

UNITED STATES
DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Region
State, Federal & Constituent Programs Office



COMPLETION REPORT

Grantee: MAINE DEPARTMENT OF MARINE RESOURCES

Project No: 3-IJ-154

Grant No: NA96FI0021

Project Title: INTERJURISDICTIONAL FISHERIES RESOURCE
MONITORING AND ASSESSMENT

Period Covered: 01/01/99 - 12/31/99

Prepared by: _____

Approved by: LINDA P. MERCER

Date: APRIL 24, 2000

Statutory Funding Authority: Anadromous Fish Conservation Act
(P.L. 89-304)

- ☐ Chesapeake Bay Studies
- ☐ Endangered Species Act
- ☒ Interjurisdictional Fisheries Act
(Title III of P.L. 99-659)
- ☐ Magnuson Act
- ☐ Oyster Disease Research
- ☐ Saltonstall-Kennedy
- ☐ Unallied Industry Projects
- ☐ Unallied Science Projects
- ☐ ACFCMA
- ☐ Unallied Management Projects

**UNITED STATES
DEPARTMENT OF COMMERCE**

**National Oceanic and Atmospheric Administration
National Marine Fisheries Service
State, Federal and Constituent Program Division**

**COMPLETION REPORT
Interjurisdictional Fisheries Resource Monitoring and Assessment**

**State: Maine
Project No. 3-IJ-154
Grant No. NA96FI0021**

January 1, 1999 – December 31, 1999

**Maine Department of Marine Resources
21 State House Station
Augusta, ME 04333**

April 24, 2000

LOBSTER

Survey of the lobster fishery along the Coast of Maine

Completion Report

January 1 1999 through December 31 1999.



**Carl J. Wilson
Glenn E. Nutting
Gary A. Robinson
Norris C. Bowie
And
Jason Bartlett**

Completion of proposed work

In the past year there have been three senior staff changes on the lobster project. Continuity of field sampling by technical staff has been admirable considering the many changes. The core lobster projects outlined in the proposal, namely port sampling (established in 1967) and sea sampling (established in 1985) completed extensive sampling for the period of the project. However, with senior staffing changes there have been shortfalls on historical data analysis. These shortfalls have been identified and work will continue to follow these projects through to completion.

Job #1: Survey of the lobster resource/fishery along the coast of Maine.

The commercial lobster catch and effort monitoring programs completed extensive field seasons in 1999. The commercial port sampling program expanded to winter months for the first time since 1970; 466 boats from 61 randomly selected dealers were sampled. The sea sampling program has expanded from three boats in 1985 to 1997, 18 in 1998, and 69 in 1999. The sea sampling program now collects detailed catch and effort information in all seven lobster management zones. Detailed analysis of the port and sea sampling programs are presented in this completion report.

Job #2: Sample natural population of lobsters.

The movement patterns and growth rates of sublegal sized and newly recruited lobsters were extensively studied in the 1980s. There is an immense amount of information that has largely been untapped to-date. Files have been organized in appropriate research areas, but limited analysis has begun. The CONFIRM® insecticide spraying in Casco Bay, initiated in 1997, has allowed continued work on refinement of molt probability, molt frequency, and incremental growth rates through the monitoring program. The spraying was conducted to control the brown tail moth larvae whose barbed setal hairs cause annoying and, in extreme cases, life-threatening allergic reaction in humans. Results of this monitoring effort are included in this completion report.

Past gear selectivity work conducted by the DMR has identified benefits of escape vents in traps. These studies conducted in the late 1970s contributed to some of the original vent regulations in the lobster fishery in 1979. In 1999, in accordance with Amendment #3 (ASMFC 1997), the state of Maine increased the minimum escape vent size to 1 15/16". The increase in vent size was seen as a de facto minimum size increase intended to address overfishing in the lobster fishery. Changes in the composition of lobsters in traps were observed. Dramatically reduced numbers of short lobsters were recorded, and the average size and weight of the landed catch increased in 1999 (see section on sea sampling for further results). Future analysis of past gear work will contribute to future discussions of vent placement and size.

Job #3: Historical analysis of sea sampling data

Evaluation of the Maine sea-sampling database has begun. Past sea sampling was found to be in an awkward format for characterizing trends in catch rates of berried and V-notched lobsters. Technical staff has worked to organize the data into a dBase database file structure. We are now at the point where detailed analysis can begin on the historical sea sampling. Development of a recruitment index will be further enhanced by a cooperative juvenile trap survey. We hope to gather detailed length frequency data on juvenile lobsters with

vent-disabled traps. Through comparison with vent disabled trap data, we can determine the usefulness of normal traps for a prerecruit index. Analysis on egg bearing and v-notched lobsters is included in this completion report under the sea sampling section.

Job #4: Develop a strategy for a lobster management plan

The State of Maine lands approximately 70% of all lobsters in the United States. Maine plays a key role in lobster fishery management and continues to support federal and interstate management plans intended to minimize the chance of population collapse due to recruitment failure. Maine fully supports local lobster management zone councils who have been given the opportunity to regulate numbers of traps, numbers of traps on a buoy line and time of fishing in their zone. Initiated in 1996, the zone process has begun a shift in lobster management within the state. There are appropriate scales for lobster management; some are best addressed at the federal, interstate and state levels and others are more appropriate at a local/zone scale. For example, regulatory measures such as trap limits may benefit the health of the lobster resource as a whole, but probably contribute more to local stability that translates into economic benefits for zones and communities. The DMR will continue to actively engage members of state and federal agencies as well as the lobster industry to work towards a goal of maintaining a healthy lobster resource.

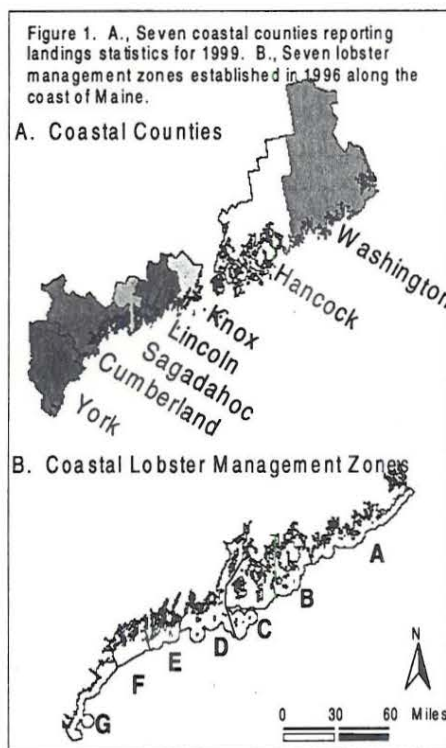
Overview and Status of the Resource: Carl Wilson

The Maine Department of Marine Resources (DMR) has monitored biological, catch/effort and socio-economic trends in the lobster fishery, Maine's most valuable commercial species, since 1966. In 1966, the DMR established a dock side (port) monitoring program to accurately track estimates of catch and effort in the lobster fishery. Since 1970, the port sampling program was conducted from April through December. In 1999, the program was expanded to start in March and continue through the winter of 1999/2000. An at-sea sampling program was initiated in 1985 to obtain information on total catch (landed and discarded lobsters), along with associated biological and catch/effort information. In 1998, the program was expanded from the initial three regions (Cape Porpoise, Boothbay and Spruce Head) to include all seven newly formed lobster management zones in the state. In 1999, the sea sampling program continued to grow to 123 trips off of 69 commercial boats.

A total of 123 at sea sampling trips, representing 69 commercial vessels, were conducted from May through November. During sampling trips, numbers of legal, sublegal, and illegal lobsters were recorded for each trap haul (total of 28,123). Specific biological information (size, sex, cull rate, egg condition and presence/absence of V-notch) was collected from 25% of all trap hauls. Additional catch and effort information (total traps hauled, pounds landed, number of crew, boat hours, trap type, set over days and location) was recorded for each trip. Landings are collected by NMFS according to seven coastal counties. When the sea sampling program expanded in 1998, sampling was structured around the seven lobster management zones (Fig. 1), which were thought to represent spatial differences in the lobster fishery.

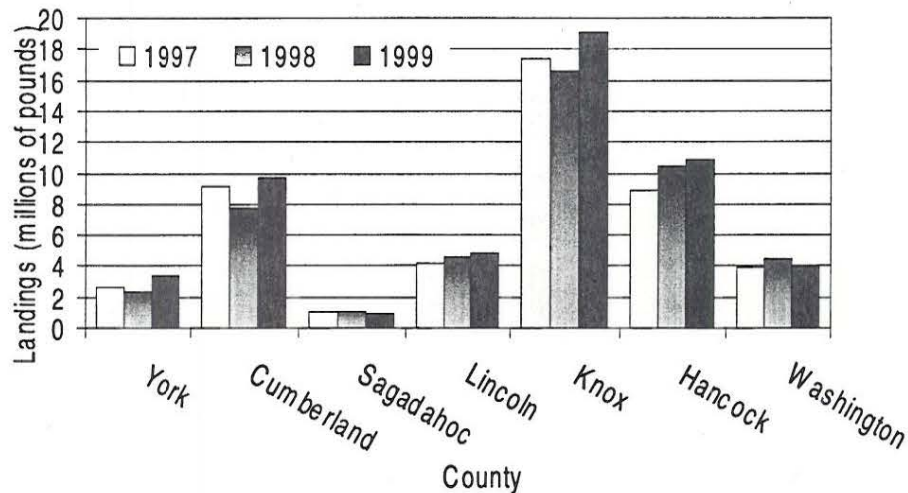
The port sampling project collected catch and effort data from 466 lobster boats that landed at 61 randomly selected dealer locations along the coast from Kittery to Eastport. Biological information was collected from 4,644 lobsters that weighed 5880.58 lbs. Interviews with each captain gave insights into the spatial distribution of fishing, gear type, set over days and total numbers of traps hauled for the day.

The 1999 fishing season brought record harvests. An estimated 52.6 million pounds of lobster were landed, with an ex-vessel value of \$181.5 million (\$3.45 per pound). These figures were up from 1998 when 47.2 million pounds were landed valued at \$137.2 million (\$2.91 per pound). The largest increases were seen in Knox and Cumberland counties. Modest increases were observed in York and Hancock. Washington and Sagadahoc counties landed slightly fewer lobster than in 1997 and 1998 (Fig. 2).



There has been a steady increase in the number of traps per boat from a low of 200 in 1970 to nearly 575 in 1999. The increase in effort has been coherent with an increase in pounds per trap haul (Fig. 3). Concern has been raised in past American lobster stock assessments (see *A review of the Population Dynamics of American Lobster in the Northeast*,

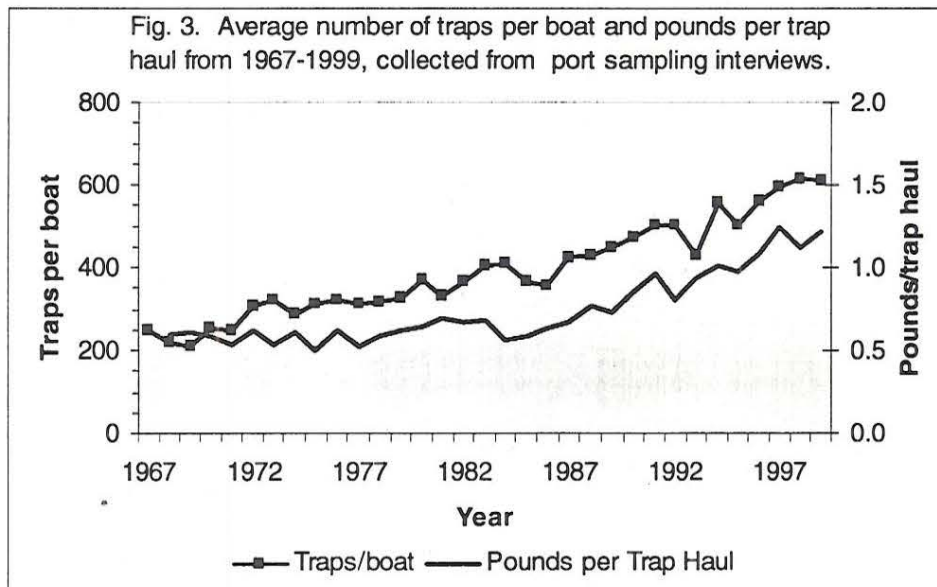
Figure 2. Lobster landings (pounds) by county 1997-1999.



NMFS 1996) about the level of effort in the lobster fishery. To address levels of effort, maximum trap numbers have decreased since 1997 (1200 in 1998, 1000 in 1999 and 800 in 2000) as a result of Amendment #3 to the Interstate Fishery

Management Plan for Lobster (ASMFC 1997). A trap tag program was instituted to monitor trap levels. Since the beginning of the program in 1997, nearly 1 million additional tags are being bought on an annual basis and participation (licenses) in the fishery has increased (Fig. 4). The trap limit to date has failed to reduce the numbers of traps in the water.

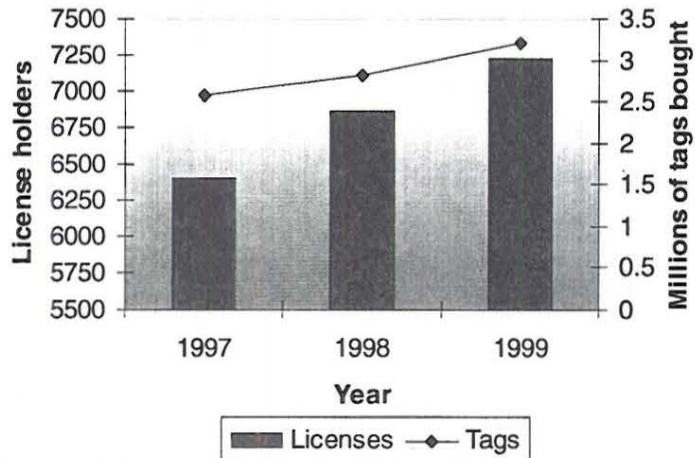
The 1999 American Lobster Stock Assessment Report for Peer Review (ASMFC, 2000)



states that lobster abundance has increased despite the increase in traps and effort in the Gulf of Maine. Estimates from the NMFS trawl survey indicate levels of egg bearing, or broodstock, lobsters have increased in the 1990s. The

increase in effort of the fishery has responded to increases in abundance. The assessment indicates concern if/when there is a recruitment decline, the level of effort in the fishery will be at the highest and catch per unit effort would be expected to decline dramatically.

Fig. 4. Number of lobsters licenses and trap tags bought 1997-1999 during the build down to 800 traps per boat/license in 2000.



The DMR will continue to aggressively monitor the lobster fishery in Maine. We are actively looking for ways to build on existing sampling programs to further track trends in the lobster resource and associated fishery.

Port Sampling : Gary Robinson, Butch Bowie and Carl Wilson

In February 1999, it was decided to expand the Commercial Port Sampling Survey to the full twelve months of the year. The purpose for this is, assessment needs statistically accurate data for the winter months of January through March. The winter surveying has not been done since 1969 when budget constraints prevented an in-depth survey. In 1969, the catch landed represented approximately 5% of the total landings. Because of the late decision to increase the Commercial Port Sampling, we were only able to begin in March of 1999. Our tables and summaries will reflect the additional month of sampling this year.

During 1999, we have: (1) collected catch and effort data from lobstermen at ten randomly selected lobster dealers each month, except January and February; (2) compiled the survey data by sample day, then summarized these results by month and year (Table 1); (3) completed daily, monthly, and annual estimates of mean lengths and weights along with percentages of females, culls, and shedders from the cluster samples (Table 2); and (4) completed the expanded estimates by sample month and year for all dealer-days in the survey (Table 3).

Length-frequencies for the cluster samples of 10 lobsters measured from each boat were grouped by 1mm increments (males, females, and sexes combined) by month and year for 1999 (Table 4). With the size frequency data combined we determined the percentages of lobsters within 14% carapace length (molt) groupings of 83-94, 95-108, 109-124, and 125-127 mm (maximum legal size). These values were then applied to the number of lobsters caught in 1999 (obtained by dividing total pounds harvested, according to the Maine Landings, by the mean weight of commercially caught lobsters) to estimate the number of lobsters harvested by size category in 1999 (Table 5).

The port-sampling crew collected data from 466 lobster boats that landed catches at randomly selected dealers who purchase lobsters from at least five boats located from Kittery to Eastport. A total of 100 dealer-buying locations (10 locations per month) were randomly selected in 1999. Of these, we collected statistical information at 61 locations or 61 % of the time. Of the remaining 39 dealers selected, we were able to call ahead 25 times during inclement weather to determine if fishermen were actually fishing that day (Table 6). We also record comments from lobstermen as seen in Table 6.

There were 133 Commercial Lobster sampling locations (dealers buying from five or more boats) open in 1999. Our randomized samples were representative of the distribution of dealers by counties along the Maine Coast and off shore islands (Table 7). In Table 7, many of the data points refer to more than one sampling location.

The total catch sampled at these locations weighed approximately 58.6 tons and consisted of 92,786 lobsters. The cluster samples (actual measurements recorded) for this landed catch was made up of 2,207 females and 2,437 males or a total number of 4,644 lobsters measured. These cluster samples weighed 5880.58 lbs. or 2.94 tons of lobsters. To accomplish this task the port sampling crew traveled 18,745 miles during this ten-month period in addition to distances traveled by boat to off shore islands.

Selected findings from 1999 survey show: 1) the 1999 catch-per-unit-effort values of 1.22 lbs./trap-haul and 248.87 lbs./boat-day, up from 1998 (1.12 and 224.3 respectively), 2) landed lobsters had an average CL of 89.6 mm $\pm$.2 and weight of 573.1gr $\pm$ 3.8 (1.26 lbs), 3) prices per lb. averaged \$4.33 for hard-shells, \$3.30 for soft-shell and \$4.55 for select lobsters.

In the interviews with the lobstermen it was noted that they were completely satisfied with the prices they were receiving during 1999. Dealers we sampled were not paying a cull price. It should be mentioned that determining a select lobster varies from location to location. In one location a dealer may determine a select lobster by weight (2 lbs. and over), whereas another will consider a select as a lobster that meets or exceeds a special gauge measurement (usually 4" or 100 mm CL).

This being the first year to expand our sampling program since 1969, even though we only have one month (March 1999) for comparison, it is interesting to follow the trend of our series of catch-per-unit-of-effort values (Figure 1.). We believe that the catch in numbers of lobsters per trap-haul-set-over-day is the most important index we calculate. However, for comparative purposes and for the fact that industry relates more to trap-hauls we have listed that information also. Catch in pounds-per-trap-haul could be misleading as an indicator of the health of the fishery; if say, there were 1) a significant change is the percentage of culls, 2) a change in the mean weight; 3) a change in the average number of set-over-days from month to month. Whereas, using the number-of- lobsters caught gives us a more stable indicator, but could be an indicator of trap saturation. Trap-Haul-Set-Over-Day (THSOD) is calculated by multiplying the number of traps hauled by the number of nights the traps set. The CPUE value (numbers-per-trap-haul-set-over-day) in Figure 1 would indicate that the best fishing years were 1968 and 1997 for the effort involved.

In our continuing search for new and ongoing ways to measure effort, we attempted to get an idea of the number of traps lobstermen carry aboard their boats when shifting to new fishing grounds while hauling. To do this we introduced a new question in the survey. We asked each lobstermen, "How many traps do you carry on board when shifting to new ground?" The answers were more diversified than expected (Table 8.). There were many variables such as: 1) depending on the weather, 2) size and width of the boat, 3) some did not shift gear at all, 4) some larger boats carried less traps, and 5) depending on how much risk a fisherman was willing to take. We made a comparison of the number of traps carried by the total number of traps set out. As one can see in Table 9, the numbers are very diverse. Also, the calculated R^2 shows little correlation between traps carried and traps set out. However, what is very interesting, in Table 9, is the cutoff at one thousand traps. This is indicative of the recent trap limits set by the State and zones.

The number of traps fished per boat has been the subject of discussions for quite some time. It seems the majority of fishermen pointed out that some lobstermen had large gangs of traps in the water. As a result (after months of discussions), the State enacted a trap limit. The lobster port sampling division did not consider this a trap limit. It should be considered a trap shift. This has been proven to be true, as larger gangs of traps have to be reduced, other lobstermen, with less gear in the water, are increasing their traps. We compiled trap data from our Port Sampling Survey for three separate years, 1993, 1996 and 1999 (Table 9.). This shows a shift in the total number of traps from the larger gangs of traps to an increase in the smaller gangs.

In order to have an effective trap limit, we must look at our calculated average number of traps-per-boat values (Figure 2). Any trap limit needs to be set below the average number to experience a decrease in traps from the present number. If the limit is set at the average number of traps per fisherman the lobstermen will only maintain the same number of traps in the water. This limit needs to be combined with a limited or controlled entry into the industry. Of the 466 lobster boats sampled in 1999 by the Commercial Port Sampling Program, the average number of traps in the water declined slightly from the previous year. The amount of decline is

insignificant when one takes into consideration the total number of traps in the water at any given time. The percentage of double parlor traps has been on the increase in recent years. The double parlor trap has a higher retention rate than single parlor traps (see our Gear Selectivity Study in the Annual Report 1989). It would seem appropriate to resume this study in the coming years due to industries focus on reducing traps in order to reduce effort. Most changes in the lobster industry are gradual, however; the lobster port sampling crew observed a very rapid change replacing the traditional wooded holding crate with plastic crates. We first observed plastic crates at a buying station on Chebeague Island in Casco Bay a few years ago. This year, dealers along the entire coast converted or were in the process of converting to the new plastic crates. Many dealers said that the savings in time and repair of the wooded crates far exceeded the cost of the plastic crates.

Table 1. Survey catch and effort values summarized by category for each sample month, 1999.

	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL
1. TOTAL CATCH IN POUNDS (LBS.)	55	633	3,582	4,484	25,981	26,651	24,105	19,890	9,725	2,110	117,216
2. TOTAL CATCH IN NUMBERS (NO.)	46	515	2,889	3,453	20,412	20,978	19,127	15,774	7,857	1,735	92,786
3. TOTAL VALUE OF CATCH (\$)	275	2,529.85	13,037.05	17,800.05	80,304.15	89,094.00	80,168.58	64,402.05	33,019.00	8,446.70	389,076
4. TOTAL NO. OF FEMALES IN SAMPLE	8	35	147	210	377	450	467	300	177	36	2,207
5. TOTAL NO. OF MALES IN SAMPLE	12	39	113	260	633	520	453	240	133	34	2,437
6. TOTAL NO. OF TRAP-HAULS	115	1,624	4,615	7,949	19,805	20,239	20,981	12,399	6,593	1,400	95,720
7. TOTAL NO. OF TRAPS SET OUT	850	3,641	13,345	23,870	57,511	59,474	62,261	38,117	19,648	5,678	284,395
8. TOTAL NO. OF MAN-DAYS	3	12	45	79	170	165	153	98	61	14	800
9. TOTAL NO. OF MAN-HOURS	18.59	94.81	356.19	580.25	1,322.00	1,357.91	1,206.84	781.09	491.78	116.78	6,326
10. TOTAL NO. OF BOAT-DAYS	2	8	26	49	102	99	93	54	31	7	471
11. TOTAL NO. OF BOAT-HOURS	13.42	60.63	204.98	356.95	798.83	800.04	733.82	425.43	244.58	58.39	3,697
12. MEAN WEIGHT LOBSTERS (LBS.)	1.2	1.23	1.24	1.30	1.27	1.27	1.26	1.26	1.24	1.22	1.26
13. CATCH IN LBS. / TRAP-HAUL	0.48	0.39	0.78	0.56	1.31	1.32	1.15	1.60	1.48	1.51	1.22
14. CATCH IN NO. / TRAP-HAUL	0.4	0.32	0.63	0.43	1.03	1.04	0.91	1.27	1.19	1.24	0.97
15. CATCH IN LBS. / MAN-DAY	18.33	52.75	79.60	56.76	152.83	161.52	157.55	202.96	159.43	150.71	146.52
16. CATCH IN NO. / MAN-DAY	15.33	42.92	64.20	43.71	120.07	127.14	125.01	160.96	128.80	123.93	115.98
17. CATCH IN LBS. / MAN-HOUR	2.96	6.68	10.06	7.73	19.65	19.63	19.97	25.46	19.78	18.07	18.53
18. CATCH IN NO. / MAN-HOUR	2.47	5.43	8.11	5.95	15.44	15.45	15.85	20.19	15.98	14.86	14.67
19. CATCH IN LBS. / BOAT-DAY	27.5	79.13	137.77	91.51	254.72	269.20	259.19	368.33	313.71	301.43	248.87
20. CATCH IN NO. / BOAT-DAY	23	64.38	111.12	70.47	200.12	211.90	205.67	292.11	253.45	247.86	197.00
21. VALUE / TRAP-HAUL (\$)	2.39	1.56	2.82	2.24	4.05	4.40	3.82	5.19	5.01	6.03	4.06
22. VALUE/MAN-DAY (\$)	91.67	210.82	289.71	225.32	472.38	539.96	523.98	657.16	541.30	603.34	486.35
23. VALUE/MAN-HOUR (\$)	14.79	26.68	36.60	30.68	60.74	65.61	66.43	82.45	67.14	72.33	61.50
24. VALUE/BOAT-DAY (\$)	137.5	316.23	501.43	363.27	787.30	899.94	862.03	1192.63	1065.13	1206.67	826.06
25. VALUE/BOAT-HOUR (\$)	20.49	41.73	63.60	49.87	100.53	111.36	109.25	151.38	135.00	144.66	105.24

Table 2. Mean carapace length (mm) and weight (g) with percentages of female (F), and softshells (S), and culls (C, missing and/or regenerated claws [S]) of lobsters in cluster samples by dealer code and sampled months, 1999.

MARCH						APRIL						MAY						JUNE						JULY					
CODE	LTH	WGT	F	S	C	CODE	LTH	WGT	F	S	C	CODE	LTH	WGT	F	S	C	CODE	LTH	WGT	F	S	C	CODE	LTH	WGT	F	S	C
L-10	89.7	580.0	60.0%	0.0%	0.0%	H-29	89.4	571.6	36.6%	0.0%	3.8%	H-5	88.1	565.3	70.0%	0.0%	4.4%	H-6	90.6	613.9	67.1%	0.0%	77.7%	K-4	88.6	553.4	20.5%	99.2%	11.2%
L-4	86.6	521.0	20.0%	0.0%	10.0%	H-13	88.6	562.5	52.9%	0.0%	12.5%	H-17	88.5	561.7	60.7%	0.0%	5.3%	C-1	88.0	576.9	55.8%	0.0%	7.9%	C-19	87.8	535.9	30.0%	98.5%	15.3%
												W-17	90.5	588.7	50.5%	0.0%	11.2%	H-30	91.2	620.1	47.4%	0.0%	13.3%	K-34	88.9	569.5	14.5%	100.0%	12.5%
												S-3	90.4	593.8	44.9%	0.0%	30.0%	C-19	88.0	555.6	50.1%	0.0%	24.0%	H-19	90.9	601.7	43.8%	90.2%	6.0%
												K-17	90.1	606.4	56.0%	0.0%	4.6%	Y-20	89.2	578.8	45.9%	0.0%	11.9%	W-10	92.1	610.1	33.3%	98.8%	5.5%
												K-37	90.5	608.4	58.0%	0.0%	6.4%	W-12	92.4	659.7	67.2%	0.0%	10.6%	K-22	90.0	582.1	42.5%	99.0%	7.4%
																		C-10	91.7	580.3	18.2%	98.5%	13.8%	C-24	89.6	577.6	53.4%	100.0%	12.7%
																		S-2	88.8	569.0	31.8%	91.5%	11.9%	K-3	89.1	555.8	41.8%	94.1%	9.1%
X	88.2	550.5	40.0%	0.0%	5.0%	X	89.0	567.0	44.8%	0.0%	8.2%	X	89.7	587.4	56.7%	0.0%	13.5%	X	90.0	594.3	47.9%	23.7%	13.9%	X	89.6	573.3	35.0%	97.5%	10.0%
SE	1.6	29.5	20.0%	0.0%	5.0%	SE	0.4	4.6	8.2%	0.0%	4.3%	SE	0.4	8.1	3.5%	0.0%	4.4%	SE	0.6	12.1	5.9%	15.6%	1.7%	SE	0.5	8.8	4.6%	1.2%	1.3%

AUGUST						SEPTEMBER						OCTOBER						NOVEMBER						DECEMBER					
CODE	LTH	WGT	F	S	C	CODE	LTH	WGT	F	S	C	CODE	LTH	WGT	F	S	C	CODE	LTH	WGT	F	S	C	CODE	LTH	WGT	F	S	C
L-2	89.1	572.0	38.1%	97.9%	4.3%	S-7	90.0	576.0	47.8%	100.0%	10.0%	H-26	90.1	582.1	37.9%	100.0%	6.0%	C-27	88.1	516.7	80.0%	100.0%	24.8%	H-2	89.2	568.0	70.0%	100.0%	20.0%
W-3	91.1	600.2	50.3%	100.0%	17.3%	H-28	91.0	592.4	51.2%	100.0%	10.2%	L-11	89.6	570.0	40.0%	100.0%	10.0%	K-12	89.3	546.7	60.0%	100.0%	22.3%	Y-4	88.2	541.3	52.0%	100.0%	11.3%
K-20	90.1	571.5	30.7%	99.7%	20.2%	Y-9	88.8	527.8	64.2%	100.0%	28.7%	C-28	88.2	538.8	67.4%	100.0%	1.4%	C-25	89.7	541.6	60.0%	100.0%	5.5%	K-24	90.4	579.0	30.0%	100.0%	50.0%
L-9	88.6	556.3	53.4%	100.0%	12.2%	W-11	89.7	561.0	47.0%	100.0%	18.2%	H-23	90.8	613.9	45.3%	100.0%	10.0%	L-8	88.7	534.0	300.0%	100.0%	10.0%	H-7	87.4	521.0	70.0%	100.0%	30.0%
H-30	91.1	600.6	50.7%	100.0%	3.6%	K-4	89.0	550.8	47.8%	100.0%	13.1%	W-24	90.1	562.2	60.0%	100.0%	6.4%												
K-7	90.1	583.2	46.8%	100.0%	12.6%	W-10	90.3	558.9	45.1%	100.0%	21.1%	C-6	89.1	553.1	67.3%	99.7%	11.5%												
W-6	90.7	595.6	51.6%	100.0%	7.2%	C-16	89.9	566.5	37.9%	100.0%	26.3%	K-5	91.5	606.4	61.5%	100.0%	10.5%												
Y-1	88.4	524.1	47.3%	100.0%	18.5%	W-7	90.0	577.8	56.5%	100.0%	13.8%	K-17	93.4	639.3	49.3%	100.0%	10.7%												
Y-9	90.6	622.0	40.0%	100.0%	0.0%	W-8	90.6	582.7	50.0%	100.0%	9.3%																		
						C-21	88.2	527.7	46.5%	100.0%	19.7%																		
X	90.0	580.6	45.4%	99.7%	10.6%	X	89.8	562.2	49.4%	100.0%	17.0%	X	90.3	583.2	53.6%	100.0%	8.3%	X	88.9	534.7	55.1%	100.0%	20.3%	X	88.8	552.3	55.4%	100.0%	27.8%
SE	0.3	9.6	2.5%	0.2%	2.4%	SE	0.3	6.9	2.2%	0.0%	2.2%	SE	0.6	12.0	4.2%	0.0%	1.2%	SE	0.4	6.6	9.4%	0.0%	3.5%	SE	0.6	13.1	9.5%	0.0%	8.3%

YEARLY TOTALS					
CODE	LTH	WGT	F	S	C
X	89.7	573.1	48.3%	73.2%	13.5%
SE	0.2	3.8	1.8%	5.6%	1.1%

**Table 3. Some expanded estimates of catch and effort with standard errors calculated for all dealer-days in the survey.
March through December, 1999.**

EXPANDED ESTIMATES - 1999													
MONTHS	Catch in Pounds	Catch in Numbers	Value in Dollars	Number of Traps	Number of Trap-Hauls	Number of T.H.S.O.D.	Number of Man-Days	Number of Boat-Days	Pounds per Trap-Haul	Numbers per Trap-Haul	Numbers per T.H.S.O.D.	Pounds per Boat-Day	Pounds per Man-Day
MARCH	19,778 +/- 14,336	16,542 +/- 11,832	98,890 +/- 71,682	49,300 +/- 46,418	41,354 +/- 29,122	767,746 +/- 579,640	1,079 +/- 768	719 +/- 479	0.47826 +/- 0.31740	0.40000 +/- 0.25231	0.02155 +/- 0.01716	27.50000 +/- 10.15564	18.33333 +/- 0.85974
APRIL	220,284 +/- 149,959	179,220 +/- 121,138	880,388 +/- 587,466	211,178 +/- 209,411	565,152 +/- 405,693	2,088,000 +/- 1,407,844	4,176 +/- 2,971	2,784 +/- 1,927	0.38978 +/- 0.06489	0.31712 +/- 0.06361	0.08583 +/- 0.00118	79.12500 +/- 4.98141	52.75000 +/- 7.56772
MAY	1,443,546 +/- 506,911	1,164,267 +/- 416,127	5,253,931 +/- 1,822,755	289,142 +/- 101,110	1,859,442 +/- 720,163	12,575,615 +/- 4,607,536	18,135 +/- 5,985	10,478 +/- 3,761	0.77633 +/- 0.10171	0.62614 +/- 0.07015	0.09258 +/- 0.00883	137.76923 +/- 17.32157	79.60000 +/- 7.34304
JUNE	1,842,924 +/- 689,891	1,419,183 +/- 524,099	7,315,821 +/- 2,615,420	408,774 +/- 113,379	3,267,039 +/- 821,365	16,141,203 +/- 4,660,227	32,469 +/- 8,046	20,139 +/- 4,842	0.56410 +/- 0.10352	0.43439 +/- 0.07783	0.08792 +/- 0.02322	91.51020 +/- 19.19587	56.75949 +/- 11.26211
JULY	9,820,818 +/- 3,324,728	7,715,736 +/- 2,556,494	30,354,969 +/- 10,644,136	1,006,443 +/- 302,725	7,486,290 +/- 2,017,937	30,751,812 +/- 9,166,823	64,260 +/- 17,148	38,556 +/- 9,934	1.31184 +/- 0.15883	1.03065 +/- 0.11744	0.25090 +/- 0.01958	254.71569 +/- 29.30611	152.82941 +/- 13.44135
AUG	10,512,339 +/- 2,810,005	8,274,656 +/- 2,155,058	35,142,633 +/- 9,827,368	938,368 +/- 199,174	7,983,161 +/- 1,644,048	32,555,078 +/- 7,120,286	65,083 +/- 13,851	39,050 +/- 8,262	1.31681 +/- 0.12860	1.03651 +/- 0.09687	0.25417 +/- 0.01995	269.20202 +/- 36.71287	161.52121 +/- 20.95752
SEPT	10,268,730 +/- 3,897,350	8,148,102 +/- 2,994,798	34,151,815 +/- 12,858,669	884,106 +/- 311,212	8,937,906 +/- 3,396,144	35,352,036 +/- 12,136,102	65,178 +/- 19,009	39,618 +/- 11,830	1.14890 +/- 0.08159	0.91163 +/- 0.07183	0.23049 +/- 0.01195	259.19355 +/- 23.46018	157.54902 +/- 17.04914
OCT	9,414,600 +/- 3,278,247	7,466,360 +/- 2,603,169	30,483,637 +/- 10,444,850	676,577 +/- 231,818	5,868,860 +/- 2,102,065	24,756,280 +/- 8,578,133	46,387 +/- 16,244	25,560 +/- 8,157	1.60416 +/- 0.24479	1.27220 +/- 0.18383	0.38029 +/- 0.02269	368.33333 +/- 28.09718	202.95918 +/- 15.49801
NOV	3,792,750 +/- 1,913,895	3,064,230 +/- 1,543,917	12,877,410 +/- 6,523,652	638,560 +/- 350,255	2,571,270 +/- 1,286,574	19,675,110 +/- 10,436,254	23,790 +/- 12,048	12,090 +/- 6,247	1.47505 +/- 0.15762	1.19172 +/- 0.11980	0.15574 +/- 0.01730	313.70968 +/- 36.47840	159.42623 +/- 12.93509
DEC	739,133 +/- 617,271	607,771 +/- 511,505	2,958,879 +/- 2,468,970	160,404 +/- 119,800	49,042 +/- 345,874	3,467,970 +/- 2,512,807	4,904 +/- 2,773	2,452 +/- 1,387	1.50714 +/- 0.24696	1.23929 +/- 0.21188	0.17525 +/- 0.02575	301.42857 +/- 104.45104	150.71429 +/- 52.22552
TOTALS	47,829,179 +/- 7,040,408	37,866,843 +/- 5,474,016	158,542,930 +/- 23,276,158	5,262,852 +/- 0	38,635,289 +/- 5,068,839	175,978,690 +/- 22,598,404	321,132 +/- 37,131	188,761 +/- 21,215	1.22458 +/- 0.05829	0.96936 +/- 0.04444	0.21177 +/- 0.00674	248.86624 +/- 12.25527	146.52000 +/- 6.82496

Table 4. Carapace length frequencies from survey of commercial landings by sex and month for 1999.

carapace length (mm)	MARCH			APRIL			MAY			JUNE			JULY			AUGUST			SEPTEMBER			OCTOBER			NOVEMBER			DECEMBER			TOTALS			
	Males	Female	Total	Males	Female	Total	Males	Female	Total	Males	Female	Total	Males	Female	Total	Males	Female	Total	Males	Female	Total	Males	Female	Total	Males	Female	Total	Males	Female	Total				
82	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	0	0	1	2	3	
83	2	1	3	1	4	5	13	13	26	22	27	49	31	31	62	21	46	67	16	34	50	8	16	24	2	14	16	3	5	8	117	190	307	
84	2	0	2	3	6	9	9	13	22	15	13	28	32	32	64	33	34	67	27	42	69	14	18	32	10	11	21	2	4	6	145	173	318	
85	0	1	1	5	1	6	8	9	17	19	26	45	37	34	71	48	26	74	31	41	72	10	17	27	9	11	20	3	2	5	170	167	337	
86	1	1	2	3	4	7	2	10	12	14	18	32	45	45	90	24	45	69	31	31	62	14	18	32	12	15	27	2	4	6	147	190	337	
87	2	1	3	4	2	6	7	12	19	21	13	34	55	33	88	26	30	56	27	42	69	6	25	31	10	14	24	3	4	7	159	175	333	
88	0	0	0	2	4	6	11	11	22	16	11	27	32	33	65	32	33	65	36	32	68	22	22	44	8	14	22	4	4	8	163	165	328	
89	1	1	2	3	0	3	8	9	17	16	15	31	50	22	72	33	46	79	30	37	67	14	26	40	14	16	30	4	3	7	172	174	346	
90	0	1	1	6	2	8	7	12	19	16	13	29	53	29	82	40	41	81	29	38	67	23	28	51	12	23	35	3	2	5	189	188	377	
91	0	1	1	4	3	7	9	9	18	21	18	39	39	27	66	44	33	77	34	39	73	23	22	45	9	17	26	2	0	2	185	168	353	
92	1	1	2	2	1	3	11	14	25	18	7	25	51	22	73	40	25	65	34	24	58	19	24	43	16	15	31	2	1	3	193	133	326	
93	0	0	0	1	4	5	4	10	14	23	14	37	46	22	68	34	27	61	35	28	63	11	19	30	7	10	17	3	0	3	164	134	298	
94	1	0	1	2	2	4	5	10	15	15	5	20	42	21	63	29	16	45	29	21	50	17	22	39	7	10	17	0	2	2	146	109	255	
95	1	0	1	1	2	3	6	3	9	11	9	20	41	10	51	41	17	58	19	29	48	15	16	31	4	1	5	1	3	4	139	90	229	
96	1	0	1	0	0	0	8	3	11	10	6	16	23	6	29	18	14	32	27	13	40	16	12	28	5	3	8	0	2	2	107	59	166	
97	0	0	0	0	0	0	1	2	3	6	3	9	21	0	21	26	8	34	21	8	29	9	5	14	6	2	8	1	0	1	91	28	119	
98	0	0	0	1	0	1	2	1	3	3	0	3	12	5	17	5	4	9	11	4	15	7	4	11	1	0	1	0	0	0	42	18	60	
99	0	0	0	0	0	0	0	1	1	4	1	5	5	1	6	8	4	12	5	1	6	1	1	2	1	0	1	0	0	0	24	9	33	
100	0	0	0	1	0	1	0	0	0	1	0	1	6	0	6	3	0	3	2	0	2	4	2	6	0	0	0	0	0	0	17	2	19	
101	0	0	0	0	0	0	1	1	2	0	1	1	1	0	1	3	0	3	2	0	2	1	1	2	0	0	0	0	0	0	8	3	11	
102	0	0	0	0	0	0	0	1	1	1	0	1	4	0	4	2	0	2	0	0	0	0	2	2	0	0	0	0	0	0	0	7	3	10
103	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	1	0	1	1	0	1	0	0	0	0	0	0	0	4	0	4
104	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	3	0	3	0	3	3	0	0	0	0	0	0	0	0	0	0	3	4	7
105	0	0	0	0	0	0	0	1	1	1	1	2	1	0	1	1	0	1	2	0	2	1	0	1	0	0	0	0	0	0	0	6	2	8
106	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	3	0	3
107	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	1	0	1	2	0	2	0	0	0	0	0	0	0	0	0	0	3	2	5
108	0	0	0	0	0	0	0	0	0	0	2	2	1	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2	2	4
109	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	2	1	3
110	0	0	0	0	0	0	1	0	1	0	1	1	1	0	1	1	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	4	1	5
111	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3
112	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2	1	3
113	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
114	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	
115	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	2
116	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
117	0	0	0	0	0	0	0	0	0	0	1	1	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3
118	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	1	3	
119	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
122	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
123	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
124	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
127	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	12	8	20	39	35	74	113	147	260	260	210	470	633	377	1010	520	450	970	453	467	920	240	300	540	133	177	310	34	36	70	2,437	2,207	4,644	

Table 5. Size Composition by Number and 14 Percent Groupings of Total Maine Lobster Landings, 1967 Through Present.

Year	Total Commercial Catch in Numbers	(0.93-1.32 lbs.) 81-92 mm.	(1.36-1.98 lbs.) 93-106 mm.	(2.03-2.95 lbs.) 107-122 mm.	(3.02-3.31 lbs.) 123-127 mm. (legal max.)
1967	14,175,747	11,462,509 (80.86)	2,435,393 (17.18)	249,493 (1.76)	28,352 (.20)
1968	17,550,287	14,338,584 (81.70)	2,930,898 (16.70)	261,499 (1.49)	19,305 (.11)
1969	16,952,803	13,423,229 (79.18)	3,254,938 (19.20)	252,597 (1.49)	22,039 (.13)
1970	15,400,228	11,442,369 (74.30)	3,676,034 (23.87)	264,884 (1.72)	16,940 (.11)
1971	15,007,138	11,567,502 (77.08)	3,270,055 (21.79)	165,078 (1.10)	4,502 (.03)
1972	13,894,416	10,184,607 (73.30)	3,458,320 (24.89)	220,921 (1.59)	30,568 (.22)
1973	14,322,852	10,034,590 (70.06)	3,968,862 (27.71)	309,374 (2.16)	10,026 (.07)
1974	13,829,971	10,041,942 (72.61)	3,532,175 (25.54)	233,726 (1.69)	22,128 (.16)
1975	14,421,535	10,842,110 (75.18)	3,252,056 (22.55)	310,063 (2.15)	17,306 (.12)
1976	16,102,587	12,010,920 (74.59)	3,774,446 (23.44)	275,354 (1.71)	41,867 (.26)
1977	15,535,410	11,789,823 (75.89)	3,441,093 (22.15)	270,316 (1.74)	34,178 (.22)
1978	16,212,253	12,893,605 (79.53)	3,062,495 (18.89)	238,320 (1.47)	17,833 (.11)
1979	18,444,362	15,061,666 (81.66)	3,181,652 (17.25)	178,910 (.97)	22,133 (.12)
1980	18,165,860	14,089,441 (77.56)	3,745,800 (20.62)	330,619 (1.82)	0 (0)
1981	18,859,682	15,153,754 (80.35)	3,381,541 (17.93)	303,641 (1.61)	20,746 (.11)
1982	19,077,739	14,209,100 (74.48)	4,586,288 (24.04)	257,549 (1.35)	24,801 (.13)
1983	18,466,341	14,507,157 (78.56)	3,792,986 (20.54)	158,810 (.86)	7,386 (.04)
1984	16,419,066	13,399,600 (81.61)	2,738,700 (16.68)	262,705 (1.60)	16,419 (.10)
1985	15,662,026	13,101,285 (83.65)	2,216,177 (14.15)	302,277 (1.93)	42,287 (.27)
1986	16,284,560	13,346,825 (81.96)	2,703,237 (16.60)	226,355 (1.39)	8,142 (.05)
1987	16,443,400	13,851,920 (84.24)	2,385,937 (14.51)	198,965 (1.21)	6,577 (.04)
1988	17,612,735	(0.96-1.37 lbs.) 82-93 mm. 15,481,594 (87.90)	(1.41-2.04 lbs.) 94-107 mm. 1,937,400 (11.00)	(2.09-3.02 lbs.) 108-123 mm. 24-127 mm. (legal max.) 188,456 (1.07)	(3.09-3.31 lbs.) 7,045 (.04)
1989	19,041,146	(0.99-1.41 lbs.) 83-94 mm. 17,266,511 (90.68)	(1.45-2.09 lbs.) 95-108 mm. 1,620,402 (8.51)	(2.15-3.09 lbs.) 109-124 mm. 25-127 mm. (legal max.) 140,904 (.74)	(3.16-3.31 lbs.) 11,425 (.06)
1990	22,642,627	19,893,812 (87.86)	2,499,746 (11.04)	242,276 (1.07)	9,057 (.04)
1991	24,875,717	22,201,577 (89.25)	2,509,960 (10.09)	156,717 (.63)	7,463 (.03)
1992	21,509,906	18,814,715 (87.47)	2,374,694 (11.04)	286,082 (1.33)	32,265 (.15)
1993	23,982,134	20,552,689 (85.70)	3,093,695 (12.90)	294,980 (1.23)	38,371 (.16)
1994	30,656,826	26,622,388 (86.84)	3,933,271 (12.83)	101,168 (.33)	0 (0)
1995	28,301,132	23,693,708 (83.72)	4,332,903 (15.31)	263,200 (.93)	8,490 (.03)
1996	28,978,102	25,161,686 (86.83)	3,523,737 (12.16)	283,985 (0.98)	8,693 (0.03)
1997	36,486,936	31,721,742 (86.94)	4,473,298 (12.26)	259,057 (0.71)	32,838 (0.09)
1998	37,928,024	32,967,038 (86.92)	4,775,138 (12.59)	178,262 (0.47)	7,586 (0.02)
1999	36,671,564	31,090,152 (84.78)	5,368,717 (14.64)	212,695 (0.58)	0 (0)

Commercial Port Sampling Trips - 1999

Code	DATE	Total Lbs	Lbs/ TH	Lbs/ THSOD	No. BOATS	Comments
C - 1	03/18/99	0	0	0	0	No Boats, only 2 guys fishing this time of year.
C - 6	04/07/99	0	0	0	0	Small craft warning, no boats out.
C -10	04/10/99	0	0	0	0	Called ahead,small craft warnings.
C -15	04/23/99	0	0	0	0	Two boats came in before 12:00.
C -16	05/20/99	0	0	0	0	No boats out, wind and rain!
C -19	05/25/99	0	0	0	0	No boats out , "too windy."
C -19	06/05/99	221	0.41	0.0643	3	"What are you guys doing here on a Saturday?"
C -19	06/09/99	0	0	0	0	Called ahead due to weather, no boats out.
C -19	06/10/99	295	0.29	0.0674	7	"Not catching much, but price is good".
C -21	06/21/99	1560	1.01	0.3009	8	Lobsters are kept in a closed system.
C -21	07/10/99	1680	0.9	0.2434	9	Saves \$ by leasing plastic crates at .035 per day each.
C -23	07/29/99	733	0.81	0.1797	5	"I'm not tell'n you guys nothing! To many laws now!
C -24	09/19/99	1173	1.16	0.3009	3	Dealer is buying from 12 boats now
C -25	09/24/99	3240	1.04	0.2754	14	Teaching a new temporary back up sampler today.
C -26	10/04/99	761	0.78	0.2463	4	Everyone likes the price their getting this year.
C -27	10/16/99	5617	1.22	0.336	17	Buyer has three buying stations during busy times.
C -28	11/03/99	0	0	0	0	Called ahead, strong winds and rain, no boats out.
C -28	11/09/99	2708	1.22	0.2712	6	Dealer said his boats are fishing off aways, good catches.
C -28	11/13/99	0	0	0	0	Called ahead, high winds, no boats out.
C -28	11/19/99	3441	1.43	0.1681	11	Most boats fishing off shore, nice day.
C -32	12/15/99	0	0	0	0	Called ahead, no boats out, gale winds.
Subtotals		21429			87	
H - 2	03/04/99	0	0	0	0	Bad weather, called ahead, no boats
H - 5	04/03/99	258	0.49	0.0995	3	Nice day, many fishermen just setting out.
H - 6	04/25/99	375	0.34	0.1101	5	"Would like to sell this place." fishings slow.
H - 7	05/05/99	321	0.87	0.0785	2	"Catch is picking up, looks good."
H - 7	05/11/99	973	0.56	0.0911	8	Dealer said "Doing better than last year, so far!"
H -11	06/04/99	103	0.32	0.095	3	"Typical spring, fishing slow." Rock crabs .40 lb.
H -13	06/08/99	1210	0.76	0.1539	9	Informed buyer of low D.O., low tide, heavy rain?
H -17	07/22/99	733	0.65	0.3389	6	"Beautiful day, good fishing and good price for a change"
H -19	08/16/99	8004	1.87	0.4494	17	Sends a smack to Swans Island every day in the summer.
H -19	09/06/99	9209	1.09	0.3207	29	Very busy day, bought from 2 scales on separate floats..
H -23	10/01/99	2791	1.24	0.443	7	Encountered belligerent fisherman. Wanted to fight on the dock!
H -24	10/11/99	446	1.17	0.378	2	Small craft warning, only two boats out.
H -26	10/29/99	0	0	0	0	Trip scratched. Marine Patrol unavailable for trip.
H -26	11/11/99	0	0	0	0	Called ahead, high winds, no boats out.
H -28	11/16/99	0	0	0	0	Called ahead, high winds, no boats out.
H -29	12/12/99	0	0	0	0	Called ahead, no boats out, gale winds.
H -30	12/14/99	34	0.28	0.0405	1	Cold and windy.
H -30	12/16/99	0	0	0	0	Called ahead, no boats out, gale winds.
H -37	12/22/99	154	0.91	0.151	1	Planning to fish all winter.
Subtotals		24611			93	
K - 3	03/15/99	0	0	0	0	Called ahead, heavy snow & wind,no Bs
K -17	03/19/99	0	0	0	0	No lobster boats out! Two guys out scalloping
K -17	04/11/99	0	0	0	0	Called ahead, "Two guys setting gear, not hauling"
K - 2	04/19/99	0	0	0	0	No boats out. Sunny and clear.
K -17	05/26/99	855	0.96	0.1311	4	Plans to have a buying station in Tenants Harbor.
K -37	05/27/99	574	0.89	0.137	3	Talk of having a trap war.
K - 4	07/05/99	3464	1.36	0.3147	14	Sunny and hot! 94 degrees
K -34	07/12/99	2411	2.28	0.5344	7	Wharf owner very unpleasant, buyer very pleasant.
K -22	07/28/99	8952	1.89	0.395	25	Very busy day needed 3 samplers bought from 2 scales.
K - 3	07/30/99	5272	1.21	0.2952	19	"Catch has slacked off. Don't like government supervision"
K -20	08/11/99	3174	1.46	0.2762	11	" I've seen a lot of under size lobsters with eggs, why?
K - 7	08/18/99	4466	1.4	0.2637	16	Many complaints about the trap limit.

Table 6. listing of lobster dealers sampling in 1999 with daily catch and effort values.
Code refers to dealers cumberland (C), Hancock (H), Knox (K), Lincoln (L), and York (Y) counties.

