480	137844	134356	82010	840386	805527
1980	65993	51373	83997	5139	2112	4899	22953	227282	122058	160871	171995	79844	998516	1003215
1981	103927	50791	53438	1872	4683	3501	19566	158610	132848	175060	103830	71411	879537	854108
1982	40512	50393	88717	13161	0	0	35765	179762	101683	166230	97052	83896	857171	834354
1983	42964	77437	32708	16857	0	0	13346	139222	89742	92173	89751	59546	653746	549130
1984	7498	9953	11440	36459	0	0	10991	36860	28518	24301	20723	18521	205264	165451
1985	5851	4759	14896	31	0	0	26989	114386	49074	36522	25353	17022	294883	349698
1986	35690	16430	11046	13044	1431	2711	51049	147937	78836	135768	74349	53059	621350	625047
1987	53024	11535	19273	217	0	0	51327	133499	80447	135550	58152	26362	569386	527957
1988	13923	18421	10206	67	0	3	34	192167	104593	81498	49526	43632	514070	528043
1989	23366	13674	19236	259	12	46	235	140373	78587	108889	79162	52427	516266	547503
1990	33495	16412	35434	778	1189	522	695	159382	86096	108235	79672	40915	562825	575513
1991	32515	30488	35015	2446	54	0	108	285447	174176	227186	95835	50366	933636	

(1) Fishing year beginning in July of the year shown.

Table 8.--Florida west coast landings in pounds of spiny lobster, monthly

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	12-month sum	
													Year	Fishing year (1)
1952	35635	30699	29066	112	397	0	25826	61624	39651	53666	107788	72236	456700	538976
1953	65159	34839	78187	0	0	0	22085	114655	85831	49459	68263	55731	574209	514141
1954	38956	31402	34105	13654	0	0	0	83977	101684	78286	183277	158667	724008	974835
1955	87403	83892	165297	32352	0	0	0	310618	132780	114177	151835	137649	1216003	1398626
1956	133246	126485	291149	687	0	0	0	568755	201700	314721	310034	367382	2314159	2629010
1957	271433	227298	367687	0	0	0	0	689212	422145	533150	526155	351463	3388543	3273325
1958	246181	169167	250337	85515	0	0	0	422154	321554	302664	285936	248020	2331528	2312617
1959	221361	111329	399170	429	0	0	0	460727	353362	386273	368248	336855	2637754	2392518
1960	174907	177472	134619	55	0	0	0	411804	279797	404489	316385	229668	2129196	2097940
1961	132836	173584	149377	0	0	0	0	394132	327353	310625	372857	240634	2101398	2198624
1962	189763	118053	245207	0	0	0	0	438487	329181	299664	419675	394713	2434743	2424105
1963	223351	118885	200149	0	0	0	0	504439	417970	416763	458927	430106	2778059	2880888
1964	246783	214706	191194	0	0	0	0	534350	413994	452829	508299	283257	2845412	2983787
1965	182436	181693	426929	0	0	0	0	777651	584868	1157480	639829	434209	4385095	4650150
1966	221827	388619	445667	0	0	0	0	647991	366745	590559	719041	283679	3664128	3121509
1967	205385	109322	198787	0	0	0	0	530562	389328	497453	465146	340989	2736972	3233368
1968	342983	287188	379719	0	0	0	0	708159	489229	642067	732060	339454	3920859	3600368
1969	152840	266326	270233	0	0	0	0	971184	894683	709306	752694	635298	4652564	5140558
1970	451006	303520	422867	0	0	0	0	1152538	1038109	1385101	1138968	959608	6851717	6546026
1971	351651	210785	309266	0	0	0	0	1126292	735401	875685	767801	411155	4788036	5463977
1972	454293	460239	259241	162448	162318	49104	40818	691349	670160	933803	736621	528908	5149302	4705575
1973	374854	272058	226252	58972	83661	88119	46341	967647	995355	1006544	780385	649884	5550072	5572907
1974	259325	184216	319846	113538	132913	116913	48675	1706642	864153	1492501	505822	991034	6735578	6507041
1975	300347	221756	197570	100559	37908	40074	68528	1467456	897203	839038	567712	350943	5089094	5063224
1976	263630	134278	250479	209213	13024	1720	120872	1043551	588312	819081	593926	320180	4358266	4053965
1977	244056	144158	133235	12247	19902	14445	28466	1025330	859928	1228184	695970	437454	4843375	4837875
1978	307752	122289	96471	8568	6520	20943	63253	840862	755954	1175205	794408	519159	4711384	5123654
1979	425751	322995	199125	21808	3202	1932	99345	1424862	1299748	1266342	1165102	757671	6987883	7091715
1980	497622	330513	216690	30022	522	3276	122317	1499828	838512	893424	854746	408854	5696326	5273104
1981	304361	183493	154550	12671	348	0	118364	1401675	686708	879248	764058	508992	5014468	4926393
1982	252763	166788	147797	0	0	0	199109	1420952	1120090	1090177	826036	415921	5639633	5587611
1983	256777	147330	105562	5657	0	0	47973	990941	710539	555708	558158	284609	3663254	3799654
1984	287989	156233	205983	100	0	1421	206031	1526607	1126283	1091619	976727	467660	6046653	6114797
1985	363478	171558	182919	1915	0	0	175534	1322237	1187115	787032	604291	648431	5444510	5455774
1986	345023	218232	152651	9230	5512	486	121850	949269	623192	881565	511559	589121	4407690	4743679
1987	538692	302070	216004	3467	6206	684	131099	1321732	884779	1121965	637363	358522	5522583	4901810
1988	172108	162343	109181	921	230	1567	921	1657569	1580181	980782	626959	502926	5795688	6039977
1989	297106	189540	200886	778	670	1659	293	1892525	1576980	1385277	1061082	556571	7163367	7265562
1990	296320	185327	310442	456	111	178	82	1486769	1133178	953409	682959	299177	5348408	5352539
1991	241036	247078	307297	779	18	757	357	1822477	1258808	1006587	600017	491783	5976994	

(1) Fishing year beginning in July of the year shown.

Average

1952/53 to 1974/75  
1975/76 to 1990/9132.  
44.

1955	2,710	3,849	22,479	1,172	63,432	75,147	2,710	67,018	58,592
1956	3,632	4,687	25,258	1,285	81,557	97,140	3,632	75,996	64,671
1957	4,846	5,588	28,181	1,067	89,344	107,470	4,846	82,602	72,132
1958	6,303	7,686	25,938	378	79,516	102,111	6,303	88,561	80,172
1959	4,189	5,199	28,092	2,105	93,747	109,513	4,189	89,544	84,156
1960	3,733	3,210	27,895	593	533	103,493	3,733	98,314	85,644
1961	4,241	3,235	27,648	692	4,321	117,902	4,241	105,179	82,161
1962	5,123	3,664	31,329	611	5,562	129,385	5,123	103,277	80,298
1963	6,665	4,180	28,752	735	4,561	132,269	6,665	118,722	89,360
1964	5,071	4,088	29,302	396	5,405	131,985	5,071	117,056	91,037
1965	2,711	6,237	30,923	591	6,300	129,344	2,711	123,852	94,987
1966	5,483	5,844	29,337	322	7,265	142,934	5,483	119,265	84,454
1967	6,811	4,868	27,300	301	7,738	141,834	6,811	122,501	84,026
1968	3,760	7,476	35,800	259	7,002	156,190	3,760	130,554	91,054
1969	5,210	8,781	37,537	309	7,346	157,833	5,210	142,203	103,051
1970	7,544	10,345	32,526	151	5,064	170,042	7,544	147,410	105,008
1971	4,267	8,941	34,572	348	6,876	153,190	4,267	140,389	110,619
1972	4,109	12,215	34,110	370	8,529	164,771	4,109	143,863	107,425
1973	7,461	11,432	30,756	373	7,029	157,638	7,461	142,506	103,699
1974	5,044	11,708	31,243	327	8,759	159,426	5,044	139,971	93,495
1975	6,485	7,613	30,343	265	11,721	169,852	6,485	161,695	108,565
1976	2,719	5,643	33,269	352	14,874	181,893	2,719	163,155	95,069
1977	6,246	6,660	33,863	297	10,867	176,071	6,246	161,167	110,291
1978	4,968	4,629	31,336	285	11,414	164,040	4,968	146,424	98,773
1979	5,872	6,301	31,067	241	13,110	174,991	5,872	157,987	102,594
1980	5,668	6,861	27,447	123	8,587	144,077	4,517	130,526	96,138
1981	4,517	6,619	28,128	294	9,548	147,358	3,864	127,471	90,333
1982	3,864	6,438	25,505	43	9,804	137,461	3,330	135,766	95,284
1983	3,330	5,218	26,412	99	11,900	146,899	2,913	138,160	91,920
1984	2,913	6,303	29,422	133	13,469	162,111	3,019	153,054	99,655
1985	3,019	5,311	29,603	275	13,618	162,945	3,187	797	152,586
1986	3,187	6,775	27,456	159	14,346	161,433	2,229	1,244	153,502
1987	2,229	5,755	26,723	391	14,835	158,148	3,197	2,093	146,464
1988	3,197	7,166	23,378	316	14,112	148,829	2,899	2,689	137,443
1989	2,899	8,127	22,553	690	10,077	129,144	1,643	4,425	119,790
1990	1,643	7,120	28,569	866	254	99,737	1,034	7,520	89,115
1991	1,034	7,096	26,906	246	79	91,516	2,343	4,316	80,171

