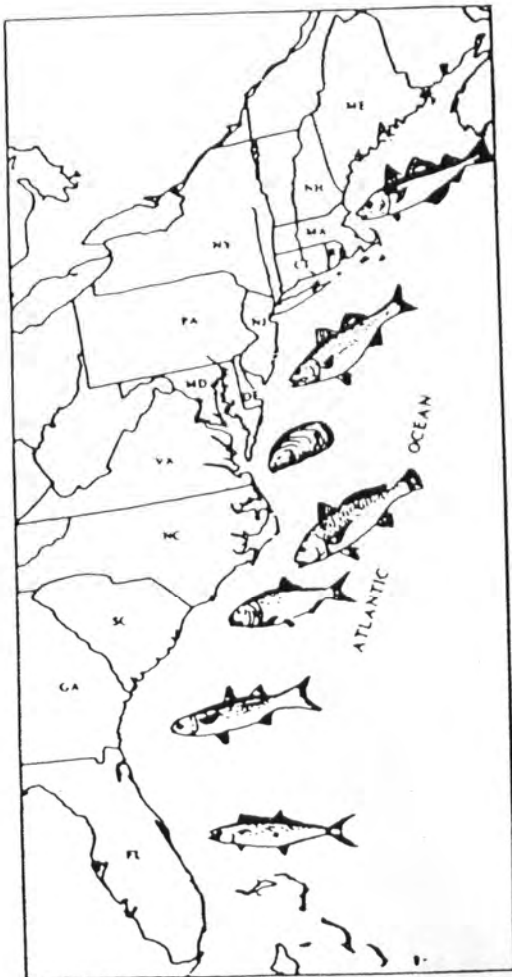


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*Fisheries Management Report No. 9
of the*

ATLANTIC STATES MARINE FISHERIES COMMISSION



FISHERY MANAGEMENT PLAN FOR NORTHERN SHRIMP

October 1986

INTERSTATE FISHERY MANAGEMENT PLAN
FOR THE
NORTHERN SHRIMP (Pandalus borealis Krøyer) FISHERY
IN THE WESTERN GULF OF MAINE

Prepared by:
Duncan McInnes
New Hampshire Fish and Game Department
34 Bridge Street
Concord NH 03301

This plan was prepared in cooperation with the Northern Shrimp Technical Committee and the Northern Shrimp Section of the Atlantic States Marine Fisheries Commission.

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EXECUTIVE SUMMARY

This fishery management plan was rewritten from the Draft Northern Shrimp Management Plan and Environmental Impact Statement accepted by the Northern Shrimp Management Board of the Atlantic States Marine Fisheries Commission (ASMFC) in October 1979. This plan presents a management approach for the Gulf of Maine northern shrimp (Pandalus borealis) stock and is intended to generate the greatest possible economic and social benefits from its harvest over time. Regulatory measures have been designed to optimize yield, recognizing that natural fluctuations in abundance will occur. The plan also outlines biological and socioeconomic research requirements for effective management.

The Resource

This stock is located in the Gulf of Maine with large concentrations occurring from Jeffreys Ledge to Cashes Ledge, and eastward along the coast of Maine. Mating occurs in offshore areas of the Gulf of Maine during the summer, after which eggs are extruded and fertilized. Egg bearing (ovigerous) females migrate into inshore nursery areas where hatching occurs in late winter. The larvae are pelagic until they metamorphose during summer; the young shrimp then become bottom dwellers and normally remain as juveniles until the end of their second summer. As the juveniles mature they migrate offshore. During their third summer (age 2) they mature as males and mate with older females. After mating, males go through sexual transition and

become functional females during their fourth summer (age 3). They then mate with younger males, extrude their eggs and move inshore to complete the life cycle in late fall and winter. Spent females return to the deeper offshore areas and some may live to mate and bear eggs a second or even a third time.

The shrimp resource within the Gulf of Maine is considered to be a single stock. There is no evidence from seasonal distribution patterns to indicate movement of northern shrimp into or out of the Gulf of Maine. Pronounced fluctuations in abundance have been documented for this stock, with environmental factors apparently playing a major role. Abundance and biomass have increased substantially since the mid-1970's.