Commercial Port Sampling Trips - 1999

K-21	08/27/99	0	0	0	0	Bad weather, called ahead, no boats
K-4	09/15/99	5361	1.69	0.3306	16	"This has been a good fishn' year - price and catch.
K-5	10/27/99	4092	2.26	0.3723	9	"Getting some pretty good catches here this year."
K-17	10/28/99	5425	2.75	0.4545	12	Dealer said his poundage is way up over last year.
K-22	11/07/99	0	0	0	0	Called ahead, gale winds, no boats out.
K-12	11/12/99	3456	1.89	0.1773	13	Still getting good catches and a good price.
K-33	11/18/99	0	0	0	0	Three boats went out, but returned before noon, Too rough.
K-24	12/20/99	134	1.34	0.1914	1	Beautiful day but cold.
Subtotals		47636			150	
L-12	03/11/99	0	0	0	0	Called ahead, snow & rain, no boats.
L-10	03/12/99	38	0.95	0.0679	1	Hauled shrimp traps also. "Rough out there".
L-3	03/13/99	0	0	0	0	Called all day, no answer, very windy
L-4	03/17/99	17	0.23	0.0108	1	Sunny & warm, temps in the 40's
L-9	03/28/99	0	0	0	0	Called ahead, no boats. 2 guys setting out gear.
L-16	05/16/99	0	0	0	0	Thought she had 1 boat out but he went to a barbeque
L-2	08/03/99	2059	1.05	0.2432	10	Heavy fog in this area, early shed. Say lobstermen.
L-9	08/13/99	3635	1.33	0.3168	20	"Fogs thick but with this catch and this price, it's worth it."
L-11	10/03/99	295	2.36	0.472	1	Nice day, only one fishermam out.
L-8	11/24/99	120	0.96	0.24	1	Called ahead only one boat out, bad weather.
Subtotals		6164			34	
S-3	05/18/99	92	0.41	0.1036	2	"If you want answers, you can ride a boat and haul traps."
S-2	06/23/99	364	0.47	0.1646	5	Majority of fishermen seemed reluctant to ans. questions.
S-7	09/02/99	905	1.21	0.4022	4	Lobstermen weigh their own catches. Using plastic crates
S-3	12/06/99	0	0	0	0	Called ahead, no boats out, gale winds.
Subtotals		1361			11	
W-24	04/09/99	0	0	0	0	No boats lobstering, went shrimp sampling, beautiful day.
W-5	04/28/99	0	0	0	0	Heard that someone is making trap tags & selling them cheap.
W-12	04/29/99	0	0	0	0	No boats. Landings range 102 - 205 lb per boat.
W-5	05/08/99	0	0	0	0	Fog. 1 boat hauled 300 traps for 18 lbs. Came in early.
W-17	05/12/99	767	1.05	0.1586	7	"Doing good for this time of year for up here."
W-30	06/15/99	0	0	0	0	Called with cell phone, thick fog, no boats out.
W-12	06/19/99	139	0.27	0.0376	3	"Fishings slow here, price OK though."
W-17	07/23/99	0	0	0	0	Heavy fog in this area, shedders just starting.
W-10	07/27/99	2736	0.86	0.225	16	Buyer has over 45 fishermen selling here!
W-3	08/09/99	615	0.87	0.3342	4	Can only land catches at low tide here.
W-6	08/21/99	3123	0.84	0.3756	14	Can't buy at low tide. Buys from 60n - 70 boats.
W-11	09/11/99	770	0.94	0.2369	4	"Fishings steady, the price is good."
W-10	09/18/99	437	1.05	0.3201	3	"We're getting a good price this year"
W-7	09/21/99	2505	0.89	0.2006	13	Uncooperative until Butch got hurt and started bleeding.
W-8	09/22/99	185	0.53	0.1321	3	Wind and rain, not a nice day for fishing.
W-24	10/12/99	463	1.68	0.3166	2	"Fishing's hard up here, but the price is good this year.
W-5	12/11/99	0	0	0	0	Called ahead, no boats out, windy.
W-25	12/27/99	0	0	0	0	Six boats still fishing, none out today.
Subtotals		11740			69	
Y-13	03/30/99	0	0	0	0	No boats out, "too windy."
Y-20	06/17/99	592	0.36	0.0518	10	"Poor fishing, good price, can't have both!
Y-30	07/26/99	0	0	0	0	Was not buying today!
Y-1	08/25/99	1537	1.11	0.2618	4	"It's not fair, I have to cut back on traps & the next guy builds up!"
Y-9	08/26/99	38	0.58	0.1152	1	Majority of fishermen are tuna fishing at this time.
Y-9	09/08/99	320	1.25	0.1957	3	Owner requested D.O. test on tanks, low test high mortality.
Y-25	10/22/99	0	0	0	0	No boats out, only two boats fishing this time of year.
Y-4	12/19/99	1788	1.77	0.2436	4	"Getting some pretty good catches on long sets."
Subtotals		4275			22	

Totals 117216 466

Table 7. Percent of active lobster dealers by county as compared to percent of randomly sampled dealers by county, 1999.

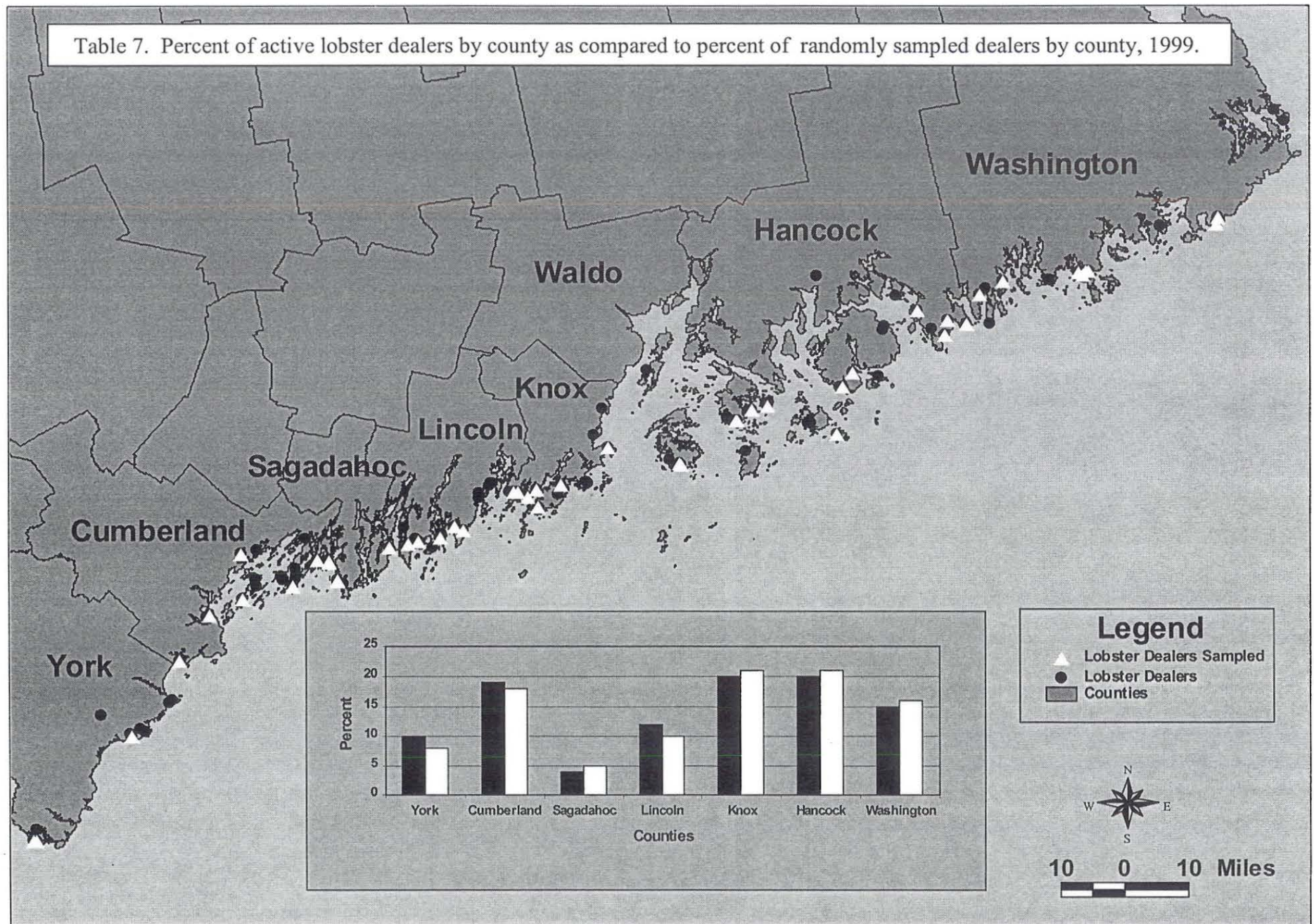


Table 8. Relation of total traps fished per fisher to average number of traps carried per fisher during gear shift.

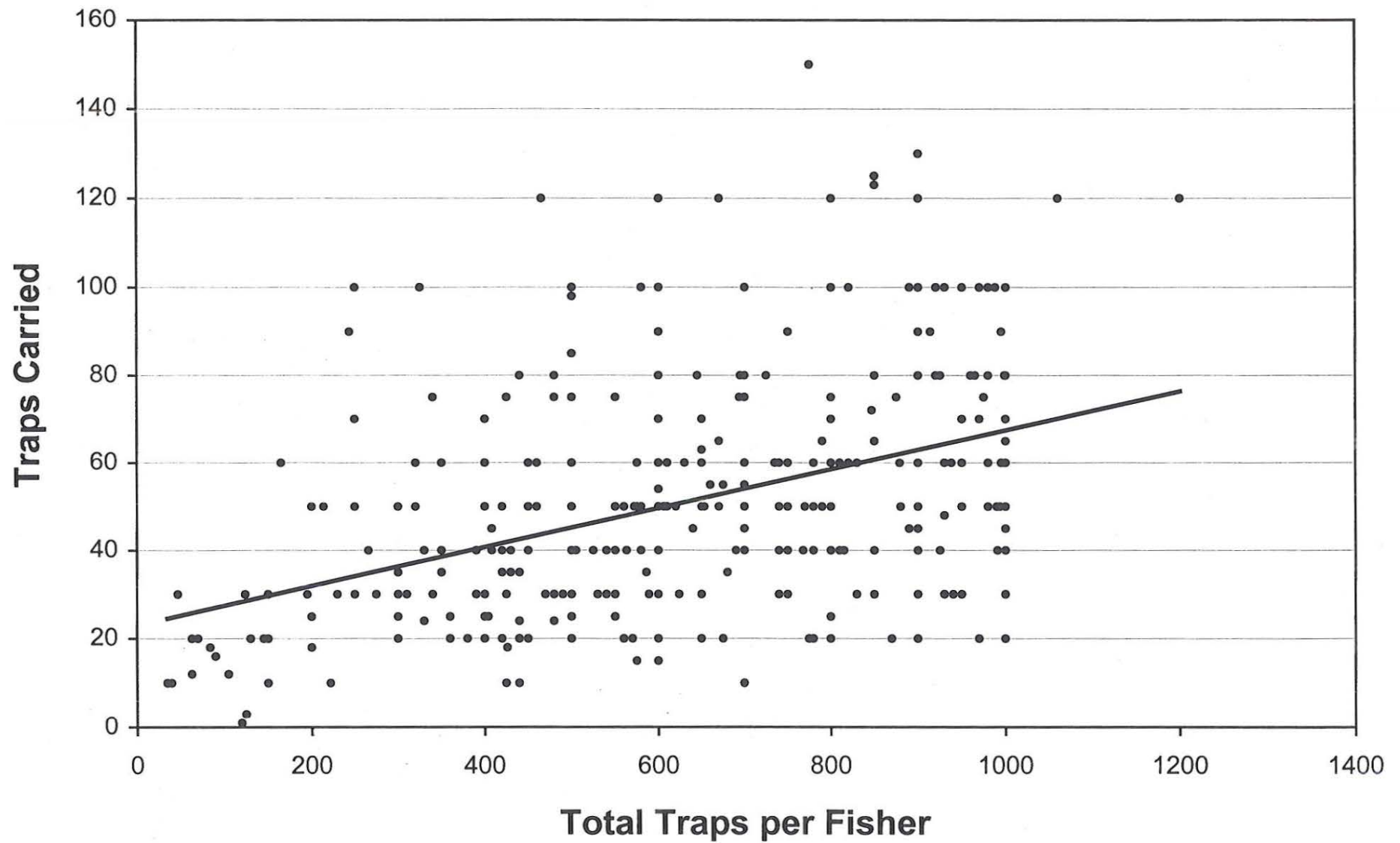


Table 9. Comparison of traps per boat from survey data for years 1993, 1996, and 1999.

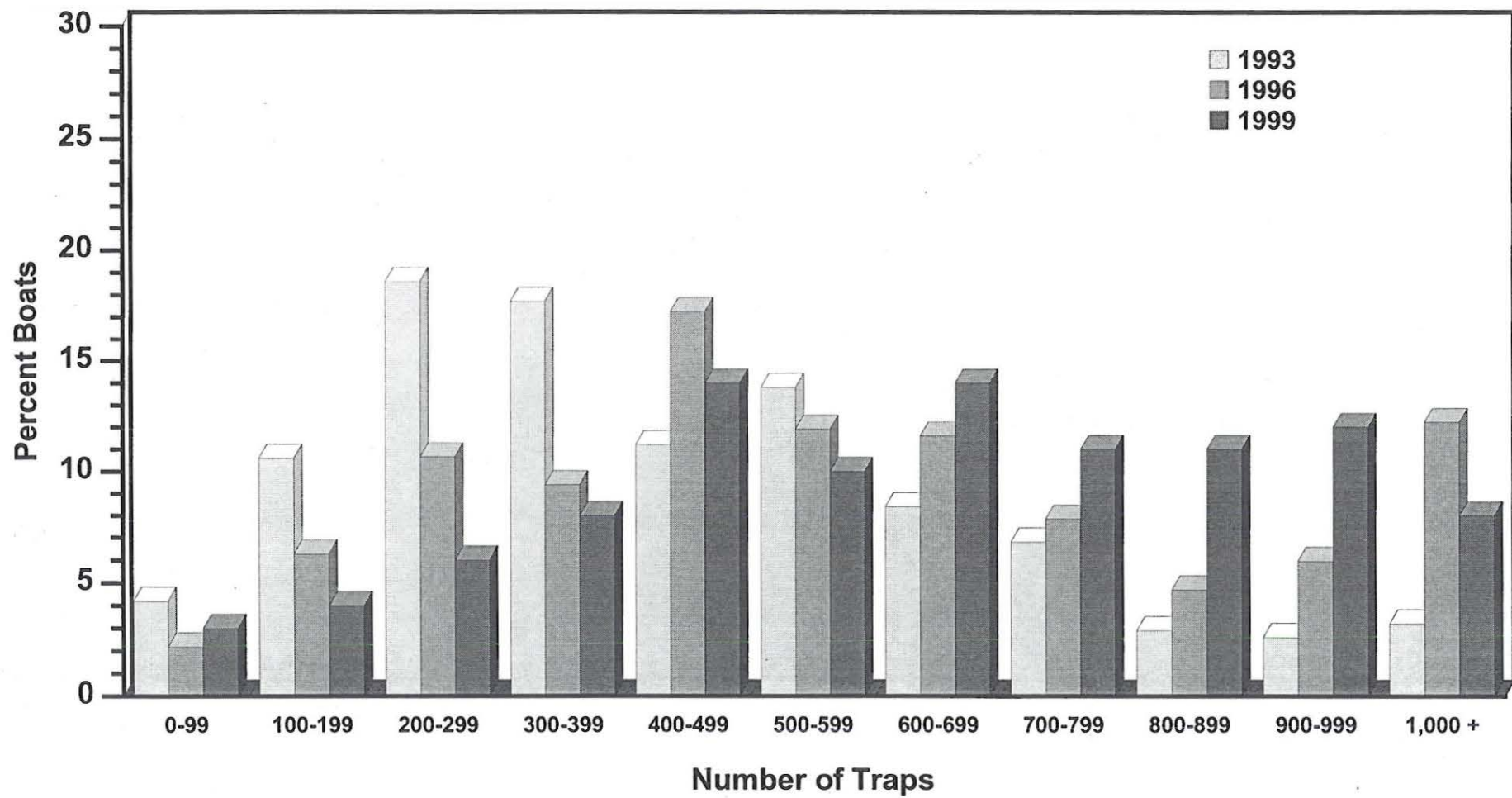


Figure 1. Series of catch-per-unit-effort values from dockside survey, 1968 to present.

LEGAL CATCH IN NUMBERS OF LOBSTERS PER TRAP-HAUL-SET-OVER-DAY											
	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
January	0.09	0.13									
February	0.05	0.09									
March	0.13										
April	0.18	0.18	0.13	0.06	0.01	0.22	0.09	0.09	0.11	0.04	0.06
May	0.22	0.10	0.19	0.13	0.06	0.19	0.14	0.15	0.10	0.16	0.08
June	0.15	0.08	0.09	0.06	0.05	0.11	0.11	0.08	0.11	0.06	0.07
July	0.15	0.12	0.24	0.08	0.11	0.10	0.13	0.11	0.17	0.12	0.13
August	0.28	0.26	0.19	0.20	0.16	0.14	0.19	0.16	0.17	0.23	0.24
September	0.35	0.32	0.20	0.23	0.23	0.15	0.25	0.17	0.18	0.18	0.23
October	0.35	0.31	0.26	0.19	0.20	0.20	0.22	0.16	0.19	0.15	0.21
November	0.32	0.32	0.22	0.19	0.14	0.12	0.23	0.18	0.18	0.19	0.18
December		0.07	0.10	0.13	0.28	0.20	0.08	0.12	0.07	0.09	0.14
Yearly Values	0.24	0.18	0.19	0.16	0.13	0.14	0.18	0.14	0.15	0.14	0.17
	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
January											
February											
March											
April	0.06		0.12	0.08	0.07		0.01	0.05	0.05	0.07	0.10
May	0.09	0.09	0.22	0.10	0.12	0.08	0.05	0.09	0.10	0.12	0.14
June	0.10	0.09	0.13	0.11	0.14	0.07	0.06	0.13	0.07	0.07	0.10
July	0.11	0.26	0.20	0.18	0.11	0.13	0.19	0.16	0.15	0.11	0.14
August	0.22	0.22	0.27	0.23	0.27	0.20	0.23	0.21	0.20	0.18	0.12
September	0.29	0.18	0.22	0.20	0.19	0.11	0.13	0.15	0.22	0.20	0.20
October	0.27	0.22	0.19	0.20	0.12	0.22	0.19	0.12	0.18	0.17	0.20
November	0.21	0.17	0.14	0.21	0.21	0.14	0.16	0.15	0.14	0.29	0.11
December	0.09	0.07	0.19	0.06	0.11	0.09		0.10	0.08	0.16	0.16
Yearly Values	0.19	0.19	0.20	0.18	0.17	0.14	0.14	0.14	0.16	0.17	0.15
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Monthly Means
January											
February											
March										0.02	
April	0.08	0.06	0.04	0.02	0.06		0.05	0.07	0.08	0.09	0.08
May	0.15	0.06	0.05	0.08	0.10	0.06	0.11	0.12	0.10	0.09	0.11
June	0.12	0.07	0.06	0.08	0.07	0.08	0.05	0.07	0.08	0.09	0.09
July	0.16	0.24	0.10	0.14	0.21	0.20	0.17	0.17	0.23	0.25	0.16
August	0.20	0.27	0.30	0.19	0.33	0.36	0.38	0.33	0.28	0.25	0.23
September	0.22	0.23	0.26	0.28	0.18	0.22	0.21	0.31	0.28	0.23	0.22
October	0.26	0.22	0.12	0.22	0.28	0.25	0.16	0.21	0.19	0.30	0.21
November	0.22	0.18	0.13	0.19	0.16	0.23	0.14	0.20	0.22	0.56	0.20
December		0.30	0.04	0.19	0.18		0.09	0.16	0.14	0.18	0.13
Yearly Values	0.18	0.21	0.16	0.17	0.21	0.23	0.20	0.23	0.21	0.21	

Figure 1. Continued

LEGAL CATCH IN NUMBERS OF LOBSTERS PER TRAP-HAUL

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
January	0.43	0.69									
February	0.36	0.59									
March	0.36	0.80									
April	0.31	0.48	0.48	0.40	0.25	0.42	0.23	0.25	0.42	0.23	0.25
May	0.52	0.45	0.44	0.46	0.19	0.36	0.38	0.31	0.38	0.46	0.38
June	0.47	0.27	0.33	0.24	0.23	0.45	0.45	0.27	0.31	0.21	0.27
July	0.34	0.34	0.46	0.25	0.29	0.36	0.37	0.34	0.46	0.38	0.38
August	0.46	0.48	0.43	0.50	0.46	0.50	0.52	0.41	0.52	0.56	0.47
September	0.60	0.66	0.41	0.47	0.69	0.43	0.56	0.47	0.57	0.50	0.52
October	0.63	0.62	0.58	0.58	0.72	0.51	0.53	0.50	0.56	0.40	0.50
November	0.73	0.92	0.92	0.59	0.62	0.53	0.76	0.70	1.13	0.72	0.74
December		0.67	0.63	0.75	1.16	1.12	0.70	0.75	0.53	0.47	0.78
Yearly Values	0.51	0.52	0.50	0.46	0.54	0.45	0.51	0.42	0.52	0.45	0.49
	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
January											
February											
March											
April	0.23		0.23	0.43	0.28		0.17	0.19	0.23	0.24	0.28
May	0.24	0.41	0.75	0.31	0.35	0.37	0.22	0.45	0.32	0.45	0.53
June	0.36	0.31	0.52	0.39	0.50	0.33	0.29	0.37	0.34	0.28	0.32
July	0.35	0.66	0.56	0.52	0.37	0.43	0.42	0.39	0.45	0.29	0.43
August	0.55	0.58	0.62	0.64	0.68	0.64	0.56	0.66	0.48	0.64	0.52
September	0.46	0.42	0.50	0.59	0.60	0.38	0.44	0.38	0.80	0.71	0.72
October	0.55	0.59	0.58	0.64	0.41	0.52	0.60	0.51	0.77	0.85	0.75
November	0.78	0.47	0.71	0.72	0.95	0.46	0.84	1.01	0.76	1.17	0.71
December	0.59	0.57	0.80	0.30	0.68	0.54		0.60	0.42	1.16	1.29
Yearly Values	0.51	0.53	0.58	0.55	0.57	0.47	0.50	0.52	0.56	0.62	0.60
	1990	1991	1992	1993	1994	1995	1996	1997	1998	Monthly 1999 Mean	
January											
February											
March										0.4	
April	0.27	0.29	0.17	0.16	0.24		0.33	0.32	0.36	0.32	0.29
May	0.53	0.25	0.20	0.46	0.44	0.33	0.49	0.65	0.61	0.63	0.42
June	0.57	0.34	0.30	0.32	0.33	0.29	0.27	0.35	0.36	0.43	0.35
July	0.54	0.92	0.38	0.55	0.73	0.52	0.60	0.67	0.75	1.03	0.49
August	0.63	0.92	0.83	0.71	1.08	1.11	1.45	1.11	1.10	1.04	0.68
September	0.87	0.78	0.99	0.72	0.68	0.75	0.93	1.33	1.07	0.91	0.65
October	1.00	0.63	0.60	0.89	1.08	0.97	0.85	1.00	0.96	1.27	0.69
November	1.08	0.77	0.48	1.14	0.86	1.00	0.70	1.26	1.21	1.19	0.83
December		1.87	0.51	1.07	0.89		0.60	1.01	0.93	1.24	0.81
Yearly Values		0.77	0.64	0.76	0.79	0.76	0.88	0.98	0.90	0.97	

Figure 1. Continued

LEGAL CATCH IN POUNDS OF LOBSTERS PER TRAP-HAUL-SET-OVER-DAY

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
January	0.10	0.15									
February	0.06	0.11									
March	0.15	0.92									
April	0.20	0.20	0.16	0.06	0.01	0.26	0.11	0.11	0.13	0.05	0.07
May	0.26	0.12	0.22	0.15	0.07	0.22	0.17	0.18	0.12	0.20	0.10
June	0.19	0.09	0.11	0.07	0.05	0.14	0.14	0.10	0.13	0.07	0.09
July	0.17	0.14	0.27	0.09	0.14	0.12	0.16	0.13	0.21	0.15	0.16
August	0.31	0.30	0.22	0.23	0.19	0.16	0.22	0.18	0.20	0.27	0.29
September	0.41	0.37	0.23	0.27	0.26	0.18	0.29	0.20	0.22	0.22	0.27
October	0.41	0.36	0.31	0.22	0.23	0.22	0.27	0.20	0.23	0.17	0.24
November	0.38	0.37	0.27	0.22	0.17	0.14	0.26	0.21	0.20	0.23	0.22
December		0.08	0.12	0.15	0.34	0.24	0.10	0.14	0.08	0.10	0.16
Yearly Values	0.28	0.22	0.22	0.18	0.16	0.17	0.21	0.17	0.18	0.17	0.20
	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
January											
February											
March											
April	0.08		0.14	0.09	0.08		0.02	0.06	0.06	0.08	0.13
May	0.11	0.10	0.26	0.11	0.15	0.10	0.06	0.11	0.13	0.15	0.17
June	0.12	0.11	0.17	0.14	0.18	0.09	0.07	0.16	0.09	0.08	0.13
July	0.14	0.30	0.24	0.21	0.14	0.15	0.23	0.20	0.18	0.13	0.17
August	0.26	0.26	0.32	0.28	0.31	0.23	0.28	0.26	0.24	0.22	0.15
September	0.35	0.23	0.26	0.24	0.23	0.13	0.15	0.18	0.26	0.24	0.24
October	0.33	0.27	0.23	0.24	0.14	0.26	0.23	0.15	0.20	0.22	0.24
November	0.26	0.24	0.17	0.25	0.25	0.18	0.19	0.18	0.17	0.36	0.14
December	0.11	0.08	0.23	0.06	0.12	0.11		0.12	0.09	0.19	0.20
Yearly Values	0.23	0.23	0.24	0.21	0.20	0.16	0.17	0.17	0.20	0.21	0.18
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Monthly Means
January											
February											
March										0.03	
April	0.10	0.08	0.05	0.03	0.08		0.07	0.08	0.11	0.11	0.10
May	0.18	0.08	0.06	0.10	0.13	0.08	0.15	0.16	0.13	0.12	0.14
June	0.16	0.09	0.08	0.10	0.09	0.10	0.08	0.09	0.10	0.11	0.11
July	0.20	0.31	0.12	0.17	0.27	0.24	0.21	0.21	0.30	0.32	0.19
August	0.24	0.33	0.37	0.24	0.42	0.47	0.46	0.42	0.35	0.32	0.28
September	0.27	0.29	0.33	0.35	0.22	0.28	0.25	0.40	0.35	0.30	0.26
October	0.32	0.28	0.16	0.27	0.35	0.33	0.20	0.27	0.23	0.38	0.26
November	0.27	0.23	0.15	0.24	0.22	0.28	0.18	0.26	0.26	0.19	0.23
December		0.37	0.06	0.24	0.21		0.13	0.21	0.18	0.21	0.16
Yearly Values	0.22	0.26	0.20	0.22	0.27	0.29	0.25	0.29	0.26	0.27	

Figure 1. Continued

LEGAL CATCH IN POUNDS OF LOBSTERS PER TRAP-HAUL											
	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
January	0.48	0.82									
February	0.45	0.71									
March	0.43	0.92									
April	0.34	0.53	0.57	0.45	0.32	0.40	0.26	0.29	0.49	0.26	0.30
May	0.62	0.53	0.51	0.54	0.21	0.42	0.45	0.37	0.46	0.58	0.46
June	0.58	0.32	0.40	0.29	0.28	0.57	0.55	0.32	0.37	0.26	0.33
July	0.39	0.41	0.54	0.31	0.36	0.43	0.45	0.40	0.54	0.44	0.47
August	0.51	0.56	0.51	0.58	0.55	0.59	0.60	0.49	0.60	0.67	0.56
September	0.71	0.78	0.48	0.55	0.81	0.52	0.66	0.56	0.69	0.59	0.60
October	0.74	0.72	0.69	0.68	0.81	0.57	0.64	0.59	0.66	0.46	0.58
November	0.85	1.05	1.10	0.67	0.74	0.60	0.89	0.82	1.29	0.85	0.89
December		0.80	0.71	0.86	1.38	1.28	0.85	0.89	0.61	0.48	0.91
Yearly Value	0.60	0.61	0.59	0.54	0.62	0.54	0.61	0.50	0.62	0.53	0.58
	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
January											
February											
March											
April	0.28		0.27	0.51	0.34		0.21	0.25	0.30	0.28	0.36
May	0.29	0.48	0.90	0.37	0.43	0.44	0.26	0.56	0.39	0.56	0.67
June	0.44	0.38	0.66	0.48	0.62	0.41	0.38	0.45	0.44	0.36	0.40
July	0.43	0.78	0.67	0.63	0.46	0.50	0.51	0.48	0.54	0.35	0.52
August	0.64	0.69	0.74	0.77	0.80	0.74	0.66	0.78	0.58	0.77	0.64
September	0.55	0.55	0.60	0.71	0.71	0.45	0.51	0.46	0.94	0.86	0.87
October	0.66	0.71	0.70	0.76	0.49	0.62	0.72	0.62	0.87	1.06	0.91
November	0.96	0.66	0.83	0.85	1.12	0.58	0.98	1.18	0.90	1.48	0.89
December	0.68	0.68	0.96	0.34	0.75	0.65		0.72	0.50	1.34	1.60
Yearly Value	0.62	0.65	0.70	0.67	0.68	0.56	0.59	0.63	0.67	0.77	0.73
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Monthly Mean
January											
February											
March										0.48	
April	0.34	0.37	0.21	0.20	0.29		0.42	0.41	0.46	0.39	0.35
May	0.66	0.33	0.25	0.57	0.52	0.44	0.63	0.86	0.78	0.78	0.51
June	0.71	0.43	0.40	0.44	0.42	0.37	0.4	0.45	0.47	0.56	0.44
July	0.68	1.17	0.49	0.69	0.93	0.66	0.76	0.84	0.95	1.31	0.60
August	0.79	1.11	1.04	0.90	1.38	1.42	1.79	1.39	1.36	1.32	0.83
September	1.05	0.98	1.24	0.89	0.86	0.97	1.14	1.71	1.32	1.15	0.80
October	1.24	0.77	0.76	1.09	1.37	1.25	1.05	1.25	1.17	1.6	0.84
November	1.33	0.96	0.58	1.42	1.13	1.27	0.89	1.64	1.44	1.48	1.01
December		2.30	0.66	1.32	1.08		0.88	1.3	1.16	1.51	0.97
Yearly Value	0.85	0.96	0.80	0.94	1.01	0.97	1.09	1.24	1.12	1.22	

Figure 2. Mean Number of traps per boat, 1967 through 1999.

YEAR	TOTAL TRAPS	WIRE TRAPS		TOTAL BOATS	MEAN NO. TRAPS/BOAT	NO. S.E.	RANGE IN NUMBER OF TRAPS		% DOUBLE PARLOR TRAPS
		% an	S.E.				LOW	HIGH	
1967	63,210	-		256	247	± 16	25	1,000	-
1968	63,928	-		292	219	± 17	15	1,200	-
1969	67,484	-		320	211	± 13	8	900	-
1970	96,639	-		383	252	± 14	25	1,400	-
1971	89,673	-		363	247	± 16	7	900	-
1972	74,634	-		243	307	± 16	5	1,050	-
1973	90,696	-		281	323	± 23	5	1,250	-
1974	95,804	-		330	290	± 16	13	1,200	-
1975	107,470	-		345	312	± 14	24	1,200	-
1976	115,948	-		358	324	± 25	30	1,700	-
1977	133,598	-		431	310	± 23	30	1,800	-
1978	114,502	14	± 3	360	318	± 27	26	1,500	-
1979	82,031	20	± 4	252	326	± 15	22	1,200	-
1980	86,812	23	± 4	233	372	± 16	25	1,300	-
1981	93,503	40	± 6	281	333	± 16	20	1,215	-
1982	114,639	35	± 4	315	364	± 14	30	1,400	-
1983	113,920	39	± 5	281	405	± 33	24	1,500	-
1984	118,049	39	± 5	289	408	± 31	17	1,600	-
1985	95,646	48	± 5	262	365	± 16	25	1,000	-
1986	75,881	47	± 5	212	358	± 23	15	1,200	-
1987	119,116	69	± 5	281	424	± 23	13	1,500	-
1988	122,031	72	± 4	284	430	± 23	25	1,230	-
1989	140,590	73	± 4	312	451	± 35	53	1,500	29.79
1990	124,275	75	± 4	263	472	± 35	33	3,000	41.45
1991	160,364	74	± 4	319	503	± 40	17	1,600	45.01
1992	196,445	83	± 3	392	501	± 38	7	2,000	26.62
1993	132,762	93	± 2	311	427	± 24	30	1,600	44.68
1994	188,282	91	± 2	338	557	± 37	38	2,800	48.67
1995	157,383	93	± 2	313	503	± 34	8	1,600	41.12
1996	179,237	97	± .9	319	562	± 32	42	1,600	46.18
1997	276,513	96	± 1	464	596	± 30	2	1,885	57.77
1998	276,641	98	± 1	449	616	± 26	35	1,720	54.31
1999	284,395	98	± 1	466	610	± 23	20	1,200	52.77

Sea Sampling : Glenn Nutting, Jason Bartlett and Carl Wilson

The DMR lobster sea sampling program began collecting at-sea catch/effort and biological information on the near shore Maine lobster resource from three boats (Cape Porpoise, Boothbay Harbor, Tenants Harbor/Spruce Head) in 1985, then expanded in 1998 to 18 boats from Cape Porpoise to Cutler. In 1999, we sampled on three boats in each zone from May through November. Data was compiled by month from May through November (Table 1) and by zones A through G, east to west (Table 2). We completed 123 sampling trips on 69 commercial lobster boats out of 35 ports (Figure 1). Information was collected on total lobster catch for the day including sublegal (<83 mm CL), legal (83-127 mm CL), and illegal (>127 mm CL, berried, and V-notched) lobsters.

The total commercial lobster fishing effort sampled in 1999 was 28,123 trap-hauls and 1082 boat hours. The total legal catch was 32,269 lobsters, weighing 41,794 lbs. for a mean weight of 1.30 lbs. The ratio of sublegal to legal lobsters was 1:2.

Cull rates (missing and/or regenerated claws) of legal-sized lobsters from the sampler's measured traps ranged from 0 to 40%. Coastwide cull rates generally decreased from west to east, although we observed no culls in our measured traps on two sampling trips out of Orrs Island and Cape Porpoise.

Figure 2 shows the CPUE for the total sea sampling catch of legal, sublegal, and illegal (oversize, berried, V-notched). The average CPUE of sublegals decreased from west to east, with the exception of Zone G. The average CPUE for legal lobster was higher in eastern zones. There is no clear trend for the illegal catch by zone.

A total of 1571 berried females were caught and measured, of which 1045 (66.5%) possessed a mutilated flipper. Figure 3 illustrates the variability with the V-notching practice among the seven zones. For example, fishermen in zones A, B, and E appear to be stronger supporters of V-notching than those in the remaining four zones since they had the highest percentage of berried females with a V-notch, ranging from 72.5 to 80.5%, compared to the other zones which ranged from 56.7 to 68.4%. The highest percentage of lobsters with a V-notch but not berried was observed between 85 mm CL and 100 mm CL and decreased rapidly at larger sizes. The highest percentage of berried females was observed in the same size range. A narrow peak of sublegal berried lobsters indicates a small percentage of egg production coming from sublegal lobsters in Maine (Figure 6).

In July 1992 Maine, along with other lobster producing states, increased the trap vent size. Data collected from DMR gear selectivity studies subsequent to this increase indicated that these larger openings maximize escapement of sublegal lobsters while minimizing the loss of legal-sized lobsters. To address the overfishing of the American lobster stock, the Atlantic States Marine Fisheries Commission (Amendment #3, ASMFC 1997) recommended increasing the vent sizes to 1 15/16 x 5 3/4" and 2 7/16". Maine and other states adopted this larger size vent for the 1999 fishing season. Figure 4 shows sublegal catches for all zones were significantly lower in 1999 compared to 1998. Although the 1999 legal CPUE did not show a clear trend relative to 1998 (Figure 5), the mean weight for legal increased slightly from 1.26 lbs. in 1998 to 1.30 lbs. in 1999. Port sampling data also indicated an increase in mean weight from 1.24 lbs. to 1.26 lbs. for 1998 and 1999, respectively.

In the upcoming lobster sea sampling season, we anticipate augmenting our data collecting capabilities by purchasing 124 electronic logbooks to be installed on commercial lobster boats. We anticipate training lobster fishermen in proper sampling techniques and use of the logbooks. In this important era of co-management, we greatly appreciate the interest and cooperation of Maine's lobster industry, and we look forward to a continued collaborative relationship in our lobster sea sampling program.

Table 1. Sea sampling catch and effort values summarized by category by zone (east to west), 1999.

	A	B	C	D	E	F	G	TOTAL
TOTAL CATCH IN POUNDS	7,089	7,337	6,603	7,149	4,486	6,393	2,737	41,794
TOTAL CATCH IN NUMBERS	8,575	11,236	9,517	12,850	10,371	18,814	7,102	78,465
TOTAL NUMBER OF SAMPLING TRIPS	17	20	19	16	16	20	15	123
TOTAL NUMBER OF BOAT-HOURS	158	187	187	132	131	171	118	1,082
TOTAL NUMBER OF TRAP-HAULS	3,797	5,024	4,181	3,589	2,919	5,764	2,849	28,123
TOTAL NUMBER OF LEGAL LOBSTERS	5,344	5,290	4,979	5,626	3,656	5,123	2,251	32,269
TOTAL NUMBER OF SUBLEGAL LOBSTERS	2,775	4,354	3,342	6,102	5,762	11,806	4,203	38,344
TOTAL NUMBER OF OVERSIZE LOBSTERS	28	47	34	18	12	2	12	153
MEAN WEIGHT IN POUNDS OF LEGAL LOBSTERS	1.33	1.39	1.33	1.27	1.23	1.25	1.22	1.30
TOTAL NUMBER OF LEGALS PER TRAP-HAUL	1.41	1.05	1.19	1.57	1.25	0.89	0.79	1.15
TOTAL NUMBER OF POUNDS PER TRAP-HAUL	1.87	1.46	1.58	1.99	1.54	1.11	0.96	1.49
TOTAL NUMBER OF BERRIED LOBSTERS	120	210	281	237	176	360	187	1,571
TOTAL NUMBER OF BERRIED LOBSTERS w/ V-NOTCH	87	169	174	162	135	212	106	1,045
TOTAL NUMBER OF BERRIED LOBSTERS w/o V-NOTCH	33	41	107	75	41	148	81	526
TOTAL NUMBER OF NON-BERRIED LOBSTERS w/ V-NOTCH	324	1,366	905	900	793	1,706	473	6,467

Table 2. Sea sampling catch and effort values summarized by category by month, 1999

	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	TOTAL
TOTAL CATCH IN POUNDS	3,241	4,108	5,728	6,811	9,286	6,353	6,267	41,794
TOTAL CATCH IN NUMBERS	10,968	10,659	11,950	11,967	15,752	9,984	7,185	78,465
TOTAL NUMBER OF SAMPLING TRIPS	20	23	19	21	19	11	10	123
TOTAL NUMBER OF BOAT-HOURS	171	192	173	180	171	109	86	1,082
TOTAL NUMBER OF TRAP-HAULS	3,718	5,564	4,747	4,834	4,717	2,467	2,076	28,123
TOTAL NUMBER OF LEGAL LOBSTERS	2,450	3,061	4,487	5,383	7,342	4,916	4,630	32,269
TOTAL NUMBER OF SUBLEGAL LOBSTERS	7,392	6,151	6,601	5,470	7,014	3,852	1,864	38,344
TOTAL NUMBER OF OVERSIZE LOBSTERS	17	25	29	26	19	13	24	153
MEAN WEIGHT IN POUNDS OF LEGAL LOBSTERS	1.32	1.34	1.28	1.27	1.26	1.29	1.35	1.30
TOTAL NUMBER OF LEGALS PER TRAP-HAUL	0.66	0.55	0.95	1.11	1.56	1.99	2.23	1.15
TOTAL NUMBER OF POUNDS PER TRAP-HAUL	0.87	0.74	1.21	1.41	1.97	2.58	3.02	1.49
TOTAL NUMBER OF BERRIED LOBSTERS	216	348	184	337	196	199	91	1,571
TOTAL NUMBER OF BERRIED LOBSTERS w/ V-NOTCH	165	231	112	216	130	122	69	1,045
TOTAL NUMBER OF BERRIED LOBSTERS w/o V-NOTCH	51	117	72	121	66	77	22	526
TOTAL NUMBER OF NON-BERRIED LOBSTERS w/ V-NOTCH	949	1,136	679	792	1,246	1,071	594	6,467

Figure 1. 1999 Lobster Sea Sampling Ports

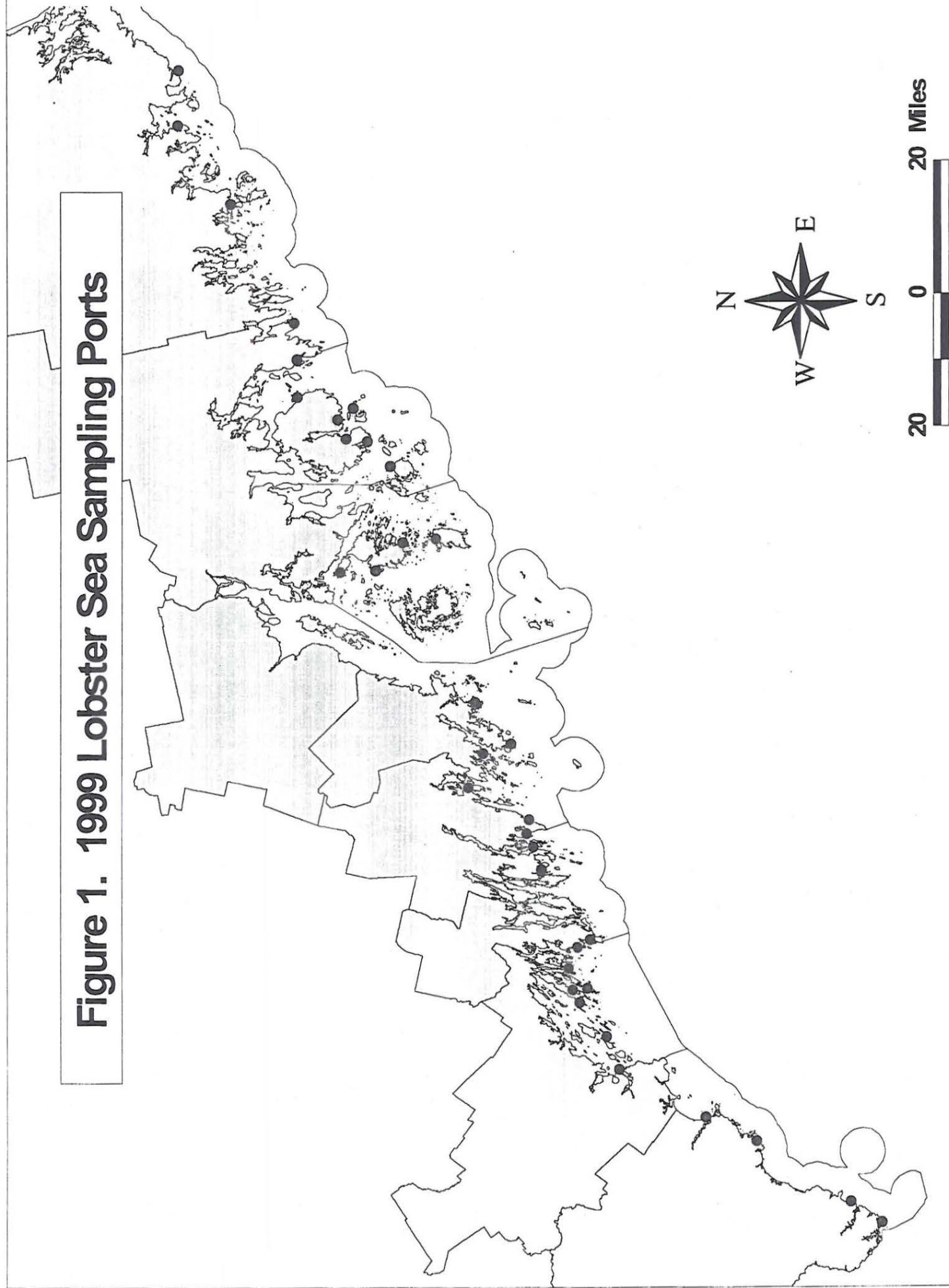


Figure 2. 1999 Sea Sampling Catch per Trap-Haul of Legal, Sublegal, and Illegal Lobsters