(1) Stocks (tails only), imports and exports on a product weight basis. Sources: NMFS, Fishery Statistics of the United States, 1949-77; NMFS, Frozen Fishery Products, annuals, 1978 to date; NMFS, Fisheries of the United States, 1978 to date; NMFS, unpublished trade data base for 1972 to date. Imports and exports converted to live weight using the following factors: tails, 3: 1, live; 4.5, canned; 4.35, other; imports for 1950-59, other than canned are assumed to be lobster tails; exports are assumed to be mostly frozen whole lobster. Landings for 1978 to date are preliminary (from NMFS, Fisheries of the United States), whereas data in Tables 1, 2, 3, 7 has been revised, except as noted otherwise.

Figure 1.--Florida landings of spiny lobster

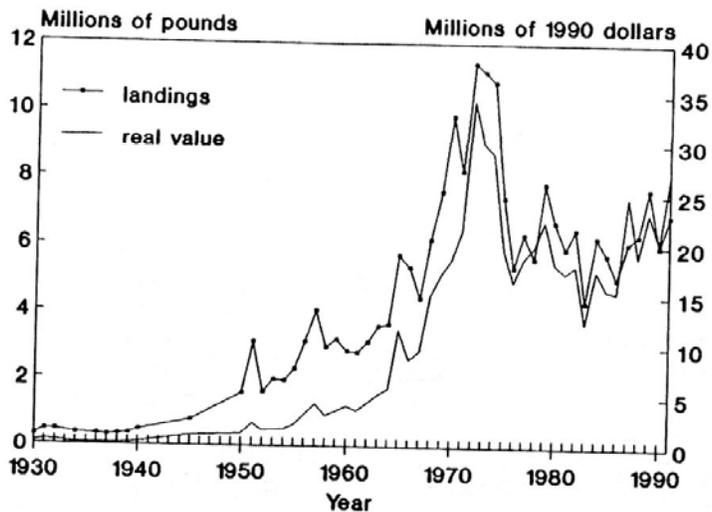


Figure 2.--Florida landings of spiny lobster (From waters now under U.S. and foreign waters)

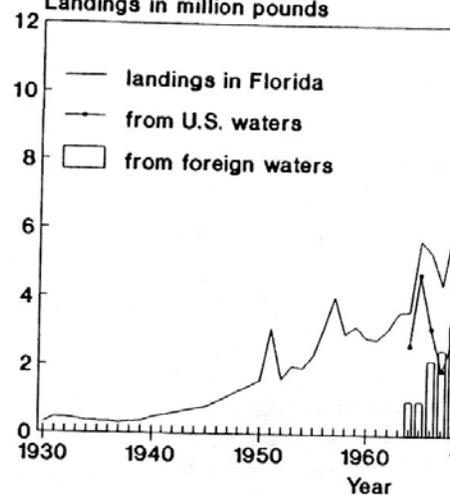


Figure 3.--Florida landings of spiny lobster, by coast (Semi-log scale)

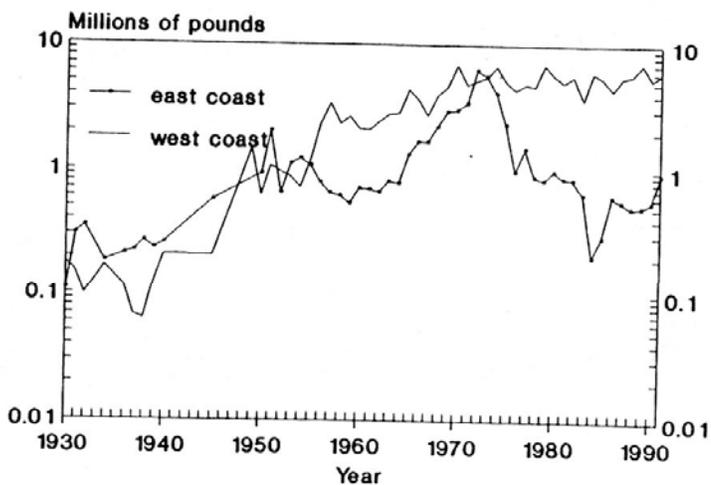


Figure 4.--Florida spiny lobster (Landings, value and price)

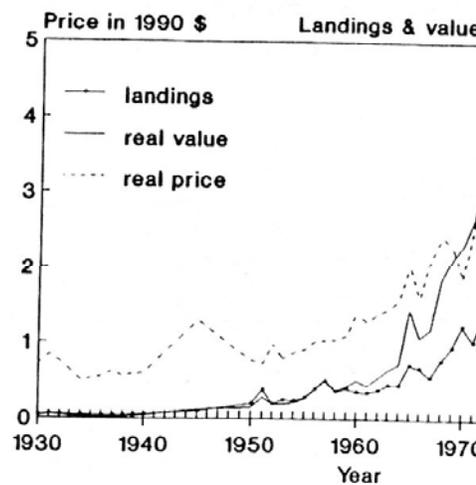


Figure 5.--Inputs, Florida spiny lobster fishery  
(Semi-log scale)

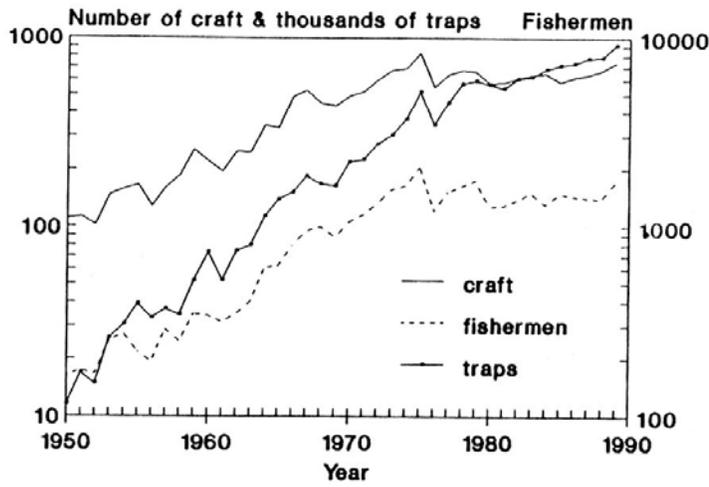


Figure 6.--Inputs, Florida spiny lobster fishery

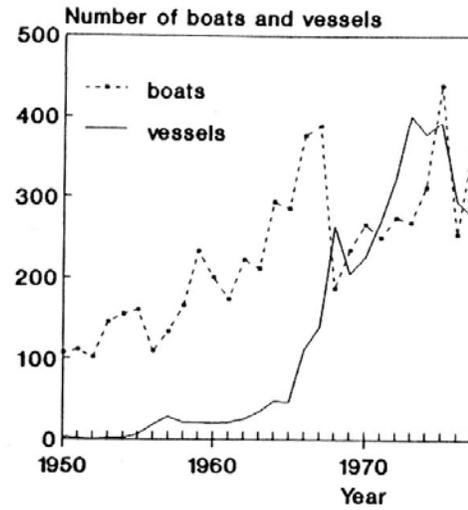


Figure 7.--Vessels, Florida spiny lobster fishery, by coast  
(Semi-log scale)