The Commercial Fishery

Landings from the Gulf of Maine northern shrimp fishery have fluctuated considerably. Annual landings declined from an average of 11,400 metric tons (t) during 1969-1972 to about 400 t in the late 1970's. Since then, landings increased to 4,100 t in 1985; the 1986 preliminary total was 4700 t. The collapse of this fishery in the mid-1970's has been attributed to both intensive exploitation and environmental conditions.

Traditionally the fishery has been conducted in inshore waters in the winter and spring. Historically, Maine vessels have accounted for most of the catch, although since 1969 Massachusetts landings have also been significant. Landings by New Hampshire vessels have increased considerably since the late 1970's. Effort by Maine vessels has been concentrated off south-central Maine between Portland and Rockland; Massachusetts vessels fish primarily from the Scantum Basin-Jeffreys Ledge area to Stellwagen Bank. Most vessels conduct one-day trips, although some larger vessels from Gloucester, Massachusetts and Portland, Maine are now making extended trips further offshore. Approximately

300 vessels participated in the 1986 fishery. Coast wide effort, in terms of number of trips, has increased from an estimated 400 trips in 1979 to over 8,000 trips in 1986.

The size of shrimp harvested varies depending on seasons and areas fished. Landings in the wintertime are composed primarily of larger age 3 and older females. As effort is directed further offshore in the springtime, the harvest of small shrimp increases. In the past, a summer fishery harvested significant amounts of small shrimp, which is believed to have had severe impacts on subsequent recruitment to the inshore fishery.

By-catch of juvenile finfish in the shrimp fishery may represent a significant source of mortality to Gulf of Maine finfish stocks. By-catch of shrimp in small-mesh finfish fisheries, (e.g., whiting) is also a potential concern. By-catch has not been well documented, but the effects could be detrimental to the shrimp stock, especially at low levels of abundance.

Management

Management of northern shrimp in the Gulf of Maine is unique in that the participating states have designated the ASMFC as the joint regulatory agency under Amendment One of the ASMFC Compact. From 1972 to 1979, the management of this stock was administered through the Northeast State/Federal Fisheries Management Program. In 1980, this program was restructured as the Interstate Fisheries Management Program (ISFMP) of the ASMFC. The Northern Shrimp Technical Committee, which consists of scientists from Maine, New Hampshire, Massachusetts, and the National Marine Fisheries Service (NMFS) prepares annual assessments and submits them to the ASMFC's Northern Shrimp Section. The Section develops management options and policy based on the results of

these assessments and solicited input from the industry and general public. Management regulations enacted by the participating states have been primarily directed toward reducing fishing mortality on young shrimp. Regulations now include: 1) a minimum mesh size of 44.5 mm (1.75 inches) in the body and codend; 2) seasonal closures; 3) possession limitations; and 4) reporting requirements.

The policy statement adopted in 1981 by the Northern Shrimp Fishery Management Board/ASMFC Northern Shrimp Section as amended in 1986 is as follows:

STATEMENT OF POLICY

ASMFC NORTHERN SHRIMP SECTION

1. The Section agrees that, despite natural fluctuations in stock abundance, the northern shrimp fishery is manageable.
2. The Section will provide for a continuing management program based on recommendations of the Technical Committee to: a) maintain and eventually rebuild the stock, and b) to ensure a viable northern shrimp fishery in the Gulf of Maine over time.
3. The Section intends to allow a northern shrimp fishery through the mechanism of an annual open season recognizing that: a) stock abundance will tend to fluctuate, b) the fishery interacts with other fisheries through by-catch of juveniles, and c) the fishery is economically important to the fishing industry.