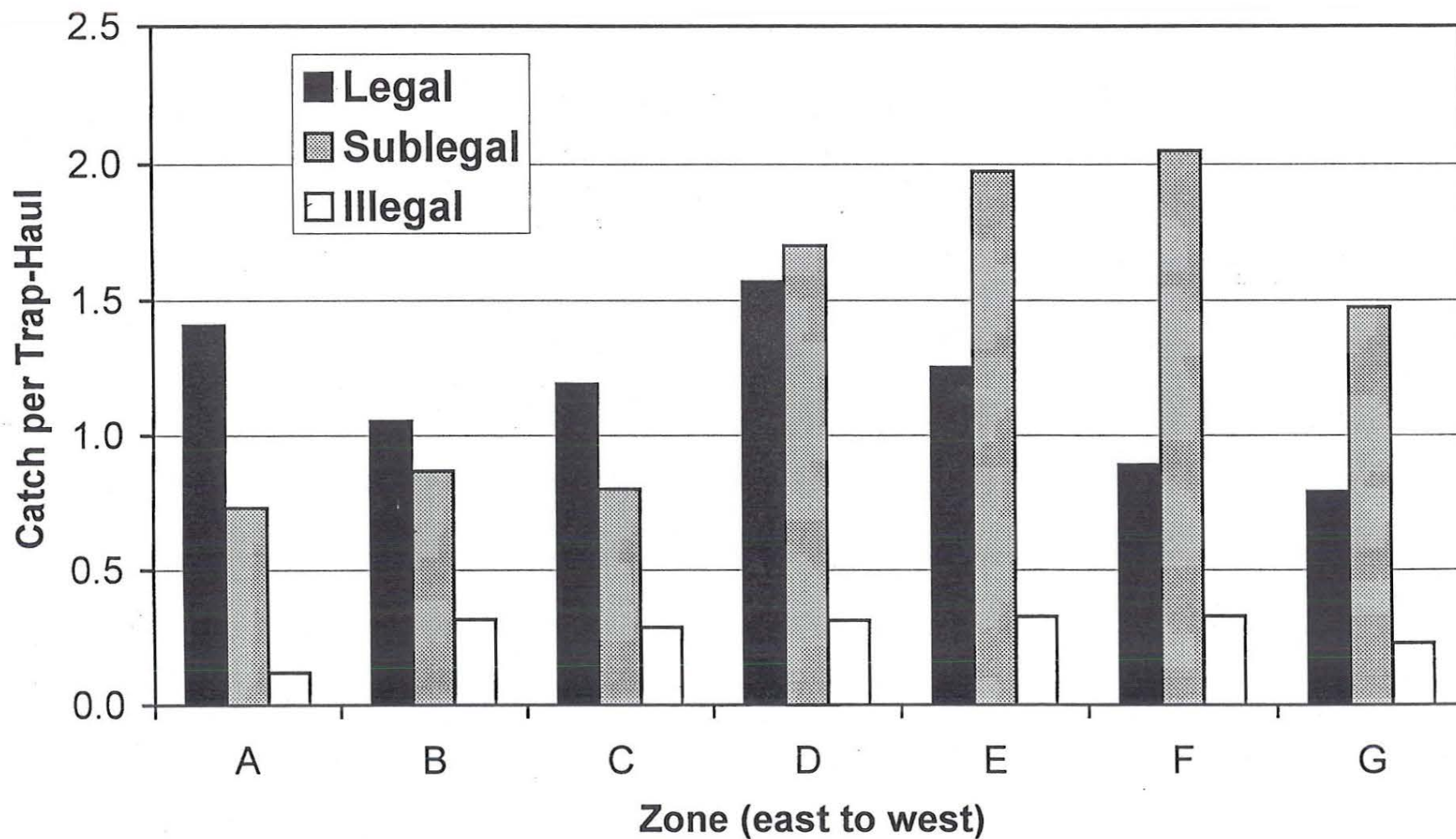


Figure 3. 1999 Sea Sampling Catch of Berried Females

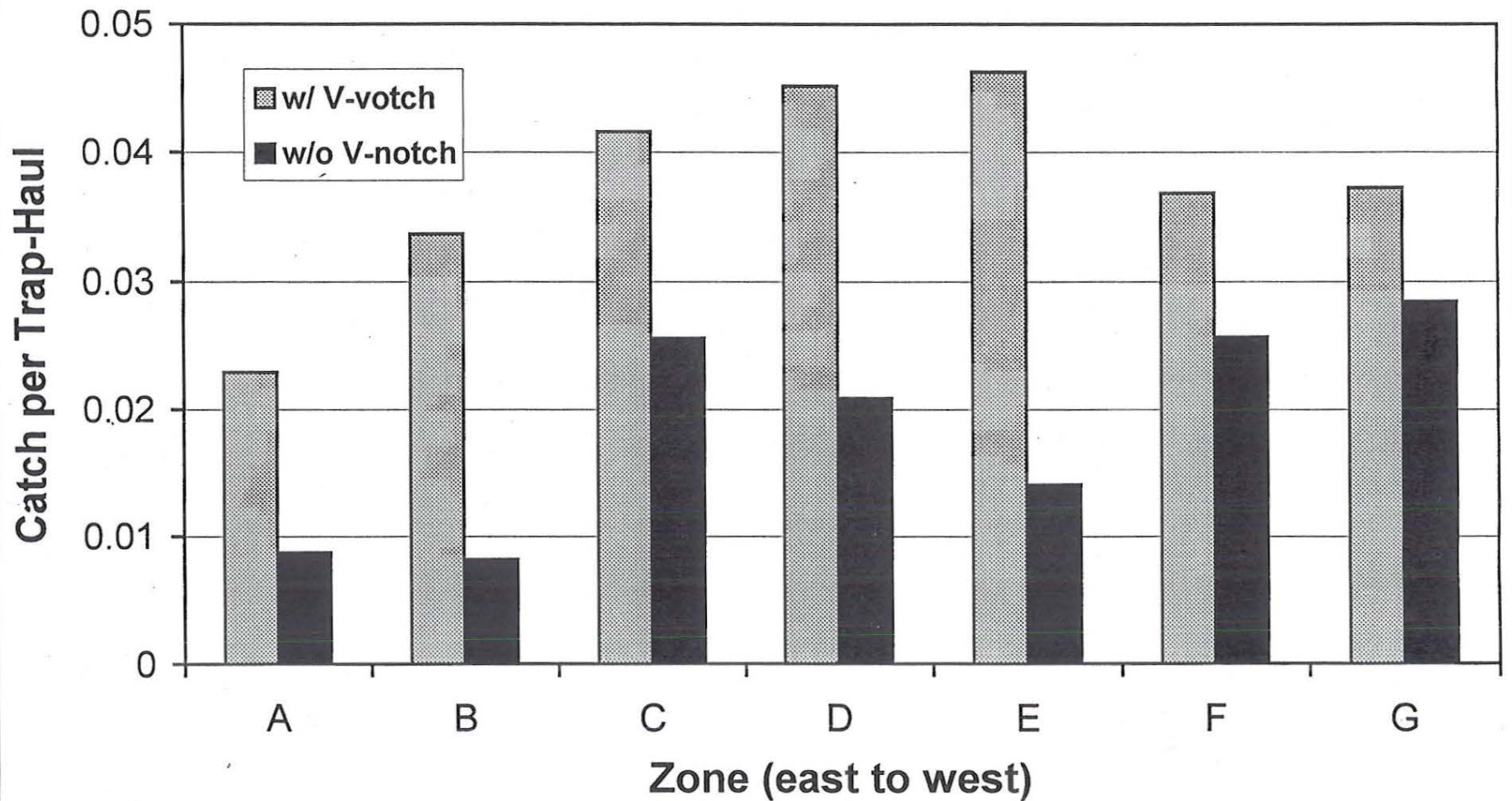


Figure 4. Sea Sampling Catch of Sublegal Lobsters

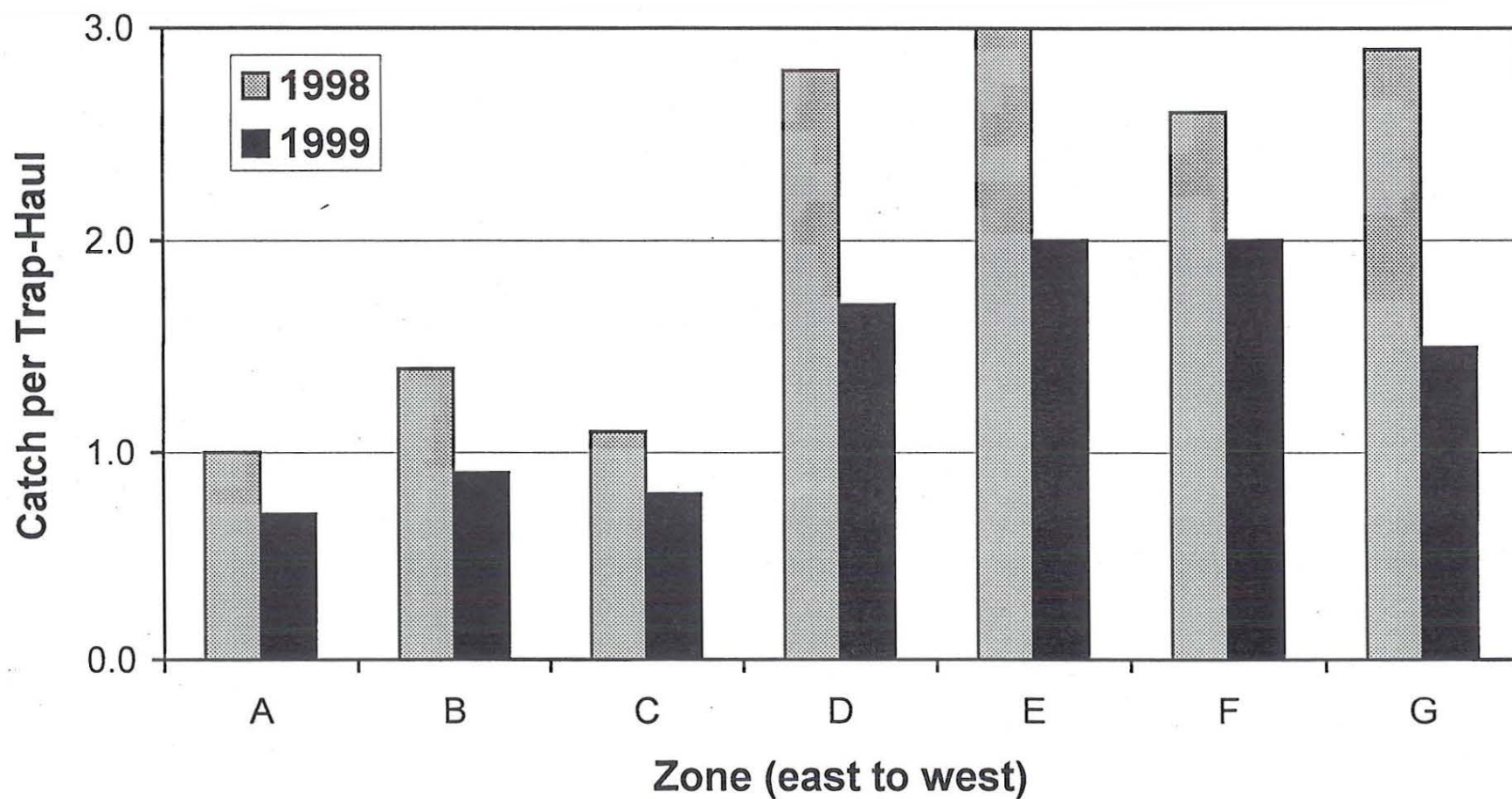


Figure 5. Sea Sampling Catch of Legal Lobsters

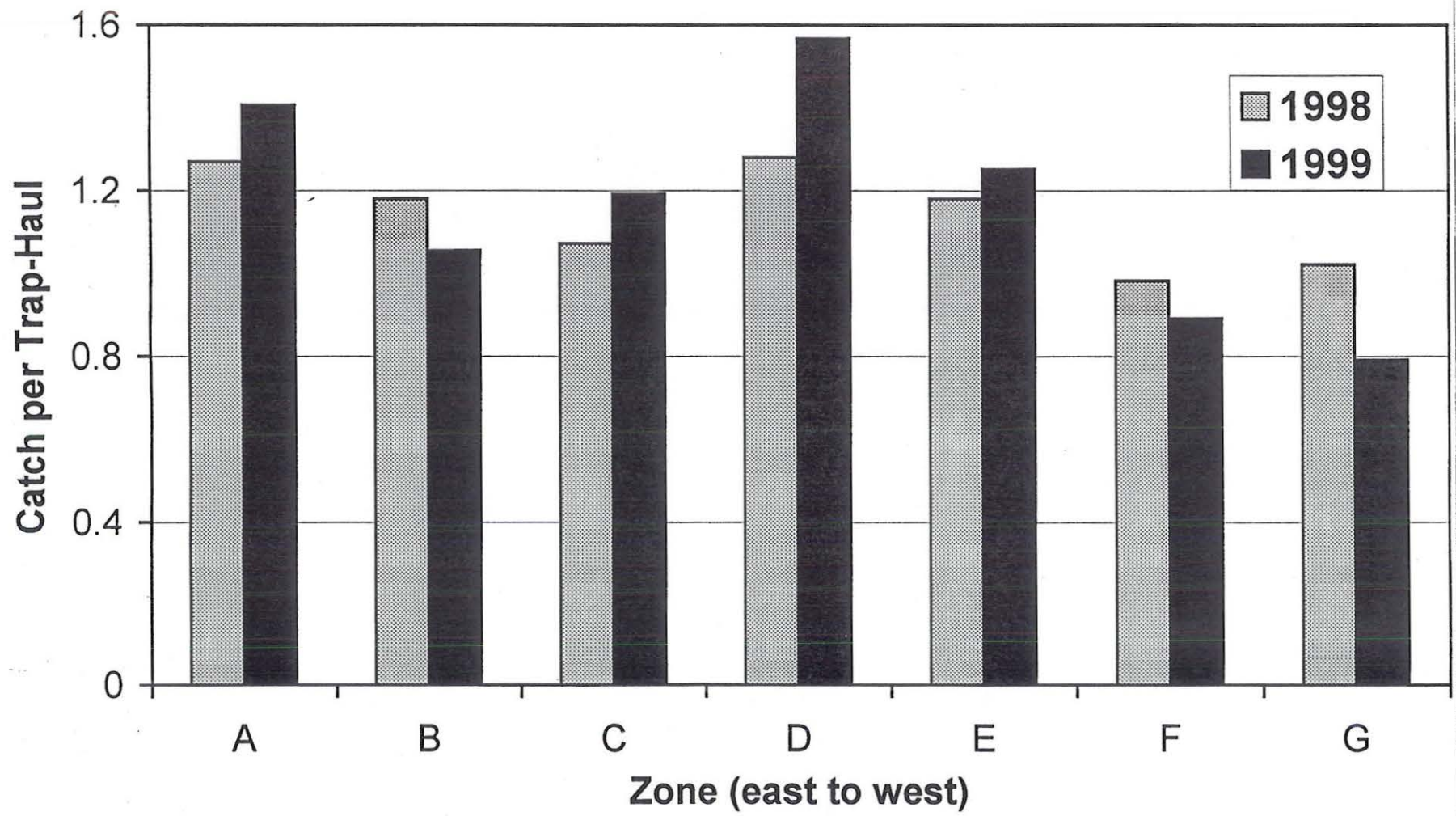
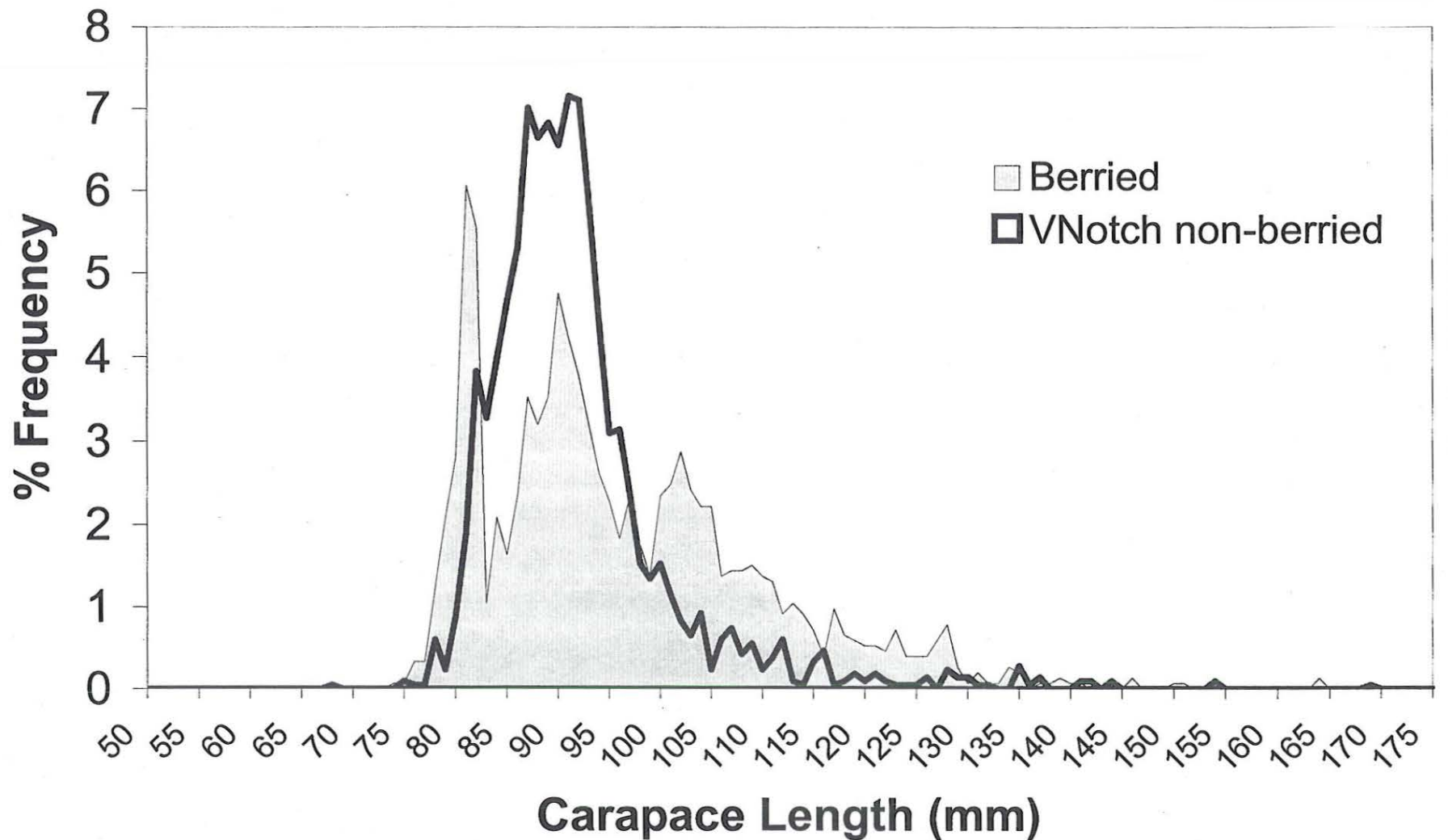


Fig. 6. Size frequency of Berried females and Non-berried but Vnotched females in the recorded commercial fishery for 1999. All zones combined



CONFIRM® Monitoring Study in Casco Bay: Glenn and Jason Bartlett

Introduction

Each spring since 1995, the Maine Forest Service's Division of Insect and Disease Management has aerially sprayed insecticides onto several Casco Bay islands and along coastal areas from Portland to Cundys Harbor. The spraying was conducted to control the browntail moth larvae whose barbed setal hairs cause annoying and, in extreme cases, life-threatening allergic reaction in humans.

The insecticide diflubenzuron (DFB; trade name: DIMILIN®), a chitin synthase inhibitor, was sprayed from 1995-1998. Since this chemical inhibits the deposition of chitin, essential for a normal molt, it is potentially toxic to nontarget biota such as marine crustaceans, including lobster and crab. In 1996, we initiated a study to monitor any resource impact. In 1999, the Maine Forest Service elected to spray a more environmentally friendly insecticide, CONFIRM®. Although its toxicity is less severe than DIMILIN®, CONFIRM® still presented a potential problem to Maine's lobster and crab fishery. The purpose of this report is to present and discuss the findings of the 1999 monitoring activities.

Methods

For the general methodology, please see Appendix I in the 1996 DMR Lobster Stock Assessment Completion Report. On 10 May 1999, assisted by Marine Patrol Officer Mike Neelon, we set 10 wire cages each containing six banded lobsters, ranging from 53 to 82 mm CL, at 10 different sites in Casco Bay (Table 1, Figures 1 and 2). The cages were hauled and a food source provided by area fishermen on a weekly basis.

Spraying by Lavoie Aerial Applicators began at daylight on May 14 over Falmouth. A total of 5120 acres were sprayed over 10 days, ending on May 27 along Harpswell's shoreline. The cages were hauled on June 3 and the lobsters were returned to DMR's wet lab. During the holding phase, the ambient sea water temperature ranged from 2.8°C to 20.7°C (Figure 3).

Results and Discussion

Of 60 lobsters caged during the aerial spraying, 57 (three missing; assumed to have molted and subsequently consumed by their cohorts) were returned to the wet lab's holding tanks for observation over the next several months. Fifty-three of 57 (93%) of the lobsters molted at least once and seven molted twice (Table 2). These results are consistent with 1997 and 1998, respectively (90%, 15%; 88%, 12%). Of the four that did not molt, all were 77 mm CL or larger. One, an 82 mm female, extruded eggs. The mean initial CL of the double molters was 59.4 mm. Since the intermolt period is shorter for juvenile lobsters, a second molt within a few months of the preceding molt was expected.

The growth increment (%CL increase), ranging from 4.8 to 16.1% and averaging 11.6%, was within normal limits for adolescent phase lobsters. There were no apparent trends or differences among the various stations of the sentinel study. Figure 4 shows a normal premolt/post molt relationship among the experimental lobsters, indicating similar growth rates regardless of their proximity to the spraying.

From the end of May through the completion of the study (January 25, 2000), only two experimental lobsters (3.5% of total) died while under observation in the wet lab. One died of unknown causes in January, while the other died following an extremely stressful molt in which the lobster lost a claw and several walking legs. Since lobster dealers/retailers typically experience shrinkage rates of 5-10%, the two deaths are well within acceptable limits for lobsters held in storage environments.

Conclusions

Although DMR's monitoring of the CONFIRM® aerial spraying program revealed no adverse effects on the lobster resource, we remain concerned about the use of any insecticide in close proximity to the marine environment that possibly may impact Maine's valuable lobster fishery.

Acknowledgements

We appreciate lobstermen Ted Bear, Gary Hawkes, Dana McIntire, Steve Train and their crews for providing food for the caged lobsters. We are also thankful to Norris Bowie and Jason Bartlett for their contribution to the report graphics and assisting Marine Patrol Officer Mike Neelon in the deployment and retrieval of the cages with the P/V WINDS.

Table 1. Location and depths of CONFIRM® study cages, 1999.

<u>Station No.</u>	<u>Location</u>	<u>Depth (feet high tide)</u>	<u>Loran Bearings</u>
1	Long Island	14	13242.3 26023.3
2	Cliff Island	20	13226.0 26013.3
3	Stave Island	13	13211.5 26015.5
4	Cousins Island	10	13218.0 26040.0
5	Great Chebeague Island	10	13196.6 26030.2
6	Basin Cove	10	13177.0 26010.0
7	Bailey Island	8	13165.5 25998.8
8	Bustins Island	11	13168.0 26035.4
9	Lower Goose Island	8	13161.0 26025.8
10	Bear Island	20	13105.4 25982.7

Table 2. Size and growth information on sublegal lobsters placed in wire cages around Casco Bay aerially sprayed with the insecticide CONFIRM® in May 1999.

Station no.	Depth (feet)	Initial CL (mm)	Sex	Cull	1st molt date	1st molt CL (mm)	CL % increase	Remarks	2nd molt date	2nd molt CL (mm)	CL % increase	Remarks
1	14	56	m		8/2/99	62	10.7		12/28/99	69	11.3	
		63	f		7/19/99	71	12.7					
		60	m		8/13/99	67	11.7					
		77	f		9/27/99	85	10.4					
		74	f					molted and eaten while caged in Casco Bay				
		79	f		8/9/99	86	8.9					
2	20	59	m					molted and eaten while caged in Casco Bay				
		61	f		8/10/99	70	14.8					
		62	f	rrp	8/4/99	70	12.9					
		76	m					molted and eaten while caged in Casco Bay				
		72	m		8/28/99	82	13.9					
		80	m		11/7/99	90	12.5	lays upside-down, lost left crusher after molting				
3	13	57	f		6/27/99	64	12.3	lost left crusher after molt	11/7/99	72	12.5	rlc is mostly blue
		62	f		6/24/99	67	8.1		10/26/99	76	13.4	lost left crusher and several legs after molting, died 11/19/99
		63	f		7/1/99	71	12.7					
		77	m									
		78	f		7/31/99	85	9.0	lost right pincher after molting				
		79	f		10/2/99	86	8.9					
4	10	58	f		8/18/99	65	12.1					
		64	m		7/9/99	72	12.5					
		65	m		7/15/99	72	10.8					
		75	m		6/13/99	83	10.7					
		76	f		12/15/99	84	10.5					
		79	f		7/4/99	86	8.9					
5	10	53	m		7/27/99	61	15.1		1/7/00	68	11.5	
		64	f		6/27/99	70	9.4					
		67	m		8/28/99	74	10.4					
		77	m		7/6/99	89	15.6					
		75	m	rrp	8/11/99	84	12.0					
		79	f		8/13/99	88	11.4					

Table 2. (cont.)

Station no.	Depth (feet)	Initial CL (mm)	Sex	Cull	1st molt date	1st molt CL (mm)	CL % increase	Remarks	2nd molt date	2nd molt CL (mm)	CL % increase	Remarks
6	10	57	m		6/25/99	63	10.5		11/19/99	72	14.3	
		62	f		9/2/99	69	11.3					
		66	m		7/25/99	75	13.6					
		73	m		8/31/99	81	11.0					
		77	f		6/13/99	84	9.1		12/12/99	93	10.7	lost right pincher after molt
		82	f					extruded viable eggs while in the wet lab				
7	8	56	m	ric	7/11/99	65	16.1					
		62	m	rrc	6/8/99	65	4.8					
		77	f		10/25/99	83	7.8					
		77	m		6/3/99	85	10.4					
		63	m	ric	7/11/99	70	11.1	molted while caged in Casco Bay died in wet lab 1/5/00				
		81	m		11/17/99	89	9.9					
8	11	57	f		8/23/99	64	12.3					
		69	m		6/8/99	79	14.5					
		61	m		6/24/99	69	13.1					
		73	f		7/4/99	81	11.0					
		76	f	ric	6/13/99	83	9.2					
		80	f		7/22/99	90	12.5					
9	8	59	f		8/22/99	66	11.9					
		64	f		7/13/99	73	14.1					
		69	f		8/30/99	78	13.0					
		73	f		10/22/99	81	11.0					
		71	m		10/15/99	79	11.3					
		80	m									
10	20	54	m		7/12/99	60	11.1		12/16/99	68	13.3	
		65	f		7/29/99	73	12.3					
		62	f		7/27/99	70	12.9					
		76	f		8/2/99	86	13.2					
		71	m		6/6/99	79	11.3					
		81	f									

Figure 1. Chart of Casco Bay showing location of CONFIRM® study cages, 1999.

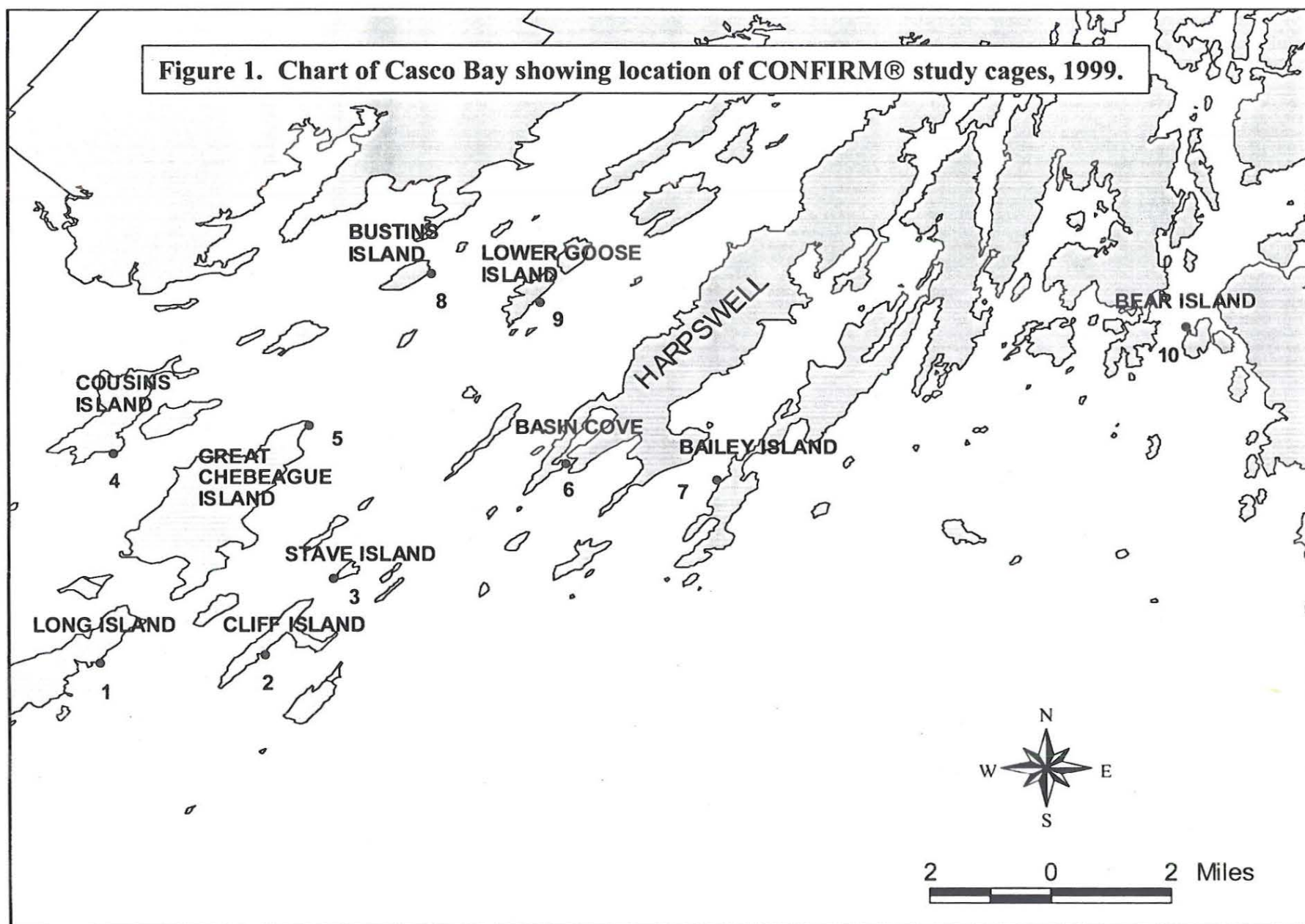


Figure 2. Size composition of sublegal lobsters caught in the Boothbay Harbor region and placed in wire cages in Casco Bay, May 1999.

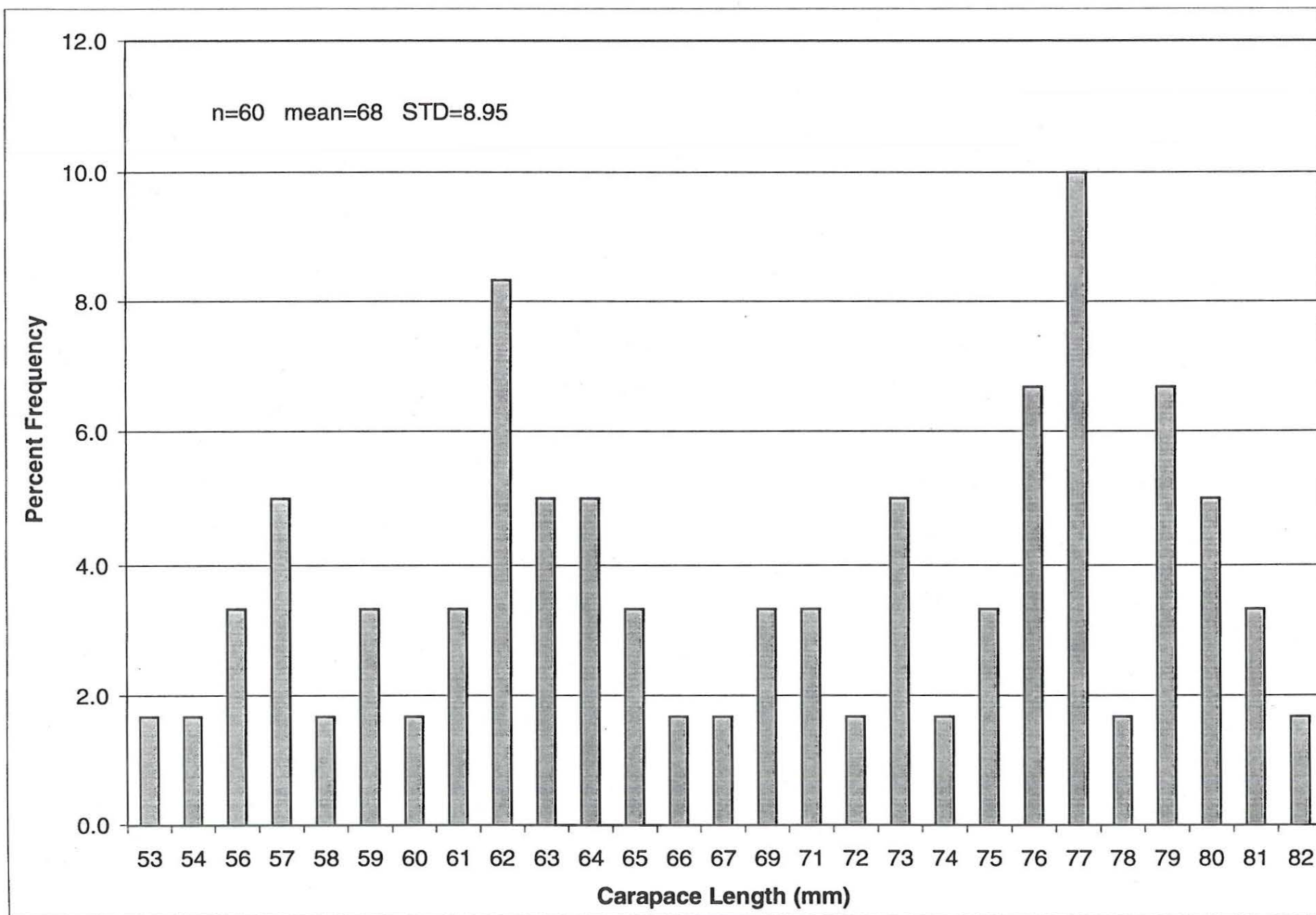


Figure 3. Ambient water temperature range of the CONFIRM study holding tanks from June 14, 1999 through January 30, 2000.

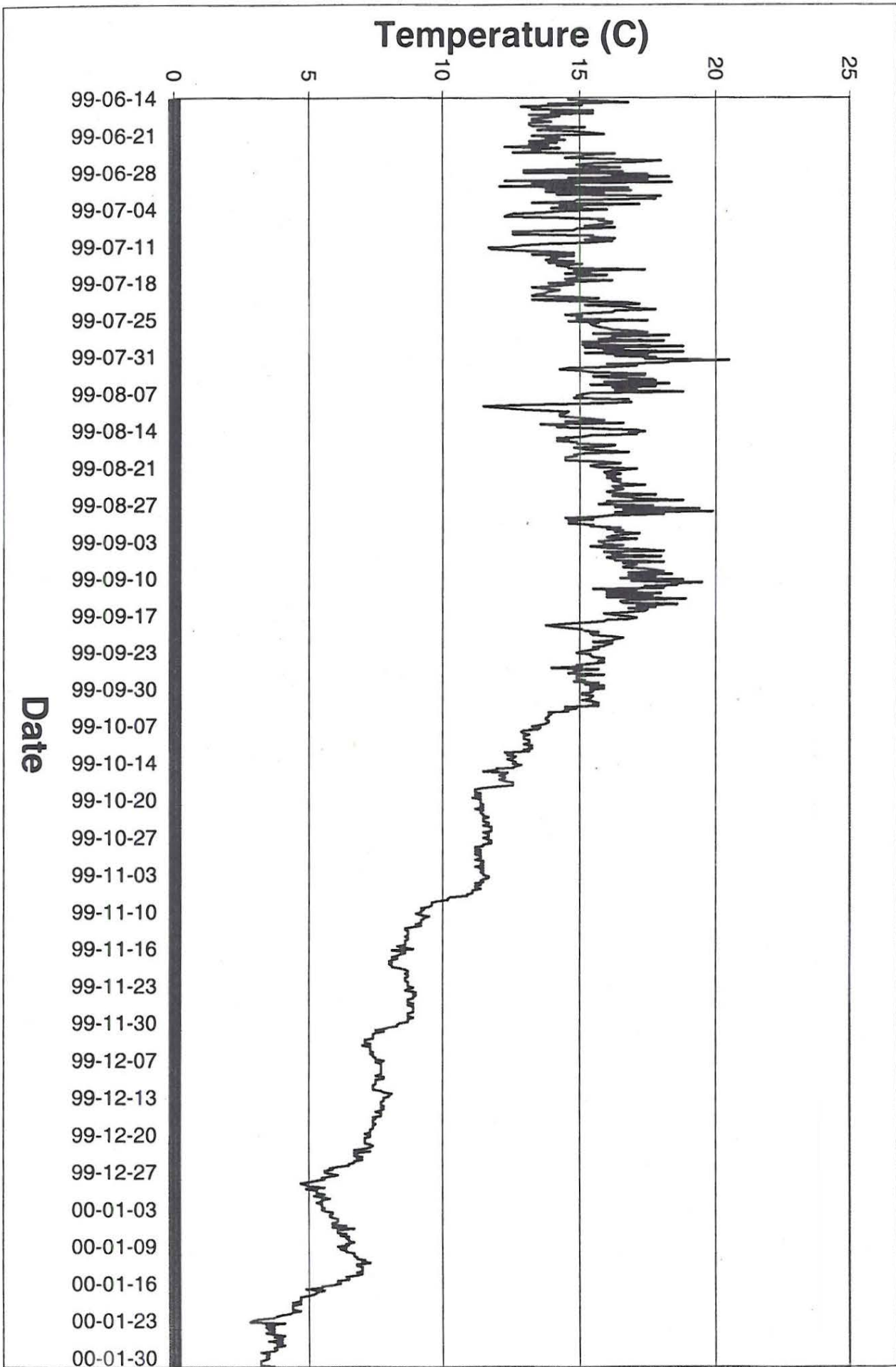
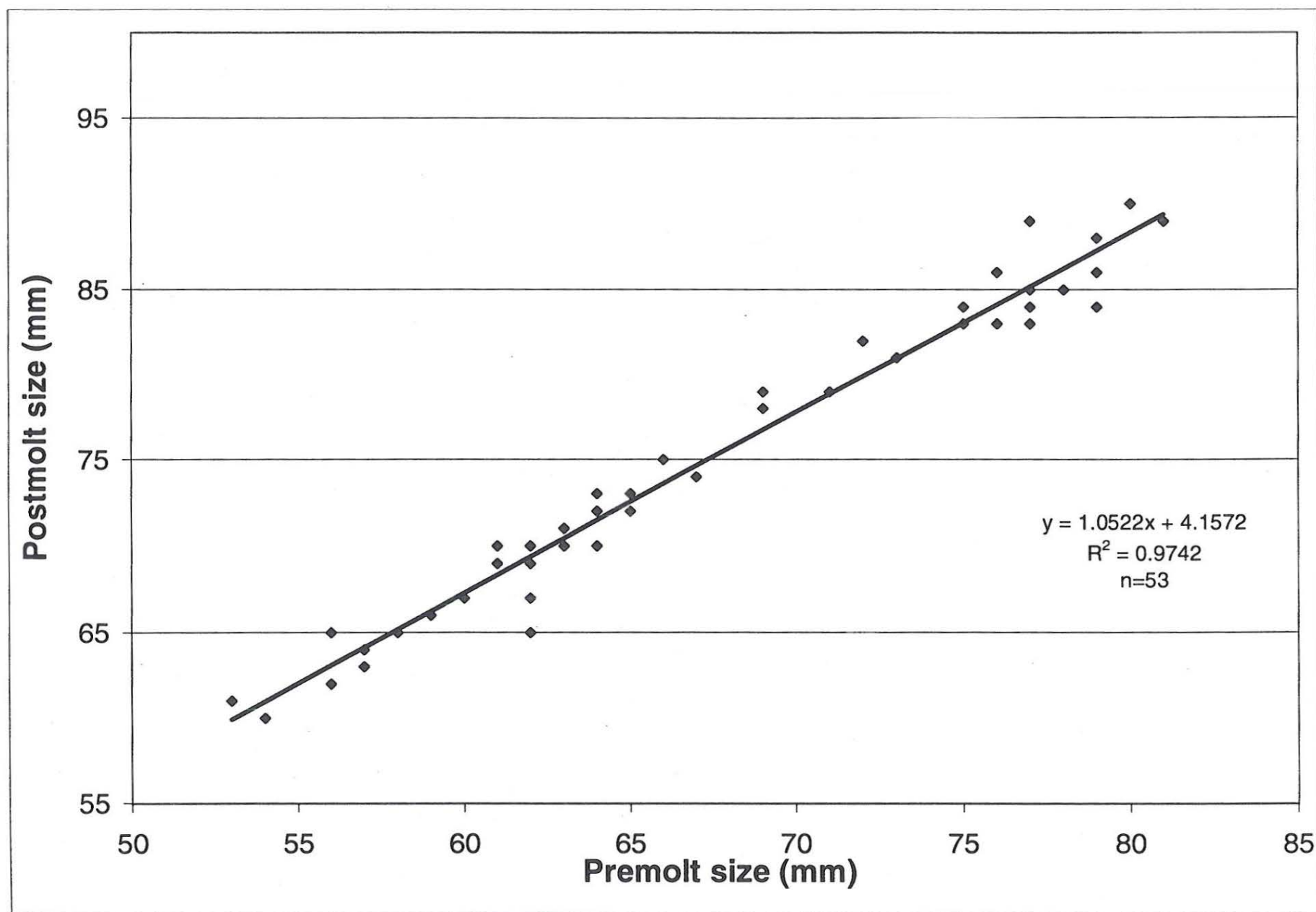


Figure 4. Relation of postmolt (y) to premolt (x) carapace lengths for the sentinel study lobsters held in the wet laboratory.



Percent landed lobsters in first molt group: Kevin Kelly

Fishing mortality can strongly affect size structure in a population. In particular, heavily fished populations often have truncated size distributions and increasing proportions of smaller animals in the catch as survival to larger sizes is diminished. For lobsters, a fishery which is highly dependent on newly-recruited animals is at higher risk of failure should environmental factors cause a disruption of the molting process, or worse, a decrease in survival between egg and adult stages (Idoine 1998). Higher proportions of lobsters one molt above legal size can also be indicative of increased recruitment.

Proportions of newly-recruited lobsters in Gulf of Maine landings were obtained from expanded catch-at-length estimates. Newly-recruited lobsters were defined as those within one molt increment of minimum legal size (MLS). In survey years 1981-86 this was 81-91 mm CL, in survey year 1987 this was 82-92 mm CL and in survey years 1988-97 this was 83-93 mm CL.

The proportion of lobsters landed in the first molt group rose sharply in the Gulf of Maine during 1981-88 for both males and females (Figs. 1a,b). New recruits were 72-77% of the landings in 1981, increasing to 85-90% in 1988. This proportion then began to decrease somewhat, so that by 1994, 77% of the male landings and 85% of the female landings were within one molt increment of MLS. The proportion of females that are new recruits was between 85-89% in 1994-97. These values are high relative to the overall time series, but female percentage in the first molt group has not shown much trend in the 1990's. Generally 85-90% of the female catch has been new recruits, indicative of the continued very high dependence of the resource on newly-molted animals. The majority (41-88%) of Gulf of Maine females in this size group have not attained sexual maturity. Numbers of landed females in the first molt group have generally trended upward since around 1988, while their percentage in the landings has remained steady. Values of percent in the first molt group were higher for females than males in all years.

Percent males in the first molt group was 77-81% in 1994-97 (Figs. 1a,b). The pattern since 1981 has been similar for males and females, however the percentage for males showed slightly more of a decrease during the 1990's. Numbers of landed males in the first molt group began trending upward significantly beginning around 1987.

Data from the coastal Maine fishery indicate around 84-89% of the landings (sexes combined) have been within one molt of MLS since 1990 (Fig. 2). Overall, although the proportion of new recruits in the landings remains very high, particularly for females, it does not appear to be increasing.

Exploitation indices

The ratio between lobster catch (landings) and abundance was used as an index of exploitation for the Gulf of Maine stock area. Abundance was defined as the yearly index of abundance (stratified mean number per tow) for all legal-sized lobsters obtained from bottom trawl surveys. This index provided information on the portion of the resource removed by fishing in relation to stock abundance.

Total catch (millions of lobsters landed as estimated from expanded landings at size data) was divided by survey abundance for fully-recruited lobsters for each stock area to obtain the exploitation index. National Marine Fisheries Service (NMFS) fall trawl survey indices of abundance were used for NMFS Gulf of Maine statistical areas 511-513 (coastal Maine and New Hampshire) and 515 (offshore). The State of Massachusetts fall trawl survey was used for statistical area 514 (Massachusetts Bay). Exploitation indices were scaled relative to the mean because the magnitude of each index was directly affected by survey catch rates, which in turn depended on the design and fishing performance of the trawl gear used in the survey. For this reason, exploitation indices between surveys could only be compared in terms of temporal trends.

Exploitation indices for both sexes based on the NMFS fall survey showed no clear trend over the entire time series (1982-97 survey years) (Figs. 3a,b). During the period (1989-97) of a roughly two-fold increase in landings, however, exploitation indices based on this survey tended slightly downward. Males and females were very similar in overall trend and magnitude. The high estimate in 1982 for females was produced by a very low survey abundance value in that year. Exclusion of that value produced a flat trend in exploitation index during 1983-97. NMFS survey exploitation indices appeared stable over the last four years, with a slight increase in 1997.

Exploitation indices based on Massachusetts trawl survey data for statistical area 514 were more variable than the NMFS survey indices for the rest of the Gulf of Maine (Figs. 3a,b). Male values produced no clear trend over the time series and showed little change during 1994-97. Overall magnitude and trend for males were very similar for NMFS and MA surveys in their respective Gulf of Maine areas.

Female exploitation based on the MA survey showed an increasing trend driven primarily by high values in 1988, 1993 and 1997 (Figs. 3a,b). The 1997 MA survey abundance index was the lowest of the time series and produced a high exploitation estimate. The low female abundance observed in 1997 may be of concern.

Bottom temperature monitoring: Kevin Kelly

Sea bottom temperature was monitored at two sites off Boothbay Harbor ME in 1999. Depths at the two locations were approximately 14 m (Spruce Point) and 27 m (Ram Island). Temperature monitoring began at these locations in 1989. Temperature was recorded at 2 hour intervals. Temperature sensors that had been put in place at each site in September 1998 were retrieved and replaced with newly programmed units in August 1999. Data were transferred from the thermographs to a desktop PC for processing and analysis.

Ocean bottom temperatures at Ram Island during September through November 1998 were lower than the combined average for the same period of the previous five years (Fig. 4a). However, December 1998 through July 1999 bottom temperatures recorded at Ram Island generally exceeded the 1993-97 average, particularly from May through July. The minimum temperature range of 5-6°C required for active premolt condition in lobsters (Aiken 1980) was attained during early to late May 1999 which was indicative of a very warm spring favorable for early molting (Fig. 4a).

Maximum 1999 Ram Island and Spruce Point temperatures were not available for this report (data not available beyond 4 August). However, minimum 1999 temperature at Ram Island was 1.8°C on 8 March, compared to the 1998 low of 2.0°C on 11 February. Minimum 1999 temperature at Spruce Point was 2.0°C on 27 February, compared to the 1998 low of 1.9°C on 10 February (Fig. 4b). Spruce Point 1999 temperatures were generally comparable to those of 1998.

References

- Aiken, D.E. 1980. Molting and growth. Chapter 2 in J.S. Cobb and B.F. Phillips, editors. The biology and management of lobsters, volume 1. Academic Press, New York.
- Idoine, J. 1998. American lobster. pp. 120-122 in Clark, S.H. (ed.). Status of Fishery Resources off the Northeastern United States for 1998. NOAA Technical Memorandum NMFS-NE-115.

Figure 1a

Gulf of Maine - Males
Number and percentage lobsters landed in first molt above minimum legal size

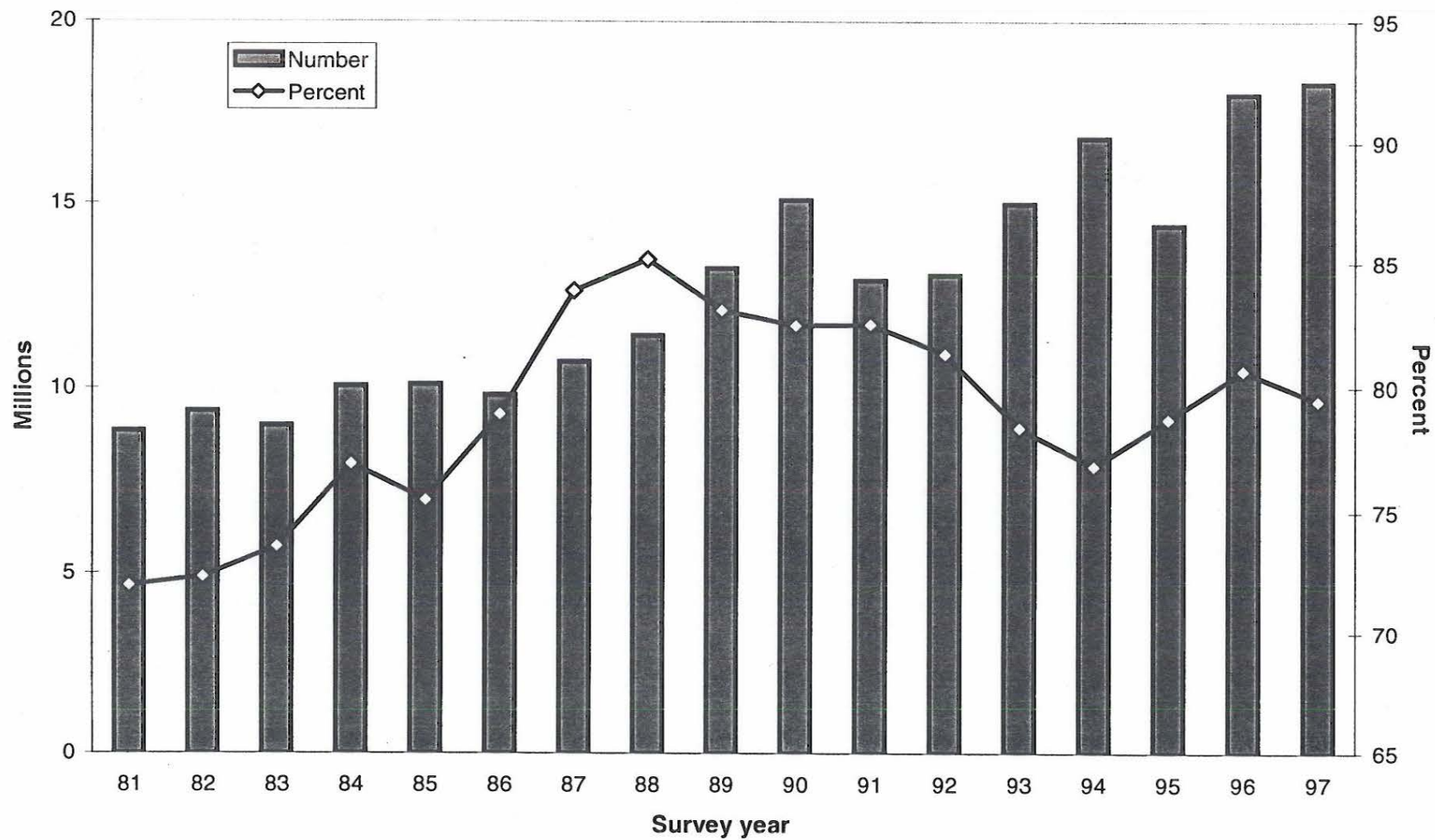


Figure 1b

Gulf of Maine - Females
Number and percentage lobsters landed in first molt above minimum legal size

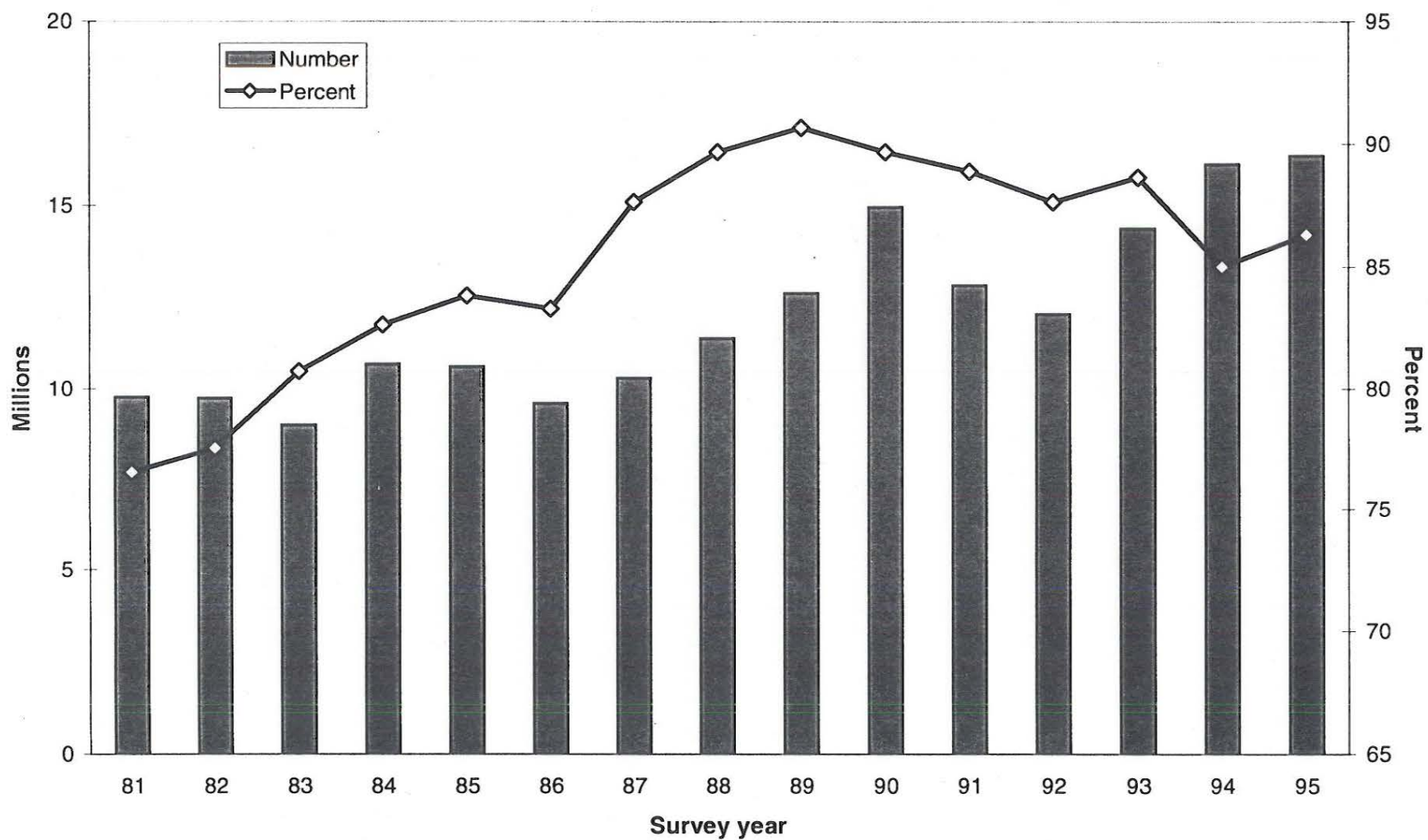


Figure 2 Percentage of ME landings within one molt of minimum legal size (sexes combined) (source: ME Dept of Marine Resources)