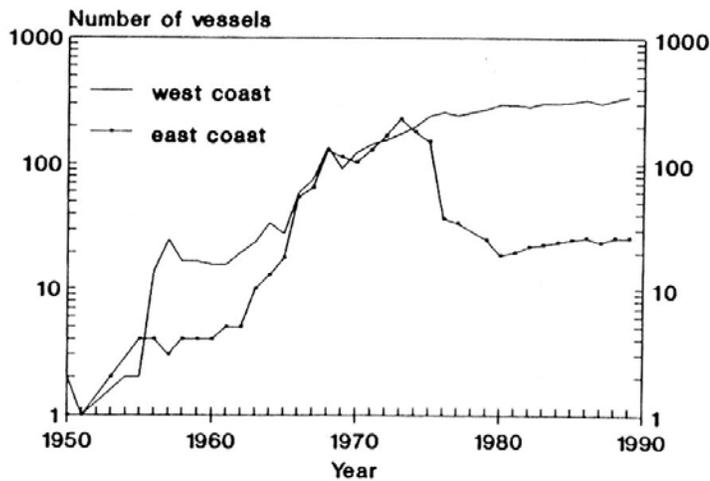


Figure 8.--Boats, Florida spiny lobster fishery  
(Semi-log scale)

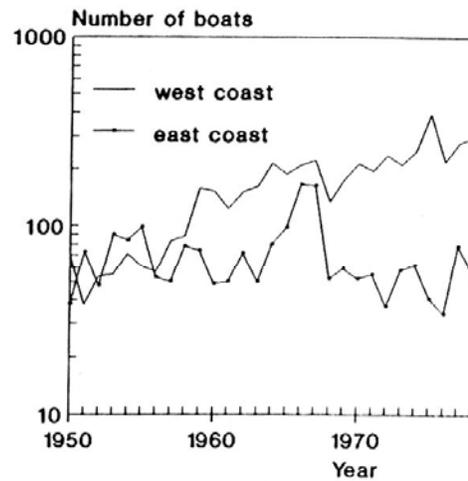


Figure 9.--Input ratios, Florida spiny lobster fishery

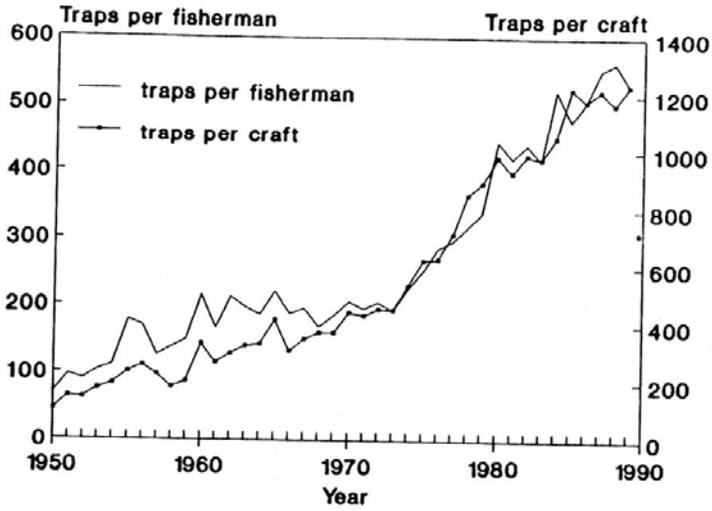


Figure 10.--Craft productivity, Florida spiny lobster fishery

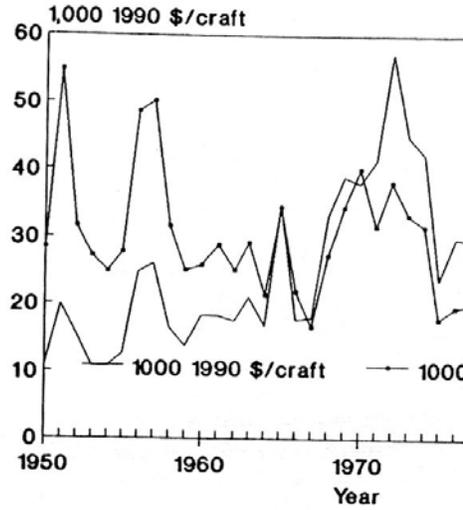


Figure 11.--Fisherman prod., Florida spiny lobster fishery

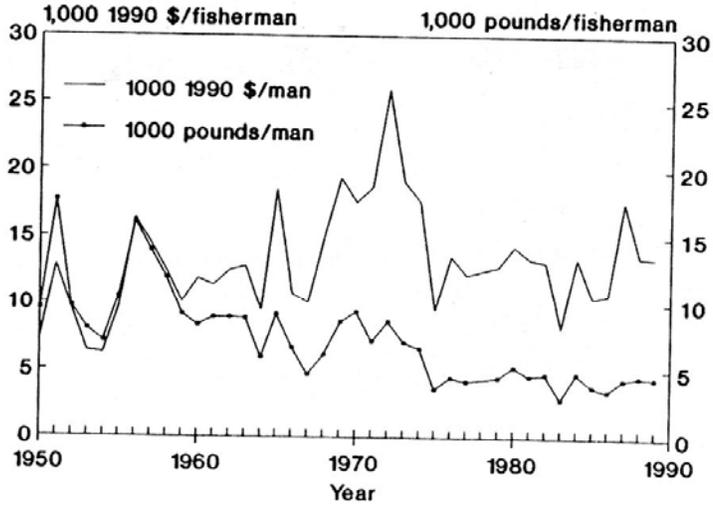


Figure 12.--Trap productivity, Florida spiny lobster fishery

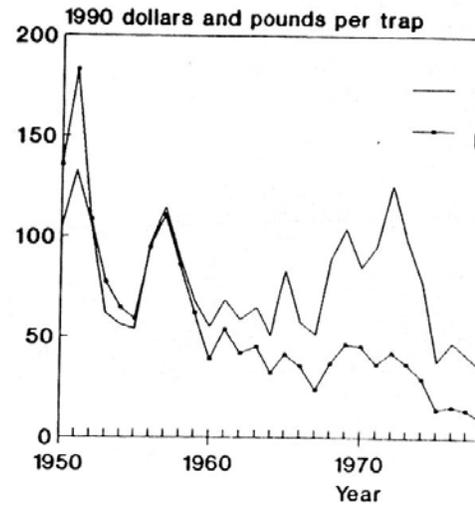


Figure 13.--Florida east coast landings of spiny lobster  
(% of fishing year landings by quarter)

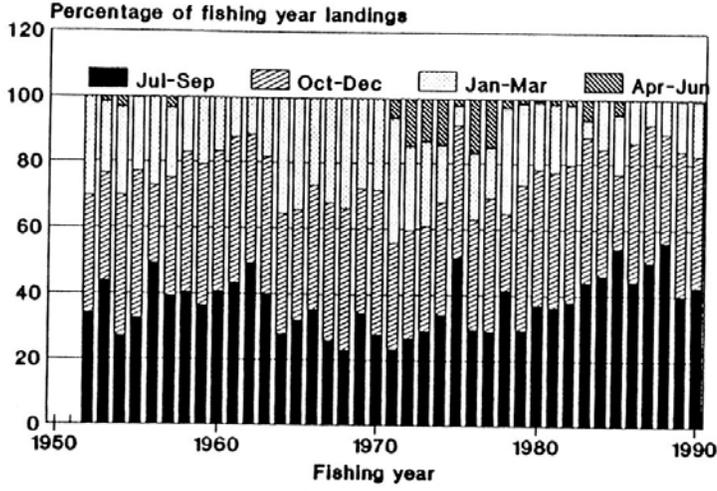


Figure 14.--Florida west coast landings of spiny lobster  
(% of fishing year landings by quarter)

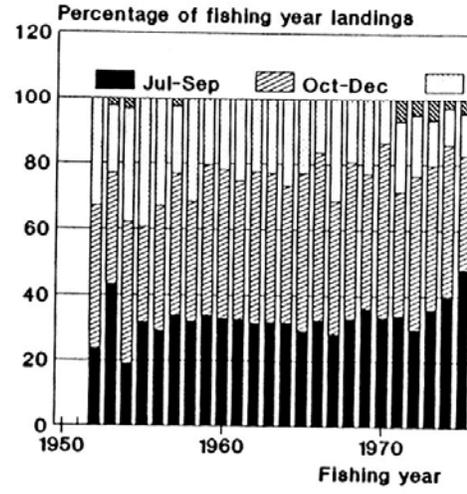


Figure 15.--Florida east coast landings of spiny lobster  
(% of fishing year landings by quarter)