4. The Section endorses the following measures as appropriate for regulating the harvest of northern shrimp in the Gulf of Maine:

- a) Gear limitations - A minimum mesh size will be incorporated as an integral part of the plan and will be consistent with the Northern Shrimp Gear Evaluation Study of 1974 Appendix III.
- b) Seasonal limitations - An open season, not to exceed 183 days, will be set on an annual basis. The fishery shall not begin sooner than December 1 nor end later than May 31 for any one year. The Section shall determine the exact length of the season after considering recommendations from the Technical Committee on a season designed towards achieving Item #2 above.
- c) Possession limitations - The count per pound for all shrimp landed and subsequently possessed by fishermen and dealers/processors shall be consistent with the selectivity of the minimum mesh size specified by regulation based on 4a above.
- d) Information collection provisions - There shall be a method of determining participants in the fishery (e.g., vessel licensing). All primary dealers/processors shall report periodically their transactions involving northern shrimp. The information reported shall be that which is determined necessary to manage the fishery. Dockside and sea sampling of the shrimp catch shall be conducted.

5. The Section will re-examine, periodically, the allowed mesh size and the possible by-catch of northern shrimp in other directed fisheries as management programs for other small mesh net fisheries (e.g., silver hake and Illex squid) are developed and implemented.

Adopted April 17, 1981; Amended Oct. 5, 1981; Amended Nov. 12, 1981; Amended Oct. 7, 1986.

This Policy, as established has been reviewed by the Northern Shrimp Technical Committee and the Northern Shrimp Section and both reaffirm their support for the overall management concepts it embodies. Furthermore, it should be emphasized that the management concepts embodied in the Statement of Policy are applicable for managing this resource regardless of stock abundance.

In addition, during the 1986 review, the following management objectives have been identified:

1. Offer adequate protection to the stock to enhance egg production and future recruitment.
2. Reduce the adverse impacts the shrimp fishery may have on other fishery resources.
3. Optimize yield and reproductive capabilities of strong year classes.
4. Maintain a high product standard by eliminating the harvest of low quality shrimp during those periods when quality is known to be poor.
5. Minimize the adverse impacts of regulations, including increased costs to the shrimp industry and the associated coastal community.

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INTRODUCTION

Overview and Plan Development

The northern shrimp (Pandalus borealis Krøyer; Family Pandalidae) supports an increasingly important commercial fishery in the western Gulf of Maine. Small catches of shrimp were first reported in the 1920's, but a directed fishery did not begin until the late 1930's. Traditionally, northern shrimp have been important to Maine and New Hampshire fishermen because the shrimp are located in inshore spawning areas during the winter months when other fishing activities are at a low point. The shrimp are also important to Massachusetts fishermen because they provide a profitable inshore fishery during the winter months (and formerly, provided an alternative offshore fishery throughout the year). Since 1975, due to regulations, the shrimp fishery has been exclusively a winter-spring fishery for all states.

Commercial landings for the Gulf of Maine northern shrimp stock rose from zero in the mid-1950's to an average of 11,400 metric tons (t) annually during 1969-1972; landings then declined precipitously to about 400 t annually in the late 1970's. The collapse of the fishery in the mid-1970's has been attributed to both environmental conditions and overfishing. In 1972, industry spokesmen requested meetings with representatives of the marine resource agencies of Maine, New Hampshire, Massachusetts, and the National Marine Fisheries Service (NMFS) to discuss deteriorating conditions in the fishery and appropriate management measures, including options for cooperative management. It was agreed that management under state control would be beneficial. The states designated the Atlantic States Marine Fisheries Commission (ASMFC) to be the joint regulatory agency under Amendment One of the ASMFC Compact, thus providing the necessary mechanism for a cooperative