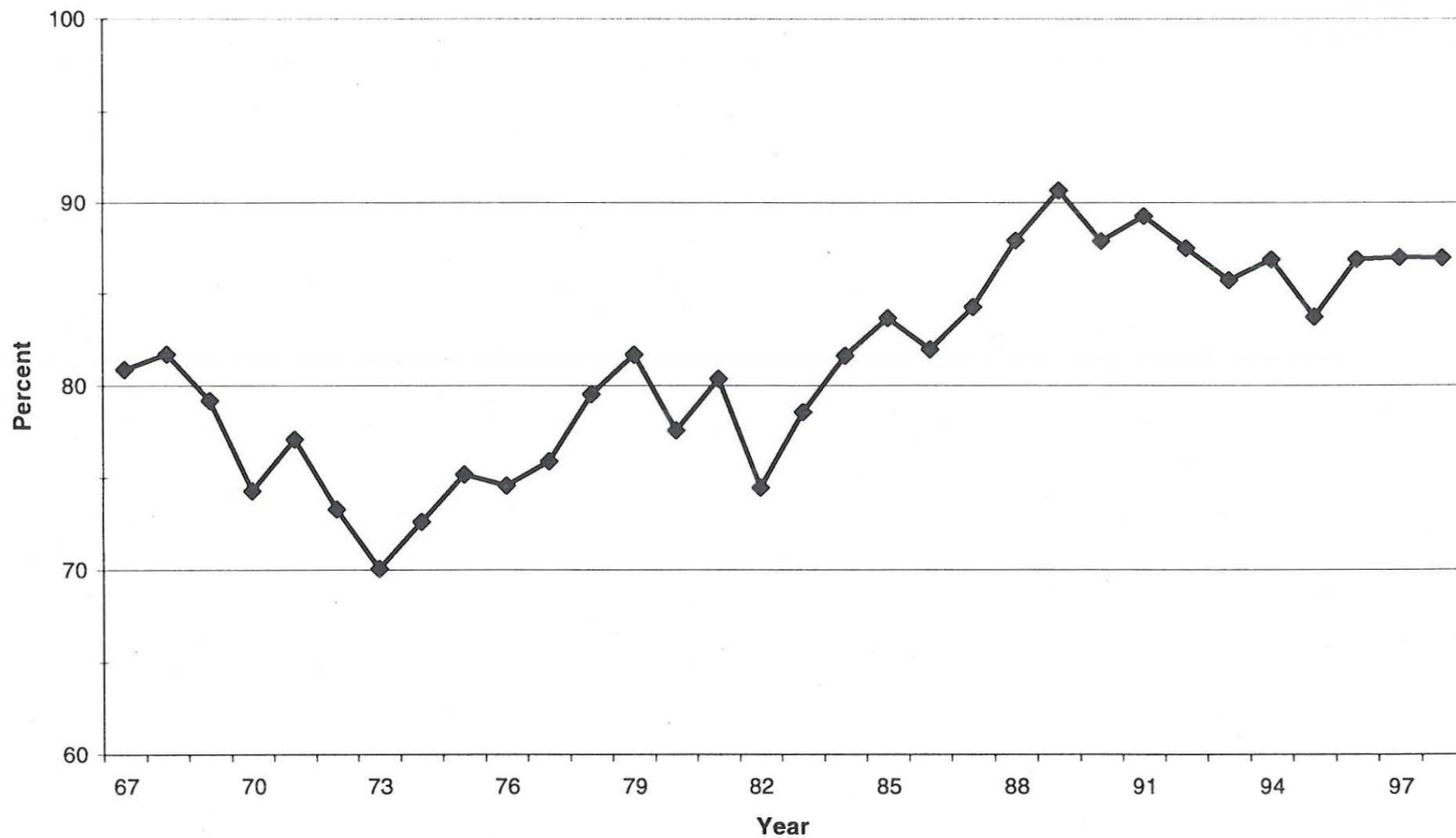


Figure 3a

GOM Exploitation Indices - Males
NMFS and MA Fall Surveys

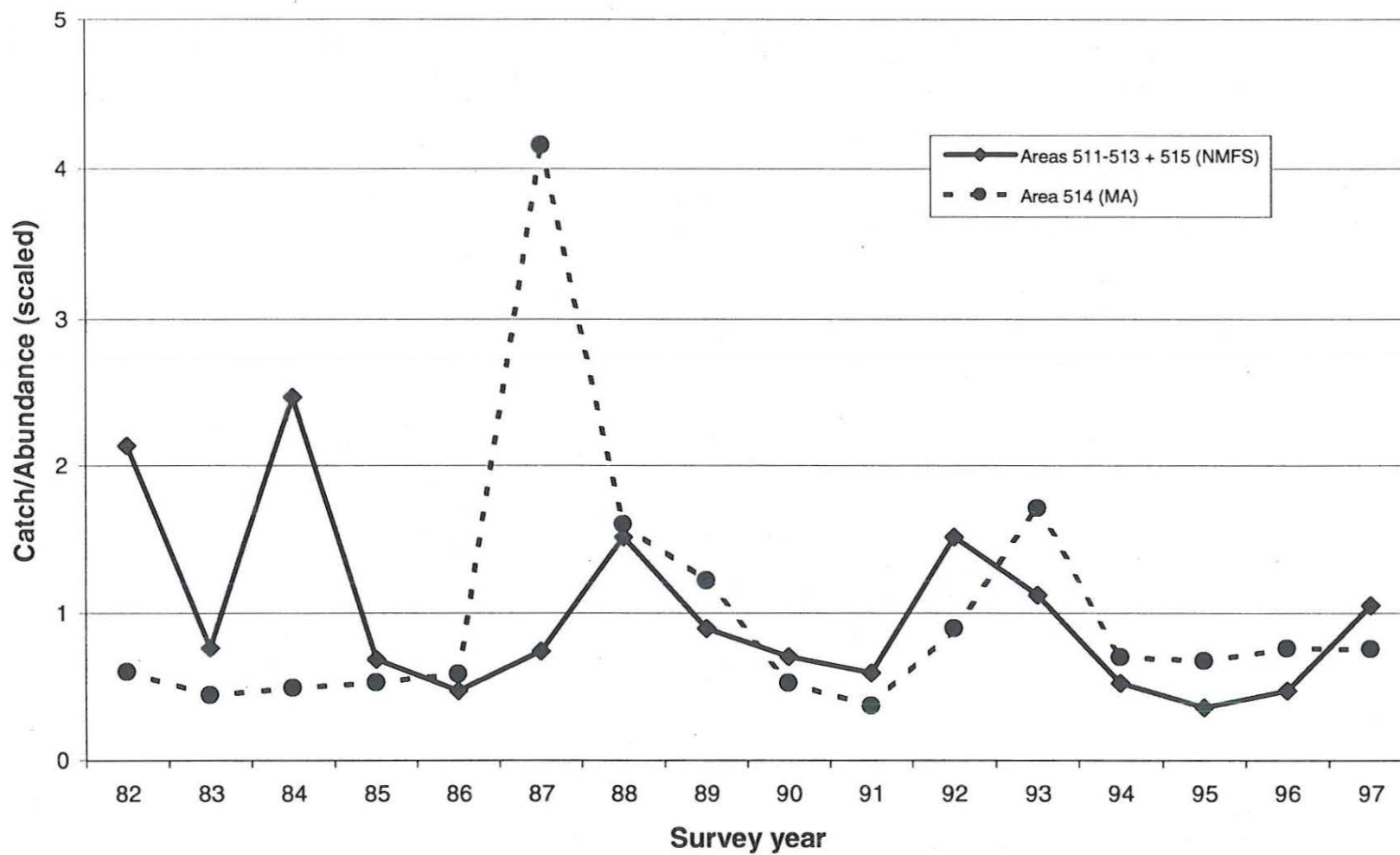


Figure 3b

GOM Exploitation Indices - Females
NMFS and MA Fall Surveys

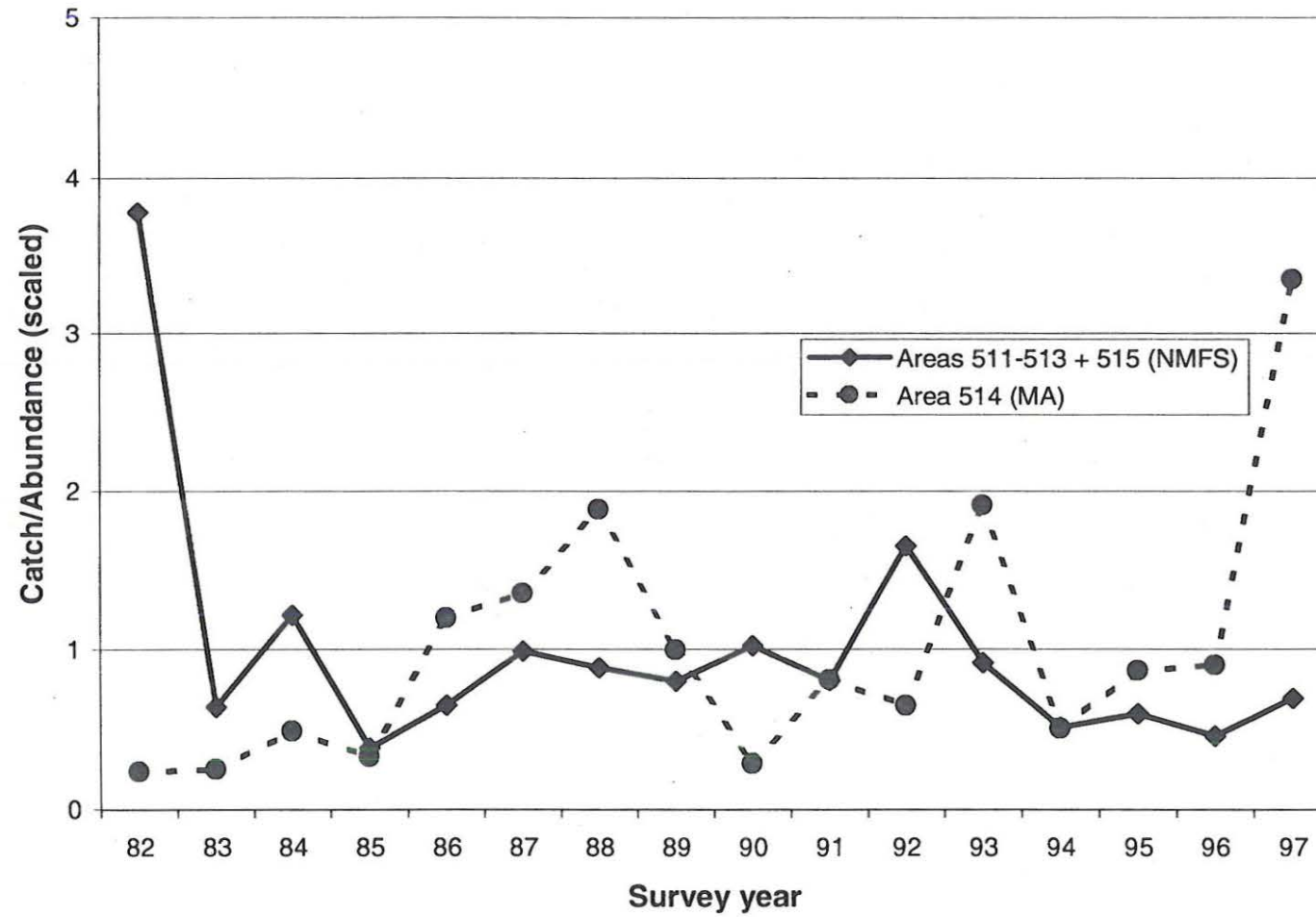


Figure 4a

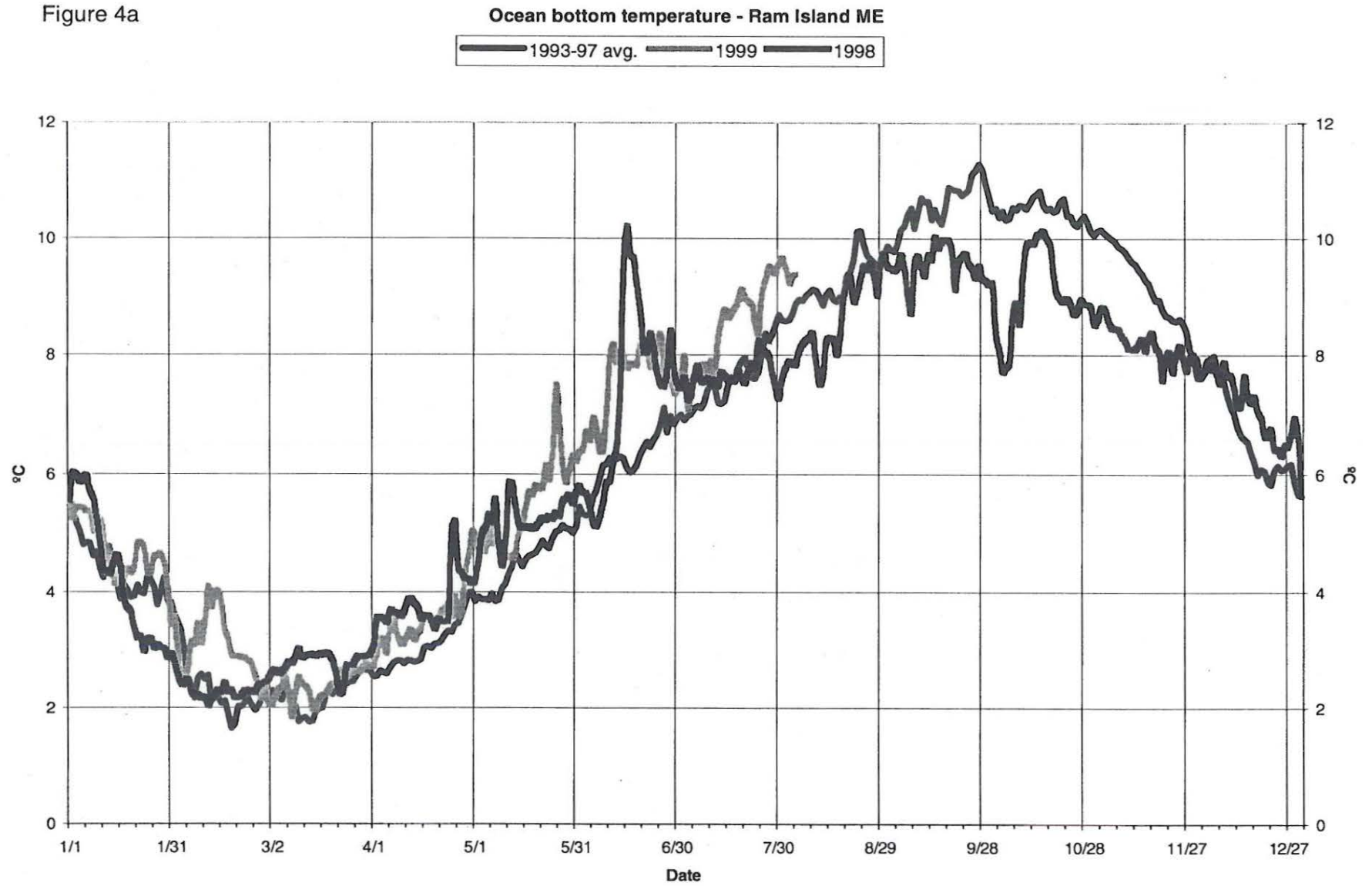
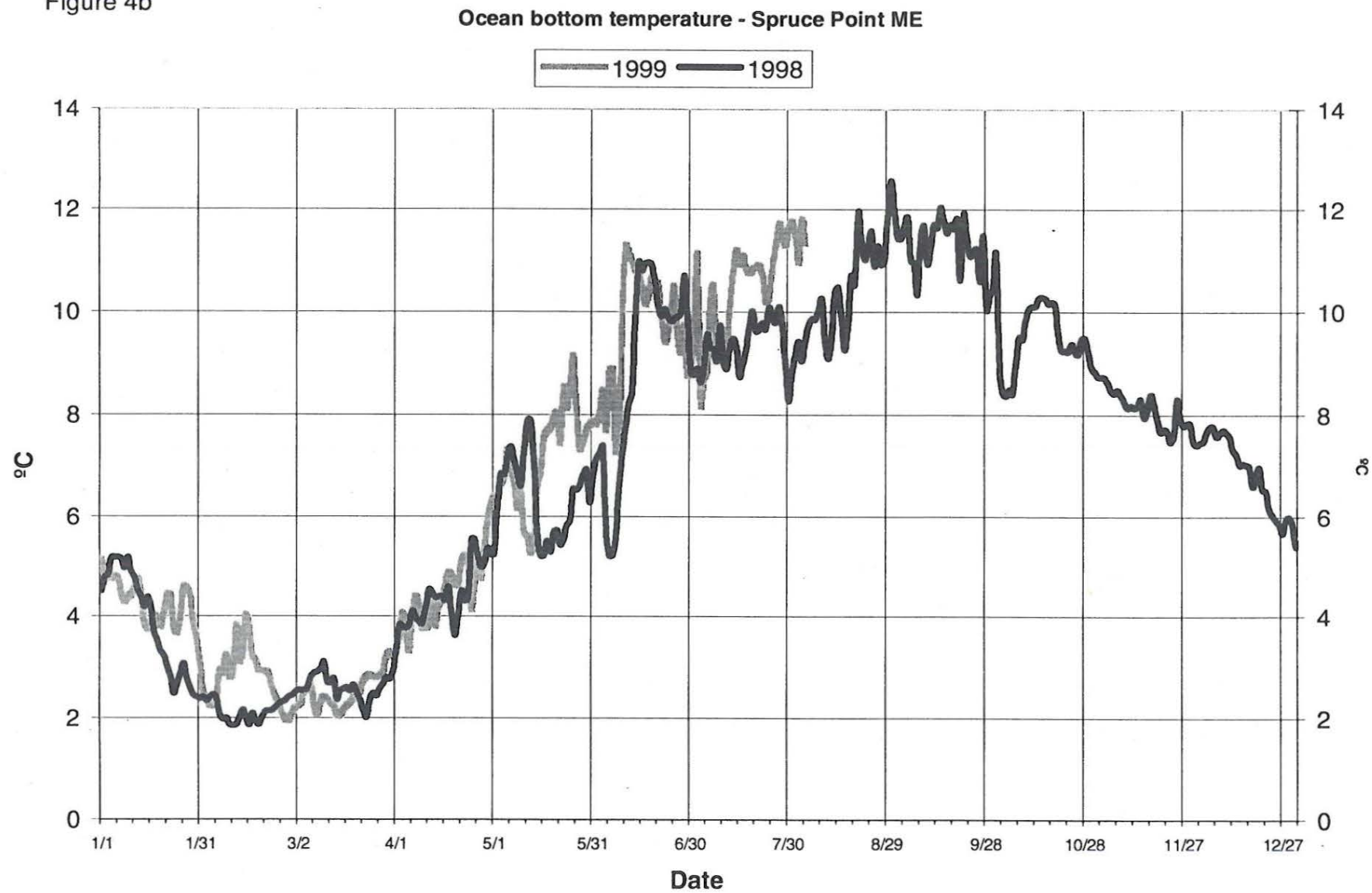


Figure 4b

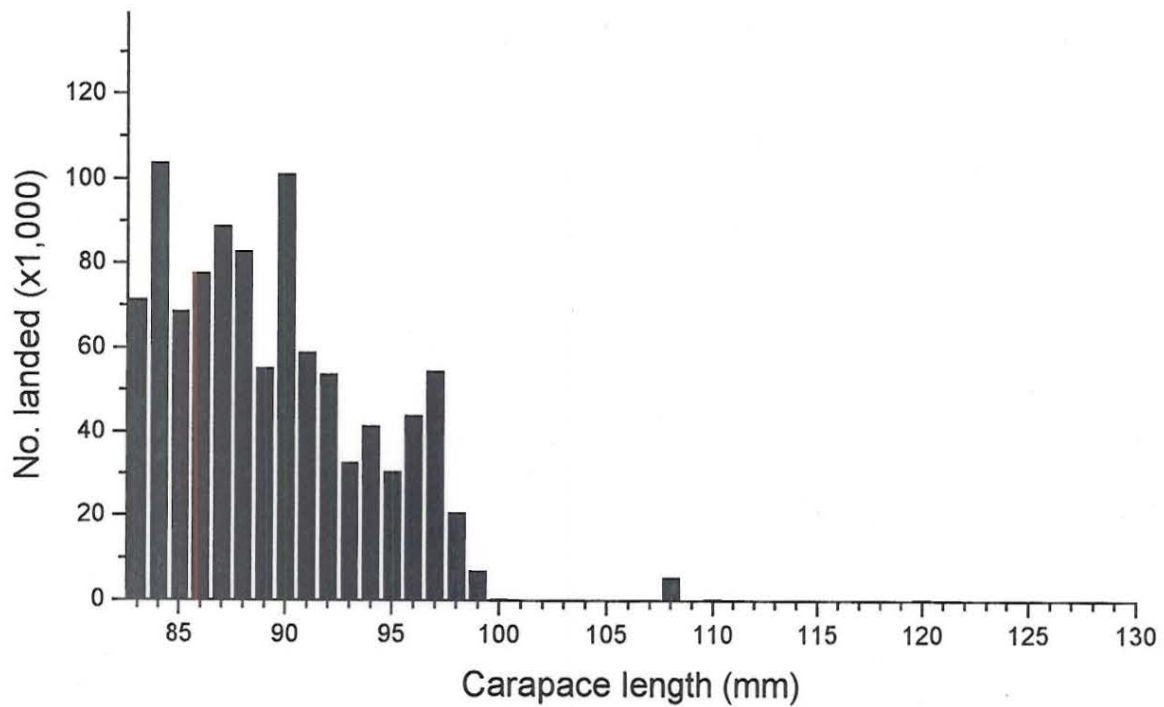


APPENDIX

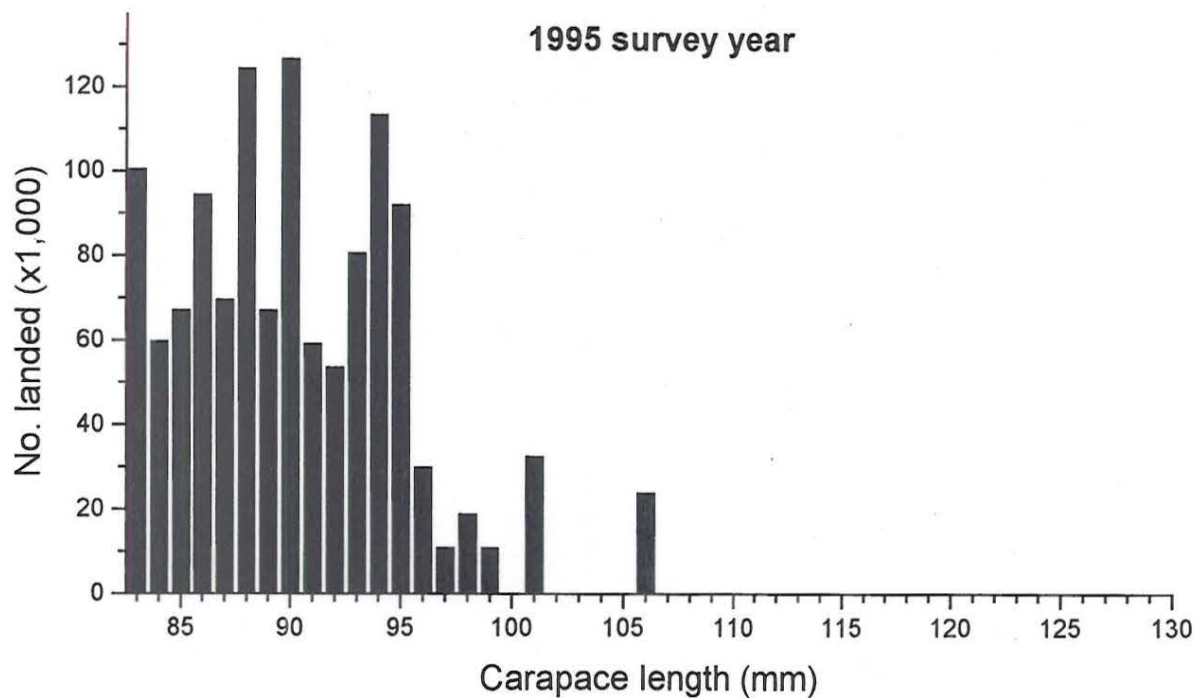
Expanded Catch-At-Age

Expanded catch-at-length - Female lobsters
Area 511 (eastern ME)

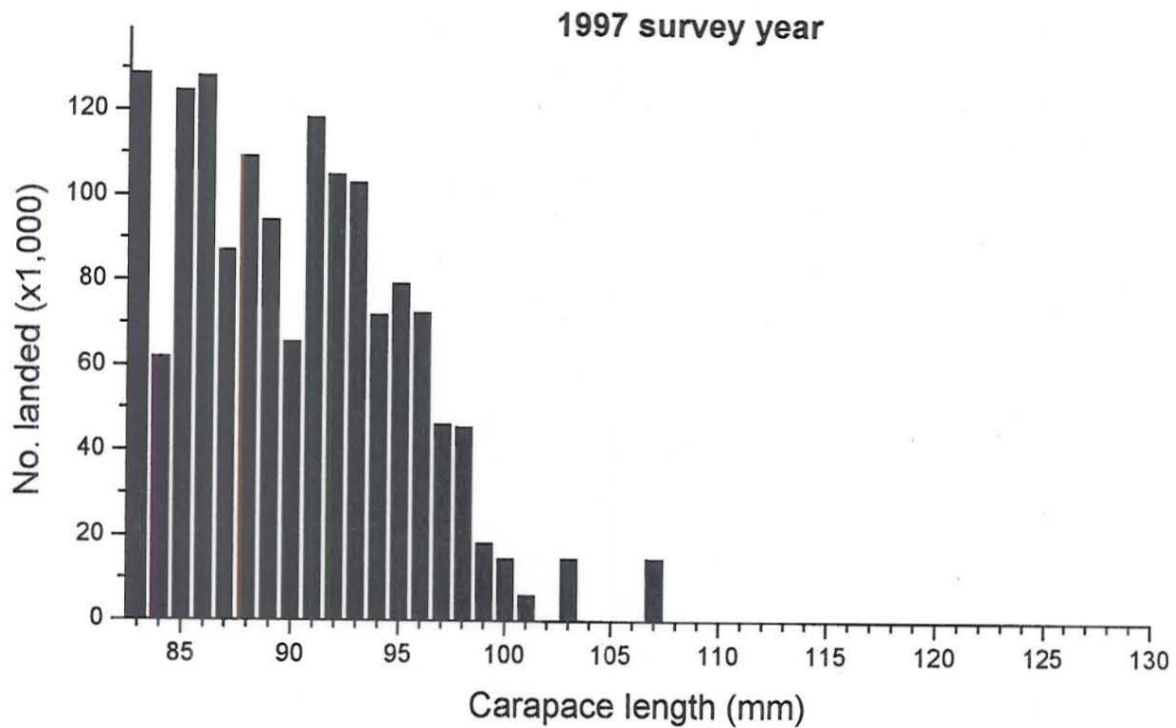
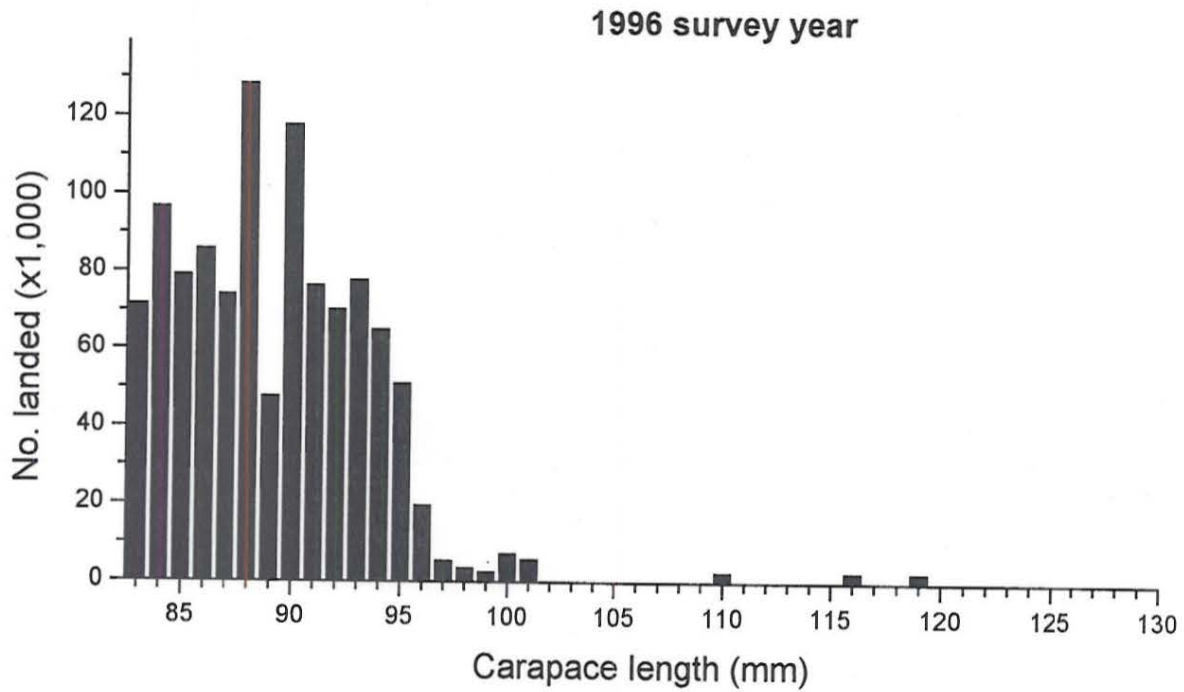
1994 survey year



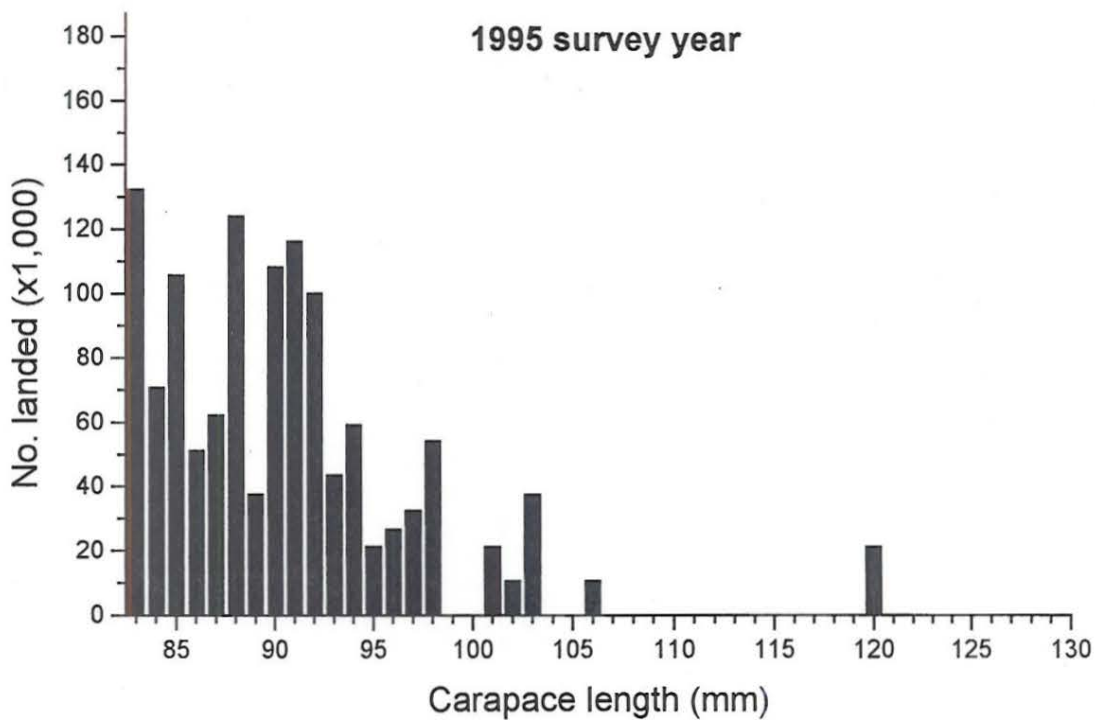
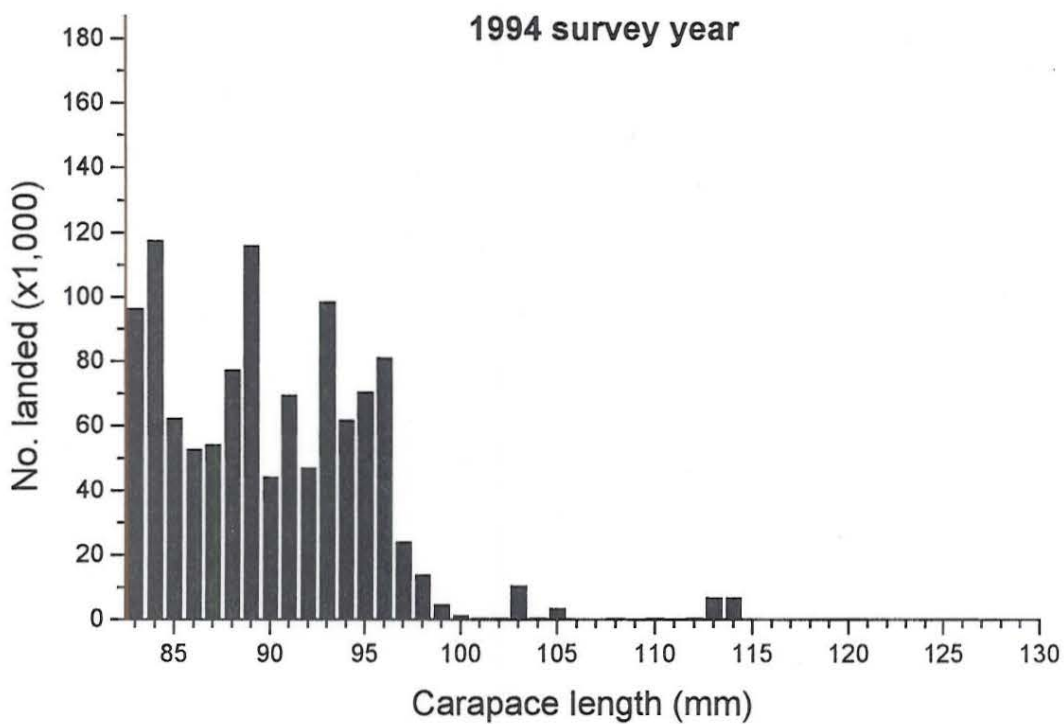
1995 survey year



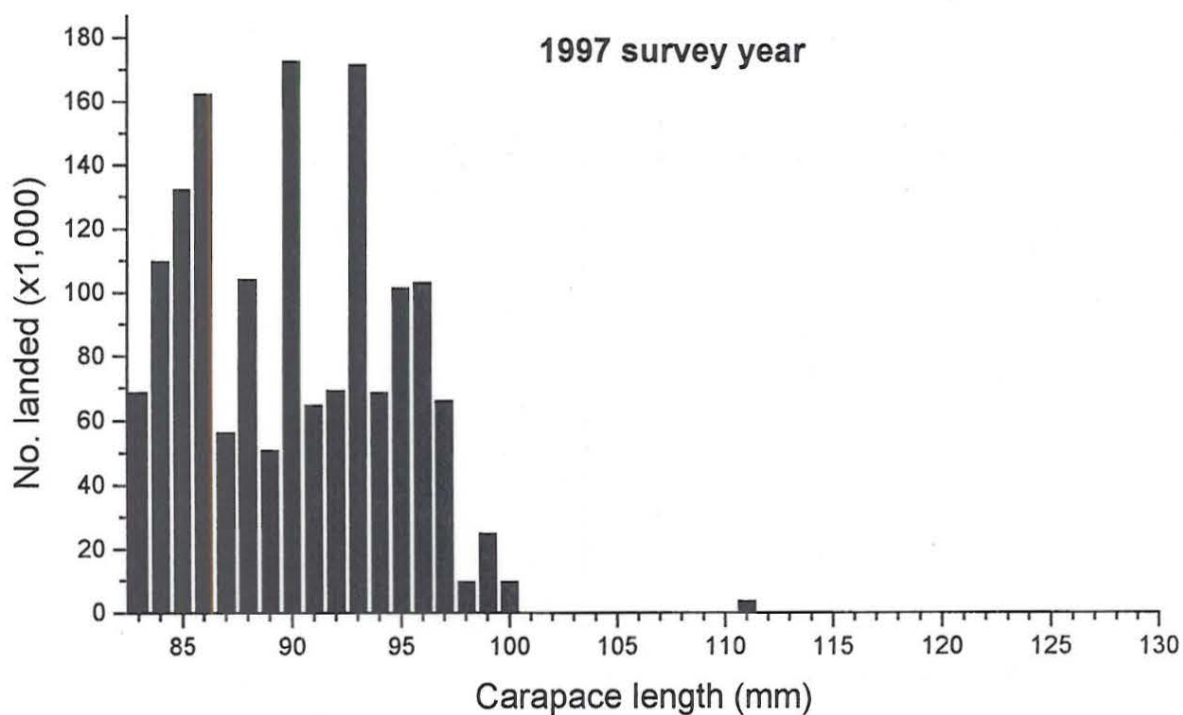
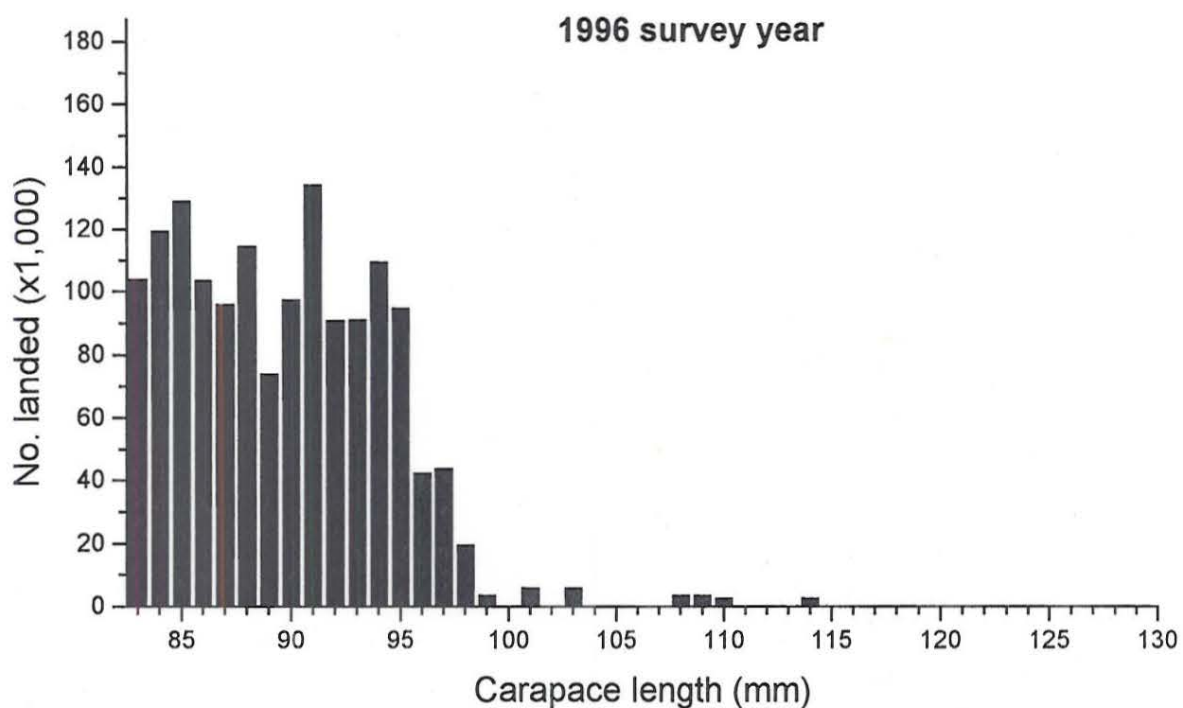
Expanded catch-at-length - Female lobsters
Area 511 (eastern ME)



Expanded catch-at-length - Male lobsters
Area 511 (eastern ME)

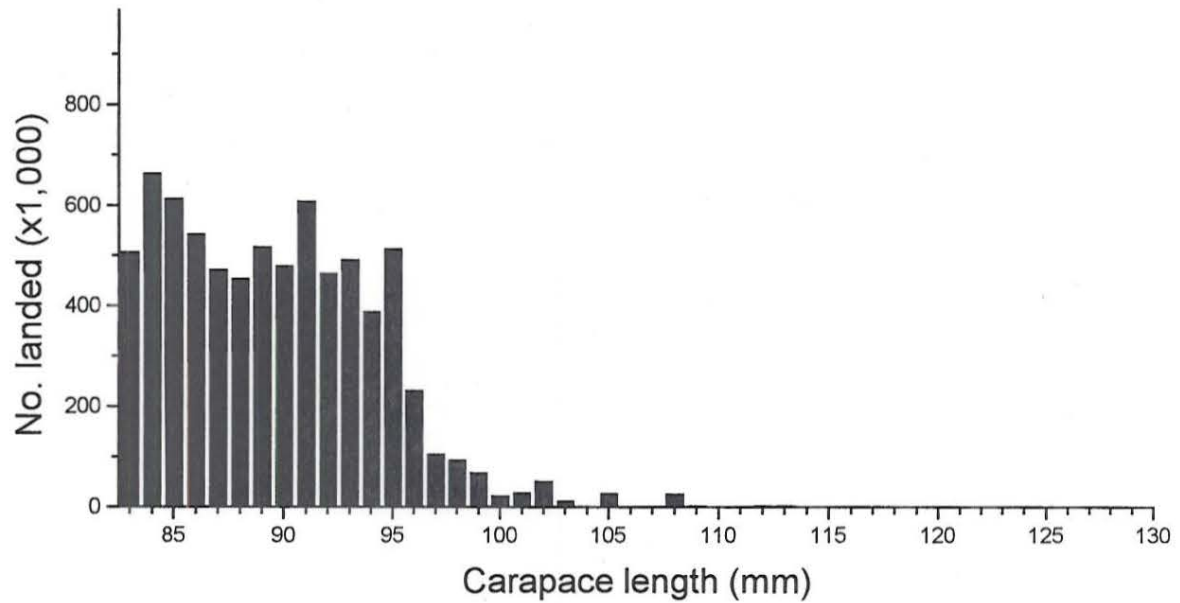


Expanded catch-at-length - Male lobsters
Area 511 (eastern ME)

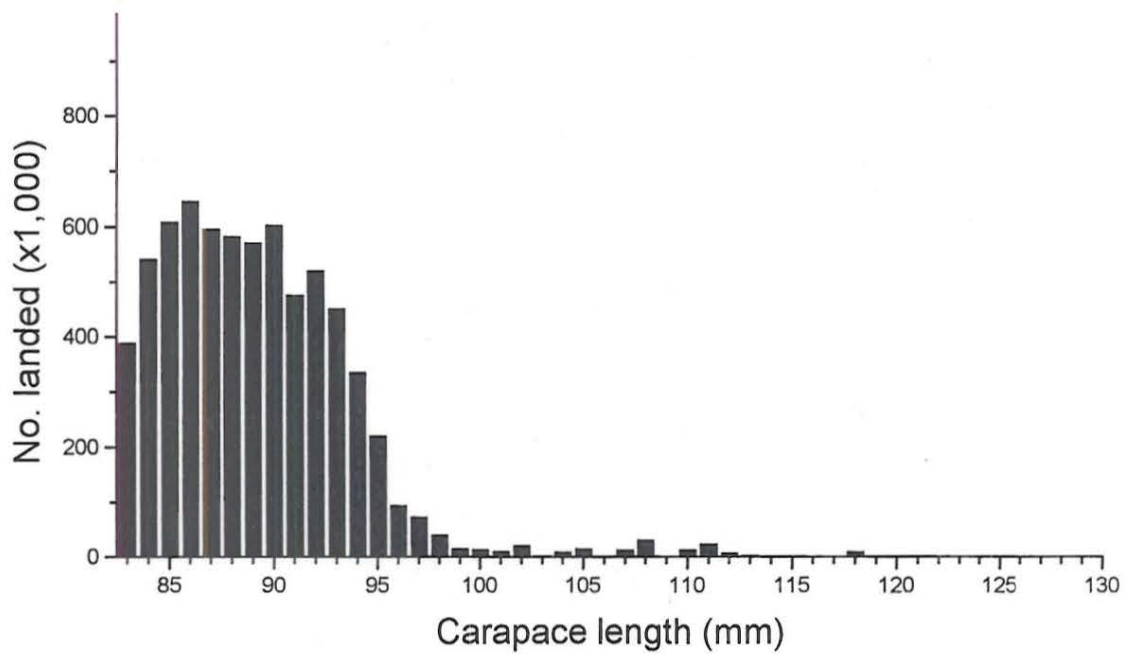


Expanded catch-at-length - Female lobsters
Area 512 (midcoast ME)

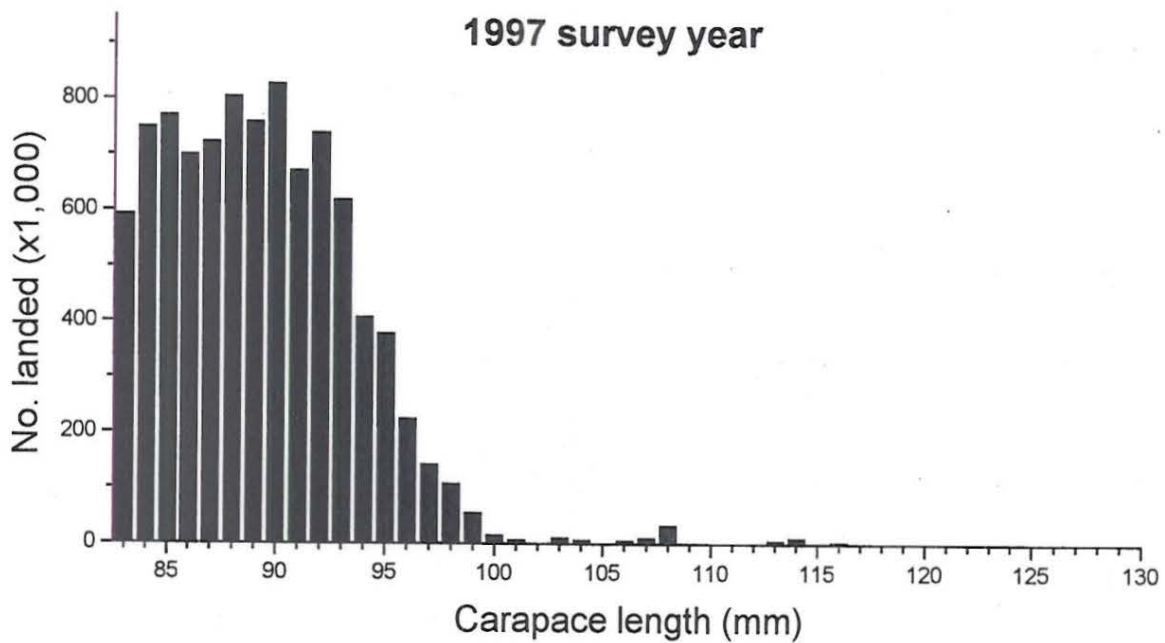
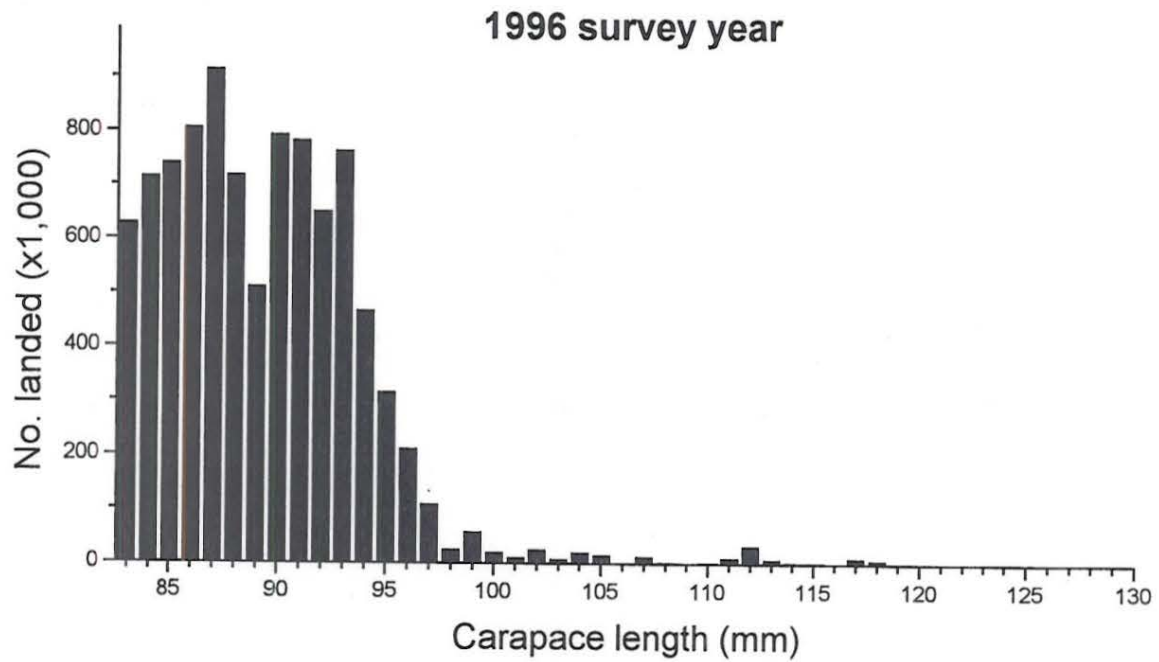
1994 survey year



1995 survey year

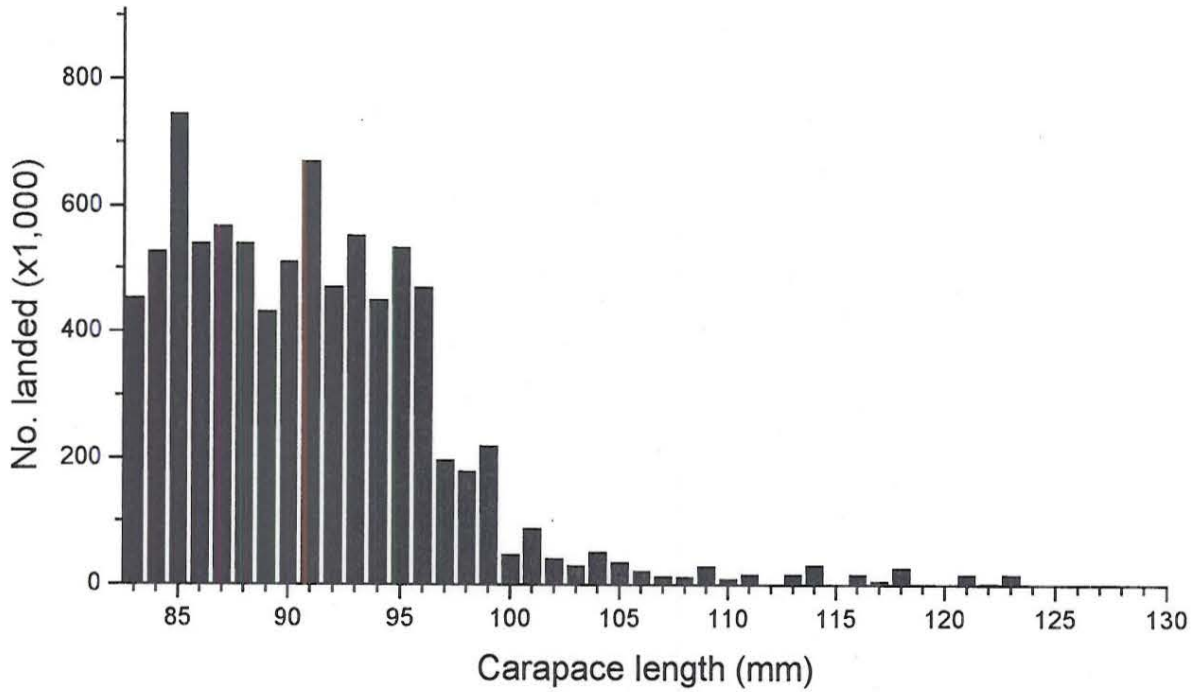


Expanded catch-at-length - Female lobsters
Area 512 (midcoast ME)

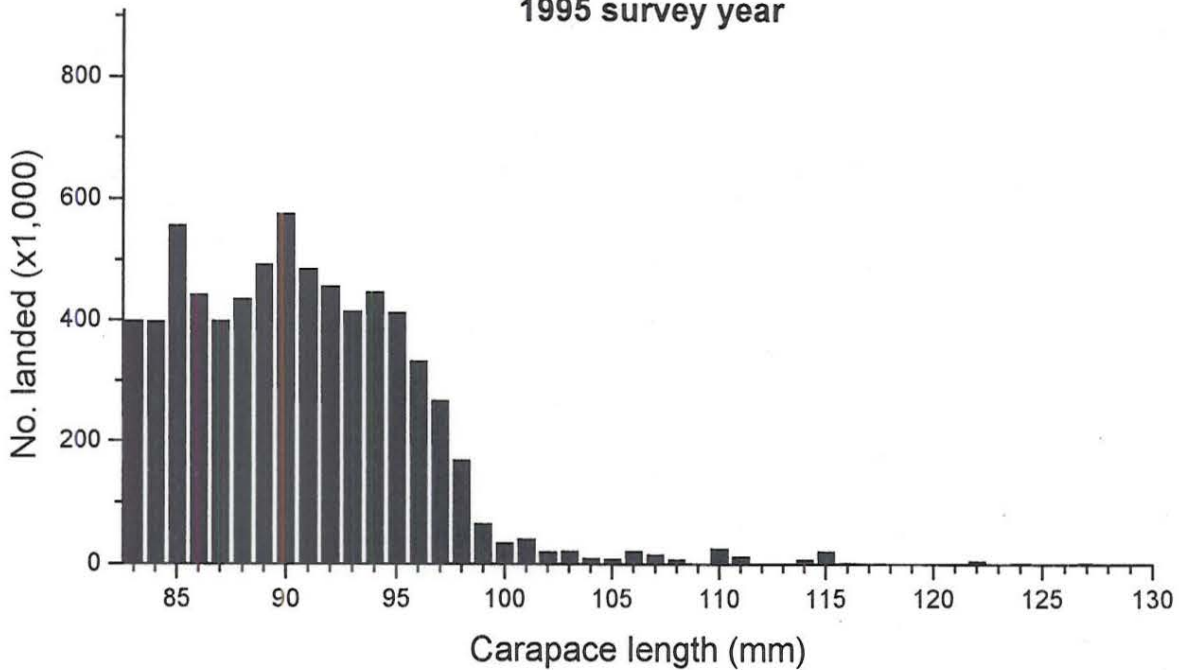


Expanded catch-at-length - Male lobsters
Area 512 (midcoast ME)