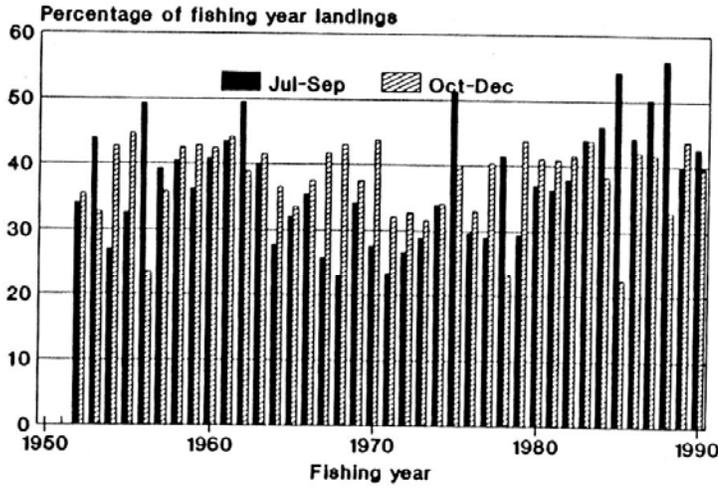


Figure 16.--Florida west coast landings of spiny lobster  
(% of fishing year landings by quarter)

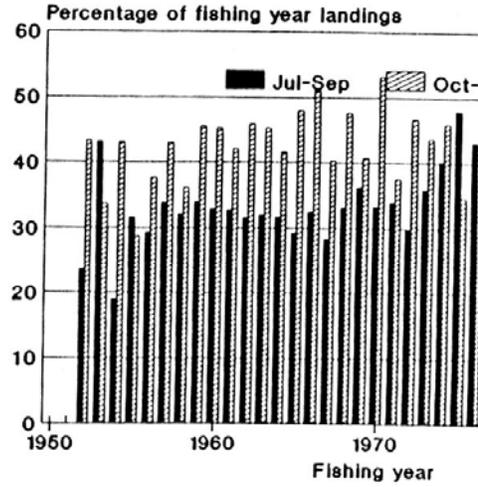


Figure 17.--Prices and craft, Florida spiny lobster fishery  
(Data for 1950-89)

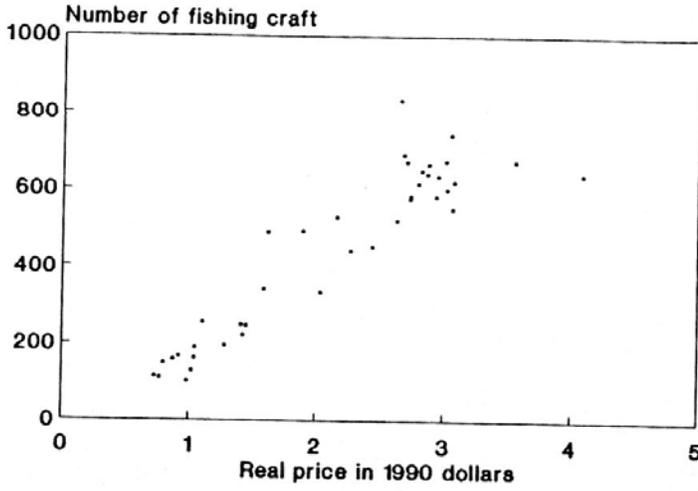


Figure 18.--Prices and traps, Florida  
(Data for 1950-89)

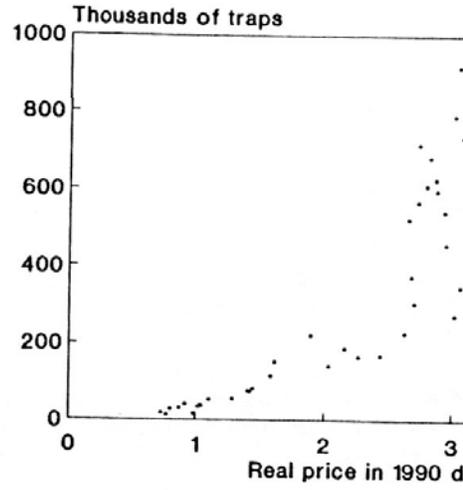


Figure 19.--U.S. consumption of spiny lobster products  
(Million pounds, round or live weight)

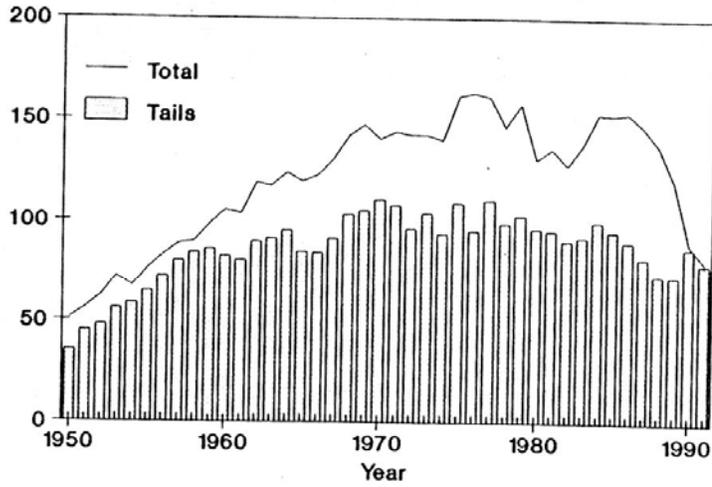


Figure 20.--U.S. and Japan imports of spiny lobster  
(Million pounds, round or live weight)

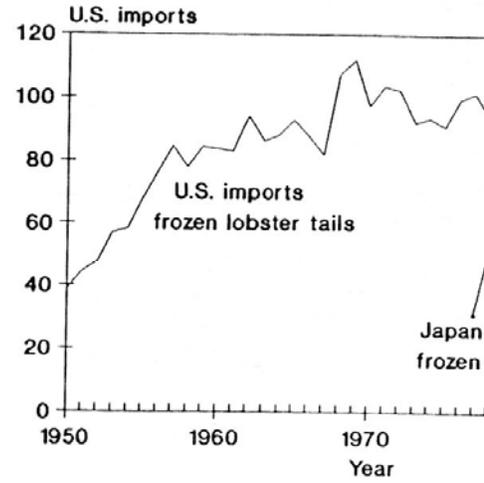
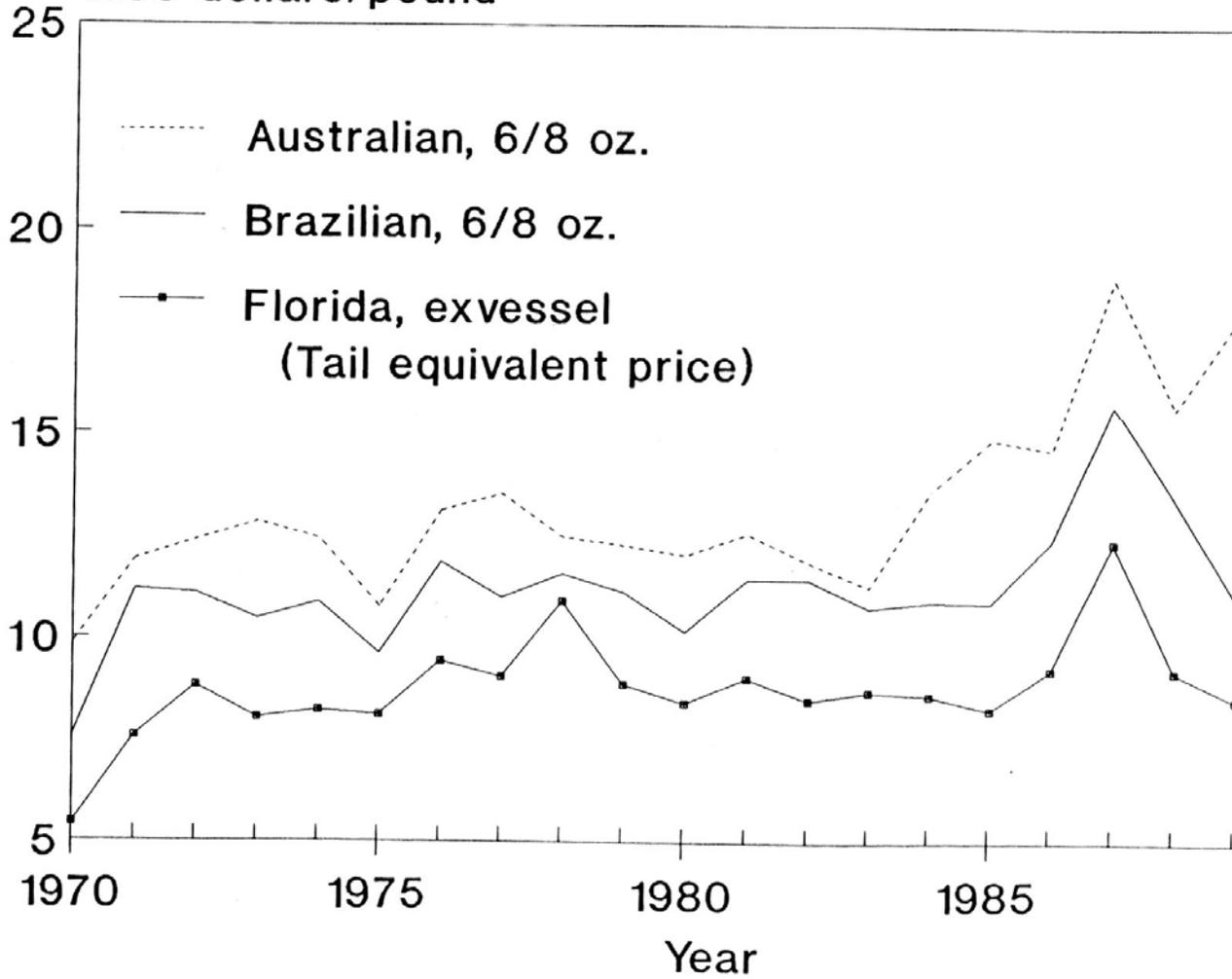


Figure 21.--Real prices of spiny lobster tails  
(6/8 oz. tails, wholesale at New York; Florida, exvessel  
1990 dollars/pound



March 29, 1991

NOTE: THE FOLLOWING IS AN UNOFFICIAL COMPILATION OF FEDERAL REGULATIONS PREPARED IN THE SOUTHEAST REGIONAL OFFICE OF THE NATIONAL MARINE FISHERIES SERVICE FOR THE INFORMATION AND CONVENIENCE OF INTERESTED PERSONS. IT DOES NOT INCLUDE CHANGES TO THESE REGULATIONS THAT MAY HAVE OCCURRED AFTER THE DATE INDICATED ABOVE.

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

National Marine Fisheries Service (NMFS)

50 CFR Part 640

PART 640 -- SPINY LOBSTER FISHERY OF THE GULF OF MEXICO AND SOUTH ATLANTIC

Subpart A - General Provisions

Sec.

- 640.1 Purpose and scope.
- 640.2 Definitions.
- 640.3 Relation to other laws.
- 640.4 Permits and fees.
- 640.5 Recordkeeping and reporting. [Reserved]
- 640.6 Gear and vessel identification.
- 640.7 Prohibitions.
- 640.8 Facilitation of enforcement.
- 640.9 Penalties.

Subpart B - Management Measures

- 640.20 Seasons.
- 640.21 Harvest limitations.
- 640.22 Size limitations.
- 640.23 Gear limitations.
- 640.24 Authorized activities.

Authority: 16 U.S.C. 1801 et seq.

Subpart A - General Provisions

§ 640.1 Purpose and scope.

The purpose of this part is to implement the Fishery Management Plan for the Spiny Lobster Fishery of the Gulf of Mexico and South Atlantic developed by the South Atlantic and Gulf of Mexico Fishery Management Councils under the Magnuson Act. The regulations in this part govern fishing for spiny lobster and slipper (Spanish) lobster by vessels of the United States within the EEZ in the Atlantic Ocean and Gulf of Mexico along the coast of the South Atlantic States from the Virginia/North Carolina border south and through the Gulf of Mexico.

§ 640.2 Definitions.

In addition to the definitions in the Magnuson Act and in § 620.2 of this chapter, the terms used in this part have the following meanings:

Carapace length means a head-length measurement taken from the orbital notch inside the orbital spine, in a line parallel to the lateral rostral sulcus, to the posterior margin of the cephalothorax (Figure 1).

Commercial fishing means any fishing or fishing activities which result in the harvest of any marine or freshwater organisms, one or more of which (or parts thereof) is sold, traded, or bartered.

Degradable panel means a panel constructed of wood, cotton, or other material that will degrade at the same rate as a wooden trap.

Live well means a shaded container used for holding live lobsters aboard a vessel in which aerated seawater is continuously circulated from the sea. Circulation of seawater at a rate that replaces the water at least every 8 minutes meets the requirement for aeration.

Management area means that area of the EEZ adjacent to the territorial sea off the coasts of the States adjacent to the Gulf of Mexico and off the Atlantic Coast south of the Virginia-North Carolina border.

Recreational fishing means fishing or fishing activities which result in the harvest of fish, none of which (or parts thereof) is sold, traded, or bartered.

Regional Director means the Regional Director, NMFS, Southeast Region, Duval Building, 9450 Koger Boulevard, St. Petersburg, FL 33702; telephone 813-893-3141, or his designee.

Slipper (Spanish) lobster means the species Scyllarides nodifer.

Spiny lobster means the species Panulirus argus.

Tail length means the measurement, with the tail in a straight, flat position, from the anterior end of the exoskeleton ("shell") of the first abdominal (tail) segment to the tip of the closed tail.

Trip means a fishing trip, regardless of number of days duration, that begins with departure from a dock, berth, beach, seawall, or ramp and that terminates with return to a dock, berth, beach, seawall, or ramp.

#### § 640.3 Relation to other laws.

(a) The relation of this part to other laws is set forth in § 620.3 of this chapter and paragraph (b) of this section.

(b) The regulations in this part apply within the boundaries of any national park, monument, or marine sanctuary in the Gulf of Mexico and South Atlantic EEZ.

#### § 640.4 Permits and fees.

##### (a) Applicability.

(1) To sell a spiny lobster in or from the EEZ, or to be exempt from the daily catch and possession limit of spiny lobster in or from the EEZ specified in § 640.21(c)(1)(i), an owner or operator of a vessel must obtain a seasonal vessel permit.

(2) To possess a separated spiny lobster tail in or from the EEZ aboard a vessel, the owner or operator of that vessel must obtain a tail-separation permit. A tail-separation permit will not be issued to an owner or operator who does not qualify for a seasonal vessel permit.

(3) An owner or operator of a vessel that has legally harvested spiny lobsters in the waters of a foreign nation and possesses spiny lobsters or separated tails in the EEZ incidental

to such foreign harvesting is exempt from the permit requirements of paragraphs (a)(1) and (2) of this section provided a proper bill of lading or other proof of lawful harvest in the waters of a foreign nation accompanies such lobsters or tails.

(4) For a corporation or partnership to be eligible for a seasonal vessel permit specified in paragraph (a)(1) of this section, the earned income qualification specified in paragraph (b)(2)(viii) of this section must be met by, and the statement required by that paragraph must be submitted by, a shareholder or officer of the corporation, a general partner of the partnership, or the vessel operator.

(b) Application for permit.

(1) An application for a seasonal vessel or tail-separation permit must be submitted and signed by the owner or operator of the vessel. The application must be submitted to the Regional Director at least 60 days prior to the date on which the applicant desires to have the permit made effective.

(2) A permit applicant must provide the following information:

(i) A copy of the vessel's U.S. Coast Guard certificate of documentation or state registration certificate;

(ii) The vessel's name, official number, length, home port, and engine horsepower;

(iii) Name, mailing address including zip code, telephone number, and Florida saltwater products license number, if applicable, of the owner of the vessel;

(iv) Name, mailing address including zip code, telephone number, and Florida saltwater products license number, if applicable, of the applicant, if other than the owner;

(v) Social security number and date of birth of the applicant and the owner;

(vi) Approximate live well capacity in gallons;

(vii) Any other information concerning vessel and gear characteristics requested by the Regional Director;

(viii) A sworn statement by the applicant certifying that at least 10 percent of his or her earned income was derived from commercial fishing during the calendar year preceding the application;

(ix) Proof of certification, as required by paragraph (b)(3) of this section; and

(x) If a tail-separation permit is desired, a sworn statement by the applicant certifying that his fishing activity --

(A) Is routinely conducted in the EEZ on trips of 48 hours or more; and

(B) Necessitates the separation of carapace and tail to maintain a quality product.

(3) The Regional Director may require the applicant to provide documentation supporting the sworn statement under paragraph (b)(2)(viii) of this section before a permit is issued or to substantiate why such a permit should not be denied, revoked, or otherwise sanctioned under paragraph (g) of this section.

(4) Any change in the information specified in paragraph (b)(2) of this section must be submitted in writing to the Regional Director by the permit holder within 30 days of any such change. The permit is void if any change in the information is not reported.

(c) Fees. A fee of \$26 will be charged for each permit application submitted under paragraph (b) of this section. The appropriate fee must accompany each permit application.

(d) Issuance.