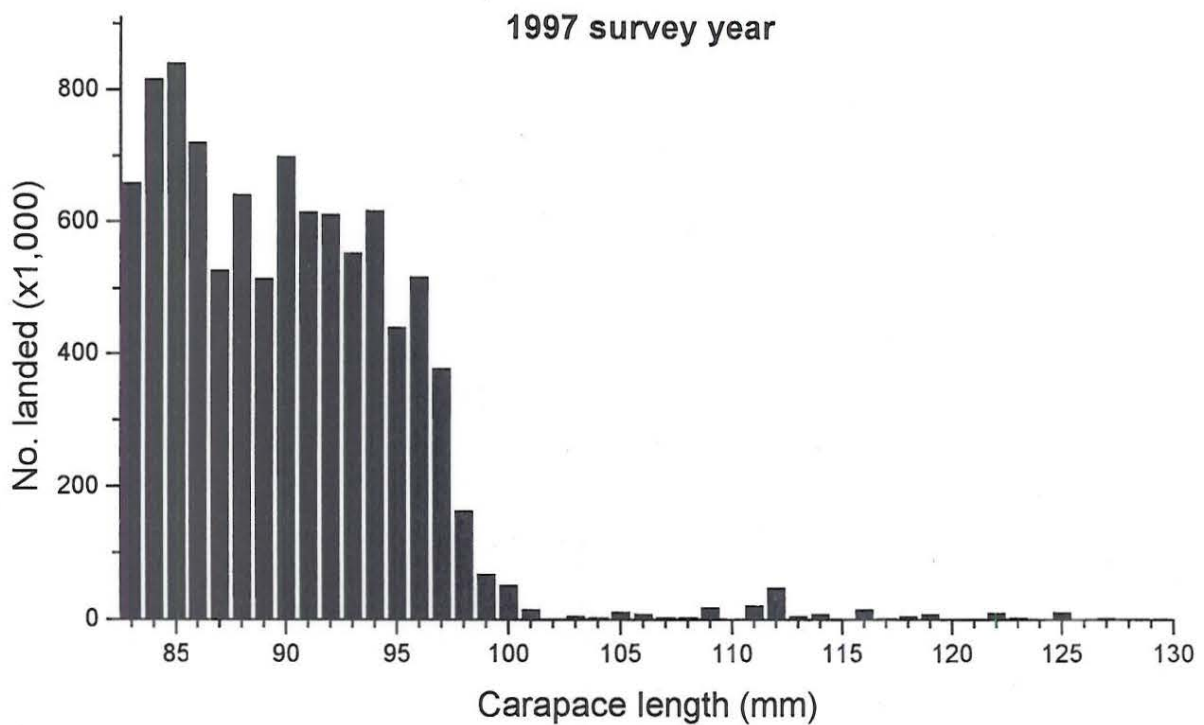
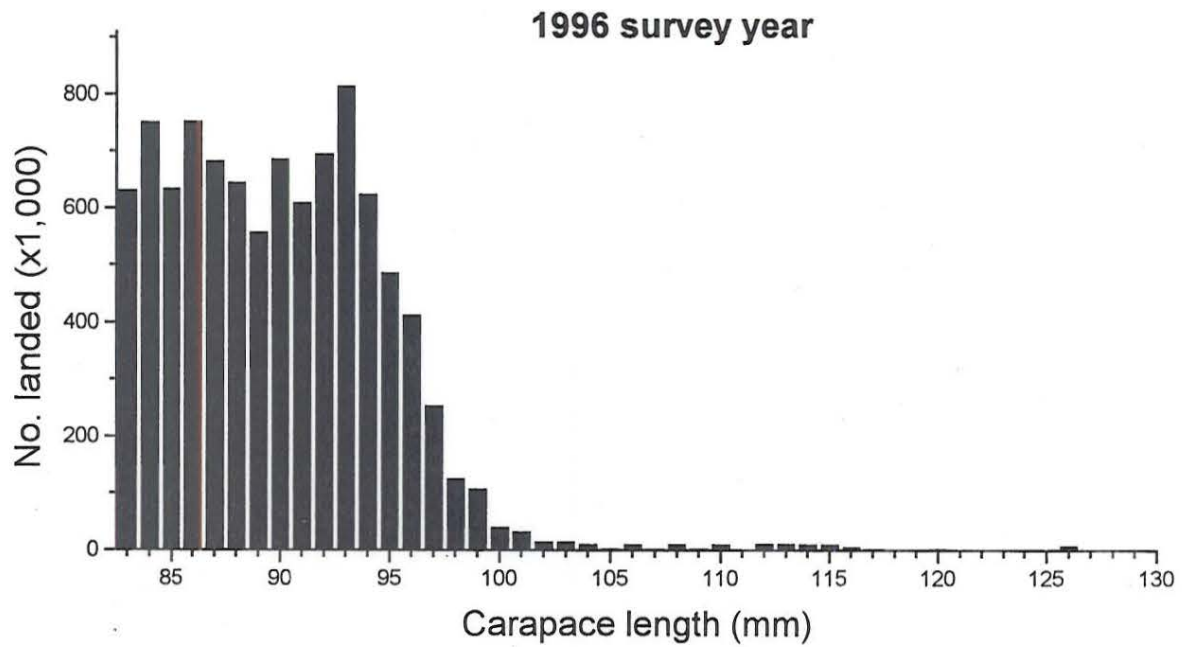
1994 survey year



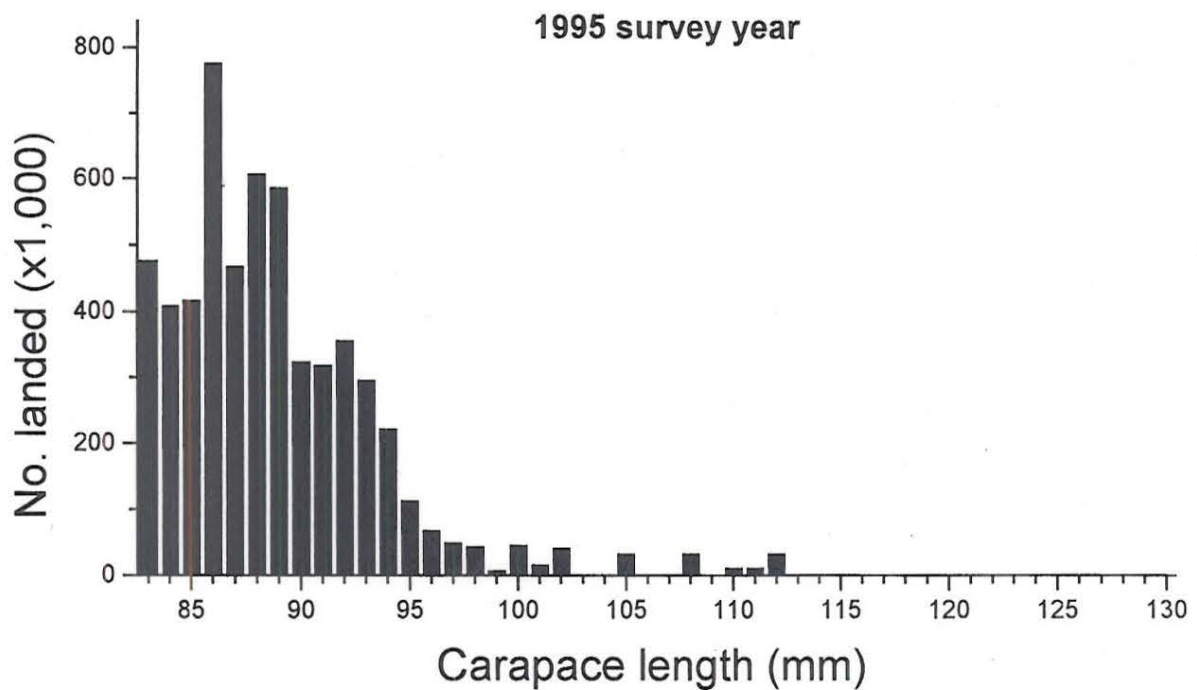
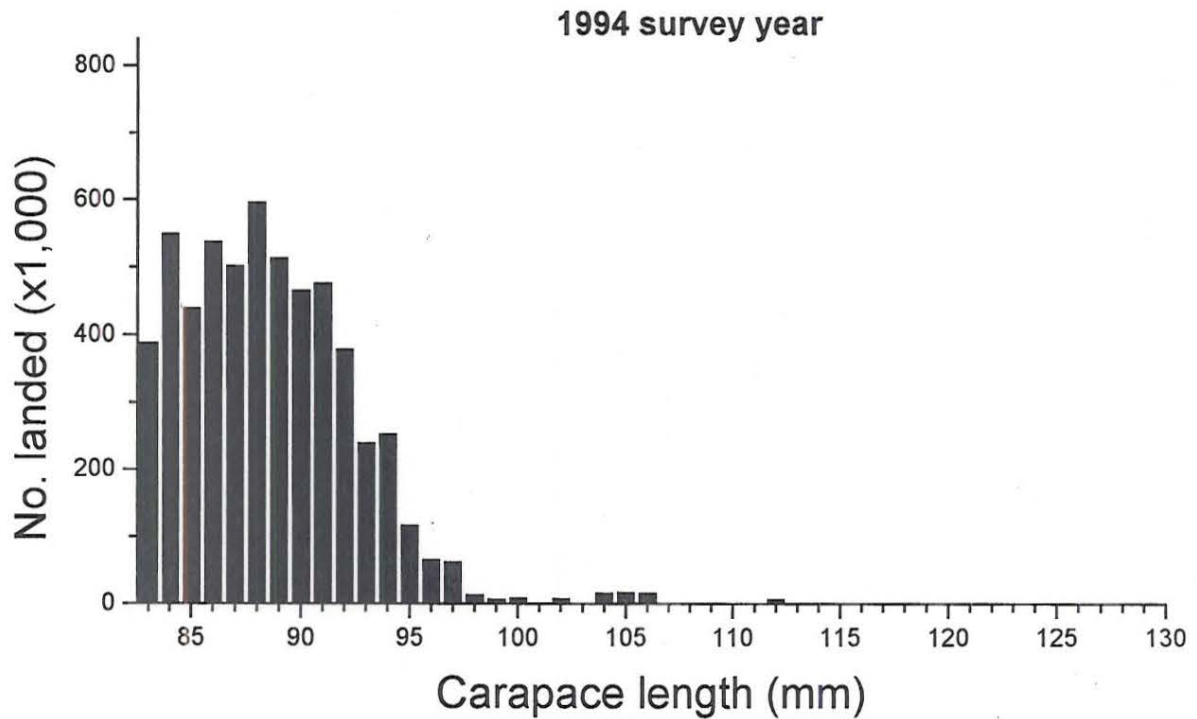
1995 survey year



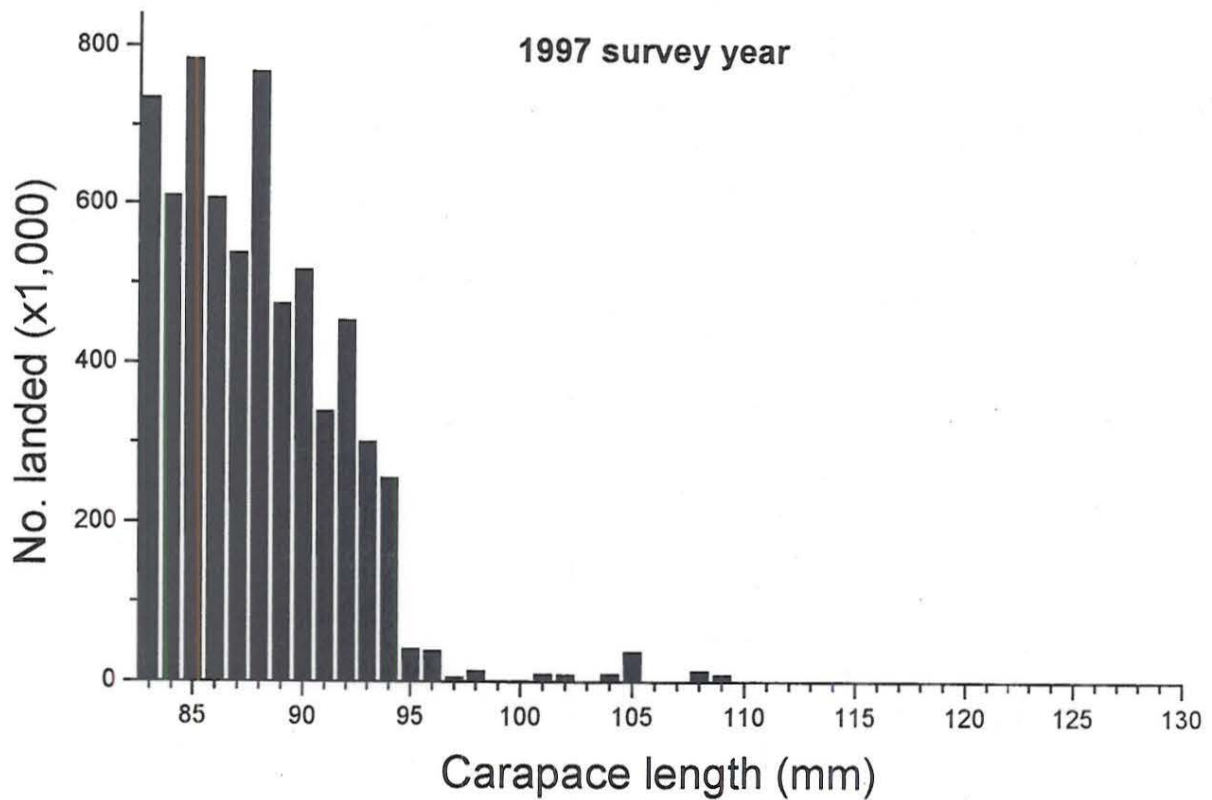
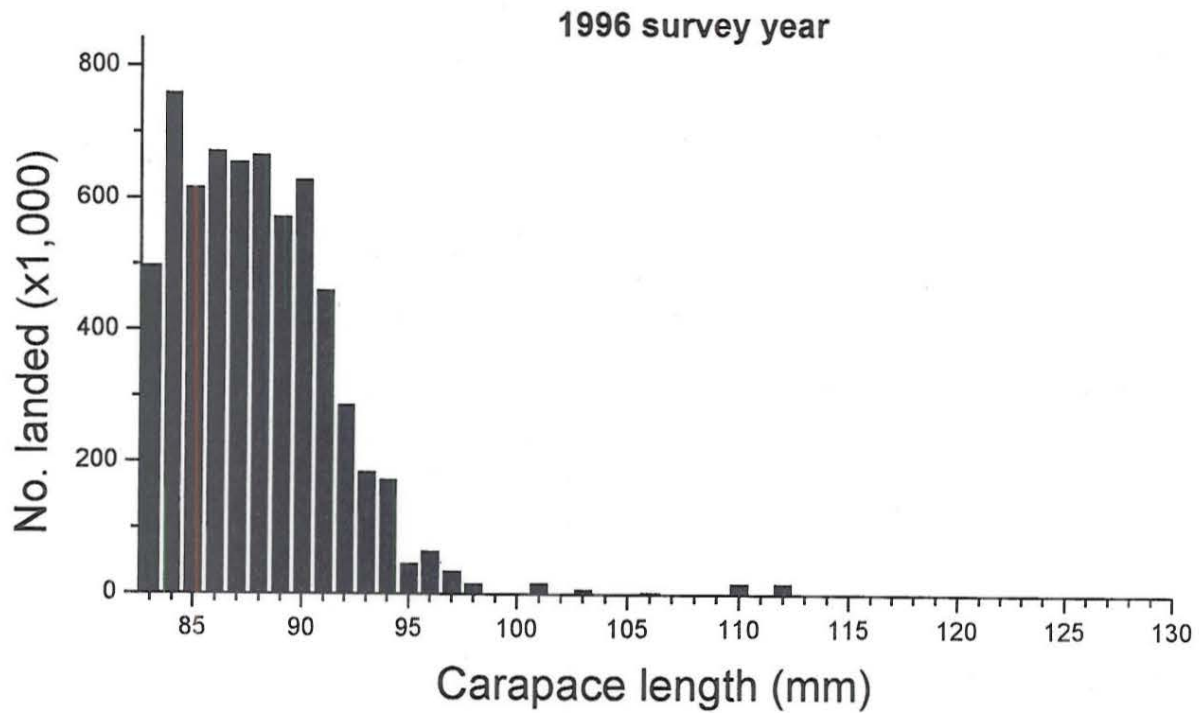
Expanded catch-at-length - Male lobsters
Area 512 (midcoast ME)



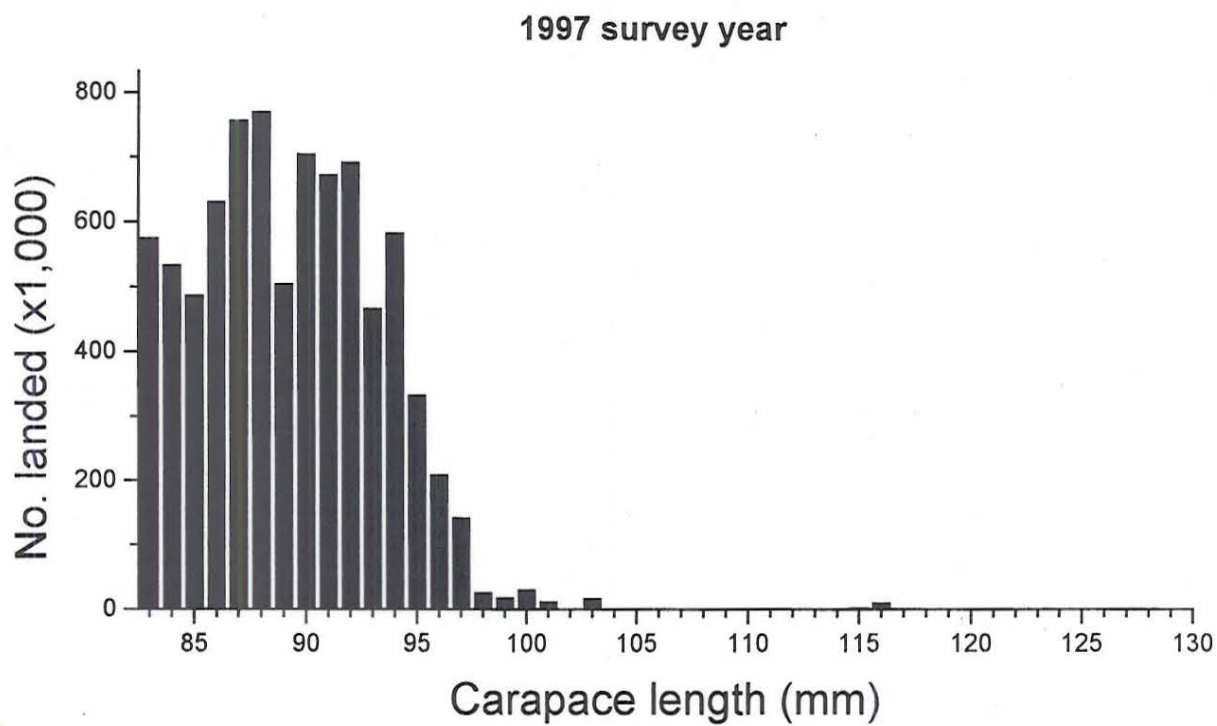
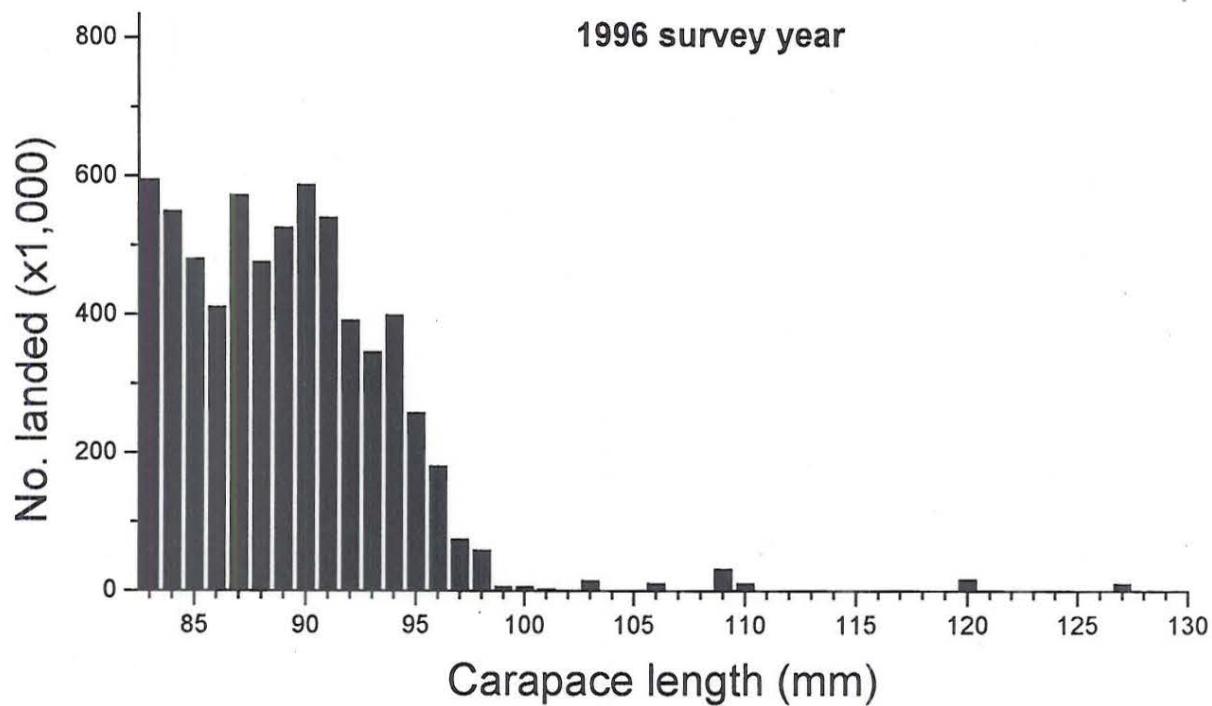
Expanded catch-at-length - Female lobsters
Area 513 (western ME)



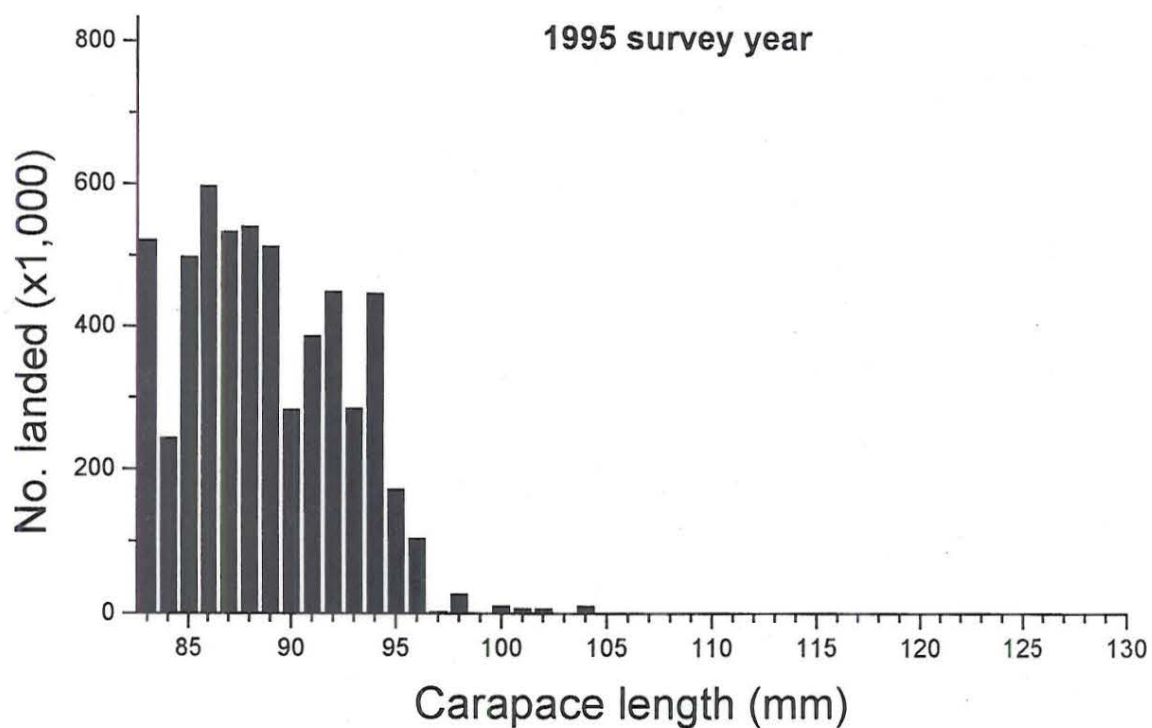
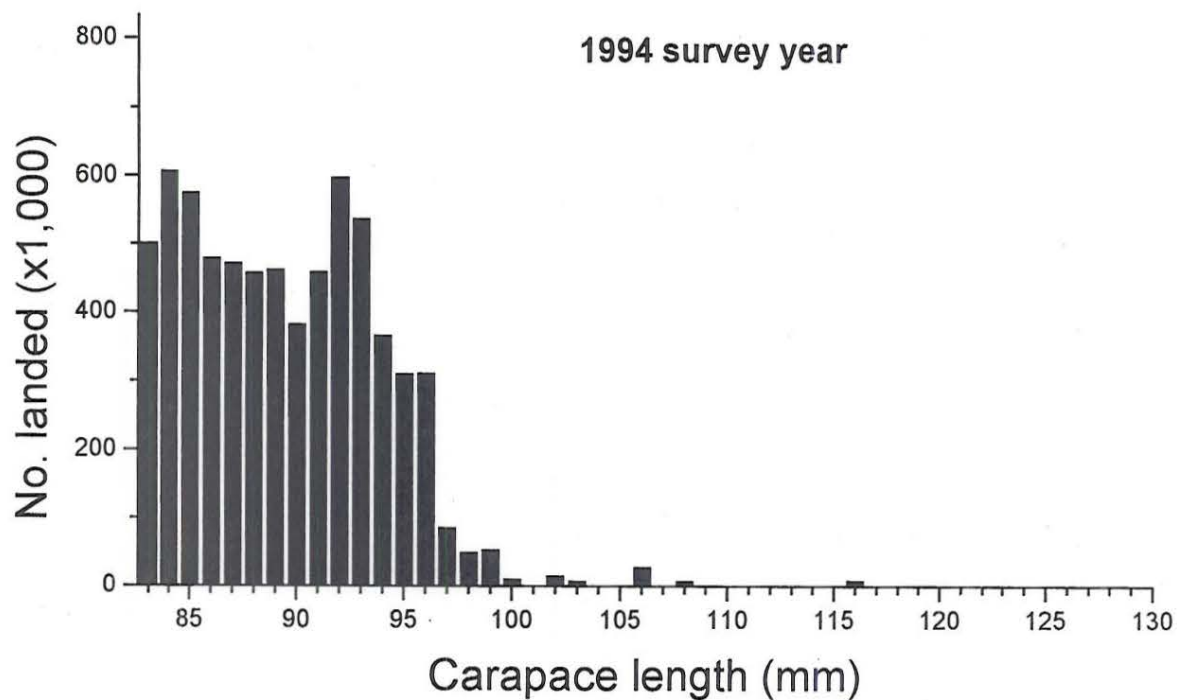
Expanded catch-at-length - Female lobsters
Area 513 (western ME)



Expanded catch-at-length - Male lobsters
Area 513 (western ME)



Expanded catch-at-length - Male lobsters
Area 513 (western ME)



HERRING

HERRING

Resource Monitoring

Sample processing and ageing

Approximately 10,000 sampled herring were processed in 1999, 35% from fishing trips made in 1998 and 65% from 1999 trips. Otoliths were removed from 2,861 fish for ageing purposes. Processing and ageing of the 1998 samples was completed in May. More fish were processed in 1999 because of increased effort to cover more of the herring fishery.

A total of 184 samples comprising 9,157 herring were collected from the 1998 fishery. Figure 1 shows the fishing areas where the samples originated. Otoliths were removed from 2,670 of these fish compared to 3,591 from the 1997 fishing year. There were 216 samples of 11,006 fish collected in 1997. Although, there were thirty-two more samples and 921 more fish aged in 1997 than in 1998 the number of fish age per sample was about the same (17/15). This was because of a change of protocol in selecting herring to be aged from a sample.

Previous to 1998 only a few samples from each week, fishing area and gear (fixed or mobile) stratum were aged. The remaining samples were used for length frequency contributions. In the later compiling of all samples into age length keys there have always been samples where no ageing was done, that had lengths not represented in the resulting keys. This was especially evident where a sample contained either smaller or larger herring than the other samples in the stratum. Also, out of a fifty fish sample a total of twenty to thirty fish were selected for ageing, at least two fish from every centimeter group in the sample. This resulted in a surplus of fish aged in some groups.

To overcome the discrepancy of missing ages for sample lengths and considering personnel and time resource limitations for processing samples it was decided to change the way herring were chosen for ageing. Only two herring from each length group were to be aged in all samples collected. This new protocol resulted in about the same total number of fish being aged as before but with greater coverage over all samples. This change in the ageing protocol has not appeared to have any direct influence in determining length at age. Table 1 shows the comparison of mean lengths at age between 1997 and 1998 by statistical area and month from where the samples were derived. Disregarding any natural change in growth rates between the years most of the mean lengths are comparable. Figure 2 is a comparison of the length at age trends for both 1997 and 1998. Logarithmic regressions were applied to each year's length at age data and inspection of the resulting trend lines and regression coefficients reveal no obvious difference.

Length, weight, and age data generated from the 1998 samples were used to estimate the numbers of herring caught at age by month, gear type, and fishing area. Mean weights at age were calculated and used for stock assessment purposes. The 1999 data will be used for the same purpose once all the 1999 samples and otoliths are processed.

Spawning closures

Examination of adult herring caught in the central Maine coastal area during the 1998 spawning closures revealed that 35% of the adults in the samples were in spawning condition compared to 45% in 1997. This reduction, although, still exceeding the 20% tolerance, was the result of a more conservative approach in protecting spawning herring during the spawning season. The Maine Department of Marine Resources revised its herring spawning closure regulations in 1998 to make enforcement more effective by eliminating individual closed areas and closure dates and extending the prohibition on the landing of spawn herring (subject to a 20% tolerance) caught anywhere in ASMFC management area 1 (Figure 3) over a three month period (August-October) instead of the pre-existing five week time periods. At the same time, a spawn herring was re-defined to include only males or females in maturity stages IV, V and VI (stage III fish, which are in a very early developmental stage, were eliminated). These changes to the state's regulations eliminated the need to monitor changes in the gonado somatic index (GSI) of adult herring for the purpose of closing individual areas on a date when a certain percentage of the females reached a pre-determined mean GSI. Project personnel worked closely with the Bureau of Marine Patrol in developing the new regulations and a protocol that was used to collect and examine samples taken from fishing vessels that continued to fish (for juveniles and spent adults) during the restricted period. Marine Patrol officers were trained in sample collection and processing procedures, especially in how to distinguish spawning herring from non-spawning herring.

Landings data

Landings reports received from Maine canneries and bait dealers during 1998 and the first quarter of 1999 were processed as they arrived at the DMR laboratory and the data entered into Dbase files. This information was combined with vessel trip report data from the NMFS (Gloucester) and a master database of 1998 catch data was created that eliminated any missing or incorrect data in either primary database. Total 1998 Maine landings data were summarized by month, fishing area, and gear type in an annual report (Appendix A) that was completed in March 1999. This report was made available at the 1999 Fisherman's Forum and mailed to herring industry members and other interested parties throughout New England. The Maine landing data was compiled and provided to NMFS office in Portland, Maine for incorporation into their commercial fisheries statistics database. Landings and catch data were also made available to the ASMFC and NEFMC Atlantic Herring Plan Development Team to be included in the Fishery Management Plans that were developed by both organizations during 1998.

Total herring catch from all fishing areas are presented in Table 2 for the completed years 1996 through 1998 and partial 1999. The catches in metric tons are shown for the four management areas (see Figure 3) by month. The 1998 catches by gear, area are presented in Figure 4 and Figures 5 a,b,c are by trimester. The 1998 catch was lower than in the previous two years. This was probably due to a decrease in effort during the August through October period in which the herring spawning regulations were in effect in management area 1. There were about 44,000 mt taken in area 1 in 1998 compared to 68,00 mt in 1997. Also, there were 318 less trips taken in 1998 (total trips = 1331) than in 1997 (total trips = 1681) during the regulated period.

Quarterly catch reports were not compiled and distributed to the industry as planned for the 1999 fishing season. The reporting catch data was slow to arrive and in some cases more difficult to get in 1999 than in past years. The problems in reporting and processing the catch data made the development of the reports difficult.

Voluntary catch reporting

The voluntary automated call-in system (FishFone) that was implemented in 1998 had very few reportings in 1999. This was another indication of the poor catch reporting by the industry. In the late spring of 1999, before the start of the coastal Gulf of Maine fishery, herring fishermen were contacted and again reminded of the FishFone reporting. This reminder did not result in increased reporting. It was decided to abandon the FishFone system and transfer the effort to implementing the NMFS IVR call-in system for the State of Maine. A mandatory call-in system is included in the New England Fishery Management Council's Herring Fishery Management Plan, which is expected to be approved in 1999. The call-in design and protocol, fishermen notification and implementation should be completed by early 2000.

Historical data analysis

Herring catch data was collected in various formats for the years 1960 through 1998. The data back to 1970 has been imported and parsed into a standard data format (dBase). The years 1960 through 1969 still need to be processed. GIS Arcview software was used to develop the various charts, themes and presentations that will be used to display results. The historical herring catch data analysis was not completed in 1999 as planned. With the implementation of the ASMFC Interstate Fishery Management Plan for Atlantic Herring in October, 1998 and the impending NEFMC Atlantic Herring Fishery Management Plan project resources were diverted to bringing Maine herring regulations into compliance with both of these plans. Current Maine herring regulations adopted on August 28, 1999 are shown in Appendix B.

Resource Assessment and Management

1998 catch at age

1998 catch at age estimates were derived from sample data and catch statistics for different fishing areas in the Gulf of Maine, southern New England and the mid-Atlantic area, and Georges Bank using age-length keys and mean weight data from the sample database. Mean weight at age was derived from the "Biostat" runs by fishing areas (Figure 6). The results from weight and numbers at age (Figure 7a & b) show that young adults (age 4) belonging to the 1994 year class dominated the catch in all areas. Figure 6 also shows a large catch of 2 year olds (1996 year class) from the central Maine fishing area. Figure 8 shows the corresponding numbers at age. Older adults (particularly six and seven year olds) were caught primarily in southern New England and the mid-Atlantic region and on Jeffreys Ledge. Overall, the 1994 year class accounted for 47% of the total catch and the 1996 year class was the second largest with 13% of the catch. The 1996 year class has also been shown to be large from the 1999 fall NMFS bottom trawl survey. Table 3 shows the comparison of metric tons of catch at age for fishing regions for years 1996 through 1998.

Virtual population analysis (VPA)

The Gulf of Maine VPA was updated in 2000 incorporating the 1998 catch and catch at age data and will soon add the 1999 data and will not be reported at this time.

Herring Fishery Management

Project personnel participated in the development and implementation of the ASMFC and NEFMC fishery management plans for herring. The results of collected and analyzed catch and sample data plus other relevant biological data were presented to the Plan Development Team, Technical Advisory Committee and the Herring Section and Committee for their consideration.

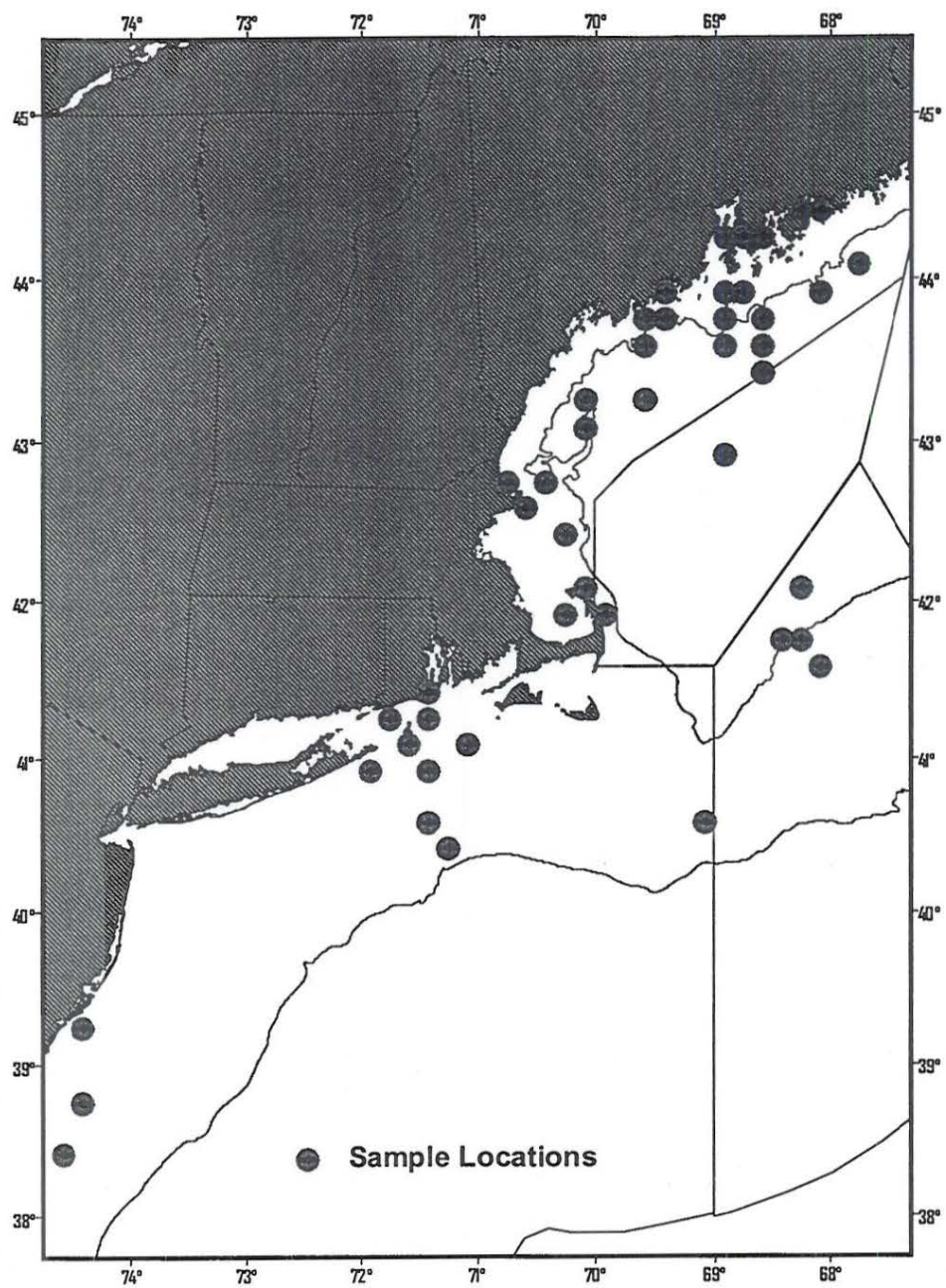


Figure 1. Fishing locations where 184 herring samples originated.

Herring length at age for 1997 & 1998

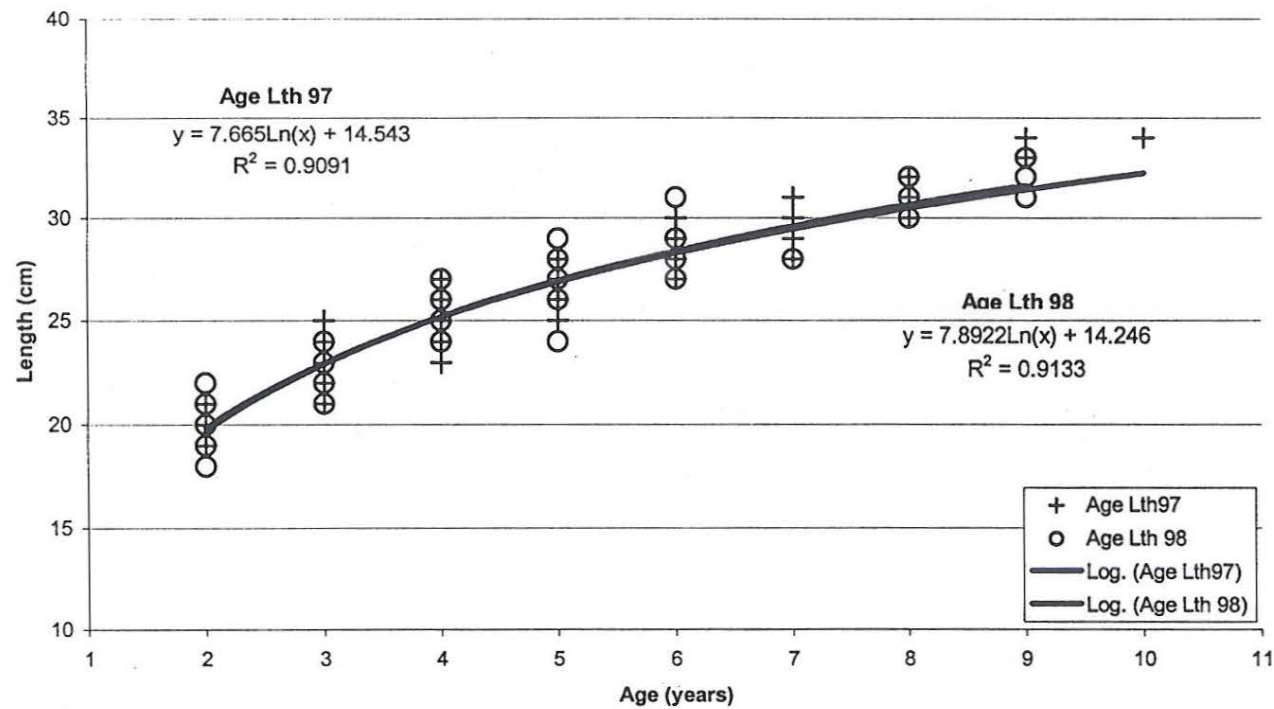


Figure 2. Comparison of length at age trends for 1997 and 1998.

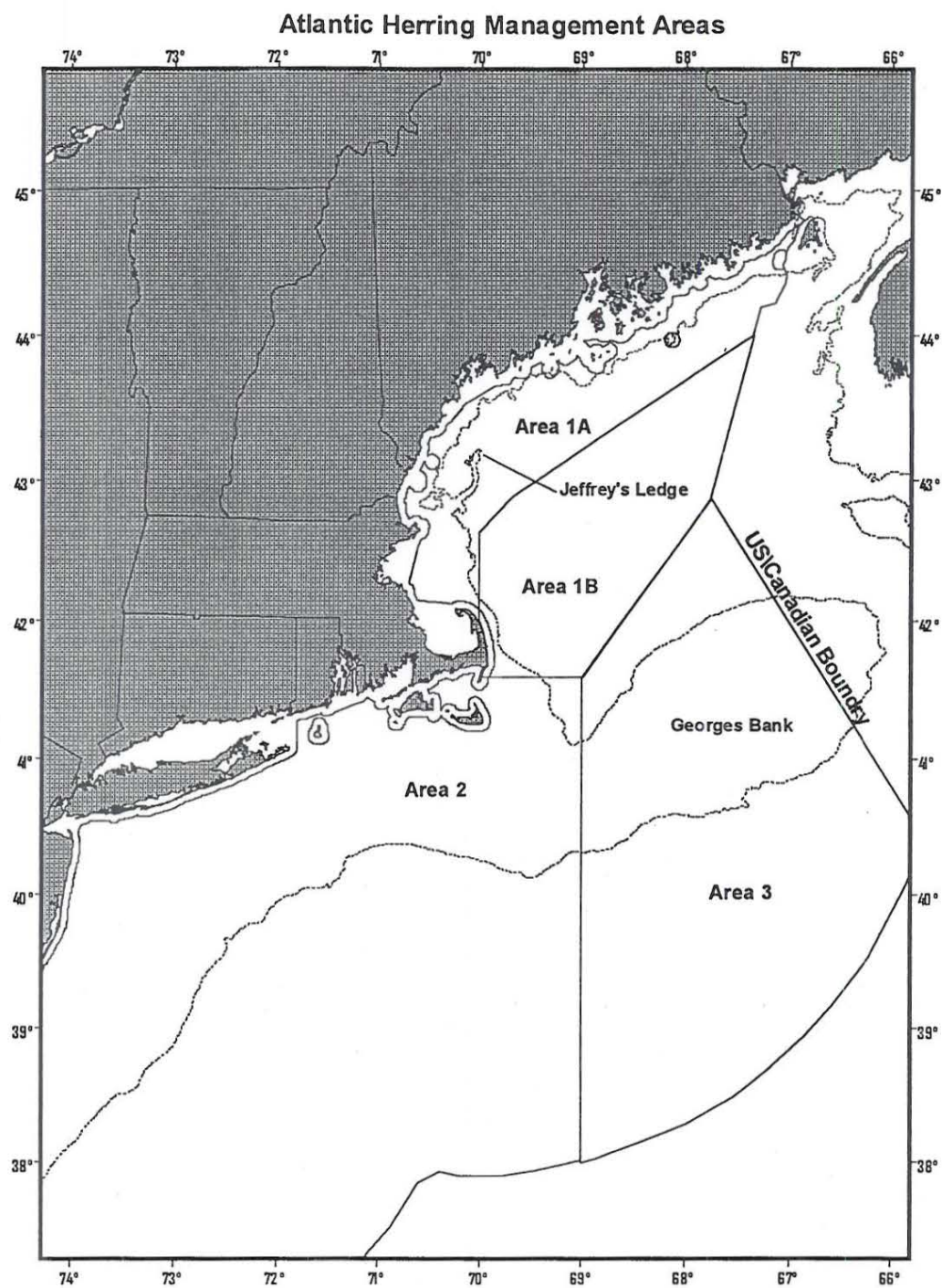


Figure 3. Herring management areas.

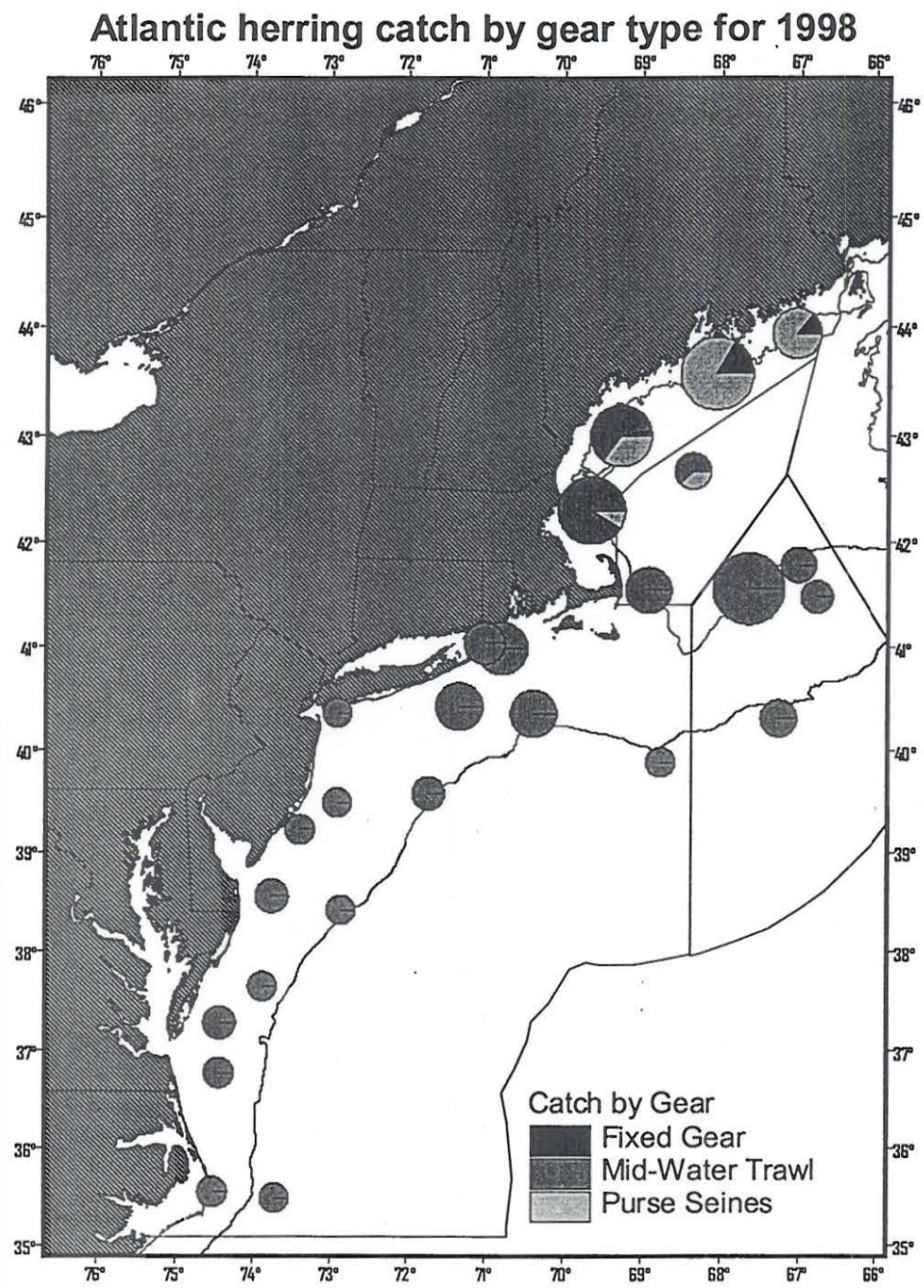


Figure 4. Herring catch for 1998 by gear and area.

Atlantic herring catch by gear for January-April 1998

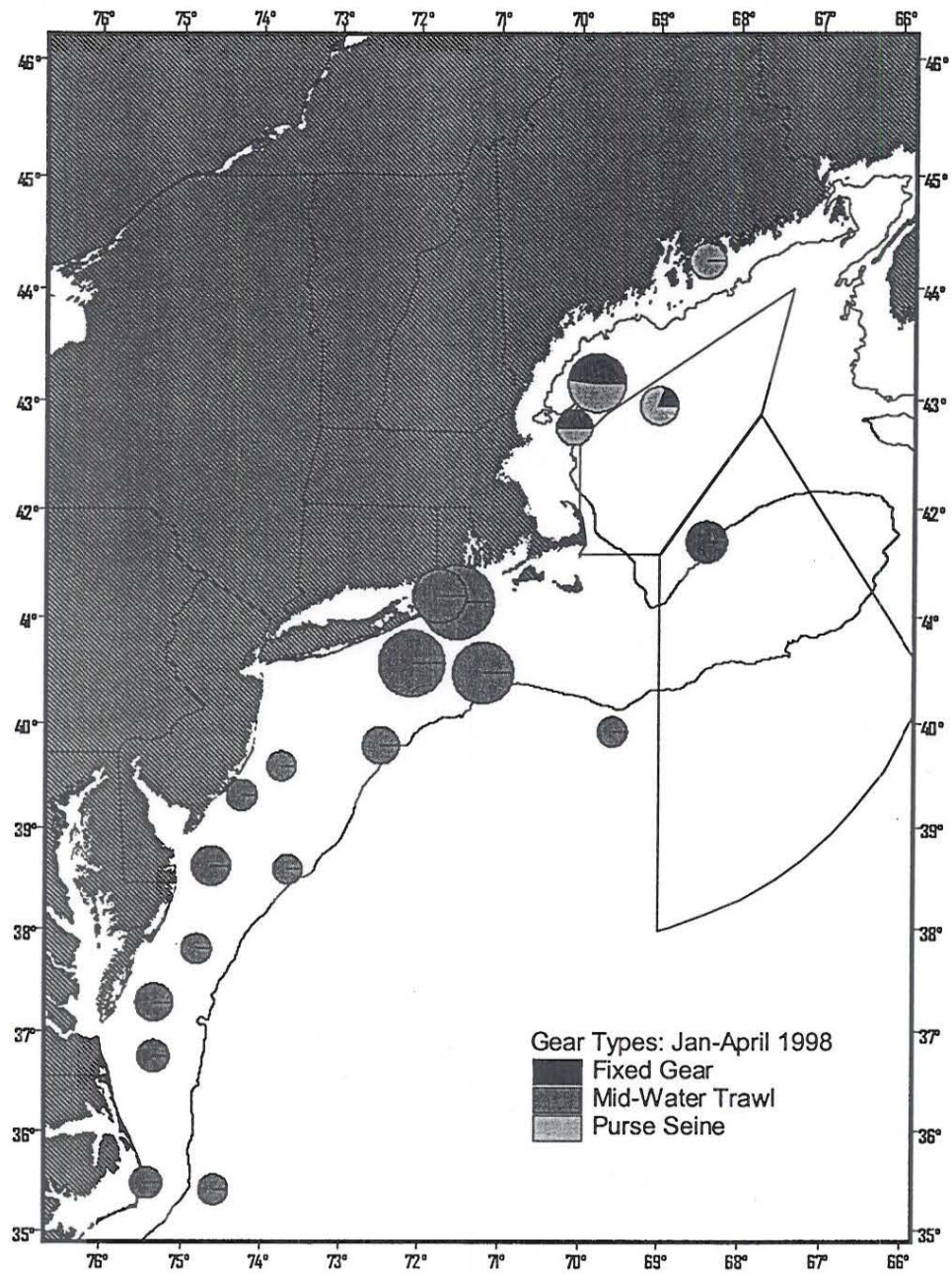


Figure 5 a. Herring catch for 1998 by gear and area for January through April.

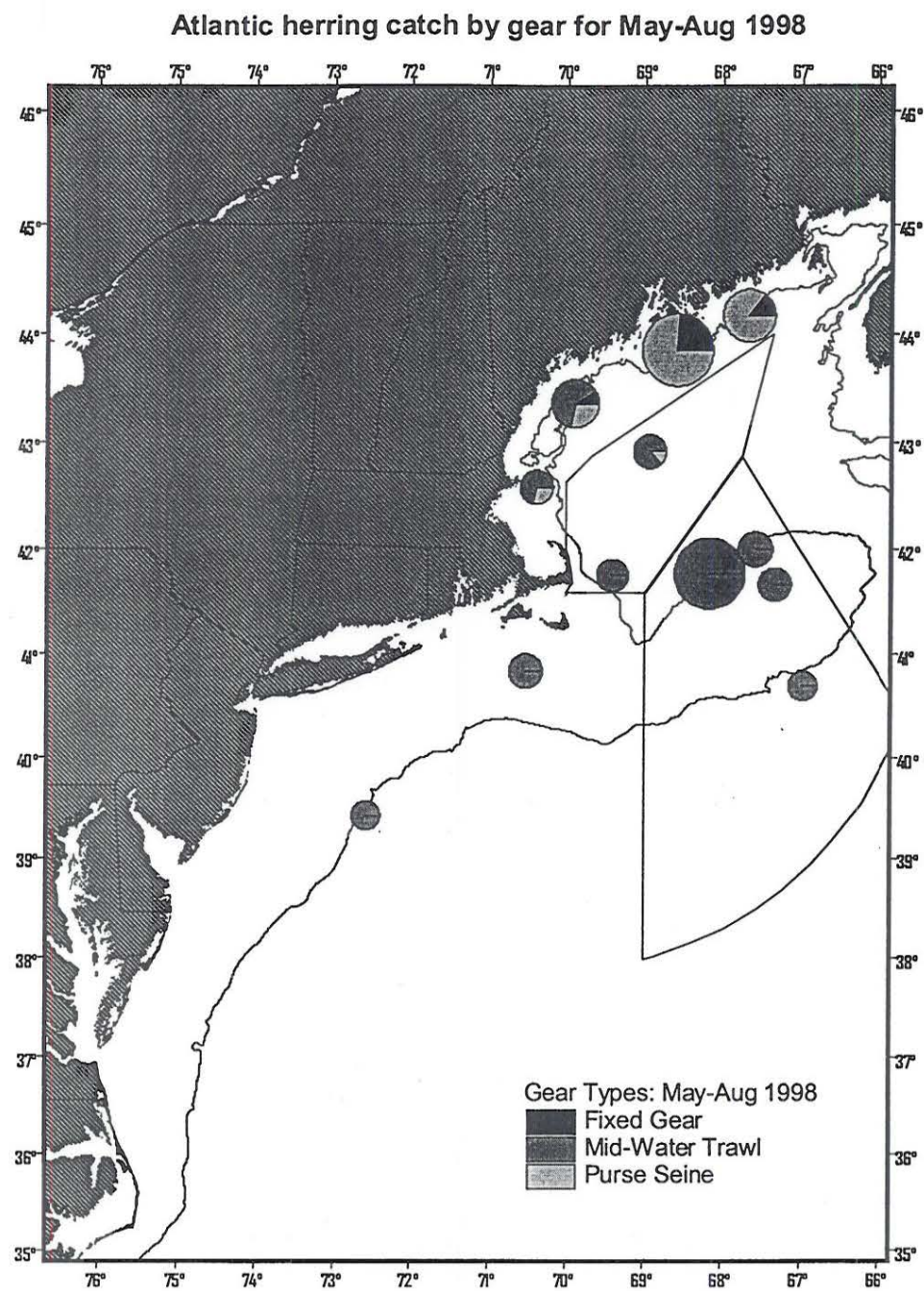


Figure 5 b. Herring catch for 1998 by gear and area for May through August.

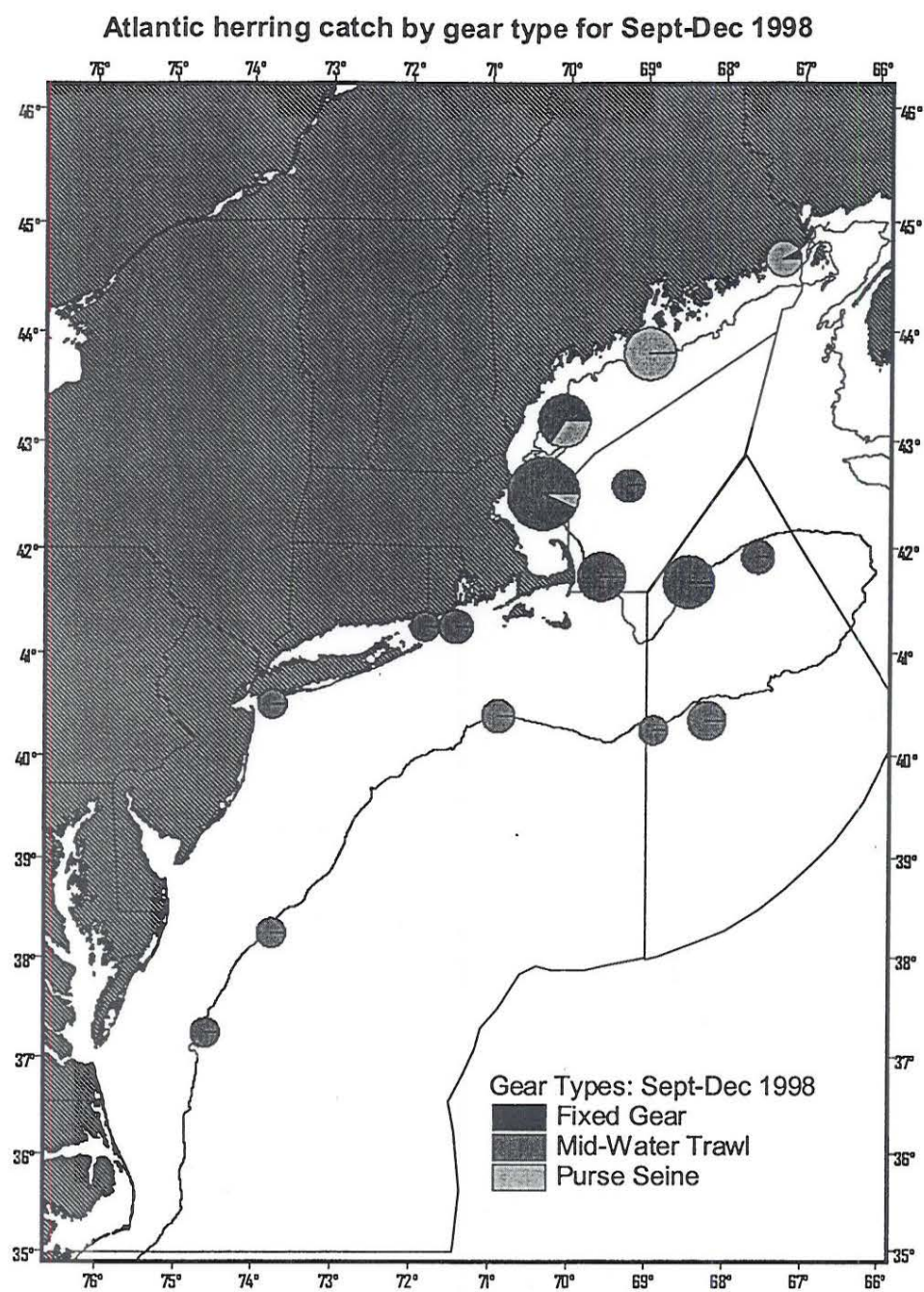


Figure 5 c. Herring catch for 1998 by gear and area for September through December.

1998 Mean Weight at Age

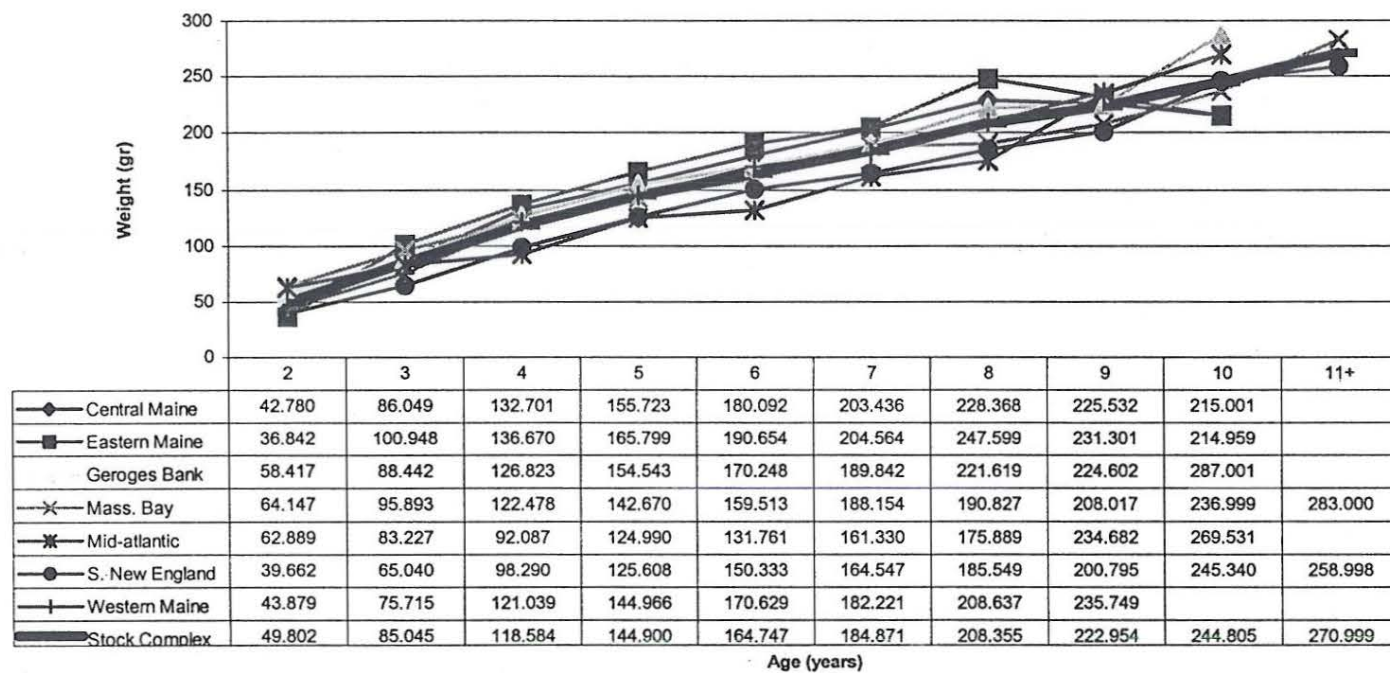
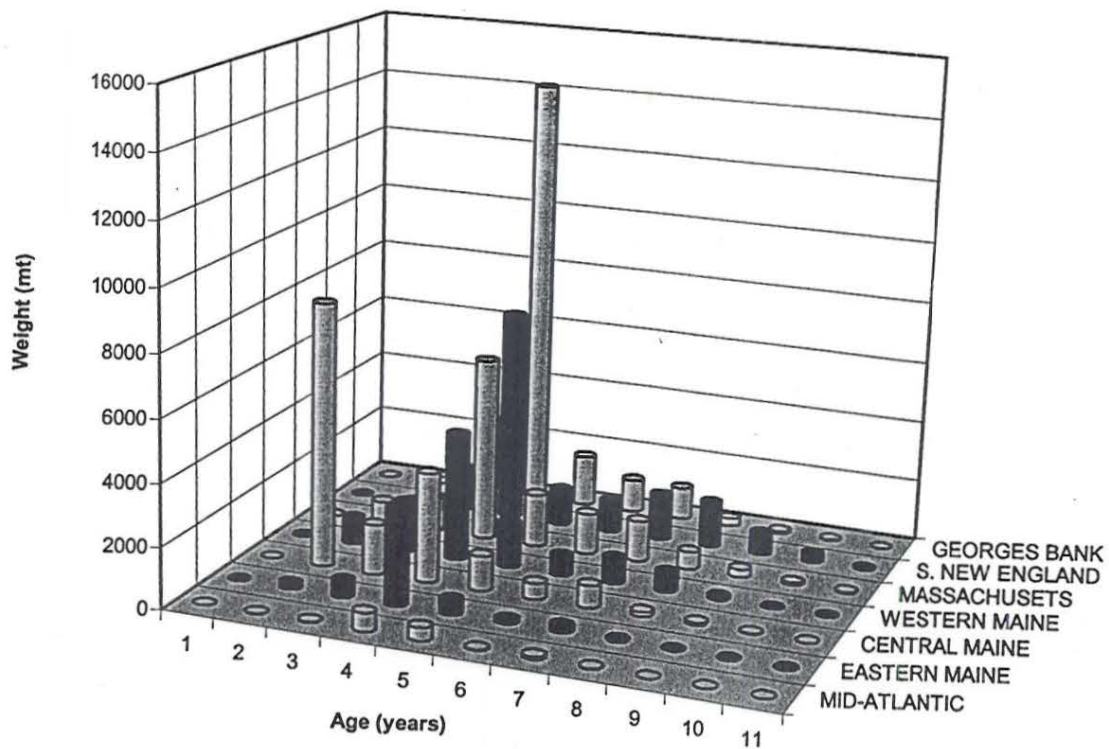


Figure 6. Mean weight at age by fishing areas for 1998.

a



b

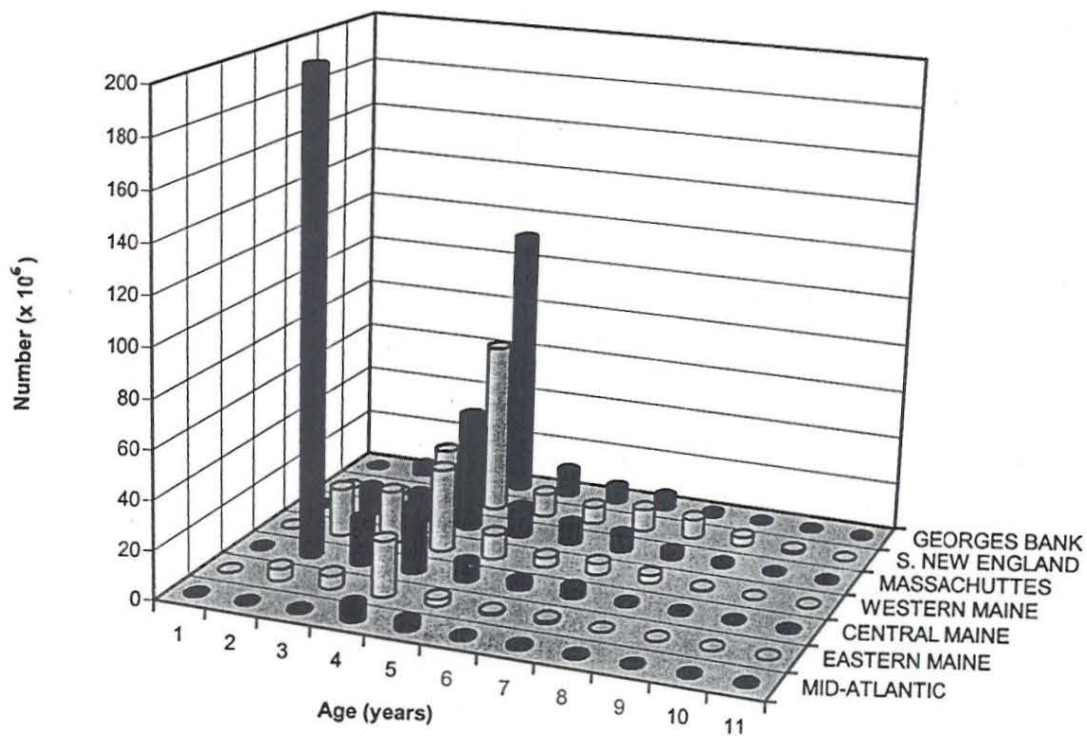


Figure 7 a & b. Weight (a) and numbers (b) at age for the different fishing regions for 1998.

STAREA	MONTH	YEAR	2	3	4	5	6	7	8	9
511	10	1997	193.2	231.0	261.5	272.3	281.0	304.0	304.0	
		1998	178.6	245.7	265.5	280.0	292.5	298.5	307.0	
512	6	1997	188.0	224.4	253.0	267.5	280.5	289.7	300.7	
		1998	168.7	225.4	253.4	267.2	287.4	294.1	305.7	
	7	1997	189.7	228.7	255.1	272.0	287.5	298.3	306.3	
		1998	198.9	225.8	257.5	273.9	283.1	295.7	303.0	
	10	1997	194.6	232.5	260.8	276.0				
		1998	198.3	233.8	252.0	253.0				
513	4	1997		218.4	247.1	268.5	277.6	289.5	302.5	320.0
		1998		208.3	243.7	258.9	271.6	289.2	298.3	308.5
	5	1997		218.8	251.1	266.4	280.9	295.2	309.4	
		1998		239.5	249.3	263.4	276.0	288.2	296.0	
	8	1997	203.5	233.0	260.2	273.8	286.1	297.7	310.0	338.5
		1998	203.2	230.6	258.3	272.3	294.8	284.0	312.3	325.3
	9	1997	197.9	230.9	257.4	274.0	281.2	294.8	305.0	
		1998	195.0	234.4	261.1	271.5	283.3	297.8	308.8	
	10	1997	215.5	235.2	261.5	272.3	284.0	298.3	309.7	331.4
		1998	197.6	238.8	255.4	275.2	287.5	298.2	332.0	332.0
	11	1997	212.8	236.1	257.5	274.3	287.7	299.5	303.8	
		1998		210.0	240.4	256.9	279.0	290.0	287.5	299.0
	12	1997		244.0	262.0	273.0	290.3	302.5	316.0	
		1998		237.6	258.1	275.1	291.6	297.8	315.5	
514	9	1997		240.6	259.5	276.6	286.3	298.7		
		1998		240.2	256.1	273.7	284.8	295.4		
	10	1997		241.1	260.8	272.2	285.0	294.4		
		1998		240.0	256.3	269.9	282.3	297.4		
515	6	1997		235.3	255.8	270.0	280.0			
		1998		213.1	249.2	258.5	272.7			
522	6	1997	212.0	226.5	250.9	270.2	275.0	288.1		
		1998	187.6	220.4	250.9	266.9	280.5	286.0		
	7	1997	200.9	229.1	257.5	272.8	286.8	292.0	294.0	
		1998	202.0	228.2	250.5	270.0	271.0	288.5	289.0	
	10	1997		235.5	257.7	267.7	283.6	297.2	303.8	337.0
		1998		240.5	254.7	271.6	283.9	297.3	304.0	305.0
539	1	1997		211.0	247.0	261.0	287.0	297.8	303.0	
		1998		204.0	237.6	261.0	269.8	286.2	292.4	
	2	1997		210.9	246.2	263.0	278.8	290.8	329.0	
		1998		207.0	241.5	264.0	280.8	285.0	300.4	

Table 1. Comparison of mean lengths at age for 1997 – 1998 by statistical area.

1999 Herring catch (mt) - Management area by month *

1999		Month											
Mgt Area	1	2	3	4	5	6	7	8	9	10	11	12	Total
1A	628		54	3264	4327	7639	11349	7795	8725	4981	7508	4653	60923
1B	272				181	48			113	731	106		1451
2	7179	7636	3017	388	9	4	34	136			4	524	18930
3		143	272	999	154	1392	220	92	1025	994			5292
Total	8080	7779	3344	4651	4671	9082	11603	8023	9864	6706	7617	5177	86596

* uncompleted catch data

1998		1998 Herring catch (mt) - Management area by month											
		Month											
Mgt Area	1	2	3	4	5	6	7	8	9	10	11	12	Total
1A		193		2705	3831	4014	7200	4092	5101	5973	6004	4473	43586
1B				392		166	154	112	186	535	1399	871	3815
2	5965	6568	2167	160	187	202	161		237	246	222	126	16242
3				523	487	3630	3988	3845	3267	1610	465	144	17959
Total	5965	6761	2167	3779	4505	8012	11503	8049	8792	8364	8091	5614	81601

1997		1997 Herring catch (mt) - Management area by month											
		Month											
Mgt Area	1	2	3	4	5	6	7	8	9	10	11	12	Total
1A		6		2801	3302	5885	10311	12530	12841	11647	7303	983	67608
1B				118	295	500	556	1091	3	94	316		2972
2	7229	4713	3841	615	5					500	102	4443	21448
3			34		839	948	2581		213	778			5393
Total	7229	4719	3875	3534	4441	7333	13448	13621	13057	13018	7721	5426	97422

1996		1996 Herring catch (mt) - Management area by month											
		Month											
Mgt Area	1	2	3	4	5	6	7	8	9	10	11	12	Total
1A		19		1613	6785	8155	10675	10037	14383	11597	9684	238	73186
1B				195	1897	2405	192	3536	30	16	477		8746
2	8088	3798	3791	1257	345	21				50	1790	4748	23888
3			29						612	1047			1688
Total	8088	3817	3820	3065	9027	10581	10867	13573	15025	12709	11951	4986	107508

Table 2. Herring catch by month and management area for 1996 – 1999.

Catch at Age Analysis

Metric tons of herring caught by age and region
1995-1998

Age	Region	1995	1996	1997	1998	1995-1998 Combined
1	Massachusetts Bay					
	S.New England/Mid-Atlantic					
	Central Maine					
	W.Maine/Jeffreys Ledge			22		22
	Georges Bank*					
2	Massachusetts Bay	407	1,635	786	726	2,827
	S.New England/Mid-Atlantic	36	1,942	29	23	2,007
	Central Maine	9,633	9,128	3,640	8553	22,400
	W.Maine/Jeffreys Ledge	1,483	5,403	750	877	7,636
	Eastern Maine				177	177
	Georges Bank*			139	233	139
	Subtotals:	11,558	18,108	5,343	10590	35,186
3	Massachusetts Bay	735	594	4,447	1118	5,775
	S.New England/Mid-Atlantic	413	1,718	7,650	1494	9,781
	Central Maine	5,395	4,648	20,749	1636	30,792
	W.Maine/Jeffreys Ledge	2,494	5,181	8,762	1653	16,436
	Eastern Maine				538	538
	Georges Bank*			4,570	2576	4,570
	Subtotals:	9,036	12,141	46,177	9016	67,892
4	Massachusetts Bay	423	363	545	5978	1,331
	S.New England/Mid-Atlantic	789	1,792	2,308	7528	4,889
	Central Maine	1,809	1,642	3,902	3574	7,352
	W.Maine/Jeffreys Ledge	1,736	3,805	1,948	4161	7,489
	Eastern Maine				3129	3,129
	Georges Bank*			673	14160	673
	Subtotals:	4,756	7,602	9,376	38531	24,864
5	Massachusetts Bay	1,064	329	374	1722	1,767
	S.New England/Mid-Atlantic	977	2,613	1,862	1613	5,452
	Central Maine	586	1,343	1,901	1136	3,830
	W.Maine/Jeffreys Ledge	2,438	6,794	2,131	1480	11,363
	Eastern Maine				463	463
	Georges Bank*			186	1676	186
	Subtotals:	5,064	11,079	6,455	8090	23,061
6	Massachusetts Bay	1,550	430	651	1334	2,631
	S.New England/Mid-Atlantic	2,726	8,716	3,314	1070	14,756
	Central Maine	1,191	1,768	1,573	515	4,532
	W.Maine/Jeffreys Ledge	7,092	17,539	4,810	659	29,441
	Eastern Maine				116	116
	Georges Bank*			292	1096	292
	Subtotals:	12,560	28,453	10,638	4790	51,767
7	Massachusetts Bay	1,068	334	889	1334	2,292
	S.New England/Mid-Atlantic	3,691	5,033	4,474	1594	13,198
	Central Maine	1,742	1,603	1,560	723	4,905
	W.Maine/Jeffreys Ledge	8,767	11,491	5,991	846	26,249
	Eastern Maine				219	219
	Georges Bank*			239	1059	239
	Subtotals:	15,268	18,461	13,153	5776	47,101
8	Massachusetts Bay	693	52	120	569	864
	S.New England/Mid-Atlantic	2,062	1,273	1,071	1511	4,406
	Central Maine	1,145	752	732	141	2,629
	W.Maine/Jeffreys Ledge	6,891	3,623	1,527	637	12,041
	Eastern Maine				29	
	Georges Bank*			133	254	133
	Subtotals:	10,790	5,700	3,582	3141	20,073
9	Massachusetts Bay	173	13	21	244	207
	S.New England/Mid-Atlantic	812	256	145	704	1,213
	Central Maine	567	73	66	72	706
	W.Maine/Jeffreys Ledge	2,324	1,123	374	109	3,822
	Georges Bank*			31	67	31
	Subtotals:	3,876	1,465	637	1196	5,978
10	Massachusetts Bay	49			83	49
	S.New England/Mid-Atlantic		44		258	44
	Central Maine	29	31		17	60
	W.Maine/Jeffreys Ledge	792	470	8		1,270
	Georges Bank*				37	
	Subtotals:	869	545	8	396	1,423
11+	Massachusetts Bay	26		32	34	58
	S.New England/Mid-Atlantic				41	
	Central Maine	41				41
	W.Maine/Jeffreys Ledge	172	48			220
	Georges Bank*					
	Subtotals:	239	48	32	75	319
Yearly Totals:		74,016	103,602	95,424	81,601	273,042

* Georges Bank data for 1997 and 1998 only.

Table 3. Catch at age by regions for 1996 - 1998.

Appendix A

1998 MAINE HERRING FISHERY STATISTICS

Compiled by:

Barbara Scully
David Libby
David Stevenson
Eileen Brewer
Lisa Pinkham

Bureau of Resource Management
Assessment and Statistics Division
Maine Department of Marine Resources
Fisheries Research Laboratory
West Boothbay Harbor, Maine 04575

April 1999

Maine Herring Fishery Statistics

Collection and tabulation of Maine herring landings and catch data were performed by the Maine Department of Marine Resources (MDMR) from 1947 until 1985. After that time, the duties were assumed by the U.S. National Marine Fisheries Service (NMFS) until they were once again taken over by the MDMR in 1990. The primary data that are recorded include landing date, quantity landed, gear type, name of the vessel and fishing location. In some cases this information is provided by fishermen who sell bait directly to other fishermen or by bait dealers who purchase herring from fishermen. The canneries provide detailed information for herring that arrives at the plants which includes point of origin (port of landing), method of transport (truck or boat), name of vessel, gear type, date of catch, quantity landed, quantity transferred to other plants for processing and/or quantity discarded (because of poor quality) and method of processing (bait or canned). Data from dealers is forwarded directly to the Maine DMR. Data from the canneries are either sent directly to the MDMR or first to the Maine Sardine Council which sends them on to the MDMR. Additional landings data are provided by NMFS port agents in Portland and Rockland. Information on Internal Waters Processing operations are provided by the trading companies. Records of herring transfers at sea are provided by the Canadian company that purchases and processes the fish. Landings data compiled by the MDMR are made available at the end of the year to the NMFS for entry into the NMFS commercial fishery dealer data base.

This report includes detailed information on catches by area, month and gear type for three different sectors of the fishery: domestic or shoreside landings, Internal Waters Processing (IWP) operations, and at-sea transfers of herring caught in U.S. waters to Canadian carriers which land in Canadian ports. IWP operations refer to herring caught by U.S. fishermen which are processed aboard foreign-owned processing ships anchored in Maine state internal waters. Throughout the report, a distinction is made between landings and catches. Landings refer to fish landed in Maine ports, regardless of where they are caught. Detailed information showing the month of capture, gear used, and fishing location describes when, how, and where the herring landed in Maine ports during 1998 was captured. Some of the information (e.g., total domestic landings, IWP landings, at-sea transfers, domestic landings by gear type, and domestic plus IWP landings by catch location) is presented historically, with records going back to 1947 or to the 1880's and 1890's. There is also some additional historical information in the last two tables which summarizes cannery production and product utilization. Gear types are categorized as "fixed" and "mobile" where fixed refers to weirs (pound nets) and stop seines and mobile refers primarily to purse seines and mid-water trawls. Stop seines are used to "stop off" a school of herring that enters a bay or cove.

Landings data are recorded and analyzed for the fishing locations shown on the map on the last page. These data are subsequently combined into several major areas for presentation in this report: western (513), central (512), and eastern (511) coastal Maine (inside 3 miles), western (513), central (512) and eastern (511) Maine offshore areas, Jeffreys Ledge and Massachusetts Bay (514, 521), Offshore Gulf of Maine (515), Georges Bank (522, 561, 562, 525), and New Brunswick.

SUMMARY OF 1998 MAINE LANDINGS AND CATCH STATISTICS

Shoreside landings of Atlantic herring to domestic markets in 1998 totalled 29,264 metric tons (mt). Maine herring landings in 1998 represented 36% of total U.S. landings for the year (81,601 mt), with 41% in Massachusetts and 20 % in Rhode Island, in sharp contrast to 1997 when Maine landings represented more than half of the total U.S. landings for the species. As in past years, the primary markets for herring landed in Maine ports were for canned products and lobster bait.

Herring caught in Maine waters, transferred at sea and landed in Canada (trans-shipments) totaled 1093 mt for 1998. This represented a decrease of 2597 mt from the 1996 record high, a 70% reduction in Canadian trans-shipments over the last 2 years. There were no Maine Internal Waters Processing (IWP) landings in 1998.

The total reported catch of herring, including Maine domestic landings and at-sea trans-shipments to Canada, was 30,357 mt in 1998 compared to 53,321 in 1997, a decrease of 22,964 mt. While the total U.S. Atlantic herring catch was 14,519 mt less than in 1997, the drop in landings was hardest felt in Maine, where the catch decreased by 43%. The decrease in the Maine catch for 1998 was fueled by the lack of herring moving into traditionally productive fishing grounds of Western and Central Maine.

Central and Eastern coastal Maine had a stronger fixed gear fishery in 1998 than has been seen in years. The herring fishery in Maine has been almost strictly a mobile gear fishery since 1982 when fixed gear accounted for 45 % of total landings. The fixed gear catch for 1998 was 2,699 mt, the highest reported fixed gear total in 5 years. Representing 9 % of the total Maine catch for 1998, the fixed gear fishery played an important role in a year which saw herring in high demand. The fixed gear contribution to the 1997 Maine catch, for comparison, was 214 mt, or less than 1% of the total. Fixed gear accounted for 100 % of the 1093 mt Canadian trans-shipment total in 1998, whereas mobile gear had provided at least 97 % of the herring involved in trans-shipments in the previous 3 years, from 1995-1997. Although the total Maine catch for 1998 is significantly lower than that of 1997 in total tonnage, the percentage of that total contributed by each of the mobile gear types remains relatively proportionate. Trawls accounted for 6,578 mt, or 22 % of the total Maine catch in 1998, essentially unchanged from their 20% contribution for 1997. Purse seines continued to account for most of the total Maine catch in 1998 with 21,079 mt (69 %).

The trend of declining catches from western coastal Maine waters which was seen in 1997 continued in 1998, down a startling 92% from 1996. The catch in central coastal Maine waters was also down a significant 43% from 1997. The catch from eastern coastal Maine waters was up slightly in 1998, increasing by 307 mt from 1997. Catch for all inshore Maine waters combined (12,841 mt), decreased by 55 % from 1997, and accounted for only 42 % of the total catch, continuing to reflect the trend of increasing use of offshore fishing grounds to target the species. Total catch from all offshore fishing grounds combined averaged only 4 % from 1992-1994, 20 % from 1995-1996, and 38% in 1997. Catch for all offshore fishing grounds combined and landed in Maine (14,373 mt), accounted for 47% of the total Maine herring catch for 1998. Maine landings from herring caught on 'Offshore Maine' fishing grounds (including Schoodic Ridge, Platts

Bank, Skate Bank, Newfound Ground and Outer Falls) was 11,112 mt in 1998, a decrease of 41% from 1997. Maine herring catch from 'Offshore Gulf of Maine' (Cashes Ledge, Fippennies Ledge) and Georges Bank fishing grounds was 3,261 mt in 1998, a 208% increase over corresponding 1997 landings (1058 mt). The reported Maine catch from Jeffreys Ledge and other areas in Massachusetts Bay declined significantly in 1997 to less than 5,000 mt, and declined even further in 1998 to 3,144 mt, a 75% decrease from the 1993-1996 period when the Maine catch from that area averaged 12,639 mt. Most of the herring caught on Jeffreys Ledge, Georges Bank and 'Offshore Gulf of Maine' fishing grounds in 1998 were landed in Massachusetts.

The Maine herring fishery had an atypical year in 1998, with a brief and modest peak during the month of July followed by a steady decline. Typical peak months for the Maine domestic herring fishery are July through October. Eastern and western coastal Maine catches were consistently low throughout 1998 with no defined peaks. Maine landings for central coastal Maine and offshore Maine were highest in July, while Maine landings from offshore Gulf of Maine areas were highest in April.

Purse seiners accounted for 100 % of the Maine herring catch from offshore eastern and central Maine waters. Vessels fishing on offshore grounds in eastern Maine had their highest catch in July, when they landed over 68% (2676 mt) of the total for the year from that area. Vessels fishing on offshore grounds in central Maine had an unremarkable year, with their highest monthly catch (1712 mt) in May. The month of May also yielded the largest monthly catch (1188 mt) for offshore western Maine waters, and for herring landed in Maine from the Jeffreys Ledge/Massachusetts Bay vicinity (940 mt). Purse seiners caught 97% of the herring landed from 'Offshore Maine' areas in 1998, accounting for 10,772 mt of the 11,112 mt total for the year, while mid-water and pair trawls accounted for 91 % of the 'Offshore Gulf of Maine' and Georges Bank herring landed in Maine.

Over 18,000 mt of herring were caught on Georges Bank this year, most of which were landed in Massachusetts from June through September. A strong fall and winter fishery on Jeffreys Ledge and in Massachusetts Bay also contributed an additional 20,000 mt to Massachusetts ports during the final months of 1998, bringing a strong finish to the U.S. Atlantic herring fishery of 1998, despite the decreased contribution from Maine landings.

Table 1
MAINE DOMESTIC HERRING LANDINGS¹
(metric tons)

Year	Total Maine Landings	Year	Total Maine Landings	Year	Total Maine Landings
1880	15,738	1940	17,244	1986	16,264
-	-	1941	32,931	1987	20,376
1887	15,277	1942	42,637	1988	16,575
1888	18,508	1943	25,941	1989	15,630
1889	14,586	1944	37,244	1990	22,398
-	-	1945	41,999	1991	24,572
1892	18,446	1946	36,337	1992	27,848
-	-	1947	65,486	1993	34,741
1897	51,079	1948	76,437	1994	35,124
1898	82,673	1949	74,029	1995	39,503
1899	56,086	1950	90,557	1996	48,517
1900	44,068	1951	34,411	1997	52,041
1901	67,390	1952	79,139	1998	29,264
1902	55,967	1953	58,337		
1903	55,549	1954	64,067		
1904	73,642	1955	43,506		
1905	78,694	1956	66,494		
1906	71,615	1957	68,623		
1907	27,649	1958	80,759		
1908	30,940	1959	53,037		
1909	49,716	1960	59,348		
1910	52,399	1961	24,131		
1911	79,466	1962	69,376		
1912	62,138	1963	66,895		
1913	17,772	1964	26,295		
1914	59,743	1965	32,088		
1915	-	1966	26,177		
1916	93,935	1967	28,576		
1917	-	1968	31,072		
1918	-	1969	23,852		
1919	39,453	1970	15,617		
-	-	1971	12,960		
1924	21,741	1972	20,271		
-	-	1973	16,886		
1928	29,341	1974	21,499		
1929	41,668	1975	17,348		
1930	33,541	1976	31,858		
1931	25,301	1977	33,135		
1932	14,510	1978	30,341		
1933	19,856	1979	40,540		
1934	-	1980	48,912		
1935	23,107	1981	51,976		
1936	-	1982	24,453		
1937	22,658	1983	19,824		
1938	7,283	1984	21,720		
1939	31,572	1985	14,657		

¹ Maine landings include all herring caught in Maine territorial waters, plus any herring caught in other state or federal waters and brought to Maine by boat. "Domestic" landings exclude herring processed aboard foreign-owned ships operating in Maine's internal waters and herring transferred at sea to Canadian carriers.

Table 2
MAINE IWP HERRING LANDINGS
(metric tons)

Year	Total
1987	300
1988	0
1989	3491
1990	0
1991	2918
1992	3339
1993	6647
1994	2849
1995	8776
1996	3767
1997	0
1998	0

Table 3
U.S. GULF OF MAINE HERRING CATCHES TRANSFERRED
AT SEA AND LANDED IN CANADA* (TRANS-SHIPMENTS)
(metric tons)

Year	Total
1987	791
1988	186
1989	118
1990	42
1991	723
1992	1537
1993	977
1994	1547
1995	2086
1996	3690
1997	1280
1998	1093

* = Data provided by Connors Bros.

Table 4
MAINE HERRING CATCH BY GEAR¹
(metric tons)

Year	Stop Seines/ Haul Seines	Weirs	Purse Seines	Floating Traps	Trawl	Gill Nets	Dip Nets	Unknown	Total
1887		10,626 ²	10			2,832		1,759	15,227
1888		13,179 ³	4			3,206		2,119	18,508
1919		33,586 ²	5,740 ⁴			4	48	75	39,454
1924	6,551	13,217	1,931 ⁴			1		42	21,741
1928	9,820	13,914	5,213 ⁴	395					29,341
1929	10,233	21,864	9,339 ⁴	232					41,668
1930	1,162	14,013	17,683 ⁴	669		3	3	8	33,541
1931	117	14,003	11,069 ⁴	106		6			25,301
1932		7,194	7,190 ⁴	91		35			14,510
1933		8,761	10,995 ⁴	93		8			19,856
1935		9,310	13,619 ⁴	179		<1			23,108
1937	12,822	9,336	327 ⁴	174					22,659
1938	4,722	2,111	363 ⁴	86	<1				7,282
1939	17,504	12,566	173 ⁴	1,274			51	4	31,572
1940	7,183	9,492	491 ⁴	59			18		17,244
1941								32,931	32,931
1942	25,178	16,886	573 ⁴						42,637
1943	15,438	7,246	3,256 ⁴	1					25,941
1944	13,026	19,289	4,643					286	37,244
1945								41,999	41,999
1946								36,336	36,336
1947	33,345	15,629	2,621					283	51,878
1948	46,030	17,665	1,045					316	65,057
1949	36,703	26,326	74					38	63,142
1950	53,873	26,793	379					372	81,417
1951	22,010	8,727	456					157	31,349
1952	57,336	16,789	1,814					33	75,971
1953	40,982	9,611	1,158					493	52,243
1954	46,375	11,070	493					76	58,014
1955	33,813	6,775	31					76	40,694
1956	52,504	7,386	404					2	60,296
1957	51,666	10,222	671	1				30	62,590
1958	64,942	8,522	156	10				230	73,860
1959	45,027	3,551	15						48,592
1960	43,899	6,011	284	2	1				50,198
1961	15,670	1,297	5,141	23	17				22,147
1962	50,918	5,407	2,683		41			89	59,138
1963	41,989	3,655	1,104	5	2			2,906	49,661
1964	20,047	1,961	2,843	8	112			159	25,129
1965	18,731	6,148	5,026		44			280	30,230
1966	9,156	6,236	7,523	18				29	22,962
1967	8,287	3,552	14,814	5				23	26,681
1968	14,128	5,039	8,681	3					27,852
1969	3,980	3,486	15,178	1				21	22,667
1970	2,259	925	12,311						15,495
1971	2,950	246	9,190					572	12,957
1972	15,495	1,731	3,031						20,257

¹ Catches reported in Maine waters

² Includes floating traps & pound nets

³ Includes floating traps

⁴ Incidental to mackerel purse seine catches

Table 5
MAINE DOMESTIC HERRING LANDINGS BY GEAR
(metric tons)

Year	Stop Seines	Weirs	Purse Seines	Floating Traps/ Pound Nets	Trawl ¹	Gill Nets	Dip Nets	Unknown	Total
1973	5,468	808	10,546	3	38			23	16,887
1974	2,644	2,726	16,130						21,500
1975	6,866	2,407	8,075						17,349
1976	25,226	1,848	4,782	1					31,857
1977	19,139	1,320	12,336	<1	340				33,135
1978	8,429	6,071	15,242		599				30,341
1979	31,477	6,113	2,470	1	479				40,540
1980	32,623	3,284	12,764		240				48,911
1981	31,280	13,632	7,063		<1				51,976
1982	6,680	4,278	13,495						24,453
1983	1,957	586	17,281						19,824
1984	149	231	21,279		61				21,720
1985	3,749	942	9,954		12				14,657
1986	1,284	383	14,587		10				16,264
1987	1,361	140	18,875						20,376
1988	732	1,240	14,219	1	382	2			16,575
1989	733	700	14,197						15,630
1990	216	422	21,760						22,398
1991	918	215	23,409					30	24,572
1992	3,440	397	24,011						27,848
1993	2,290	56	32,334		61				34,741
1994	292	168	32,418		2,054	19		173	35,124
1995	0	0	30,128		9,258			117	39,503
1996	438	18	36,015		12,046				48,517
1997	0	171	41,332		10,538				52,041
1998	1,543	63	21,079		6,578				29,264

¹ Mid-water, pair and bottom trawls have been combined under the heading "Trawl"

Table 6
MAINE IWP HERRING LANDINGS BY GEAR
(metric tons)

Year	Purse Seines	Trawls	Total
1987	300	0	300
1988	0	0	0
1989	3491	0	3491
1990	0	0	0
1991	2918	0	2918
1992	3339	0	3339
1993	2650	3997	6647
1994	331	2518	2849
1995	133	8643	8776
1996	0	3767	3767
1997	0	0	0
1998	0	0	0

Table 7
CANADA TRANS-SHIPMENTS BY GEAR*
(metric tons)

Year	Fixed Gear	Mobile Gear	Total
1987	274	517	791
1988	186		186
1989	118		118
1990	42		42
1991	115	608	723
1992	1537		1537
1993	977		977
1994	809	738	1547
1995		2086	2086
1996	104	3586	3690
1997	43	1237	1280
1998	1093		1093

* = Data provided by Connors Bros.

Table 8
MAINE HERRING CATCH BY AREA*
(metric tons)

Year	Western Coastal Maine	Central Coastal Maine	Eastern Coastal Maine	Jeffreys NH & Mass.Bay	Unknown Areas	Total
1947	25,251	21,587	20,106			66,944
1948	24,547	37,189	14,378		17	76,131
1949	20,873	21,638	33,182			75,693
1950	23,895	34,300	33,128			91,323
1951	6,672	17,273	10,442			34,387
1952	15,529	38,872	23,526		18	77,945
1953	19,415	27,830	10,983		15	58,243
1954	24,046	24,592	15,397		43	64,078
1955	16,504	16,675	7,530		36	40,745
1956	24,556	32,710	9,355			66,621
1957	22,584	30,378	15,638			68,600
1958	33,306	33,074	14,897			81,277
1959	25,560	19,721	7,425			52,706
1960	20,650	30,843	7,852			59,345
1961	12,322	10,106	1,665			24,093
1962	29,374	30,316	8,906		89	68,685
1963	21,804	33,388	8,011		2,830	66,033
1964	13,109	9,762	3,402		177	26,450
1965	9,368	12,848	9,581		1,037	32,834
1966	8,313	9,262	8,576			26,151
1967	6,413	17,148	4,837	12		28,410
1968	7,238	12,984	10,068	41	5	30,336
1969	5,653	13,816	4,685			24,154
1970	5,657	9,432	945	36		16,070
1971	3,944	7,577	575	664	370	13,130
1972	5,798	11,567	2,168	897		20,430

* Catches reported in Maine waters

Table 9
TOTAL MAINE HERRING CATCH BY AREA¹
(metric tons)

Year	<u>InshoreCoastal Maine</u>			Offshore ² Maine	Jeffreys NH Mass.Bay	Offshore ³ Gulf of Maine	Georges Bank	Canada	Unknown Areas	Total
	Western	Central	Eastern							
1973	2,852	12,184	1,339		488				23	16,886
1974	1,663	13,279	4,199		2,358					21,499
1975	1,170	9,456	4,556		2,166					17,348
1976	5,671	17,824	6,694		1,668					31,857
1977	9,404	16,530	6,423		776					33,133
1978	10,503	6,548	12,804		486					30,341
1979	8,008	17,582	14,629		322					40,541
1980	4,701	20,301	21,200		2,710					48,912
1981	4,924	18,527	24,795		3,730					51,976
1982	5,175	11,614	7,218		446					24,453
1983	2,695	14,833	659		1,637					19,824
1984	3,252	10,582	5,678		2,208					21,720
1985	1,650	8,528	3,691		788					14,657
1986	2,112	11,036	2,384		732					16,264
1987	5,810	11,350	3,642		665					21,467
1988	4,060	8,120	2,106		1,875				600	16,761
1989	4,010	13,228	930		1,070					19,238
1990	6,731	13,462	570		1,205				472	22,440
1991	2,646	21,584	594		2,510				877	28,212
1992	7,951	17,640	2,231	1,231	3,671					32,724
1993	16,953	14,135	225	1,213	9,394			352	93	42,366
1994	9,520	12,387	1,674	2,241	13,131			20	546	39,519
1995	9,832	12,246	322	9,828	16,464				1,674	50,365
1996	14,411	18,089	102	11,739	11,567			65		55,974
1997	8,873	19,125	449	18,939	4,874	1,058				53,321
1998	1,089	10,996	756	11,112	3,144	471	2,791			30,357

¹ Includes Internal Waters Processing landings and Canadian trans-shipments

² Fishing grounds >3 miles offshore in NMFS statistical areas 511, 512 and 513 (excluding Jeffreys Ledge)

³ Offshore fishing grounds in NMFS statistical areas 515, 521 and 522 and Georges Bank

Table 10
1998 TOTAL MAINE HERRING CATCH BY MONTH AND GEAR (metric tons)

Month	DOMESTIC LANDINGS					IWP			CANADIAN TRANS-SHIPMENTS					Total Catch
	Stop Seine	Weir	Purse Seine	Trawl	Total	Purse Seine	Trawl	Total	Stop Seine	Weir	Purse Seine	Trawl	Total	
Jan														
Feb														
Mar														
Apr			1410	590	2000									2000
May	19		2106	1021	3147									3147
Jun	797	24	2825	629	4275				372	24			396	4671
Jul	717	39	5715	907	7378				609				609	7987
Aug	10		3950	1349	5309									5309
Sep			2706	506	3212									3212
Oct			2367	16	2383				88				88	2471
Nov				763	763									763
Dec				797	797									797
Total	1543	63	21079	6578	29263				1069	24			1093	30357

Table 11
1998 TOTAL MAINE HERRING CATCH BY MONTH AND AREA
(metric tons)

<u>Month</u>	<u>Western Coastal Maine</u>	<u>Central Coastal Maine</u>	<u>Eastern Coastal Maine</u>	<u>Offshore Maine</u>	<u>Jeffreys NH and Mass. Bay</u>	<u>Offshore Gulf of Maine</u>	<u>Georges Bank</u>	<u>Total</u>
Jan								
Feb								
Mar								
Apr		143		1,188	322	278	68	2,000
May		134		2,073	940			3,147
Jun	47	1,674	241	2,092	52		566	4,671
Jul	446	2,931	125	3,678	29	145	634	7,987
Aug	314	2,630	60	888	201	48	1,168	5,309
Sep	282	1,638	241	671	25		355	3,212
Oct		1,846	88	521	16			2,471
Nov					763			763
Dec					797			797
Total	1,089	10,996	756	11,112	3,144	471	2,791	30,357

Table 12
1998 DOMESTIC LANDINGS FOR HERRING CAUGHT IN
EASTERN MAINE BY GEAR AND MONTH
(metric tons)

<u>Month</u>	<u>Coastal</u>				<u>Eastern Coastal Total</u>	<u>Offshore</u>		<u>Eastern Offshore Total</u>	<u>Eastern Combined Total</u>
	<u>Stop Seine</u>	<u>Weir</u>	<u>Purse Seine</u>	<u>Trawl</u>		<u>Purse Seine</u>	<u>Trawl</u>		
Jan									
Feb									
Mar									
Apr									
May						83		83	83
Jun	159	23			183	679		679	863
Jul	13		111		125	2676		2676	2801
Aug	10		49		59	314		314	374
Sep			241		241	68		68	309
Oct						93		93	93
Nov									
Dec									
Total	183	23	402		609	3916		3916	4525

Table 13
1998 DOMESTIC LANDINGS FOR HERRING CAUGHT IN
CENTRAL MAINE BY GEAR AND MONTH
(metric tons)

<u>Month</u>	<u>Coastal</u>				<u>Central Coastal Total</u>	<u>Offshore</u>		<u>Central Offshore Total</u>	<u>Central Combined Total</u>
	<u>Stop Seine</u>	<u>Weir</u>	<u>Purse Seine</u>	<u>Trawl</u>		<u>Purse Seine</u>	<u>Trawl</u>		
Jan									
Feb									
Mar									
Apr			143		143				143
May	19		114		134	1712		1712	1845
Jun	637		699		1336	1412		1412	2748
Jul	572	39	1711		2322	1002		1002	3324
Aug			2630		2630	410		410	3040
Sep			1638		1638	260		260	1897
Oct			1846		1846	347		347	2193
Nov									
Dec									
Total	1229	39	8781		10049	5142		5142	15191

Table 14
1998 DOMESTIC HERRING LANDINGS FOR HERRING CAUGHT IN
WESTERN MAINE BY GEAR AND MONTH
(metric tons)

<u>Month</u>	<u>Coastal</u>			<u>Western Coastal Total</u>	<u>Offshore</u>		<u>Western Offshore Total</u>	<u>Western Combined Total</u>
	<u>Stop Seine</u>	<u>Purse Seine</u>	<u>Trawl</u>		<u>Purse Seine</u>	<u>Trawl</u>		
Jan								
Feb								
Mar								
Apr					980	209	1188	1188
May					146	132	278	278
Jun			47	47				47
Jul	131	197	117	446				446
Aug		308	6	314	165		165	479
Sep		156	126	282	343		343	625
Oct					80		80	80
Nov								
Dec								
Total	131	662	296	1089	1714	340	2054	3143

Table 15
1998 DOMESTIC LANDINGS FOR JEFFREYS LEDGE AND
MASSACHUSETTS BAY VICINITY BY GEAR AND MONTH
(metric tons)

<u>MONTH</u>	<u>Purse Seine</u>	<u>Midwater Trawl</u>	<u>Total</u>
Jan			
Feb			
Mar			
Apr	32	290	322
May	50	890	940
Jun		52	52
Jul		29	29
Aug	74	127	201
Sep		25	25
Oct		16	16
Nov		763	763
Dec		797	797
Total	155	2989	3144

Table 16
 1998 DOMESTIC HERRING LANDINGS FOR HERRING CAUGHT IN
 OFFSHORE GOM (Statistical Area 515) BY GEAR AND MONTH
 (metric tons)

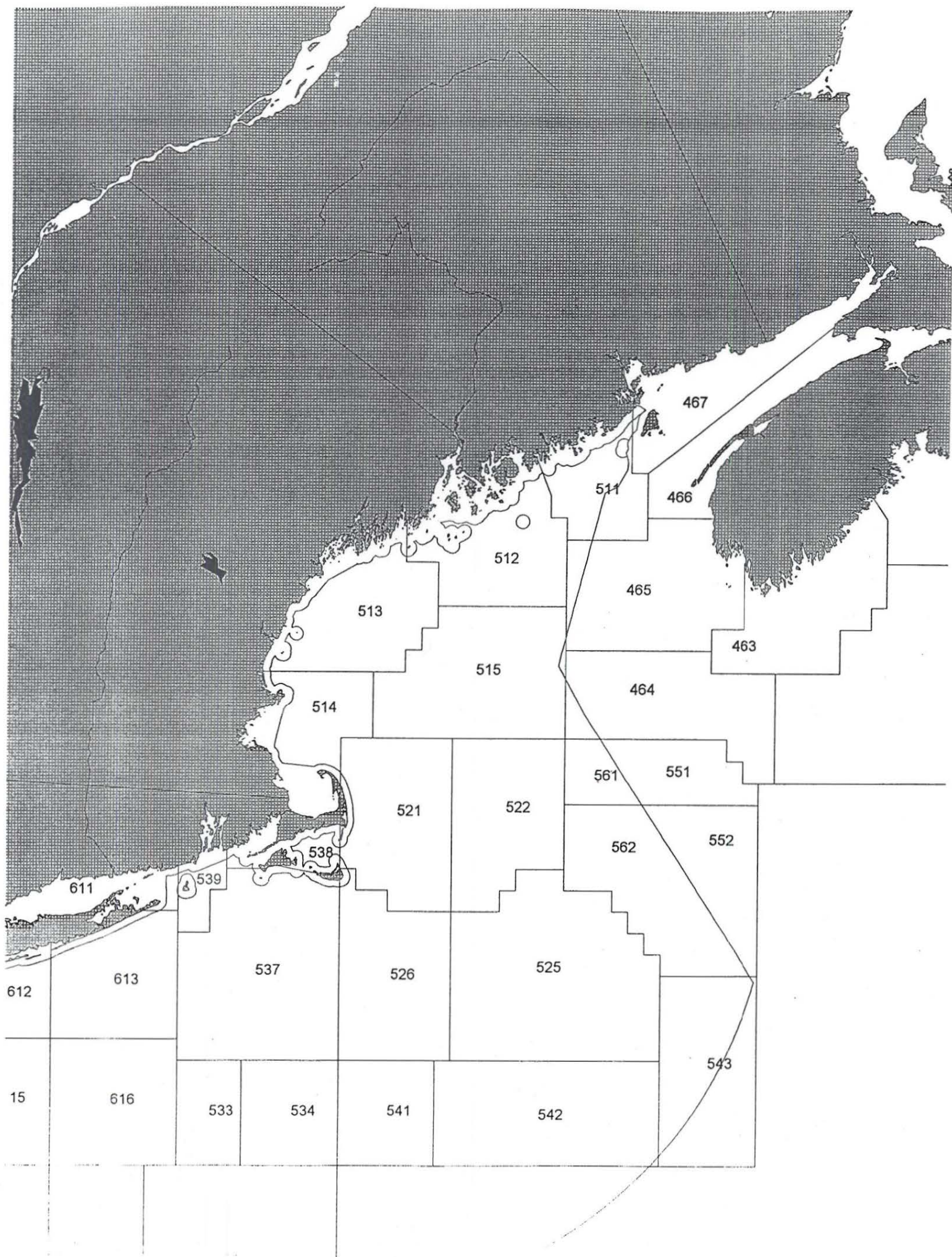
<u>Month</u>	<u>OFFSHORE GULF OF MAINE</u>		
	<u>Purse Seine</u>	<u>Midwater Trawl</u>	<u>Total</u>
Jan			
Feb			
Mar			
Apr	256	23	278
May			
Jun			
Jul	18	127	145
Aug		48	48
Sep			
Oct			
Nov			
Dec			
Total	274	197	471

Table 17
1998 DOMESTIC HERRING LANDINGS FOR HERRING CAUGHT ON
GEORGES BANK BY GEAR AND MONTH
(metric tons)

<u>Month</u>	<u>GEORGES BANK</u>		
	<u>Purse Seine</u>	<u>Midwater Trawl</u>	<u>Total</u>
Jan			
Feb			
Mar			
Apr		68	68
May			
Jun	35	531	566
Jul		634	634
Aug		1168	1168
Sep		355	355
Oct			
Nov			
Dec			
Total	35	2756	2791

Table 18
1998 MAINE HERRING LANDINGS FROM OVER THE SIDE TRANSFERS
BY AREA CAUGHT, GEAR AND MONTH
(metric tons)

Month	WESTERN MAINE		CENTRAL MAINE			EASTERN MAINE				OFFSHORE GULF OF MAINE		GEORGES BANK		TOTAL
	Purse seine	Trawl	Purse seine	Stop seine	WeirTrawl	Purse seine	Stop seine	Weir	Trawl	Purse seine	Trawl	Purse seine	Trawl	
Jan														
Feb														
Mar														
Apr														
May														
Jun				338			34	24						396
Jul				609										609
Aug														
Sep														
Oct							88							88
Nov														
Dec														
Total				947			122	24						1093



Appendix B

36.01 Herring Management Plan

A. Definitions

(1) Herring.