(1) Except as provided in Subpart D of 15 CFR Part 904, the Regional Director will issue a permit at any time during the fishing year to the applicant.

(2) Upon receipt of an incomplete application, the Regional Director will notify the applicant of the deficiency. If the applicant fails to correct the deficiency within 30 days of the Regional Director's notification, the application will be considered abandoned.

(e) Duration. A permit remains valid for the remainder of the season for which it is issued unless revoked, suspended, or modified pursuant to Subpart D of 15 CFR Part 904.

(f) Transfer. A permit issued under this section is not transferable or assignable. A person purchasing a vessel with a seasonal vessel permit must apply for a new permit in accordance with the provisions of paragraph (b) of this section. The application must be accompanied by a copy of an executed (signed) bill of sale.

(g) Display. A permit issued under this section must be carried on board the permitted vessel at all times and such vessel must be identified as provided for in § 640.6. The operator of a fishing vessel must present the permit for inspection upon request of an authorized officer.

(h) Sanctions. Procedures governing permit sanctions and denials are found at Subpart D of 15 CFR Part 904.

(i) Alteration. A permit that is altered, erased, or mutilated is invalid.

(j) Replacement. A replacement permit may be issued. An application for a replacement permit will not be considered a new application.

**§ 640.5 Recordkeeping and reporting. [Reserved]**

**§ 640.6 Gear and vessel identification.**

(a) Traps, buoys, and all vessels and boats engaged in the spiny lobster trap fishery must be identified by the number and color code issued by the Regional Director, or through Florida's identification system.

(b) An application for a Federal number and color code must be submitted and signed by the owner or operator of the vessel on an appropriate form obtained from the Regional Director. The application must be submitted to the Regional Director 45 days prior to the date on which the applicant desires receipt of the number and color code.

(c) Vessels and boats engaged in the spiny lobster trap fishery must permanently and conspicuously display such color code

and number in a manner as to be readily identifiable from the air and water; such color representation must be in the form of a circle at least 20 inches in diameter and the identification number must be at least 10 inches high.

(d) Each trap, unless part of a string of traps, must be marked by a floating buoy or a buoy designed to be submerged and automatically released at a certain time. Each string of traps must be marked with a buoy at each end of the string.

(e) Buoys must be of such color as to be easily distinguished, seen, and located; the identification number must be legible and at least 3 inches high on each buoy.

(f) Each trap, can, drum, or similar device must have a legible identification number at least 3 inches high permanently attached as in the case of buoys.

(g) All spiny lobster traps fished in the EEZ will be presumed to be the property of the most recently documented owner.

(h) Upon the sale or transfer of all or part of an owner's interest in spiny lobster traps which are fished in the EEZ, that owner must report the sale or transfer within 15 days to the Regional Director if the identification number and color code for those traps were issued by the Regional Director.

(i) An unmarked spiny lobster trap or buoy in the EEZ is illegal gear. Such trap, buoy, and connecting line may be disposed of in any manner considered appropriate by the Secretary or an authorized officer. An owner of such a trap or buoy remains subject to appropriate civil penalties.

#### **§ 640.7 Prohibitions.**

In addition to the general prohibitions specified in § 620.7 of this chapter, it is unlawful for any person to do any of the following:

(a) Fish for spiny lobster without a vessel number, or falsify or fail to affix and maintain vessel and gear markings, as required by § 640.6.

(b) Place traps in the water or harvest spiny lobsters from traps before or after the dates specified in § 640.20(a).

(c) Harvest a spiny lobster with a trap except during the season specified in § 640.20(a)(1).

(d) Possess spiny lobster or any parts thereof in the EEZ, except as specified in § 640.20.

(e) Retain on board or possess on land a berried spiny or slipper lobster taken in the EEZ.

(f) Strip eggs from or otherwise molest a berried spiny or slipper lobster, as specified in § 640.21(a).

(g) Pull or tend traps except during the hours specified in § 640.21(b).

(h) Willfully tend, open, pull, or otherwise molest another person's traps, except as provided in § 640.21(b).

(i) Exceed the recreational daily catch and possession limit, as specified in § 640.21(c)(1).

(j) Retain a spiny lobster smaller than the minimum size, except as specified in § 640.22; or purchase, barter, trade, or

sell a spiny lobster smaller than the minimum size, as specified in § 640.22(a)(1) or (2).

(k) Use traps without degradable panels, or prohibited gear or methods, as specified in § 640.23.

(l) Fail to return immediately to the water unharmed a berried (egg-bearing) spiny or slipper lobster, as specified in § 640.21(a).

(m) Operate a vessel that fishes for spiny lobster in the EEZ with spiny lobster aboard in excess of the cumulative recreational catch limit, as specified in § 640.21(c)(3).

(n) Transfer at sea in the EEZ spiny lobster caught under the recreational catch limit specified in § 640.21(c) from a fishing vessel to any other vessel or to so transfer at sea any such spiny lobster taken from the EEZ.

(o) Fail to have on board or present for inspection an extension authorization, as required under § 640.20(a)(3).

(p) Interfere with, obstruct, delay, or prevent by any means a lawful investigation or search in the process of enforcing this part.

(q) Purchase, barter, trade, or sell a spiny lobster taken in the EEZ by a vessel that does not have a seasonal vessel permit, as specified in § 640.4(a)(1).

(r) Purchase, barter, trade, or sell a separated spiny lobster tail taken in the EEZ by a vessel that does not have a tail-separation permit, as specified in § 640.4(a)(2).

(s) Falsify information specified in § 640.4(b)(2) on an application for a permit; or fail to report a change in such information, as specified in § 640.4(b)(4).

(t) Fail to display a permit, as specified in § 640.4(g).

(u) Possess a separated spiny lobster tail, except as specified in § 640.21(d).

**§ 640.8 Facilitation of enforcement.**

See § 620.8 of this chapter.

**§ 640.9 Penalties.**

See § 620.9 of this chapter.

**Subpart B - Management Measures**

**§ 640.20 Seasons.**

(a) Fishing season.

(1) The commercial and recreational fishing season for spiny lobster begins on August 6, one hour before official sunrise, and ends on March 31, one hour after official sunset.

(2) Prior to the season, spiny lobster traps may be placed in the water one hour before official sunrise on August 1 (soak period).

(3) After the season, traps must be removed from the water by one hour after official sunset on April 5 (removal period) unless an extension to the removal period is granted by Florida in accordance with Chapter 46-24, Spiny Lobster (Crawfish) and Slipper Lobster, Rules of the Department of Natural Resources, Florida Marine Fisheries Commission, Florida Administrative Code. The extension authorization must be carried aboard the boat retrieving

the traps and must be presented for inspection upon request of an authorized officer.

(4) Except as provided in paragraphs (a)(2) and (a)(3) of this section, no trap may be transported on the waters of the EEZ during the period from one hour after official sunset on March 31 to one hour before sunrise on August 6.

(5) A spiny lobster trap, buoy, or rope in the management area at times not authorized in this paragraph will be considered unclaimed or abandoned property and may be disposed of in any manner considered appropriate by the Secretary of an authorized officer. An owner of such a trap remains subject to appropriate civil penalties.

(b) Special non-trap recreational fishery. There is a special non-trap recreational fishing season on the first full weekend preceding August 1 from 0001 hours, Saturday, until 2400 hours, Sunday.

(c) Possession. Spiny lobsters or any parts thereof may be possessed in the EEZ only during the seasons specified in paragraphs (a)(1) and (b) of this section, unless accompanied by a proper bill of landing or other proof indicating lawful harvest outside the EEZ. Holding a spiny lobster in a trap while in the water during the soak period or during the removal period, or an extension thereto, will not be deemed possession provided such spiny lobster is returned immediately to the water unharmed whenever a trap is removed from the water during these periods.

#### **§ 640.21 Harvest limitations.**

(a) Berried lobsters. A berried spiny lobster or slipper lobster must be returned immediately to the water unharmed. If found in a trap, a berried lobster may not be retained in the trap. A berried lobster may not be stripped of its eggs or otherwise molested.

(b) Pulling traps.

(1) Traps may be pulled or tended only during the period beginning one hour before official sunrise and ending one hour after official sunset.

(2) Traps may be pulled or tended only by the owner's vessel, unless the boat tending another person's trap has on board written consent of the trap owner.

(c) Recreational catch.

(1) The daily catch and possession of spiny lobsters in or from the EEZ is limited to six per person:

(i) During the fishing season described at § 640.20(a), except for spiny lobsters possessed aboard a vessel with the seasonal vessel permit specified in § 640.4(a)(1); and

(ii) During the special non-trap recreational season described at § 640.20(b).