Herring means Atlantic Sea Herring, particularly the *Clupea Harengus harengus*.

(2) ICNAF gonad stages.

ICNAF gonad stages are the official stages adopted by the International Commission for the Northwest Atlantic Fisheries in 1964.

Excerpt from ICNAF, 1964, Table 2 definitions:

Stage IV. Gonads almost as long as body cavity. Eggs larger, varying in size, opaque. Ovaries orange or pale yellow; testes whitish.

Stage V. Gonads fill body cavity. Eggs large, round; some transparent. Ovaries yellowish; testes milkwhite. Eggs and sperm do not flow, but sperm can be extruded by pressure.

Stage VI. Ripe gonads. Eggs transparent; testes white; eggs and sperm flow freely.

(3) Spawn herring.

Spawn herring is a sexually mature herring (male or female) in ICNAF gonad stages IV, V or VI.

(4) Herring harvester.

Any person or vessel operator in command of any type of gear used to harvest herring.

(5) ASMFC Management Area 1.

ASMFC Management Area 1 is all U.S. waters of the Gulf of Maine encompassed by the shoreline and an imaginary line beginning at the intersection of the 41° 35' N parallel with the eastern shore of Monomoy Island; thence in an easterly direction following the 41° 35' N parallel of latitude to its intersection with 69° 00' W meridian of longitude; thence along a straight line in a northeast direction to its intersection with the U.S.-Canada boundary at the point 42° 53' 14" N parallel of latitude and 67° 44' 35" W meridian of longitude; thence in a northerly direction along the U.S.-Canada boundary.

Management Area 1 is subdivided into Area 1A (inshore) and Area 1B (offshore). The line dividing these areas is described by the following coordinates:

Beginning at	70° 00' W Longitude on the Cape Cod shoreline; thence due north to
42° 38.4' N Latitude,	70° 00' W Longitude; thence due northeasterly to
42° 53.0' N Latitude,	69° 40' W Longitude; thence due northeasterly to
43° 12.0' N Latitude,	69° 00' W Longitude; thence due northeasterly to
43° 40.0' N Latitude,	68° 00' W Longitude; thence due northeasterly to
43° 58.0' N Latitude,	67° 22' W Longitude at the U.S.-Canada boundary; thence northerly
	along the irregular U.S.-Canada boundary.

36.01 Herring Management Plan

(6) ASMFC Management Area 2.

South Coastal Area: All waters west of 68° 00' W Longitude and south of 41° 35' N Latitude, to include state and Federal waters adjacent to the states of Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia and North Carolina.

(7) ASMFC Management Area 3.

Georges Bank: All U.S. waters east of 69° 00' W Longitude and southeast of the line that runs from a point at 69° 00' W Longitude and 41° 35' N Latitude, northeasterly to the Hague Line at 67° 44' 35" W Longitude and 42° 53' 14" N Latitude.

B. Permits and reporting.

(1) Dealer Permit.

All dealers and processors who buy herring directly from harvesters and sell herring shall obtain a dealers permit issued by the Department of Marine Resources. There will be no additional charge for this permit. The Commissioner may require that dealer permit holders report volumes of herring bought and sold and other information as required.

(2) Harvester Permit.

All herring harvesters shall obtain a herring permit supplement to the commercial fishing license issued by the Department of Marine Resources. There will be no additional charge for this permit. This permit shall be issued to any commercial fishing license holder who requests a permit.

(3) Reporting of catch.

All Maine licensed herring harvesters must report accurate daily fishing information for herring that are landed in Maine to the Department of Marine Resources (DMR) according to written instructions and forms provided by the DMR. All information will be maintained by the Department in accordance with the confidentiality provisions in 12 M.R.S.A. §6173 and Chapter 5 of the Department's Regulations.

The information for fishing vessel and fixed gear trip reports must include: commercial license number; vessel state registration number and vessel name; date/time sailed; date/time landed; trip type; number of crew; number of anglers (if a party or charter boat); gear fished; quantity and size of gear; mesh/ring size; chart area fished; average depth; latitude/longitude (or loran station and bearings); total hauls per area fished; average tow time duration; pounds (or count, if a party or charter vessel), by species, off all species landed or discarded; dealer permit number; dealer name; date sold, port and state landed; vessel operator's name, signature, commercial license number and any other information or instructions deemed necessary. The reporting document serial number is to be passed on to dealer.

36.01 Herring Management Plan

The information for dealer reports must include: dealer name and mailing address; dealer permit number; name and commercial license number or vessel state registration number and vessel name of vessels from which fish are landed or received; document serial number from the harvester report; dates of purchases; pounds; price per pound or total value; port landed; and any other information or instructions deemed necessary.

C. Gear and vessel restrictions.

(1) Gear Type Prohibition.

It shall be unlawful to use otter trawls, beam trawls, pair trawls, or midwater trawls to fish for herring within the territorial waters of Maine.

(2) Vessel Size and Shaft Horespower.

It shall be unlawful for any vessel that exceeds 165 feet length overall (LOA) or no more than 750 gross registered tonnage (GRT) to fish for or take herring within Maine territorial waters or to land herring in any Maine port. It shall be unlawful for any vessel possessing more than 3000 shaft horse power to fish for or take herring within Maine territorial waters or to land herring in any Maine port.

This rule does not prohibit the landing of herring that are lawfully imported from other countries, territories or states provided the origin of fish is documented.

D. Catch restrictions.

(1) Spawning restrictions.

During the period August 1 - October 31, both days inclusive, it shall be unlawful to fish for, take, or possess spawn herring on board a Maine registered vessel or any vessel landing herring in Maine or Maine waters within the area designated as ASMFC Management Area 1,

or to land spawn herring caught by any gear in this area, in any Maine port, unless spawn herring comprise no more than 20% of the catch. The 20% tolerance shall be determined by examination of at least one hundred herring selected at random from the catch.

(a) Transport exemption.

Fish caught legally outside of ASMFC Management Area 1 will be allowed to be transported throughout Management Area 1 and landed at a Maine port, upon prior notification to the Department of Marine Resources, via the "Fish Fone" number (888) 816-5090.

(2) Catch restrictions.

Fishing for herring in ASMFC Management Areas 1, 2 and 3 is subject to the annual Total Allowable Catch (TAC) and fishing effort restrictions specified by the ASFMC Atlantic Herring Section and the NEFMC in accordance with their respective Fisheries Management Plans

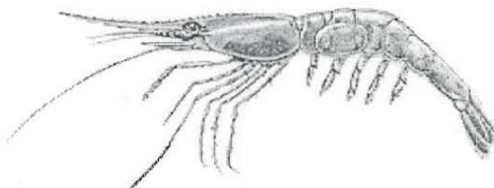
SHRIMP

1999 IJF Annual Report

**Commercial Port Sampling of Northern Shrimp (*Pandalus borealis*)
Along the Maine Coast**

Annual Summary for January 1, 1999 - December 31, 1999

**By
Stuart W. Sherburne
and
Marilyn Lash Metcalfe**



IJF Annual Report January 1, 1999 – December 31, 1999

Commercial Shrimp Port Sampling Project

The commercial shrimp port sampling project is conducted by the Maine Department of Marine Resources Biological Monitoring Division headquartered at West Boothbay Harbor.

Purpose

The purpose of this project is to furnish sufficient biological and catch/effort information about the commercial shrimp fishery to the Department's Assessment and Statistics people so they, in conjunction with the Atlantic States Marine Fisheries Commission's Northern Shrimp Technical Committee, will be able to offer the best scientific advice available to fishery managers. We do this by collecting samples from many individual fishing grounds, gathering catch and effort information through captain interviews at various fishing ports, and by completing laboratory analyses of the shrimp collected.

Sampling and Laboratory Procedures

During our boat captain interviews the following information is recorded, depending on whether the boat is a dragger or trapper: Date, Dealer, Boat name, Catch Location, Depth fished, Total hours of drag time, Number of tows, Number of Traps, Number of days the traps have been set, Total pounds caught, Comments, Number in crew and Captain's name. Permission is asked of the captain to take a 2 lb sample from his catch back to Boothbay Harbor for laboratory analyses. Samples are purchased at \$3.00 for a 2 lb sample.

For each dragger sampled, information from the interview forms is used to determine the total catch of the vessels sampled at each dealer, the total drag time, the range of catches in pounds, the average catch in pounds per boat, the average catch per unit of effort (CPUE) expressed in lbs/hr drag time for each vessel, the range of CPUE's, and the average CPUE for the vessels sampled.

From the information gathered from trappers, the total catch of the trappers sampled at each dealer, the total number of traps fished, the total soak time, the range of catches in pounds, the average catch/vessel in lbs, the range of catches in lbs/trap, and the average catch/trap is calculated. The boat price for the shrimp on that day by both draggers and trappers is recorded.

We also maintain/update discrete lists of fishing grounds from which the samples are harvested, vessels sampled, and dealer sites utilized so the lists can be reviewed and the sites/vessels readily selected to help lessen repeated sampling of the same body of shrimp, thus spatially broadening the sample base.

Shrimp are processed in the laboratory in order to generate sex - specific length frequency distributions, thus providing information on the size and age composition of the catch from different fishing grounds.

From January 4, 1999 (first day of shrimping in January) to May 25, 1999 (last day of shrimping in the 1998 - 1999 season) 170 shrimp samples and corresponding captain interviews were obtained from 158 draggers (93 different draggers) and 12 different trappers at 20 dealer locations from Portsmouth, NH to Winter Harbor, Maine. Forty -seven samples were collected in

January from 12 dealer locations from Portsmouth, NH to Southwest Harbor, ME; 49 in February from 8 dealer locations from Kennebunkport to Port Clyde; 29 in March from 8 dealer locations from Portland to Winter Harbor; 28 in April from 13 dealer locations from Kennebunkport to Winter Harbor and 17 in May from 3 dealer locations from Kennebunkport to Southwest Harbor. The length range of the boats sampled varied from 30' - 77'.

Draggers sampled in May had the highest average daily catch and highest average catch per unit of effort (CPUE), expressed in lbs/hr drag time. The average daily catch and average CPUE per dragger in January was 957.6 lbs/day, 127.5 lbs/hr; in February 1,473.6 lbs/day, 167.6 lbs/hr; in March 1106.9 lbs/day, 127.0 lbs/hr; in April 953.3 lbs/day, 116.2 lbs/hr and in May 1887.2 lbs/day, 178.3 lbs/hr.

For the period January - May, 1999, the average daily catch for the 158 draggers was 1267.7 lbs with an average CPUE of 146.0 lbs/hr drag time. For the 12 trappers, the total catch was 12, 878 lbs with an average catch of 8.4 lbs/trap.

Table 1 lists the following for each month from January, 1999 - May, 1999 : 1) the number of dealers visited and their locations, 2) number of samples collected, 3) number of different draggers sampled, 4) number of different trappers sampled, 5) length range of the boat sampled, 6) number of fishing grounds that the samples came from 7) total catch in lbs for draggers, 8) total catch in lbs for trappers, 9) number of dragger boat days, 10) draggers average catch/day in lbs, 11) total hours drag time, 12) lbs/hr drag time, 13) total number of traps hauled, 14) total set over days, 15) average lbs/trap. The table also includes totals for each of these indices.

Table 2 lists the 20 shrimp dealers where 170 shrimp samples were obtained from January 4, 1999 - May 25, 1999 with the total visits to each dealer, the number of samples obtained at each visit (the number of boats sampled) and the total number of samples obtained at each dealer.

Commercial Shrimp Port Sampling. Monthly Summary for January, 1999

During the 17 days allowed for shrimping between January 4 - 26, shrimp samples and corresponding captain interviews for catch information were obtained from 47 draggers at 12 dealer locations from Portsmouth, NH to Southwest Harbor, Maine. The lengths of the sampled vessels ranged from 35 - 65 feet. Samples came from 24 different fishing grounds ranging from Jeffreys Basin to Isle Au Haut. Net-clogging slime was still being reported by captains fishing on some grounds.

Draggers were sampled at the following 12 dealer locations: Wotton's Lobster, Boothbay Harbor; Osier's Wharf, South Bristol; Port Lobster, Kennebunkport; Massey's Wharf, South Bristol; Eugley's Wharf, South Bristol; Portland Fish Exchange, Portland; Thorbjornson's Wharf, Port Clyde; Portsmouth Fisherman's Co-op, Portsmouth, NH; Port Clyde Co-op, Port Clyde; South Bristol Co-op, South Bristol; Beal's Lobster Pier, Southwest Harbor and Southwest Harbor Lobster & Fish Unlimited, Southwest Harbor.

Of the 47 draggers sampled, 44 made 1 day trips while 3 had been on 2 day trips. Catches for the 44 draggers on 1 day trips ranged from 155 - 3390 lbs, the average daily catch was 933.5 lbs, the range of catches in lbs/hr drag time varied from 44.0 lbs/hr for a boat out of South Bristol to 376.7 lbs/hr for a boat out of Port Clyde. The average catch per unit effort or CPUE was 125.6 lbs/hr drag time.

For the 3 draggers on 2 day trips the range of catches was 1260 - 3017 lbs, the average catch/trip was 2268.3 lbs, the range of catches in lbs/hr drag time varied from 70.0 - 232.1, while the average CPUE was 140.3 lbs/hr drag time.

The average daily catch and average lbs/hr drag time were lower this January than for January of last year. During January 1998, the 54 draggers sampled had an average daily catch of 1354.3 lbs with an average CPUE of 177.0 lbs/hr drag time.

Also, in contrast to January 1998, where shrimp were of larger size (40 - 45 count/lb) and of excellent appearance, this January's shrimp were often of 60 - 65 count (even up to 100 count) and many catches were referred to as "junk" by the dealers. Prices for these shrimp ranged from a low of \$.35/lb to a high of \$1.41/lb, depending on the size, quality, and dealer.

Commercial Shrimp Port Sampling. Monthly Summary for February, 1999

Shrimp catches improved in February along with larger sized shrimp. Counts were running between 50 - 55 /lb in most catches and some counts were down to 40 - 45 count compared with January's catches that were often 60 - 65 count up to 100 count in a few instances.

During the 17 days allowed for shrimping between February 1 -23, shrimp samples and corresponding captain interviews for catch information were obtained from 37 draggers and 12 trappers at 8 dealer locations from Kennebunkport to Port Clyde. Boats were sampled at Port Lobster, Kennebunkport Pier; Portland Fish Exchange, Portland; Resource Trading Co., Portland; Cundys Harbor Wharf, Cundys Harbor; South Bristol Co-op, South Bristol; Pemaquid Fisherman's Co-op, Pemaquid Harbor; Shaw's Wharf, New Harbor and Thorbjornson's Wharf, Port Clyde. The length of the sampled vessels ranged from 30' - 70'. The samples came from 26 different fishing grounds.

Daily catches for the draggers ranged from 239 - 4665 lbs, the average daily catch was 1473.6 lbs, the range of catches in lbs/hr drag time (CPUE) was 26.6 - 491.0 while the average CPUE was 167.6 lbs/hr. (During February, 1998, the average daily catch for 48 draggers sampled at 11 dealer sites from Portsmouth, NH to Winter Harbor, ME was 1342.5 lbs with an average CPUE of 152.1 lbs/hr drag time).

For the 12 trappers sampled at 3 dealers, the 1532 traps that were hauled yielded 12,878 lbs for an average of 8.4 lbs/trap. The best catch of the trappers sampled was from a boat out of the South Bristol Co-op that landed 2330 lbs after hauling 178 traps on a 5 night set -over for an average catch of 13.1 lbs/trap. The traps had been set at depths of 30 - 45 fathoms. Boat price was \$1.00/lb.

Commercial Shrimp Port Sampling. Monthly Summary for March, 1999

Shrimp catches declined somewhat in March. During the 12 days allowed for shrimping between March 1 - 16, shrimp samples and corresponding captain interviews for catch information were obtained from 29 draggers at 8 dealer locations from Portland to Winter Harbor. Fishermen at several dealers were upset that they were not allowed extra days fishing during March to make up for days lost because of the weather during the previous 3 months.

Boats were sampled at the Portland Fish Exchange, Portland; Wotton's Lobster, Boothbay Harbor; Eugley's Wharf, South Bristol; Massey's Wharf, S. Bristol; Osier's Wharf, S. Bristol; Thorbjornson's Wharf, Port Clyde; Beal's Lobster Pier, Southwest Harbor and the Winter Harbor Co-op, Winter Harbor. The length of the sampled vessels ranged from 32' - 63'. The samples came from 17 different fishing grounds.

Daily catches ranged from 267 - 2547 lbs, the average daily catch was 1106.9 lbs, the range of catches in lbs/hr drag time (CPUE) was 40 - 283 while the average CPUE was 127.0 lbs/hr. (This compares with an average daily catch of 1473.6 lbs and an average CPUE of 167.6 lbs/hr for 37 draggers sampled in February, 1999).

Although the effort was there, with drag times ranging from 7 - 10 hrs/day, catches for 5 boats sampled at 2 Downeast dealers were disappointing. On March 10, 3 draggers at the Winter Harbor Co -op had a range of catches of 325 - 550 lbs, an average catch of 445 lbs and a CPUE of 52.3 lbs/hr. Fishing grounds were Clarks Rock Mud and Schoodic Mud. On March 11, 2 draggers out of Beal's Lobster in Southwest Harbor landed catches of 300 and 350 lbs with an average CPUE of 41.9 lbs/hr. Fishing grounds were Frenchman Bay and Cod Ledges. It is worth noting that most of the shrimp were still fully egged.

Processing of the 140 samples collected so far this season continues in the lab to determine the spatial and temporal variations in the size and age composition of the harvest throughout the season, as well as other biological attributes of the catch.

Shrimp season resumes on April 1, with a period of 20 days allowed for shrimping during the month. Meanwhile, shrimp should be moving offshore during the break.

Commercial Shrimp Port Sampling. Monthly Report for April, 1999

Shrimping activity continued to diminish in most ports in April, primarily due to poorer quality shrimp and lower prices. Counts varied between 53 - 80 shrimp/lb, depending on the fishing ground. Prices generally ranged from \$.50 - \$1.00/lb. At Southwest Harbor the dealer often had no market for the catch. Some boats quit fishing altogether, while others went groundfishing until May when they will go to offshore shrimp grounds such as Jeffreys Bank, Three Dory Ridge and Platt's Bank to shrimp.

During April 28 draggers were sampled (26 different draggers, 2 were sampled twice) at 13 dealer locations ranging from Kennebunkport to Winter Harbor. Twenty-six of the draggers had been on 1 day trips, 1 had been on a 2 day trip and 1 had been on a 3 day trip.

Draggers were sampled at the following 13 dealers: South Bristol Co-op, South Bristol; Shaw's Wharf, New Harbor; Osier's Wharf, South Bristol; Thorbjornson's Wharf, Port Clyde; Resource Trading Co., Portland; Wotton's Lobster, Boothbay Harbor; Winter Harbor Town Dock, Winter Harbor; Eugley's Wharf, South Bristol; Cundys Harbor Wharf, Cundys Harbor; C.H. Rich & Co., Bass Harbor; Southwest Harbor Lobster & Fish Unlimited, Southwest Harbor; Seahorse Lobster & Fish, Phippsburg and Port Lobster, Kennebunkport. The length of the sampled vessels ranged from 35' - 60' and the samples came from 21 different fishing grounds.

Both the average daily catch and average lbs/hr drag time (CPUE) for April were lower than for the preceding 4 months. The range of total catches when sampled for individual boats was 258 lbs (1 day trip) to 5,604 lbs (3 day trip, av. 1868 lbs/day). The range of daily catches for individual boats was 258 - 2300 lbs and the average daily catch/boat was 953.3 lbs. The range of catches in lbs/hr drag time was 29.4 - 255.6 (lowest & highest were from 1 day trips) and the average catch in lbs/hr for the 28 draggers was 116.2 lbs/hr.

Commercial Shrimp Port Sampling. Monthly Report for May, 1999

Shrimpers that continued fishing after the normal April slump landed substantial catches from offshore fishing grounds during the 17 days allowed for shrimping between May 3 - 25.

The average daily catch and average lbs/hr drag time (CPUE) for the 17 draggers sampled in May were the highest for this season (December, 1998 - May, 1999). The average daily catch was 1887.2 lbs and the average CPUE was 178.3 lbs/hr drag time.

The 17 draggers (12 different draggers, 5 were sampled twice) were sampled at 3 dealer locations ranging from Kennebunkport to Southwest Harbor. Five of the draggers had been on 1 day trips, 5 on 2 day trips and 7 on 3 day trips.

Draggers were sampled at the following 3 dealers: Port Lobster, Kennebunkport; Resource Trading Co., Portland and Southwest Harbor Lobster & Fish Unlimited, Southwest Harbor. The length of the sampled vessels ranged from 36' - 77' and the samples came from 9 different fishing grounds.

The samples came from the following fishing grounds: East of Mt. Desert Rock, Jeffreys Basin, Fingers of Jeffreys, East of 3 Dory Ridge, Winter Bottom, New Ledge (Platts Bank), Outer Falls, 12 miles SW of Jeffreys Bank and 10 miles SW of Jeffreys Bank.

The range of total catches for individual boats at the time of sampling in May varied from 250 lbs for a 1 day tripper that fished east of Mt. Desert Rock to 9, 822 lbs for a 3 day tripper that fished Jeffreys Bank. The range in daily catches for individual boats varied from 250 lbs for the 1 day tripper to 3,274 lbs for the 3 day tripper that landed 9, 822 lbs. The range of catches in lbs/hr (CPUE) for individual boats was 45.4 for the boat that landed 250 lbs - 297.6 for the boat that landed 9,822 lbs.

Table 1

Commercial Shrimp Port Sampling January 4, 1999 – May 25, 1999

	# Dealers Visited & Locations*1	# Samples Collected	Boats		Length Range (ft)	# Fishing Grounds	Total Catch (lbs)		Dragger Boat Days	Draggers Av. Catch Per Day(lbs)	Total Hrs Drag Time	Lbs/Hr Drag Time	Total # Traps Hauled	Total Set Over Days	Average Lbs/Trap
			# Different Draggers Sampled *2	# Trappers Sampled			Draggers	Trappers							
Jan. 1999	12 Portsmouth to SW Harbor	47	32	0	35' - 65'	24	47,881	0	50	957.6	375.55	127.5	0	0	0
Feb. 1999	8 Kennebunk port to Port Clyde	49	26	12	30' - 70'	26	54,524	12,878	37	1,473.6	325.25	167.6	1,532	42.3	8.4
March 1999	8 Portland to Winter Hbr.	29	26	0	32' - 63'	17	32,099	0	29	1106.9	252.75	127.0	0	0	0
April 1999	13 Kennebunk port to Winter Hbr	28	26	0	35' - 60'	21	29,554	0	31	953.3	254.25	116.2	0	0	0
May 1999	3 Kennebunk port to SW Harbor	17	12	0	36' - 77'	9	67,939	0	36	1,887.2	381.0	178.3	0	0	0
Totals:	20 different dealers Portsmouth, NH to Winter Hbr. ME	170	93 different draggers	12 different trappers	30' - 77'	80 different fishing grounds	231,997	12,878	183	1,267.7	1,588.8	146.0	1,532	42.3	8.4

*1 Dealers visited more than one time in any given month are only counted once.

Sampling is also conducted at the Portsmouth, N.H. Fisherman's Co-op due to the fact that some Maine shrimp boats land their catches at that facility.

*2 Some vessels may be sampled more than once in a given month. Hence the number of samples collected may exceed the number of vessels sampled.

Table 2

A list of the 20 shrimp dealers where 170 shrimp samples were obtained from January 4, 1999 - May 25, 1999 with the total visits to each dealer, the number of samples obtained at each visit (number of boats sampled) and the total number of samples obtained at each dealer.

Dealer	No. Visits	Samples collected/visit	Total samples
1 Portland Fish Exchange	4	2, 5, 4, 1	12
2 Thorbjornson's, Port Clyde	9	6, 4, 5, 3, 8, 7, 3, 6, 2	44
3 Wotton's Lobster, BBH	5	1, 2, 3, 2	8
4 Resource Trading Co., Portland	6	3, 3, 2, 2, 7, 5	22
5 Cundy's Harbor Wharf	2	7, 1	8
6 Osier's Seafood, South Bristol	4	4, 3, 4, 2	13
7 Eugley's Wharf, South Bristol	4	1, 2, 4, 1	8
8 Massey's , So. Bristol	3	1, 1, 3	5
9 Beal's Lobster Pier, SW Harbor	2	1, 2	3
10 South Bristol Co-op	3	1, 7, 3	11
11 Pemaquid Fishermen's Co-op	1	2	2
12 Shaw's Wharf, New Harbor	2	6, 5	11
13 Portsmouth, N.H. Co-op	1	2	2
14 Seahorse Lobster and Fish	1	1	1
15 Winter Harbor Co-op	1	3	3
16 So'west Hbr Lobster & Fish, Unl.	3	1, 1, 1	3
17 Port Clyde Co-op	2	1, 1	2
18 Port Lob, Kennebunkport Pier	6	3, 1, 1, 1, 2, 2	10
19 Winter Harbor Town Dock	1	1	1
20 C.H. Rich & Co., Bass Hbr	1	1	1
	61		170

IJF July 1, 1999 – December 31, 1999 Commercial Shrimp Port Sampling

There was no shrimp fishery along the Maine coast from July 1, 1999 - December 31, 1999. However, thank you letters, which included a 1998-1999 season synopsis from December 15, 1998 - May 25, 1999, along with a table that shows results for 15 different entities calculated for each month of the season, and for the season as a whole, were sent to 95 shrimp boat captains and 20 dealers, primarily in August and September. Enclosed are sample letters with the information sent in each letter. During December, 1999 we prepared for the upcoming shrimp season, which began on January 17, 2000. This included leasing a vehicle, obtaining supplies for port sampling, having interview forms printed and updating the list of vessels sampled at each dealer from 1995 - 1999 with the vessels names, lengths and their captains in order to facilitate our port sampling.



ANGUS S. KING, JR.
GOVERNOR

STATE OF MAINE
DEPARTMENT OF
MARINE RESOURCES
MARINE RESOURCES LABORATORY
P.O. BOX 8
WEST BOOTHBAY HARBOR, MAINE
04575-0008

GEORGE D. LAPOINTE
COMMISSIONER

Wednesday, August 11, 1999

Captain Arthur Colbeth
P.O. Box 29
Bass Harbor, ME 04653

Dear Captain Colbeth:

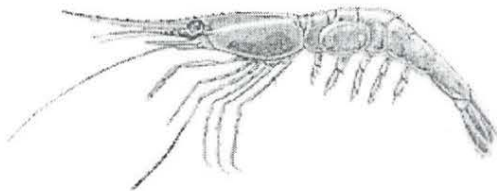
The Biological Monitoring Division of the Maine Department of Marine Resources would like to express our appreciation for your cooperation during the 1998 – 1999 shrimp season in providing DMR with catch and effort information and shrimp samples for our laboratory analyses.

Since Maine fishermen harvest approximately 85% of the New England shrimp catch, information derived from dockside interviews and shrimp samples obtained from Maine fishermen are crucially important towards the goal of providing effective resource assessment and management of the fishery by the Atlantic State Marine Fisheries Commission's Northern Shrimp Section.

Enclosed is a brief summary of the port sampling project and a table that shows results for 15 different entities calculated for each month of the past season and for the season as a whole. The entities include: 1) the number of dealers visited and range of locations along the coast, 2) # of samples collected, 3) # of different draggers sampled, 4) # of different trappers sampled, 5) length range of the vessels, 6) # of fishing grounds where the shrimp were caught, 7) total catch in lbs for draggers, 8) total catch in lbs for trappers, 9) # dragger boat days, 10) draggers average catch/day in lbs, 11) total hours drag time, 12) average catch in lbs/hr drag time, 13) total # of traps hauled, 14) total set over days and 15) average lbs/trap.

We look forward to seeing you next season and, again, many thanks for your cooperation.

Sincerely,



Stuart W. Sherburne
Marine Resources Scientist II



PRINTED ON RECYCLED PAPER



ANGUS S. KING, JR.
GOVERNOR

STATE OF MAINE
DEPARTMENT OF
MARINE RESOURCES
MARINE RESOURCES LABORATORY
P.O. BOX 8
WEST BOOTHBAY HARBOR, MAINE
04575-0008

GEORGE D. LAPOINTE
COMMISSIONER

Wednesday, August 20, 1999

C.H. Rich & Company
PO Box 8
Bass Harbor, ME 04653

Dear Gentlemen:

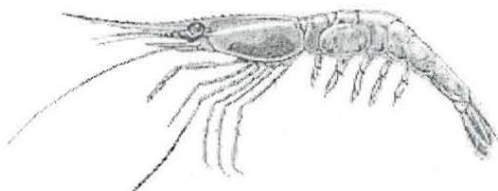
The Biological Monitoring Division of the Maine Department of Marine Resources would like to express our appreciation for your cooperation during the 1998 – 1999 shrimp season in allowing our field personnel to use your facility in order to obtain catch and effort information and shrimp samples from your shrimp boat captains as they unloaded their catches.

Since Maine fishermen harvest approximately 85% of the New England shrimp catch, information derived from dockside interviews and shrimp samples obtained from Maine fishermen are crucially important towards the goal of providing effective resource assessment and management of the fishery by the Atlantic State Marine Fisheries Commission's Northern Shrimp Section.

Enclosed is a brief summary of the port sampling project and a table that shows results for 15 different entities calculated for each month of the past season and for the season as a whole. The entities include: 1) the number of dealers visited and range of locations along the coast, 2) # of samples collected, 3) # of different draggers sampled, 4) # of different trappers sampled, 5) length range of the vessels, 5) # of fishing grounds where the shrimp were caught, 7) total catch in lbs for draggers, 8) total catch in lbs for trappers, 9) # dragger boat days, 10) draggers average catch/day in lbs, 11) total hours drag time, 12) average catch in lbs/hr drag time, 13) total # of traps hauled, 14) total set over days and 15) average lbs/trap.

We look forward to seeing you next season and, again, many thanks for your cooperation.

Sincerely,



Stuart W. Sherburne
Marine Resources Scientist II



PRINTED ON RECYCLED PAPER

Commercial Shrimp Port Sampling Summary for December 15, 1998 – May 25, 1999

The commercial shrimp port sampling project is conducted by the Maine Department of Marine Resources Biological Monitoring Division headquartered at West Boothbay Harbor.

Port sampling of the 1998 -1999 commercial shrimp fishery began on opening day, December 15. The DMR port sampling team for the season consisted of Stuart Sherburne and Marilyn Bolen. Laboratory assistance was provided by Marcy Lucas of DMR's Ecology/Biology division. Assistance from NMFS Port Agent Peter Marckoon in Rockland enhanced our sampling/interviewing efforts.

The purpose of this project is to furnish sufficient biological and catch/effort information about the commercial shrimp fishery to the Department's Assessment and Statistics people so they, in conjunction with the Atlantic States Marine Fisheries Commission's Northern Shrimp Section, will be able to offer the best scientific advice available to fishery managers. We do this by collecting samples from many individual fishing grounds, gathering catch and effort information through captain interviews at various fishing ports, and by completing laboratory analyses of the shrimp collected.

We appreciate the excellent cooperation we have received from dealers and fishermen in obtaining shrimp samples and catch information.

During the past season (Dec. 15, 1998 - May 25, 1999) 185 shrimp samples and corresponding captain interviews were obtained from 173 draggers (83 different draggers) and 12 different trappers at 20 dealer locations from Portsmouth, NH to Winter Harbor, ME. Fifteen samples were collected in December, 47 in January, 49 in February, 29 in March, 28 in April and 17 in May. The length range of the boats sampled was 30' - 77'. The shrimp samples came from 80 different fishing grounds. The average catch/day for the draggers was 1,261.8 lbs with an average catch per unit of effort (CPUE) of 146.6 lbs/hr drag time. (During the 1997-1998 season (Dec. 8, 1997 - May 22, 1998) 241 draggers sampled (110 different draggers) had an average catch/day of 1,347.4 lbs with an average CPUE of 156.5 lbs/hr drag time). For the 12 trappers, the total catch was 12,878 lbs with an average catch lbs/trap of 8.4 lbs.

Shrimp are processed in the laboratory in order to generate sex-specific length frequency distributions, thus providing information on the size and age composition of the catch from different fishing grounds. Samples of fully egged shrimp, taken from various fishing grounds from Portsmouth, NH to Southwest Harbor, ME have been saved for possible fecundity studies.

Information from the interview forms is used to determine the total catch of the vessels sampled at each dealer, the range of catches in pounds for the vessels sampled at each dealer, the average catch in pounds per boat, the total drag time for the vessels sampled, the average catch per unit of effort in lbs/hr drag time (CPUE) for each vessel, the range of catches in lbs/hr drag time for the vessels sampled, and the average CPUE for the vessels sampled. The boat price for the shrimp landed on that day is also recorded.

We also maintain/update discrete lists of fishing grounds from which the samples are harvested, vessels sampled, and dealer sites utilized, so the lists can be reviewed and the sites/vessels readily selected to help lessen repeated sampling of the same body of shrimp, thus spatially broadening the sample base.

Information from the Maine commercial fishery is combined with similar information from Massachusetts and New Hampshire and with abundance indices from the summer Gulf of Maine shrimp survey for the purpose of managing the fishery. Since approximately 85% of the New England shrimp catch is taken by Maine fishermen, information provided by DMR is crucially important to effective management of the species.

Enclosed is a table that shows results for 15 different entities calculated for each month of the past season and for the season as a whole. The entities include: 1) the number of dealers visited and range of locations along the coast, 2) number of samples collected, 3) number of different draggers sampled, 4) number of different trappers sampled, 5) length range of the boats sampled, 6) number of fishing grounds that the samples came from, 7) total catch in lbs for draggers, 8) total catch in lbs for trappers, 9) number of dragger boat days, 10) draggers average catch/day in lbs, 11) total hours drag time, 12) lbs/hr drag time, 13) total number of traps hauled, 14) total set over days and 15) average lbs/trap.

Commercial Shrimp Port Sampling December 15, 1998 – May 25, 1999

	# Dealers Visited & Locations *1 Lbs/Trap	# Samples Collected	Boats		Length Range (ft) Sampled *2	# Fishing Grounds	Total Catch (lbs)		Dragger Boat Days	Draggers Av. Catch Per Day(lbs)	Total Hrs Drag Time	Lbs/Hr Drag Time	Total # Traps Hauled	Total Set Over Days	Average
			# Different Draggers	# Trappers Sampled			Draggers	Trappers							
Dec. 1998	6 Portsmouth to Port Clyde	15	15	0	35' - 54'	7	17,844	0	15	1,189.6	115.25	154.8	0	0	0
Jan. 1999	12 Portsmouth to SW Harbor	47	32	0	35' - 65'	24	47,881	0	50	957.6	375.55	127.5	0	0	0
Feb. 1999	8 Kennebunk port to Port Clyde	49	26	12	30' - 70'	26	54,524	12,878	37	1,473.6	325.25	167.6	1,532	42.3	8.4
March 1999	8 Portland to Winter Hbr.	29	26	0	32' - 63'	17	32,099	0	29	1,106.9	252.75	127.0	0	0	0
April 1999	13 Kennebunk port to Winter Hbr	28	26	0	35' - 60'	21	29,554	0	31	953.3	254.25	116.2	0	0	0
May 1999	3 Kennebunk port to SW Harbor	17	12	0	36' - 77'	9	67,939	0	36	1,887.2	381.0	178.3	0	0	0
Season Totals:	20 different dealers Portsmouth, NH to Winter Hbr. ME	185	83 different draggers	12 different trappers	30' - 77'	80 different fishing grounds	249,841	12,878	198	1,261.8	1,704.05	146.6	1,532	42.3	8.4

*1 Dealers visited more than one time in any given month are only counted once.

Sampling is also conducted at the Portsmouth, N.H. Fisherman's Co-op due to the fact that some Maine shrimp boats land their catches at that facility.

*2 Some vessels may be sampled more than once in a given month. Hence the number of samples collected may exceed the number of vessels sampled.

SEA URCHINS

**MAINE DEPARTMENT OF MARINE RESOURCES
INTERJURISDICTIONAL FISHERIES RESOURCE MONITORING AND
ASSESSMENT**

**COMMERCIAL PORT SAMPLING AND MANAGEMENT OF
GREEN SEA URCHINS (*STRONGYLOCENTROTUS DROEBACHIENSIS*)
ALONG THE MAINE COAST
Project No. 3-IJ-154
Contract No. NA96FI0021**

**COMPLETION REPORT
January 1, 1999 – December 31, 1999**

**By Edwin P. Creaser
and
Margaret Hunter**

Commercial Port Sampling Program

Commercial port sampling data collection

The commercial sea urchin port sampling program was initiated during the 1994/1995 season. No money was available to fund travel by a part-time assistant, so interviews were collected coastwide by phone and no size information was recorded. A full-time sea urchin position was created early during the 1995/1996 season and it became possible to collect interview and size information from a commercial port sampling program conducted at buying stations along the entire coast. We attempted to sample twice/week and buying stations were selected randomly. Sampling activities were confined to locations where at least 5-7 harvesters unloaded their catches. Throughout the 1995/1996 sampling season, a substantial amount of time and thought was devoted to: locating buying station, acquainting ourselves with key buying station personnel, refining interview questions where possible, learning to rapidly process samples for diameter and weight, and developing sampling strategies for unusual sampling situations we encountered.

During the 1996/1997 commercial port sampling season, we improved the methodology involved in the selection of buying/sampling stations and the collection of catch, effort, catch per unit effort (CPUE), size (diameter, weight), external sex determination. We also developed a grading system (1-3) for the condition of the urchins measured. An attempt was made to proportionally allocate the number of buying stations sampled within each county (York, Cumberland, Hancock, Washington) or combination of counties (Sagadahoc/Lincoln, Knox/Waldo). More interviews and samples were obtained in counties with more buying stations. The sampling of urchin landings by proportional allocation is complicated by a constant change in the numbers and locations of buying stations during the course of the season; buyers enter and leave the fishery move the locations of their buying station, and change the numbers of sub-buying stations, and we never know for certain how many active buyers there are in each county at one point in time.

The coast of Maine has been divided into two Zones in order to (1) control urchin harvesting effort and (2) establish harvesting seasons which are based upon the urchin reproductive cycle. Spawning occurs earlier in Western Maine (Zone 1) and Zone 1 opens and closes sooner than Zone 2 because the product (uni) is not desirable during spawning. The division line between Zone 1 and Zone 2 occurs in Penobscot Bay (Figure 1) with York, Cumberland, Sagadahoc/Lincoln, and Knox/Waldo Counties in Zone 1, and Hancock and Washington Counties in Zone 2. We attempted to sample two buying stations per week (one in each zone), during weather conditions when harvesters were active. We also attempted to sample a different buying station during each trip but sometimes this was not possible because some of the western counties have few buying stations. The commercial port sampling procedure outlined above was used during the 1996/1997, 1997/1998, and 1998/1999 seasons.

During the 1998/1999 season, port samplers interviewed 424 divers and 71 draggers. The breakdown of diver interviews by county was York (20), Cumberland (23), Sagadahoc/Lincoln (85), Knox/Waldo (117), Hancock (76), Washington (103). Dragger

interviews were Knox/Waldo (9), Hancock (3), Washington (59). Port samplers also measured and weighed 9839 urchins from 492 catches in both zones.

Catch, effort, CPUE, and size information from interviews and samples

A summary of information recorded from diver and dragger interviews during the 1998/1999 season is shown in Tables 1 and 2 respectively. Table 1 shows that the mean (average) diver age is 34.9, the mean diver harvest depth is 9.0 – 24.9 ft., the mean catch per diver day is 584.1 lbs., the mean percent roe is 14.4%, and the mean number of bottom hours is 3.3. Table 2 shows that the mean boat length is 36.2 ft., the mean dragger harvest depth is 20.8 – 57.4 ft., the mean catch per dragger day is 665.2 lbs., the mean percent roe is 12.9%, the mean numbers of hours fished is 5.9, the mean number of minutes per tow is 7.8, and the mean number of tows per day is 35.5. Other important parameters are also listed in Tables 1 and 2. Selected information recorded above for the 1998/1999 season is compared with previous seasons in Table 3.

CPUE for both divers and draggers is presented in Table 4 and Figure 2 (A,B). A comparison of the lbs. per bottom hr. summarized from diver interviews conducted during 5 consecutive harvesting seasons (Fig. 2A), clearly shows that, for the first 3 harvesting seasons, CPUE declined in every coastal county. During the 1997/1998 and 1998/1999 seasons, the increase in CPUE in York County can be attributed to (1) erroneous estimates resulting from small sample size (2) deeper diving to reach high concentrations of lower quality (lower % roe) urchins, and (3) finding extensive beds of urchins that had previously been missed on the Isle of Shoals. It is more difficult to interpret the significant increase in CPUE observed in Sagadahoc/Lincoln and Knox/Waldo counties during the 1998/1999 season. This increase in CPUE may be attributed to (1) an abundant year class entering the fishery, (2) ideal weather conditions during a greater percentage of the season, and (3) a deeper extension of the feed line which resulted in the availability (to harvest) of deeper, more abundant urchins with higher than usual % roes. No attempt will be made to draw conclusions from dragger CPUE information (Fig. 2B) because of small sample size. It is noteworthy, however, (Table 4) that the overall CPUE for draggers, expressed as lbs./foot drag width/ hour towed, has remained fairly constant during 5 seasons.

Corrected size (diameter) frequency information summarized from samplings of the commercial catch, are shown in Figures 3 for combined Zone1/Zone2 data. Figure 3 shows that 4% of the landed catch (in numbers), are undersized (less than 2 inches in diameter). This percentage is well within the 10% allowable tolerance limits for the 2 inch size restriction. If the legal diameter of urchins was increased to 2 ½ or 2 ¾ inches in Zone 1, the landings in numbers would be reduced by 14% and 31% respectively. An increase in the minimum legal size and a maximum size limit (3½ inches) has been discussed by the Sea Urchin Zone Council as possible future restrictions. An increase in the minimum legal size would allow more urchins to spawn more than once prior to harvest. It is unknown whether an increase in the minimum size limit would result in an increase in discard mortality but we suspect that it would not, based upon recent hearsay that an increasing number of divers are culling than catches on the bottom. A maximum size limit would allow urchins with the greatest volume of eggs and sperm, to spawn and produce large numbers of larvae. Public hearings were held on the proposed maximum size limit (3 ½ inch) during July 1999 but harvesters rejected the idea despite the fact that urchins of this size are uncommon. Only 45 out of 25,534 urchins measured during commercial port sampling since 1995 exceeded 3 ½ inches in

diameter. During the 1998/1999 season, only .08% of the 9839 urchins measured (8 urchins) exceeded 3 ½ inches (figure 3). The rejection resulted from the fact that some harvesters believe that a substantial portion of their catch consists of large urchins in the maximum size range. Some harvesters also firmly believe that "thinning out" the large urchins is an effective management strategy. We have distributed 3 ½ inch measures to many harvesters in an attempt to convince them that only a small portion of their catch exceeds 3 ½ inches in diameter.

Landings

It is well known from evidence found in "kitchen middens" that Maine's aboriginal inhabitants consumed sea urchins. In more recent times, the first actual records of sea urchin landings date from 1929. Between 1937-1986, sea urchin landings varied between 3,008 and 180,085 lbs. valued between \$306.00 and \$9,078.00. These urchins were shipped to Chicago, Boston, and New York City (Fulton Fish Market) where they were purchased by ethnic groups of Italian, Spanish, Portuguese, German, Greek, and French descent. Beginning in the mid 70s, the Japanese were expressing considerable interest in North American urchins and by 1986, the value of sea urchins was increasing rapidly. During 1987, the sea urchin fishery in Maine expanded rapidly as a result to Japanese interest in our product. Table 5 shows that landings peaked in 1993 at 42 million lbs. And value peaked in 1995 at \$36 million. The fishery has steadily declined since then as a result of over fishing, as well as, size restrictions and a shortened season.

Season

The sea urchin harvesting season was 365 days long between 1987-1992 (Table 6). Beginning in 1993, the season length was gradually reduced to a present season of 120 days. The selection of these 120 days is the joint responsibility of the Department of Marine Resources and the members of the Sea Urchin Zone Council (SUZC). Factors, such as, harvest method, fishing zone, market conditions, holidays, demand and spawning conditions are considered in the selection of fishing days. Calendars for the 1998/1999 season are shown in Table 7.

Regulations and Statutes

Management of the sea urchin resource was initiated in 1992 and new regulations and statutes have been added on an annual basis since that time (Table 8).

Sea Urchin Mortalities

Sea urchin mortalities were reported from at least 24 locations along the Maine coast since the urchin-harvesting season opened in Zone 1 on Sept. 1, 1999. Locations reported by harvesters are shown in Table 9.

Anecdotal information reveals that, for the most part, the mortality was confined to the band of productive, legal-sized urchins located in the shallow kelp-feeding zone. Smaller urchins in shallow water and unproductive urchins in deep water appeared to be unaffected. In some areas, divers reported that blue mussels and crabs were also affected. Industry representatives expressed a wide range of concerns. Some viewed it

as a natural mortality of little significance. Others expressed extreme concern about the high mortality of productive urchins located around offshore islands and stated that harvesters were reluctant to inform DMR because they believed DMR would close the fishery if they knew the extent of the problem.

We speculate that the urchins were severely stressed by longer than normal exposure to high water temperature or exposure to oxygen-depleted water resulting from a die-off of a common marine phytoplankton, which was highly concentrated and distributed over a substantial portion of the coast. This concentration, which turned the water reddish to brownish, occurred early in Sept. and many urchins died during Sept. and Oct.. Some mortality was reported in the Schoodic Pt. Area, as late as, mid Nov. 1999. Apparently, large numbers of crabs (species not identified) attacked the urchins in their weakened condition and consumed their soft mouth parts leading many divers to believe that crabs were responsible for the mortality. The bacteria, Vibrio, was also associated with the mortality but it may have occurred as a secondary infection. We are uncertain about the presence or absence of Paramoeba, an organism that has been known to cause mass urchin mortalities along the coast of Nova Scotia and is also associated with higher than normal water temperatures. Although negative results were reported for samples analyzed for Paramoeba, we now know that the organism can shrivel up and disappear from the urchin once the water temperature drops below 12 degrees C (54 degrees F). In the future, the presence or absence of Paramoeba can only be confirmed through rapid analysis at the time of infection.

Urchin Dealer/Processor Logbook Program, 1998 – 1999

All sea urchin buyers and processors who buy urchins from harvesters in Maine, are required to maintain and submit logbooks in accordance with Title 12 – Chapter 623 §6759-S and DMR regulation Chapter 26.10. Failure to maintain a logbook is a Class D crime. Logbook data are protected by the confidentiality provisions of Chapter 607 §6173.

We recorded the status of 54 buyers and 19 processors during the 1998/1999 season. About 32 of these were not buying urchins directly from harvesters in Maine: they were either buying in Canada, not buying at all, just trucking, or buying solely from other buyers. The remaining 41 dealers, who buy directly from harvesters, sent in a total of 235 monthly logbooks describing 29,610 lots of urchins purchased. Each description includes date, transaction location, license no., harvest method, pounds purchased, % roe (and test method) and price per lb. for each lot.

Data from logbooks were entered, checked, and summarized to make many calculations and analyses of importance in sea urchin fishery management including:

- Landings in pounds and value in dollars per month by county and harvest method.
- Urchin roe content by month, location (zone) and harvest method.
- Daily price fluctuations.
- Numbers of harvester-fishing days, and number of active harvesters.
- Average harvester catch size.

Table 1
A summary of information recorded from diver interviews during 1998/1999 season

Maine Sea Urchin Diver Catch/Effort Summary for 1998 - 1999

Catch Location		Age (Yrs)	Exper (Yrs)	Depth						Catch (per Diver-Day)				Effort (per Diver-Day)		Catch/Effort Statistics			
				Et(Min)	Et(Max)	M(Min)	M(Max)	Ea(Min)	Ea(Max)	Pounds	Price/Lb	Value(\$)	Net Roe %	BottomHrs	AwayHrs	Lbs/AwayHr	\$/AwayHr	Lbs/BotmHr	\$/BotmHr
York County	Mean	37.35	8.65	8.82	25.47	2.69	7.76	1.47	4.25	744.85	1.36	1001.31	14.30	3.77	8.18	97.69	131.45	223.70	299.76
	StdDev	8.93	2.18	12.48	18.42	3.80	5.61	2.08	3.07	182.82	0.26	273.21	1.75	1.04	1.15	25.53	36.79	73.31	103.77
	StdErr	2.00	0.49	3.03	4.47	0.92	1.36	0.50	0.74	40.88	0.06	61.09	0.39	0.25	0.28	6.19	8.92	17.78	25.17
	N	20	20	17	17	17	17	17	17	20	20	20	20	17	17	17	17	17	17
Cumberland County	Mean	32.9	7.7	9.9	32.4	3.0	9.9	1.6	5.4	385.3	1.24	485.9	15.0	3.4	6.7	59.3	75.7	117.2	147.8
	StdDev	5.61	2.48	12.40	20.51	3.78	6.25	2.07	3.42	152.22	0.20	223.53	2.80	1.21	2.25	18.15	33.16	39.18	57.16
	StdErr	1.17	0.52	2.58	4.28	0.79	1.30	0.43	0.71	31.74	0.04	46.61	0.58	0.25	0.47	3.78	8.92	8.17	11.92
	N	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Sagadahoc - Lincoln Counties	Mean	35.5	8.9	10.1	27.1	3.1	8.3	1.7	4.5	473.2	1.23	573.4	14.9	3.1	6.1	79.8	97.8	161.5	198.6
	StdDev	7.74	4.14	12.34	14.80	3.76	4.51	2.06	2.47	203.89	0.24	264.14	2.96	1.03	1.31	34.25	46.60	68.66	90.64
	StdErr	0.84	0.45	1.34	1.61	0.41	0.49	0.22	0.27	22.11	0.03	28.65	0.32	0.11	0.14	3.72	5.05	7.28	9.83
	N	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
Knox-Waldo Counties	Mean	34.4	8.4	6.8	23.1	2.1	7.1	1.1	3.9	545.4	1.18	648.0	13.7	3.3	7.4	75.2	88.9	173.9	204.0
	StdDev	5.99	2.45	5.18	10.79	1.58	3.29	0.86	1.80	253.60	0.22	327.65	2.11	1.21	1.79	31.95	41.73	72.25	90.78
	StdErr	0.55	0.23	0.48	1.00	0.15	0.30	0.08	0.17	23.45	0.02	30.29	0.19	0.11	0.17	2.95	3.86	6.68	8.39
	N	117	116	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
Hancock County	Mean	34.0	7.5	5.5	15.4	1.7	4.7	0.9	2.8	654.2	1.24	817.1	14.5	3.4	7.1	95.6	118.7	201.0	247.1
	StdDev	6.73	2.71	5.03	5.90	1.53	1.80	0.84	0.98	258.08	0.32	391.42	3.00	1.03	1.65	40.93	58.45	73.05	101.39
	StdErr	0.78	0.31	0.58	0.68	0.18	0.21	0.10	0.11	29.37	0.04	44.90	0.34	0.12	0.19	4.89	6.70	8.38	11.63
	N	74	74	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76
Washington County	Mean	35.4	7.5	13.3	30.6	4.0	9.3	2.2	5.1	682.5	1.08	740.5	14.6	3.4	6.2	114.2	121.4	209.7	223.6
	StdDev	7.05	2.36	10.48	13.48	3.19	4.11	1.75	2.25	293.64	0.29	387.63	2.57	0.99	1.29	47.00	55.70	87.30	107.42
	StdErr	0.70	0.23	1.03	1.33	0.31	0.40	0.17	0.22	28.93	0.03	38.19	0.28	0.10	0.13	4.85	5.52	8.60	10.58
	N	103	103	103	103	103	103	103	103	103	103	103	84	103	102	102	102	103	103
Canada (N.B.)	Mean	44.0	4.0	3.0	6.0	0.9	1.8	0.5	1.0	438.0	1.20	525.6	16.0	5.0	9.0	48.7	58.4	87.6	105.1
	StdDev																		
	StdErr																		
	N	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
All Combined	Mean	34.9	8.1	9.0	24.9	2.8	7.6	1.5	4.2	584.1	1.19	692.8	14.4	3.3	6.8	89.2	104.9	183.7	215.6
	StdDev	6.92	2.93	9.55	13.82	2.91	4.21	1.59	2.30	265.33	0.27	355.02	2.63	1.09	1.68	40.94	51.41	78.02	99.95
	StdErr	0.34	0.14	0.47	0.67	0.14	0.21	0.08	0.11	12.87	0.01	17.22	0.13	0.05	0.08	2.00	2.51	3.80	4.87
	N	423	422	422	422	422	422	422	422	425	425	425	406	422	421	421	421	422	422

Maine Sea Urchin Dragger Catch/Effort Summary for 1998 - 1999

Table 2

A summary of information recorded from dragger interviews during 1998/1999 season

Catch Location		Boat (Ft)	No. of Crew	Depth						Catch (per Dragger-Day)			
				Ft(Min)	Ft(Max)	M(Min)	M(Max)	Fa(Min)	Fa(Max)	Pounds	Price/Lb	Value(\$)	Net Roe %
Cumberland County	Mean	24.0	1.0	15.0	60.0	4.6	18.3	2.5	10.0	228.0	0.15	34.20	8.0
	StdDev												
	StdErr												
	N	1	1	1	1	1	1	1	1	1	1	1	1
Knox-Waldo Counties	Mean	33.7	2.1	26.0	56.8	7.9	17.3	4.3	9.5	608.3	0.69	386.49	9.8
	StdDev	3.43	0.33	19.05	38.68	5.81	11.79	3.18	6.45	257.61	0.24	151.37	1.93
	StdErr	1.14	0.11	6.35	12.89	1.94	3.93	1.06	2.15	85.87	0.08	50.46	0.64
	N	9	9	9	9	9	9	9	9	9	9	9	9
Hancock County	Mean	33.3	3.0	16.7	28.3	5.1	8.6	2.8	4.7	523.3	1.27	684.53	12.3
	StdDev	0.58	0.00	20.21	27.54	6.16	8.39	3.37	4.59	158.99	0.25	295.23	4.04
	StdErr	0.33	0.00	11.67	15.90	3.56	4.85	1.94	2.65	91.79	0.15	170.45	2.33
	N	3	3	3	3	3	3	3	3	3	3	3	3
Washington County	Mean	36.9	2.3	20.3	59.0	6.2	18.0	3.4	9.8	688.8	1.07	717.23	13.5
	StdDev	3.16	0.44	14.94	31.58	4.55	9.62	2.49	5.26	297.03	0.39	374.79	3.36
	StdErr	0.41	0.06	1.94	4.11	0.59	1.25	0.32	0.69	38.67	0.05	48.79	0.45
	N	59	59	59	59	59	59	59	59	59	59	59	57
All Combined	Mean	36.2	2.3	20.8	57.4	6.3	17.5	3.5	9.6	665.2	1.02	665.04	12.9
	StdDev	3.62	0.47	15.47	32.29	4.72	9.84	2.58	5.38	291.05	0.40	370.82	3.46
	StdErr	0.43	0.06	1.82	3.80	0.58	1.16	0.30	0.63	34.30	0.05	43.70	0.41
	N	72.00	72.00	72.00	72.00	72.00	72.00	72.00	72.00	72.00	72.00	72.00	70.00

Catch Location		Effort (per Dragger-Day)									Catch/Effort Statistics									
		Width(ft)	Width(M)	Fish/Hr	Mins/Tow	Tows/Hr	Total Tows	Tow/Hrs	Man-Hrs	Ft-Tow/Hrs	Lbs/TowHr	Kg/TowHr	Lb/ManHr	Lb/Ft-TowHr	Kg/Ft-TowHr	Kg/M-TowHr	\$/TowHr	\$/ManHr	\$/Ft-TowHr	\$/M-TowHr
Cumberland County	Mean	3.5	1.1	4.3	7.5	4.5	19.1	2.4	5.0	8.4	95.4	43.3	45.6	27.2	12.4	40.6	14.31	6.84	4.09	13.41
	StdDev																			
	StdErr																			
	N	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Knox-Waldo Counties	Mean	5.1	1.6	5.6	11.4	3.9	21.5	4.0	17.1	20.5	152.2	69.0	37.7	29.8	13.5	44.4	100.83	24.23	19.95	65.45
	StdDev	0.65	0.20	1.58	3.04	0.78	7.73	1.23	3.99	6.95	49.55	22.48	16.00	8.71	3.95	12.96	34.76	10.91	6.63	21.75
	StdErr	0.22	0.07	0.53	1.01	0.26	2.58	0.41	1.33	2.32	16.52	7.49	5.33	2.90	1.32	4.32	11.59	3.64	2.21	7.25
	N	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Hancock County	Mean	4.8	1.5	3.8	6.2	7.0	30.3	2.2	18.0	10.6	269.7	122.3	31.2	55.1	25.0	82.0	339.07	39.77	69.57	228.24
	StdDev	0.29	0.09	1.50	3.40	4.36	28.78	1.24	6.54	5.13	143.45	65.07	14.50	27.36	12.41	40.72	192.13	20.30	37.12	121.79
	StdErr	0.17	0.05	0.87	1.96	2.52	16.62	0.71	3.77	2.96	82.82	37.57	8.37	15.80	7.17	23.51	110.93	11.72	21.43	70.32
	N	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Washington County	Mean	5.4	1.6	6.0	7.3	6.6	38.3	4.3	18.2	22.9	187.1	84.9	39.7	35.5	16.1	52.8	190.22	40.87	38.00	118.11
	StdDev	0.46	0.14	1.61	3.32	3.22	16.62	1.48	5.01	8.11	115.17	52.24	17.25	22.15	10.05	32.96	120.40	20.36	23.67	77.67
	StdErr	0.06	0.02	0.21	0.43	0.42	2.18	0.19	0.66	1.07	15.12	6.86	2.25	2.91	1.32	4.33	15.81	2.65	3.11	10.20
	N	59	59	59	59	58	58	58	58	58	58	58	59	58	58	58	58	59	58	58
All Combined	Mean	5.3	1.6	5.9	7.8	6.2	35.5	4.1	17.8	21.8	184.9	83.9	39.1	35.5	16.1	52.8	182.70	38.27	34.93	114.62
	StdDev	0.54	0.16	1.65	3.50	3.15	17.08	1.49	5.10	8.30	110.60	50.17	16.78	21.24	9.63	31.61	123.93	20.21	24.40	80.07
	StdErr	0.06	0.02	0.19	0.41	0.37	2.03	0.18	0.61	0.99	13.13	5.95	1.98	2.52	1.14	3.75	14.71	2.38	2.90	9.50
	N	72	72	72	72	71	71	71	71	71	71	71	72	71	71	71	71	72	71	71

Table 3

A summary of selected information collected from diver and dragger interviews during
1994/1995 – 1998/1999 sampling seasons.

<u>Divers</u>	<u>1994/1995</u>	<u>1995/1996</u>	<u>1996/1997</u>	<u>1997/1998</u>	<u>1998/1999</u>
Mean diver age $\pm$ 1SE	33.6 $\pm$.45	32.3 $\pm$.49	32.8 $\pm$.34	33.5 $\pm$.35	34.9 $\pm$.34
Mean range of harvest depths (ft) $\pm$ 1SE	10.7 $\pm$.43 – 21.9 $\pm$.53	14.5 $\pm$.72 – 31.7 $\pm$.97	8.4 $\pm$.37 – 24.5 $\pm$.64	9.3 $\pm$.45 – 27.3 $\pm$.72	9.0 $\pm$.47 – 24.9 $\pm$.67
Mean catch (lbs) per diver day $\pm$ 1SE	628.0 $\pm$ 19.18	558.7 $\pm$ 23.76	606.7 $\pm$ 14.79	587.8 $\pm$ 14.85	584.1 $\pm$ 12.87
Mean % roe $\pm$ 1SE	12.5 $\pm$.21	13.3 $\pm$.28	12.2 $\pm$.11	13.9 $\pm$.14	14.4 $\pm$.13
Mean no. bottom hrs. $\pm$ 1SE	3.4 $\pm$.08	3.0 $\pm$.08	3.4 $\pm$.05	3.6 $\pm$.05	3.3 $\pm$.05
<u>Draggers</u>					
Mean boat length ($\pm$ 1SE)	33.2 $\pm$.70	34.3 $\pm$.62	35.1 $\pm$.40	35.1 $\pm$.50	36.2 $\pm$.43
Mean range of harvest depths ($\pm$ 1SE)	16.6 $\pm$ 1.65 – 39.4 $\pm$ 3.01	18.1 $\pm$ 2.54 – 43.6 $\pm$ 3.56	22.6 $\pm$ 3.04 – 54.8 $\pm$ 3.96	15.9 $\pm$ 1.49 – 57.0 $\pm$ 3.74	20.8 $\pm$ 1.82 – 57.4 $\pm$ 3.80
Mean catch (lbs) per dragger day ($\pm$ 1SE)	564.3 $\pm$ 37.54	444.3 $\pm$ 35.21	526.6 $\pm$ 40.78	607.9 $\pm$ 40.67	665.2 $\pm$ 34.30
Mean % roe ($\pm$ 1SE)	11.1 $\pm$.42	15.2 $\pm$.63	13.4 $\pm$.47	12.7 $\pm$.42	12.9 $\pm$.41
Mean no. of hrs. fished ($\pm$ 1SE)	5.6 $\pm$.22	5.01 $\pm$.27	5.4 $\pm$.23	6.0 $\pm$.21	5.9 $\pm$.19
Mean minutes per tow ($\pm$ 1SE)	7.4 $\pm$.46	8.33 $\pm$.59	7.4 $\pm$.35	9.0 $\pm$.59	7.8 $\pm$.41
Mean no. of tows per day ($\pm$ 1SE)	34.3 $\pm$ 1.90	30.88 $\pm$ 3.02	34.5 $\pm$ 2.01	35.5 $\pm$ 2.80	35.5 $\pm$ 2.03

Table 4
Diver and dragger CPUE information by county during the 1994/1995 – 1998/1999 seasons

Maine Sea Urchin Catch per Unit Effort
1994 to 1999

Diver Lbs per Bottom Hour

<u>County of Catch</u>	<u>Oct 1994 - Mar 1995</u>			<u>Dec 1995 - Apr 1996</u>			<u>Aug 1996 - Apr 1997</u>			<u>Sep 1997 - Apr 1998</u>			<u>Sep 1998 - Apr 1999</u>		
	<u>Mean</u>	<u>+S.E.</u>	<u>N</u>	<u>Mean</u>	<u>+S.E.</u>	<u>N</u>	<u>Mean</u>	<u>+S.E.</u>	<u>N</u>	<u>Mean</u>	<u>+S.E.</u>	<u>N</u>	<u>Mean</u>	<u>+S.E.</u>	<u>N</u>
York	141.2	9.60	19	130.2	22.14	8	122.0	13.32	18	203.9	32.57	14	223.7	17.78	17
Cumberland	163.6	13.93	42	130.8	14.03	28	130.4	11.31	27	111.3	10.79	16	117.2	8.17	23
Sagadahoc-Lincoln	184.7	10.72	76	150.9	11.80	38	141.7	8.14	47	124.6	9.44	57	161.5	7.26	85
Knox-Waldo	183.8	11.75	89	170.0	13.69	27	167.2	7.27	101	145.9	6.39	110	173.9	6.68	117
Hancock	226.4	10.47	71	211.2	17.49	29	208.9	7.76	110	204.3	10.48	78	201.0	8.38	76
Washington	232.7	20.90	42	242.7	13.43	80	220.0	8.17	122	205.8	8.26	102	209.7	8.60	103
All	195.4	5.54	341	192.4	7.19	213	186.1	4.09	425	171.9	4.45	381	183.7	3.80	422

Dragger Lbs per Foot Width - Tow Hour

<u>County of Catch</u>	<u>Oct 1994 - Mar 1995</u>			<u>Dec 1995 - Apr 1996</u>			<u>Oct 1996 - Apr 1997</u>			<u>Oct 1997 - Apr 1998</u>			<u>Oct 1998 - Apr 1999</u>		
	<u>Mean</u>	<u>+S.E.</u>	<u>N</u>	<u>Mean</u>	<u>+S.E.</u>	<u>N</u>	<u>Mean</u>	<u>+S.E.</u>	<u>N</u>	<u>Mean</u>	<u>+S.E.</u>	<u>N</u>	<u>Mean</u>	<u>+S.E.</u>	<u>N</u>
York	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0
Cumberland	-	-	0	43.1	18.85	3	-	-	0	-	-	0	27.2		1
Sagadahoc-Lincoln	-	-	0	-	-	0	22.1	-	1	-	-	0	-	-	0
Knox-Waldo	32.5	4.77	17	20.6	5.19	9	23.9	4.66	10	28.9	3.90	12	29.8	2.90	9
Hancock	43.6	11.89	24	22.1	3.26	3	32.1	4.84	12	45.9	11.50	4	55.1	15.80	3
Washington	40.3	6.59	20	36.7	6.74	41	32.9	3.13	62	32.3	3.55	50	35.5	2.91	58
All	39.1	5.13	63	33.7	5.14	56	31.6	2.45	85	32.5	2.87	66	35.5	2.52	71

Table 5

Sea Urchin Landings and Value

	<u>Landings (lbs)</u>	<u>Value (\$)</u>	<u>Price/lb.</u>
1987	1,440,161	236,391.00	0.16
1988	6,221,604	1,758,805.00	0.28
1989	9,657,158	3,698,038.00	0.38
1990	13,227,430	5,955,975.00	0.45
1991	20,535,411	11,158,425.00	0.54
1992	26,739,442	15,322,447.00	0.57
1993	42,141,138	27,103,054.00	0.64
1994	38,295,612	33,081,336.00	0.86
1995	34,690,310	36,154,579.00	1.04
1996	25,839,600	28,983,365.00	1.12
1997	19,054,543	20,703,723.00	1.09
1998	15,040,191	17,001,151.00	1.13

Table 6
The annual number of fishing days between 1987-2000

Fishing Days

1986		365 days		
1987		365		
1988		365		
1989		365		
1990		365		
1991		365		
1992		365		
1993		335		
1994/1995	Z1	228	Z2	225 days
1995/1996	Z1	228	Z2	211
1996/1997	Z1	150	Z2	170
1997/1998	Z1	120	Z2	120
1998/1999	Z1	120	Z2	120
1999/2000	Z1	120	Z2	120

Table 7.
1998/1999 Maine Sea Urchin season for Zones 1 and 2
1998 - 1999 Maine Sea Urchin Season for Zone 1

Divers, Rakers, and Trappers

X = Closed

□ = Open

August 1998						
S	M	Tu	W	Th	F	S
						1 X
2	3	4	5	6	7	8
X	X	X	X	X	X	X
9	10	11	12	13	14	15
X	X	X	X	X	X	X
16	17	18	19	20	21	22
X	X	X	X	X	X	X
23	24	25	26	27	28	29
X	X	X	X	X	X	X
30	31					
X	X					

September 1998						
S	M	Tu	W	Th	F	S
		1	2	3	4	5
						X
6	7	8	9	10	11	12
X	X	X	X	X	X	X
13	14	15	16	17	18	19
X	X	X	X	X	X	X
20	21	22	23	24	25	26
X	X	X	X	X	X	X
27	28	29	30			
X	X	X	X			

October 1998						
S	M	Tu	W	Th	F	S
				1	2	3
						X
4	5	6	7	8	9	10
X	X	X	X	X	X	X
11	12	13	14	15	16	17
X	X	X	X	X	X	X
18	19	20	21	22	23	24
X	X	X	X	X	X	X
25	26	27	28	29	30	31
X	X	X	X	X	X	X

November 1998						
S	M	Tu	W	Th	F	S
1	2	3	4	5	6	7
X	X	X	X	X	X	X
8	9	10	11	12	13	14
X	X	X	X	X	X	X
15	16	17	18	19	20	21
X	X	X	X	X	X	X
22	23	24	25	26	27	28
X	X	X	X	X	X	X
29	30					
X	X					

December 1998						
S	M	Tu	W	Th	F	S
		1	2	3	4	5
						X
6	7	8	9	10	11	12
X	X	X	X	X	X	X
13	14	15	16	17	18	19
X	X	X	X	X	X	X
20	21	22	23	24	25	26
X	X	X	X	X	X	X
27	28	29	30	31		
X	X	X	X	X		

January 1999						
S	M	Tu	W	Th	F	S
					1	2
					X	X
3	4	5	6	7	8	9
X	X	X	X	X	X	X
10	11	12	13	14	15	16
X	X	X	X	X	X	X
17	18	19	20	21	22	23
X	X	X	X	X	X	X
24	25	26	27	28	29	30
X	X	X	X	X	X	X
31						
X						

February 1999						
S	M	Tu	W	Th	F	S
	1	2	3	4	5	6
					X	X
7	8	9	10	11	12	13
X	X	X	X	X	X	X
14	15	16	17	18	19	20
X	X	X	X	X	X	X
21	22	23	24	25	26	27
X	X	X	X	X	X	X
28						
X						

March 1999						
S	M	Tu	W	Th	F	S
	1	2	3	4	5	6
	X	X	X	X	X	X
7	8	9	10	11	12	13
X	X	X	X	X	X	X
14	15	16	17	18	19	20
X	X	X	X	X	X	X
21	22	23	24	25	26	27
X	X	X	X	X	X	X
28	29	30	31			
X	X	X	X			

April 1999						
S	M	Tu	W	Th	F	S
				1	2	3
				X	X	X
4	5	6	7	8	9	10
X	X	X	X	X	X	X
11	12	13	14	15	16	17
X	X	X	X	X	X	X
18	19	20	21	22	23	24
X	X	X	X	X	X	X
25	26	27	28	29	30	
X	X	X	X	X	X	

Draggers

X = Closed

□ = Open

August 1998						
S	M	Tu	W	Th	F	S
						1 X
2	3	4	5	6	7	8
X	X	X	X	X	X	X
9	10	11	12	13	14	15
X	X	X	X	X	X	X
16	17	18	19	20	21	22
X	X	X	X	X	X	X
23	24	25	26	27	28	29
X	X	X	X	X	X	X
30	31					
X	X					

September 1998						
S	M	Tu	W	Th	F	S
		1	2	3	4	5
		X	X	X	X	X
6	7	8	9	10	11	12
X	X	X	X	X	X	X
13	14	15	16	17	18	19
X	X	X	X	X	X	X
20	21	22	23	24	25	26
X	X	X	X	X	X	X
27	28	29	30			
X	X	X	X			

October 1998						
S	M	Tu	W	Th	F	S
				1	2	3
				X	X	X
4	5	6	7	8	9	10
X	X	X	X	X	X	X
11	12	13	14	15	16	17
X	X	X	X	X	X	X
18	19	20	21	22	23	24
X	X	X	X	X	X	X
25	26	27	28	29	30	31
X	X	X	X	X	X	X

November 1998						
S	M	Tu	W	Th	F	S
1	2	3	4	5	6	7
X	X	X	X	X	X	X
8	9	10	11	12	13	14
X	X	X	X	X	X	X
15	16	17	18	19	20	21
X	X	X	X	X	X	X
22	23	24	25	26	27	28
X	X	X	X	X	X	X
29	30					
X	X					

December 1998						
S	M	Tu	W	Th	F	S
		1	2	3	4	5
						X
6	7	8	9	10	11	12
X	X	X	X	X	X	X
13	14	15	16	17	18	19
X	X	X	X	X	X	X
20	21	22	23	24	25	26
X	X	X	X	X	X	X
27	28	29	30	31		
X	X	X	X	X		

January 1999						
S	M	Tu	W	Th	F	S
					1	2
					X	X
3	4	5	6	7	8	9
X	X	X	X	X	X	X
10	11	12	13	14	15	16
X	X	X	X	X	X	X
17	18	19	20	21	22	23
X	X	X	X	X	X	X
24	25	26	27	28	29	30
X	X	X	X	X	X	X
31						
X						

February 1999						
S	M	Tu	W	Th	F	S
	1	2	3	4	5	6
					X	X
7	8	9	10	11	12	13
X	X	X	X	X	X	X
14	15	16	17	18	19	20
X	X	X	X	X	X	X
21	22	23	24	25	26	27
X	X	X	X	X	X	X
28						
X						

March 1999						
S	M	Tu	W	Th	F	S
	1	2	3	4	5	6
	X	X	X	X	X	X
7	8	9	10	11	12	13
X	X	X	X	X	X	X
14	15	16	17	18	19	20
X	X	X	X	X	X	X
21	22	23	24	25	26	27
X	X	X	X	X	X	X
28	29	30	31			
X	X	X	X			

April 1999						
S	M	Tu	W	Th	F	S
				1	2	3
				X	X	X
4	5	6	7	8	9	10
X	X	X	X	X	X	X
11	12	13	14	15	16	17
X	X	X	X	X	X	X
18	19	20	21	22	23	24
X	X	X	X	X	X	X
25	26	27	28	29	30	
X	X	X	X	X	X	

Table 7
1998/1999 Maine Sea Urchin season for Zones 1 and 2
1998 - 1999 Maine Sea Urchin Season for Zone 2

Early Season for Divers, Draggers, Rakers, Trappers ☒ = Closed ☐ = Open

August 1998						
S	M	Tu	W	Th	F	S
						1
						X
2	3	4	5	6	7	8
X	X	X	X	X	X	X
9	10	11	12	13	14	15
X	X	X	X	X	X	X
16	17	18	19	20	21	22
X	X	X	X	X	X	X
23	24	25	26	27	28	29
X	X	X	X	X	X	X
30	31					
X	X					

September 1998						
S	M	Tu	W	Th	F	S
		1	2	3	4	5
		X	X	X	X	X
6	7	8	9	10	11	12
X	X	X	X	X	X	X
13	14	15	16	17	18	19
X	X	X	X	X	X	X
20	21	22	23	24	25	26
X	X	X	X	X	X	X
27	28	29	30			
X	X	X	X			

October 1998						
S	M	Tu	W	Th	F	S
				1	2	3
				X	X	X
4	5	6	7	8	9	10
X	X	X	X	X	X	X
11	12	13	14	15	16	17
X	X	X	X	X	X	X
18	19	20	21	22	23	24
X	X	X	X	X	X	X
25	26	27	28	29	30	31
X	X	X	X	X	X	X

November 1998						
S	M	Tu	W	Th	F	S
1	2	3	4	5	6	7
X	X	X	X	X	X	X
8	9	10	11	12	13	14
X	X	X	X	X	X	X
15	16	17	18	19	20	21
X	X	X	X	X	X	X
22	23	24	25	26	27	28
X	X	X	X	X	X	X
29	30					
X	X					

December 1998						
S	M	Tu	W	Th	F	S
		1	2	3	4	5
		X	X	X	X	X
6	7	8	9	10	11	12
X	X	X	X	X	X	X
13	14	15	16	17	18	19
X	X	X	X	X	X	X
20	21	22	23	24	25	26
X	X	X	X	X	X	X
27	28	29	30	31		
X	X	X	X	X		

January 1999						
S	M	Tu	W	Th	F	S
					1	2
					X	X
3	4	5	6	7	8	9
X	X	X	X	X	X	X
10	11	12	13	14	15	16
X	X	X	X	X	X	X
17	18	19	20	21	22	23
X	X	X	X	X	X	X
24	25	26	27	28	29	30
X	X	X	X	X	X	X
31						
X						

February 1999						
S	M	Tu	W	Th	F	S
	1	2	3	4	5	6
	X	X	X	X	X	X
7	8	9	10	11	12	13
X	X	X	X	X	X	X
14	15	16	17	18	19	20
X	X	X	X	X	X	X
21	22	23	24	25	26	27
X	X	X	X	X	X	X
28						
X						

March 1999						
S	M	Tu	W	Th	F	S
	1	2	3	4	5	6
	X	X	X	X	X	X
7	8	9	10	11	12	13
X	X	X	X	X	X	X
14	15	16	17	18	19	20
X	X	X	X	X	X	X
21	22	23	24	25	26	27
X	X	X	X	X	X	X
28	29	30	31			
X	X	X	X			

April 1999						
S	M	Tu	W	Th	F	S
				1	2	3
				X	X	X
4	5	6	7	8	9	10
X	X	X	X	X	X	X
11	12	13	14	15	16	17
X	X	X	X	X	X	X
18	19	20	21	22	23	24
X	X	X	X	X	X	X
25	26	27	28	29	30	
X	X	X	X	X	X	

Late Season for Divers, Draggers, Rakers, Trappers ☒ = Closed ☐ = Open

August 1998						
S	M	Tu	W	Th	F	S
						1
						X
2	3	4	5	6	7	8
X	X	X	X	X	X	X
9	10	11	12	13	14	15
X	X	X	X	X	X	X
16	17	18	19	20	21	22
X	X	X	X	X	X	X
23	24	25	26	27	28	29
X	X	X	X	X	X	X
30	31					
X	X					

September 1998						
S	M	Tu	W	Th	F	S
		1	2	3	4	5
		X	X	X	X	X
6	7	8	9	10	11	12
X	X	X	X	X	X	X
13	14	15	16	17	18	19
X	X	X	X	X	X	X
20	21	22	23	24	25	26
X	X	X	X	X	X	X
27	28	29	30			
X	X	X	X			

October 1998						
S	M	Tu	W	Th	F	S
				1	2	3
				X	X	X
4	5	6	7	8	9	10
X	X	X	X	X	X	X
11	12	13	14	15	16	17
X	X	X	X	X	X	X
18	19	20	21	22	23	24
X	X	X	X	X	X	X
25	26	27	28	29	30	31
X	X	X	X	X	X	X

November 1998						
S	M	Tu	W	Th	F	S
1	2	3	4	5	6	7
X	X	X	X	X	X	X
8	9	10	11	12	13	14
X	X	X	X	X	X	X
15	16	17	18	19	20	21
X	X	X	X	X	X	X
22	23	24	25	26	27	28
X	X	X	X	X	X	X
29	30					
X	X					

December 1998						
S	M	Tu	W	Th	F	S
		1	2	3	4	5
		X	X	X	X	X
6	7	8	9	10	11	12
X	X	X	X	X	X	X
13	14	15	16	17	18	19
X	X	X	X	X	X	X
20	21	22	23	24	25	26
X	X	X	X	X	X	X
27	28	29	30	31		
X	X	X	X	X		

January 1999						
S	M	Tu	W	Th	F	S
					1	2
					X	X
3	4	5	6	7	8	9
X	X	X	X	X	X	X
10	11	12	13	14	15	16
X	X	X	X	X	X	X
17	18	19	20	21	22	23
X	X	X	X	X	X	X
24	25	26	27	28	29	30
X	X	X	X	X	X	X
31						
X						

February 1999						
S	M	Tu	W	Th	F	S
	1	2	3	4	5	6
	X	X	X	X	X	X
7	8	9	10	11	12	13
X	X	X	X	X	X	X
14	15	16	17	18	19	20
X	X	X	X	X	X	X
21	22	23	24	25	26	27
X	X	X	X	X	X	X
28						
X						

March 1999						
S	M	Tu	W	Th	F	S
	1	2	3	4	5	6
	X	X	X	X	X	X
7	8	9	10	11	12	13
X	X	X	X	X	X	X
14	15	16	17	18	19	20
X	X	X	X	X	X	X
21	22	23	24	25	26	27
X	X	X	X	X	X	X
28	29	30	31			
X	X	X	X			

April 1999						
S	M	Tu	W	Th	F	S
				1	2	3
				X	X	X
4	5	6	7	8	9	10
X	X	X	X	X	X	X
11	12	13	14	15	16	17
X	X	X	X	X	X	X
18	19	20	21	22	23	24
X	X	X	X	X	X	X
25	26	27	28	29	30	
X	X	X	X	X	X	

Table 8
Regulations and Statutes since 1992

1992

- \$89 sea urchin license required for hand harvesting and dragging

1993

- Minimum size limit of 2 in.
- Authority to adopt rules on drag size, nighttime dragging, and tolerance on undersized urchins

1994

- Nighttime harvesting of urchins prohibited
- 10% tolerance on sea urchins less than 2 in.
- Urchin drag width restricted to 5 ½ ft.
- Surcharge on licenses: \$160/harvester, \$35/tender, \$500/buyer, \$2,500/processor
- Sea urchin research fund
- Moratorium on new licenses, 1995 - 1998
- Two fishing zones established with seasons: Z1: Apr. 1 - Aug. 15 Z2: May 15 - Oct. 1
- Authority to adopt rules for processor/buyer logbooks

1995

- Modified zone season closures for 1995 - 1998: Z1: Apr. 1 - Aug. 31 Z2: May 1 - Oct. 1
- Hand-raking and trapping license added plus surcharge
- Exception to license moratorium due to medical conditions and deceased license transfer to family members
- Extension of closing dates for entire zones or portions thereof to conserve spawning urchins

1996

- Sea Urchin Zone Council established (to select fishing days)
- Fishing days limited to 150 in Z1 and 170 in Z2
- Conditions stated for changing zones; cap of previous years no.
- Logbooks required from buyers/processors

1997

- Fishing day limitation modified to allow for a shorter season if needed: Z1 120 days, Z2 120 days
- Role of Sea Urchin Zone Council expanded: recommend no. fishing days, research funded, other matters of interest
- Zone changes may not be approved between Aug. 1 - Dec. 31 and are effective Aug. 1

1998

- Role of Sea Urchin Zone Council expanded: recommend limited entry ratio
- Lottery initiated for limited entry selection
- Surcharge extended
- Some license surcharge used for enforcement overtime
- Two seasons in Zone 2: Early Oct. 5 - March 26 , Late Nov. 2 - April 23
- Tender added to Zone Council

1999

- Surcharge may be used for Council support, 30% for law enforcement and support
- Failure to submit logbook reports may prevent license renewal
- No possession of urchins on boat during no-fishing day
- Suspension of license for violation of season, zone restriction
- Condition for changing zone: 1 in for 1 out
- Sea Urchin Zone Council membership changed to 2 buyer/processors per zone

Table 9

**Locations Where Sea Urchin Die – Offs Occurred
Sept./Oct. 1999**

- 1.) Isle of Shoals
- 2.) Cape Neddick (periodic die-offs here)
- 3.) Mouth of Sheepscot River
- 4.) Monhegan Island (a major die-off occurred here in 1991 – George Parr)
- 5.) Tenant's Harbor Isle of Shoals
- 6.) Big Green Island
- 7.) Little Green Island (North and East Side)
- 8.) Matinicus
- 9.) Wooden Ball Island
- 10.) Criehaven
- 11.) Two Bush Reef (Muscle Ridge Channel)
- 12.) East Penobscot Bay
- 13.) Stonington Area
- 14.) Isle au Haut (East and West Side)
- 15.) Swans Island
- 16.) Marshall Island
- 17.) East and West Sister Island (East side of Swans Island)
- 18.) Northeast Harbor
- 19.) Southwest Harbor (a small die-off here during the 1998/1999 season)
- 20.) Bar Harbor Shore
- 21.) Schoodic Point (die-off still occurring here in mid-November 1999)
- 22.) Winter Harbor
- 23.) Tommy's Island (Milbridge)
- 24.) Douglas Island (Milbridge)

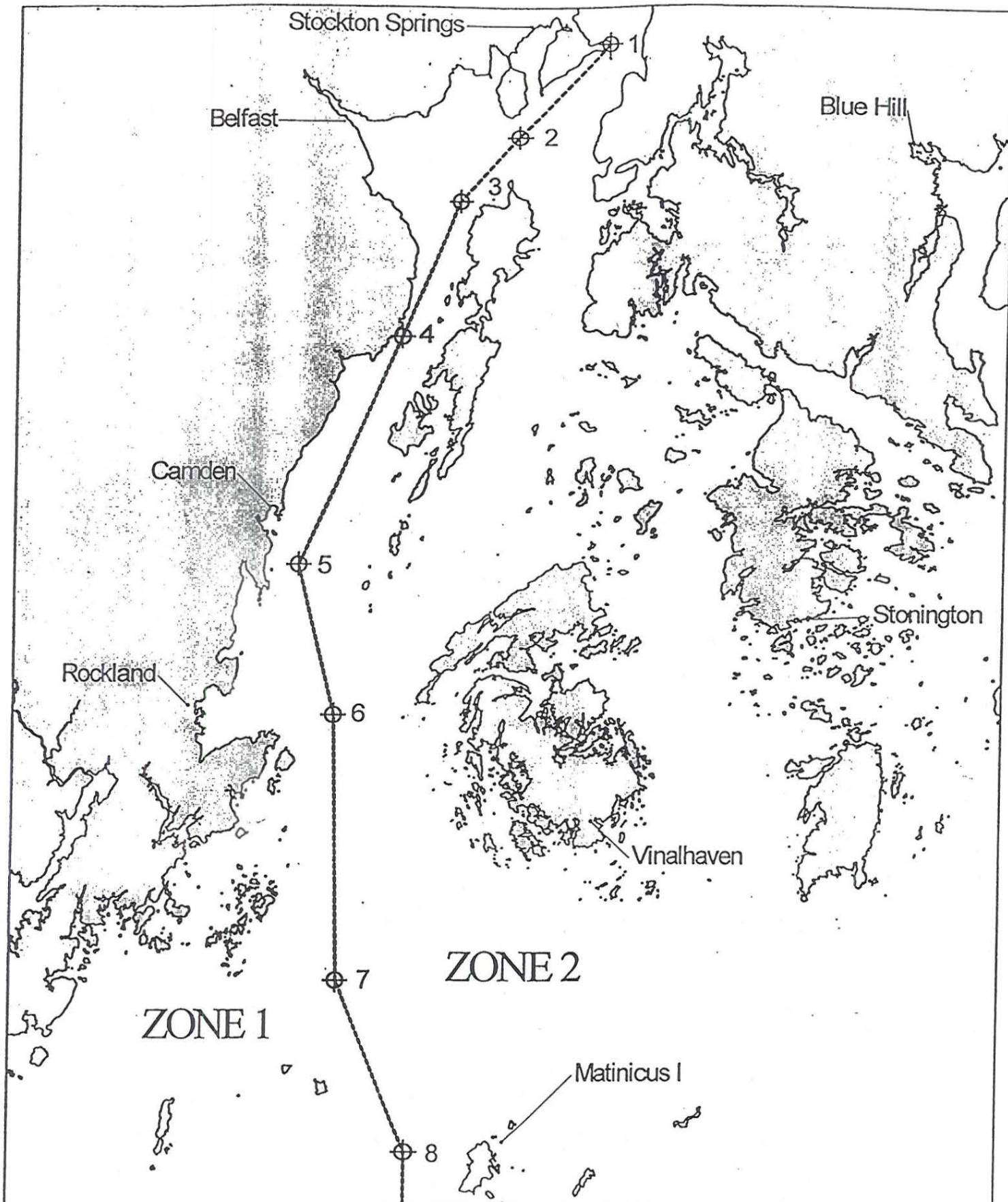


Figure 1
The Zone 1 – Zone 2 boundary through Penobscot Bay (see following numbers legend)

Figure 2
CPUE by season and county (A) divers, (B) draggers
(A)

Maine Sea Urchin Diver Catch/Effort by Year and County

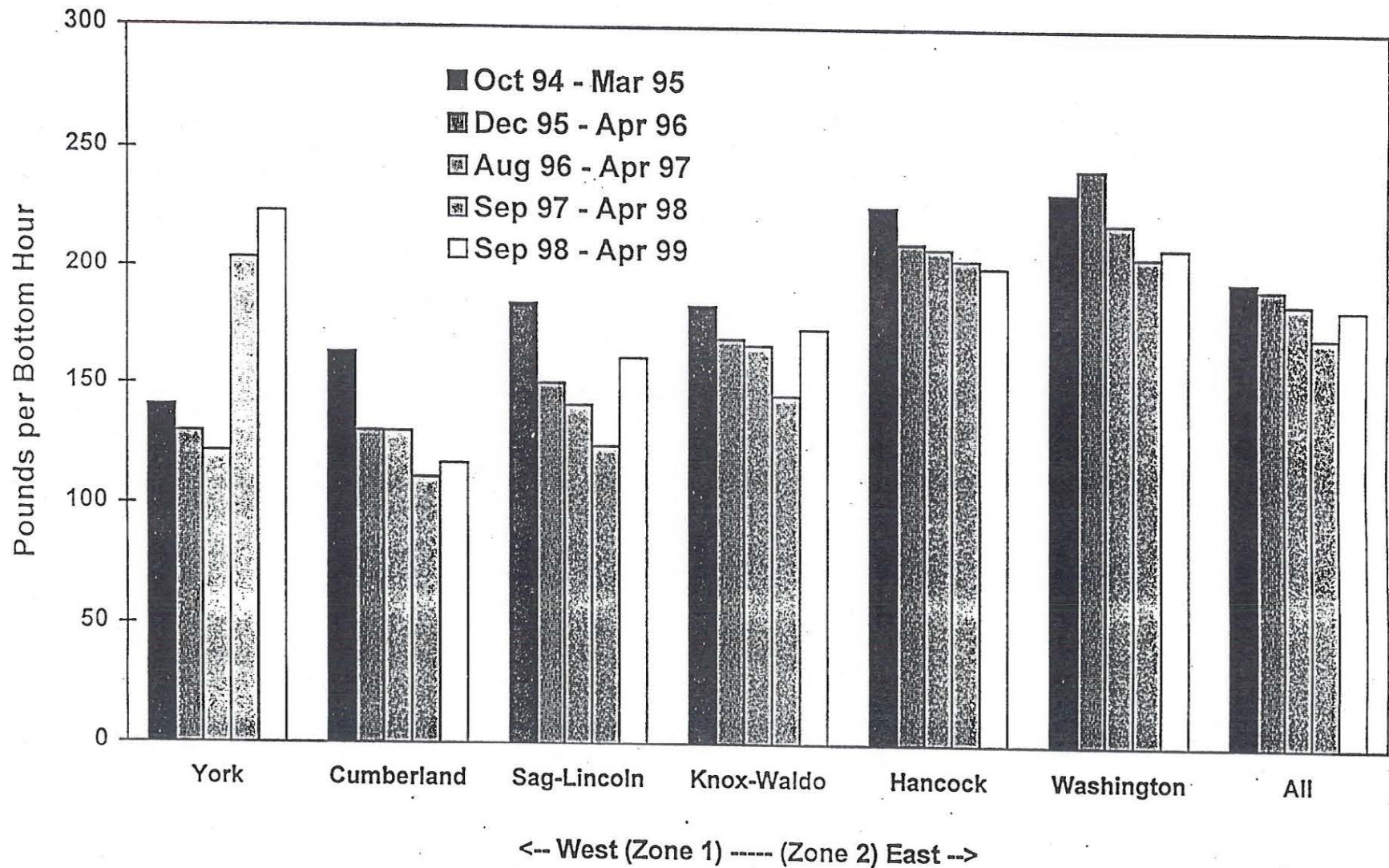


Figure 2
CPUE by season and county (A) divers, (B) draggers
(B)

Maine Sea Urchin Dragger Catch/Effort by Year and County

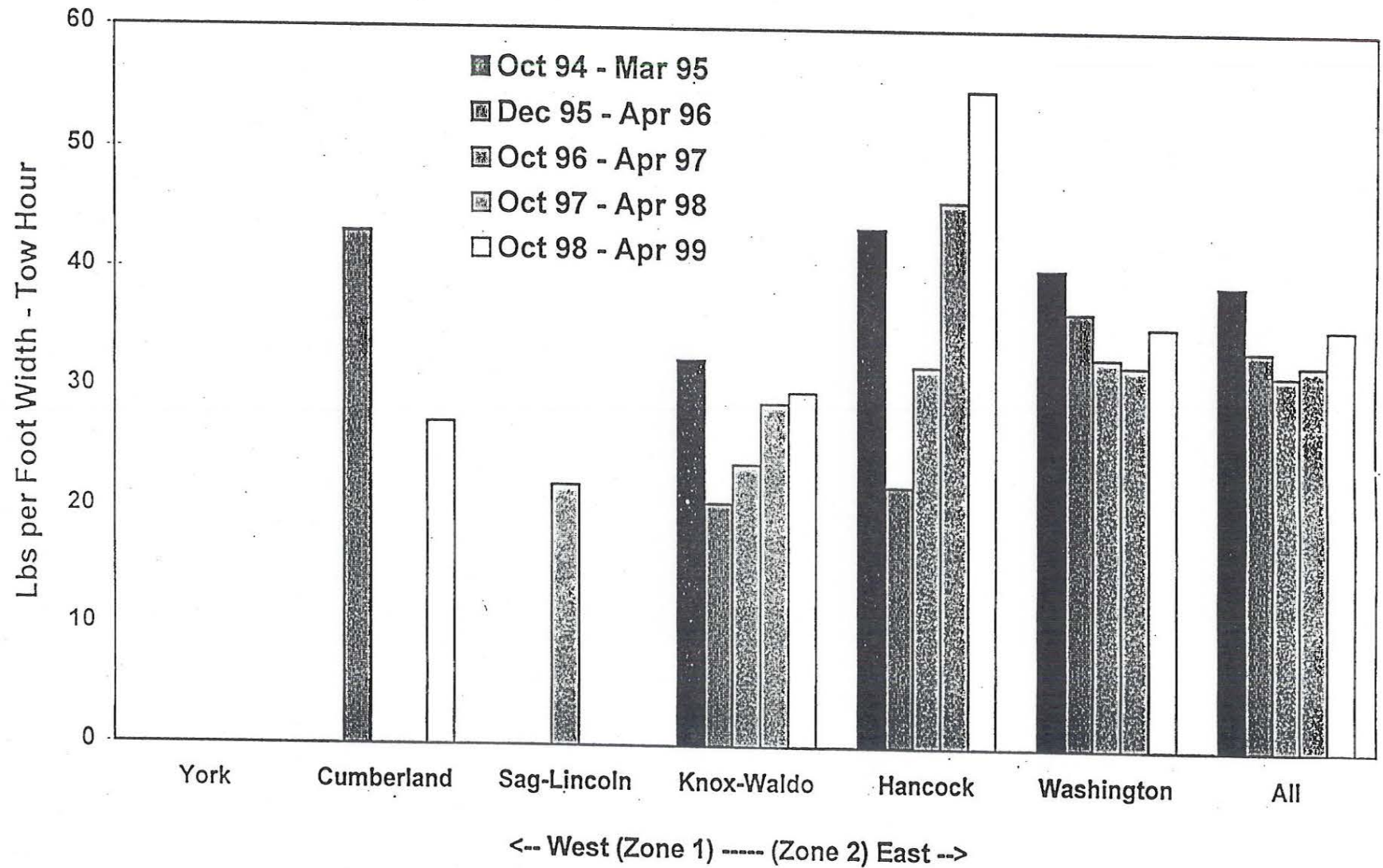
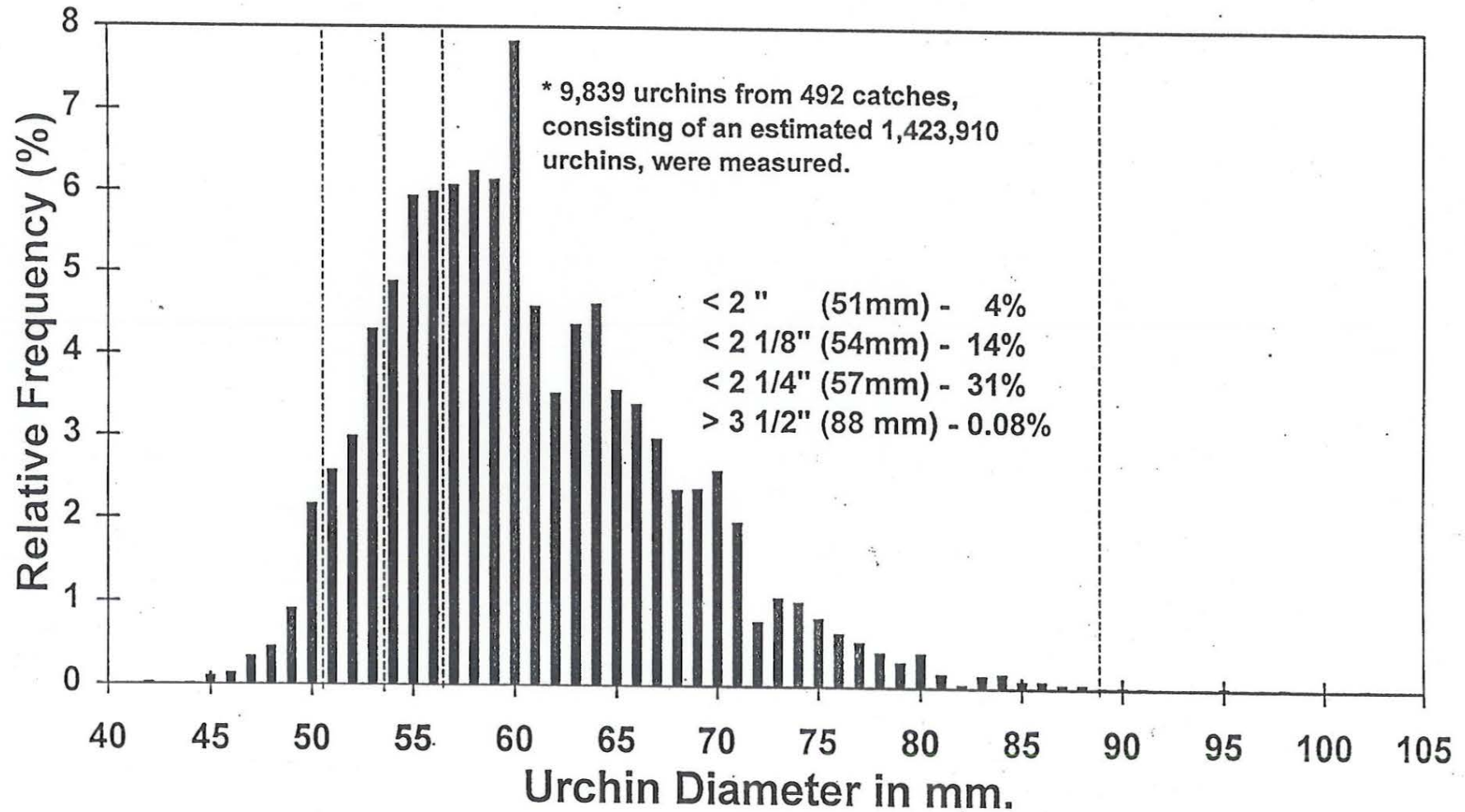


Figure 3
 Urchin diameters for Zone 1 and 2 combined data

Maine Sea Urchin Diameters from Sampled Catches*, 1998 - 1999



GROUND FISH

Gulf of Maine Multispecies (Groundfish) Assessment and Management

Participation in groundfish assessment and management activities was limited due to demands of other work, most notably the Atlantic States Marine Fisheries Commission (ASMFC) American Lobster Stock Assessment. We were unable to participate in the preparation of the 1999 Multispecies Monitoring Committee (MMC) report. The activities of the Groundfish Plan Development Team (PDT) were kept up with by review of PDT materials issued during the year and limited meeting attendance. Meetings attended during the latter part of 1999 dealt with research recommendations for groundfish and the annual framework adjustment to the Northeast Multispecies Fishery Management Plan. Four Gulf of Maine cod management programs were considered, as well as proposals for Georges Bank haddock and cod.