(2) A person who fishes for spiny lobster in the EEZ may not combine the recreational catch and possession limit of paragraph (c)(1) of this section with any bag or possession limit applicable to State waters.

(3) The operator of a vessel that fishes for spiny lobster in the EEZ is responsible for the cumulative recreational catch, based on the number of persons aboard, applicable to that vessel.

(4) A person who fishes for or possesses spiny lobsters under the recreational catch and possession limit specified in paragraph (c)(1) of this section may not transfer spiny lobsters at sea from a fishing vessel to any other vessel.

(d) Tail separation. The possession of a separated spiny lobster tail is authorized only --

(1) Aboard a vessel having on board the tail-separation permit specified in § 640.4(a)(2); and

(2) When the possession is incidental to fishing in the EEZ on a trip of 48 hours or more.

**§ 640.22 Size limitations.**

(a) Length. Except as provided in paragraph (b) of this section, a spiny lobster --

(1) With a carapace length of 3.0 inches (7.62 centimeters) or less; or

(2) Aboard a vessel authorized under § 640.21(d) to possess a separated spiny lobster tail, with a tail length less than 5.5 inches (13.97 centimeters) --

must be returned immediately to the water unharmed.

(b) Attractants. A live lobster under the minimum size may be retained for use as an attractant in a trap provided it is held in a live well aboard the vessel. No more than 100 undersized lobsters may be carried on board for use as attractants. The live well must provide a minimum of 3/4 gallons of seawater per spiny lobster.

**§ 640.23 Gear limitations.**

(a) Degradable panel. Traps constructed of material other than wood must have a panel constructed of wood, cotton, or other degradable material located in the upper half of the sides or on top of the trap, that, when removed, will leave an opening in the trap no smaller than the diameter found at the throat or entrance of the trap.

(b) Prohibited gear and methods.

(1) Spiny lobster may not be taken with spears, hooks, or similar devices, or gear containing such devices. In the EEZ, the possession of speared, pierced, or punctured lobsters is prima facie evidence that prohibited gear was used to take such lobsters.

(2) Spiny lobsters may not be taken with poisons or explosives.

**§ 640.24 Authorized activities.**

The Secretary may authorize, for the acquisition of information and data, activities otherwise prohibited by these regulations.

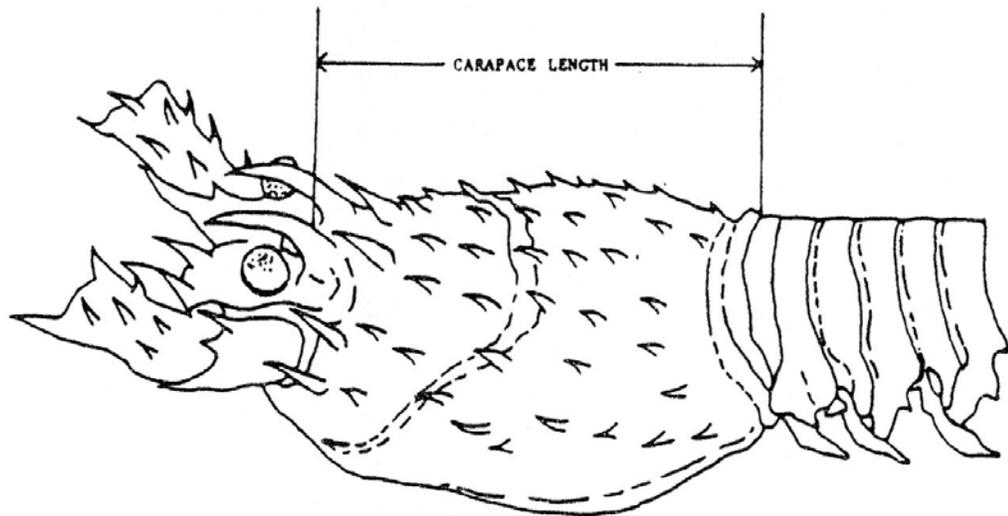


Figure 1 Method of Measuring Carapace Length

March 26, 1992

NOTE: THE FOLLOWING IS AN UNOFFICIAL COMPILATION OF FEDERAL REGULATIONS PREPARED IN THE SOUTHEAST REGIONAL OFFICE OF THE NATIONAL MARINE FISHERIES SERVICE FOR THE INFORMATION AND CONVENIENCE OF INTERESTED PERSONS. IT DOES NOT INCLUDE CHANGES TO THESE REGULATIONS THAT MAY HAVE OCCURRED AFTER THE DATE INDICATED ABOVE.

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

National Marine Fisheries Service (NMFS)

50 CFR Part 620

PART 620 -- GENERAL PROVISIONS FOR DOMESTIC FISHERIES

Sec.

- 620.1 Purpose.
- 620.2 Definitions.
- 620.3 Relation to other laws.
- 620.4 Permits.
- 620.5 Recordkeeping and reporting.
- 620.6 Vessel and gear identification.
- 620.7 General prohibitions.
- 620.8 Facilitation of enforcement.
- 620.9 Penalties.

Authority: 16 U.S.C. 1801 et seq.

**§620.1 Purpose.**

The purpose of this part is to collect and display the general provisions common to all domestic fishing regulations appearing at Parts 630 through 699 of this chapter.

**§620.2 Definitions.**

In addition to the definitions in the Magnuson Act, the terms used in this part and in Parts 630 through 699 of this chapter have the following meanings:

Administrator means the Administrator of NOAA (Under Secretary of Commerce for Oceans and Atmosphere) or a designee.

Area of custody means any vessel, building, vehicle, live car, pound, pier, or dock facility where fish might be found.

Assistant Administrator means the Assistant Administrator for Fisheries, NOAA, or a designee.

Authorized officer means:

(a) Any commissioned, warrant, or petty officer of the U.S. Coast Guard;

(b) Any special agent or fishery enforcement officer of NMFS;

(c) Any officer designated by the head of any Federal or State agency which has entered into an agreement with the Secretary and the Commandant of the U.S. Coast Guard to enforce the provisions of the Magnuson Act; or

(d) Any U.S. Coast Guard personnel accompanying and acting under the direction of any person described in paragraph (a) of this definition.

Catch, take, or harvest includes, but is not limited to, any activity which results in killing any fish or bringing any live fish on board a vessel.

Dealer means the person who first receives fish by way of purchase, barter, or trade.

Exclusive economic zone (EEZ) means the zone established by Presidential Proclamation 5030, dated March 10, 1983, and is that area adjacent to the United States which, except where modified to accommodate international boundaries, encompasses all waters from the seaward boundary of each of the coastal States to a line on which each point is 200 nautical miles from the baseline from which the territorial sea of the United States is measured.

Fish means any finfish, mollusk, crustacean, or parts thereof, and all other forms of marine animal and plant life other than marine mammals, birds, and highly migratory species of tuna.

Fishery resource means any fish, any stock of fish, any species of fish, and any habitat of fish.

Fishing, or to fish, means any activity, other than scientific research conducted by a scientific research vessel, which involves:

- (a) The catching, taking, or harvesting of fish;
- (b) The attempted catching, taking, or harvesting of fish;
- (c) Any other activity which can reasonably be expected to result in the catching, taking, or harvesting of fish; or
- (d) Any operations at sea in support of, or in preparation for, any activity described in paragraphs (a), (b), or (c) of this definition.

Fishing vessel means any vessel, boat, ship, or other craft which is used for, equipped to be used for, or of a type which is normally used for:

- (a) Fishing; or
- (b) Aiding or assisting one or more vessels at sea in the performance of any activity relating to fishing, including, but not limited to, preparation, supply, storage, refrigeration, transportation, or processing.

Magnuson Act means the Magnuson Fishery Conservation and Management Act, 16 U.S.C. 1801 et seq., as amended.

NMFS means the National Marine Fisheries Service, NOAA.

NOAA means the National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

Official number means the documentation number issued by the U.S. Coast Guard or the certificate number issued by a State or by the U.S. Coast Guard for an undocumented vessel.

Operator, with respect to any vessel, means the master or other individual on board and in charge of that vessel.

Owner, with respect to any vessel, means:

- (a) Any person who owns that vessel in whole or in part;
- (b) Any charterer of the vessel, whether bareboat, time, or voyage;
- (c) Any person who acts in the capacity of a charterer including but not limited to parties to a management agreement,

operating agreement, or any similar agreement that bestows control over the destination, function, or operation of the vessel; or

(d) Any agent designated as such by a person described in paragraph (a), (b), or (c) of this definition.

Person means any individual (whether or not a citizen or national of the United States), corporation, partnership, association, or other entity (whether or not organized or existing under the laws of any State), and any Federal, State, local, or foreign government or any entity of any such government.

Retain, retain aboard, or retain on board means to fail to return fish to the sea after a reasonable opportunity to sort the catch.

Secretary means the Secretary of Commerce, or a designee.

State means each of the several States, the District of Columbia, the Commonwealth of Puerto Rico, American Samoa, the Virgin Islands, Guam, and any other Commonwealth, territory, or possession of the United States.

U.S. fish processors means facilities located within the United States for, and vessels of the United States used or equipped for, the processing of fish for commercial use or consumption.

U.S.-harvested fish means fish caught, taken, or harvested by vessels of the United States within any fishery regulated under the Magnuson Act.

Vessel of the United States means:

(a) Any vessel documented under Chapter 121 of Title 46, United States Code;

(b) Any vessel numbered under Chapter 123 of Title 46, United States Code, and measuring less than 5 net tons;

(c) Any vessel numbered under Chapter 123 of Title 46, United States Code, and used exclusively for pleasure; and

(d) Any vessel not equipped with propulsion machinery of any kind and used exclusively for pleasure.

### **§620.3 Relation to other laws.**

(a) General. Persons affected by these regulations should be aware that other Federal and State statutes and regulations may apply to their activities. Vessel operators may wish to refer to U.S. Coast Guard regulations at U.S.C. Titles 33--Navigation and Navigable Waters and 46--Shipping, to 15 CFR Part 904 Subpart D--Permit Sanctions and Denials, and to U.S.C. Title 43--Public Lands (in regard to marine sanctuaries).

(b) State responsibilities. Certain responsibilities relating to data collection and enforcement may be performed by authorized State personnel under a State/Federal agreement for data collection and a tripartite agreement among the State, the U.S. Coast Guard, and the Secretary for enforcement.

(c) Submarine cables. Fishing vessel operators must exercise due care in the conduct of fishing activities near submarine cables. Damage to the submarine cables resulting from intentional acts or from the failure to exercise due care in the

conduct of fishing operations subjects the fishing vessel operator to the criminal penalties prescribed by the Submarine Cable Act (47 U.S.C. 21) which implements the International Convention for the Protection of Submarine Cables. Fishing vessel operators also should be aware that the Submarine Cable Act prohibits fishing operations at a distance of less than one nautical mile from a vessel engaged in laying or repairing a submarine cable; or at a distance of less than one-quarter nautical mile from a buoy or buoys intended to mark the position of a cable when being laid or when out of order or broken.

(d) Marine mammals. Regulations governing permits and certificates of inclusion for the taking of marine mammals are set forth at parts 216 and 229 of this title.

(e) Halibut fishing. Fishing for halibut is governed by regulations of the International Pacific Halibut Commission set forth at Part 301 of this title.

(f) Marine sanctuaries. All fishing activity, regardless of species sought, is prohibited under 15 CFR Part 924 in the U.S.S. Monitor Marine Sanctuary, which is located approximately 15 miles southwest of Cape Hatteras off the coast of North Carolina.

#### **§620.4 Permits.**

Regulations pertaining to permits required for certain fisheries are set forth in the parts governing those fisheries.

#### **§620.5 Recordkeeping and reporting.**

Regulations pertaining to records and reports required for certain fisheries are set forth in the parts governing those fisheries.

#### **§620.6 Vessel and gear identification.**

Regulations pertaining to special vessel and gear markings required for certain fisheries are set forth in the parts governing those fisheries.

#### **§620.7 General prohibitions.**

It is unlawful for any person to do any of the following:

(a) Possess, have custody or control of, ship, transport, offer for sale, sell, purchase, land, import, or export, any fish or parts thereof taken or retained in violation of the Magnuson Act or any regulation or permit issued under the Magnuson Act.

(b) Transfer or attempt to transfer, directly or indirectly, any U.S.-harvested fish to any foreign fishing vessel, while such vessel is in the EEZ, unless the foreign fishing vessel has been issued a permit under section 204 of the Magnuson Act which authorizes the receipt by such vessel of U.S.-harvested fish.

(c) Fail to comply immediately with enforcement and boarding procedures specified in §620.8 of this part.

(d) Refuse to allow an authorized officer to board a fishing vessel or to enter areas of custody for purposes of conducting any search, inspection, or seizure in connection with the enforcement of the Magnuson Act.

(e) Dispose of fish or parts thereof or other matter in any manner, after any communication or signal from an authorized

officer, or after the approach by an authorized officer or an enforcement vessel.

(f) Forcibly assault, resist, oppose, impede, intimidate, threaten, or interfere with any authorized officer in the conduct of any search, inspection, or seizure in connection with enforcement of the Magnuson Act.

(g) Interfere with, delay, or prevent by any means, the apprehension of another person, knowing that such person has committed any act prohibited by the Magnuson Act.

(h) Resist a lawful arrest for any act prohibited under the Magnuson Act.

**§620.8 Facilitation of enforcement.**

(a) General. The operator of, or any other person aboard, any fishing vessel subject to Parts 630 through 699 of this chapter must immediately comply with instructions and signals issued by an authorized officer to stop the vessel and with instructions to facilitate safe boarding and inspection of the vessel, its gear, equipment, fishing record (where applicable), and catch for purposes of enforcing the Magnuson Act and this chapter.

(b) Communications.

(1) Upon being approached by a U.S. Coast Guard vessel or aircraft or other vessel or aircraft with an authorized officer aboard, the operator of a fishing vessel must be alert for communications conveying enforcement instructions.

(2) VHF-FM radiotelephone is the preferred method for communicating between vessels. If the size of the vessel and the wind, sea, and visibility conditions allow, a loudhailer may be used instead of the radio. Hand signals, placards, high frequency radiotelephone, or voice may be employed by an authorized officer, and message blocks may be dropped from an aircraft.

(3) If other communications are not practicable, visual signals may be transmitted by flashing light directed at the vessel signaled. Coast Guard units will normally use the flashing light signal "L" as the signal to stop. In the International Code of Signals, "L" (.-..) <sup>1</sup> means "you should stop your vessel instantly."

(4) Failure of a vessel's operator promptly to stop the vessel when directed to do so by an authorized officer using loudhailer, radiotelephone, flashing light signal, or other means constitutes prima facie evidence of the offense of refusal to permit an authorized officer to board.

(5) The operator of a vessel who does not understand a signal from an enforcement unit and who is unable to obtain clarification by loudhailer or radiotelephone must consider the signal to be a command to stop the vessel instantly.

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<sup>1</sup> Period (.) means a short flash of light; dash (-) means a long flash of light.

(c) Boarding. The operator of a vessel directed to stop must

- (1) Guard Channel 16, VHF-FM, if so equipped;
- (2) Stop immediately and lay to or maneuver in such a way as to allow the authorized officer and his party to come aboard;
- (3) Except for those vessels with a freeboard of four feet or less, provide a safe ladder, if needed, for the authorized officer and his party to come aboard;
- (4) When necessary to facilitate the boarding or when requested by an authorized officer or observer, provide a manrope or safety line, and illumination for the ladder; and
- (5) Take such other actions as necessary to ensure the safety of the authorized officer and the boarding party.

(d) Signals. The following signals, extracted from the International Code of Signals, may be sent by flashing light by an enforcement unit when conditions do not allow communications by loudhailer or radiotelephone. Knowledge of these signals by vessel operators is not required. However, knowledge of these signals and appropriate action by a vessel operator may preclude the necessity of sending the signal "L" and the necessity for the vessel to stop instantly.

(1) "AA" repeated (.- .-) is the call to an unknown station. The operator of the signaled vessel should respond by identifying the vessel by radiotelephone or by illuminating the vessel's identification.

(2) "RY-CY" (.-. -.- -.- -.-) means "you should proceed at slow speed, a boat is coming to you." This signal is normally employed when conditions allow an enforcement boarding without the necessity of the vessel being boarded coming to a complete stop, or, in some cases, without retrieval of fishing gear which may be in the water.

(3) "SQ3" (... --.- ...-- ) means "you should stop or heave to; I am going to board you."

#### **§620.9 Penalties.**

Any person committing or fishing vessel used in the commission of a violation of the Magnuson Act or any regulation issued under the Magnuson Act, is subject to the civil and criminal penalty provisions and civil forfeiture provisions of the Magnuson Act, to Part 621 of this chapter, to 15 CFR Part 904 (Civil Procedures), and to other applicable law.