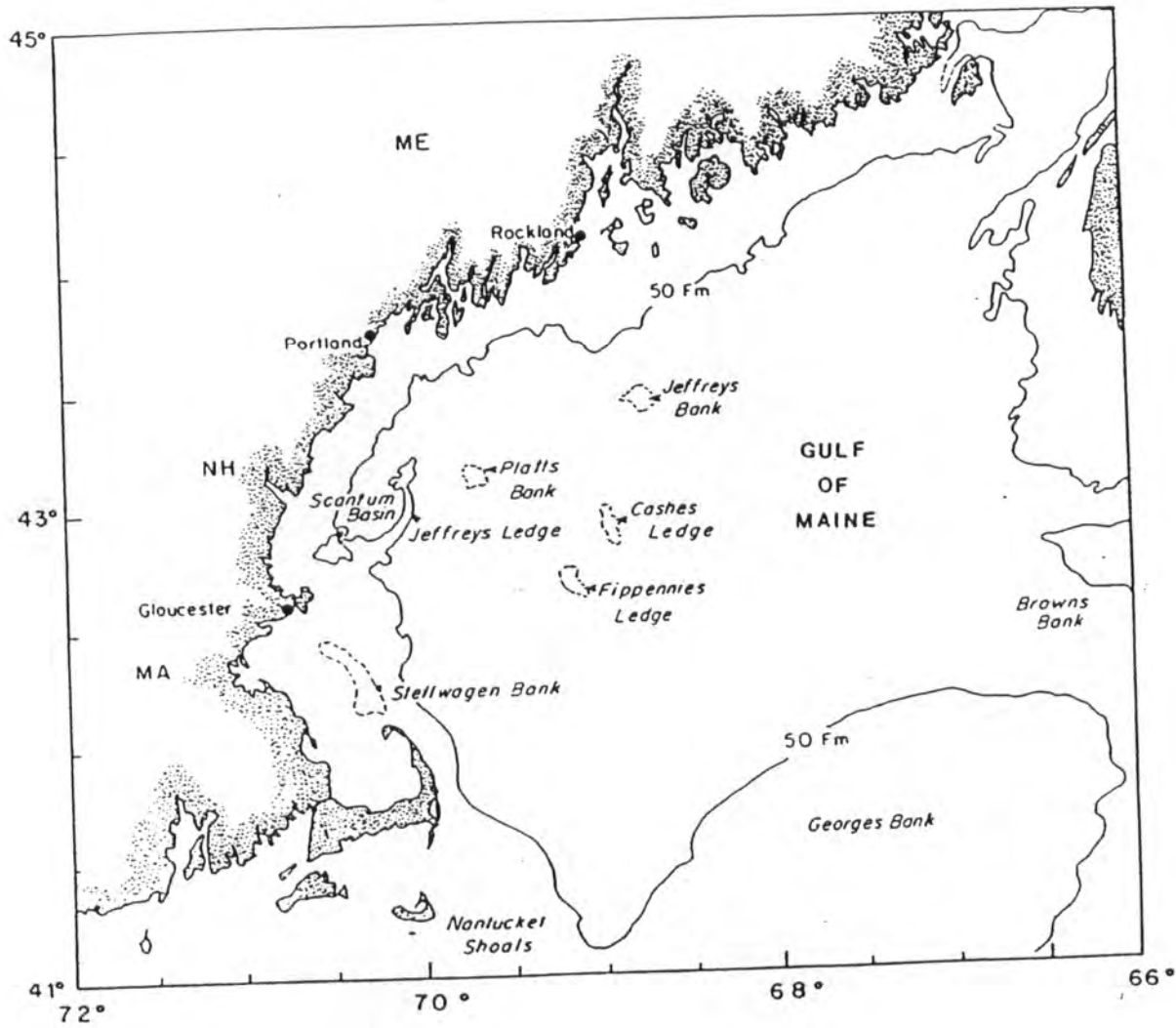
interstate arrangement. Since then landings increased to 4,200 t in 1985 and approximately 4,700 t were caught during 1986. The landed value of the catch increased steadily from \$2,000 in 1958 to over \$5.7 million in 1974. During its peak years, the northern shrimp fishery contributed an estimated \$10 million dollars annually to Gulf of Maine coastal economies. The collapse of the fishery in the mid-1970's reduced the product value to zero by 1978, when the fishery was closed. Since that time, the landed value of the catch has been increasing and reached \$4.0 million during 1985.

This Plan is rewritten from the Draft Northern Shrimp Management Plan and Environmental Impact Statement accepted by the State-Federal Northern Shrimp Fishery Management Board of ASMFC in October, 1979. This Plan presents up-to-date information on the fishery and its associated economic descriptors and identifies research and data needs. It incorporates the Statement of Policy regarding management of this fishery as amended in 1986 and the best scientific information available in order to perpetuate the Gulf of Maine northern shrimp resource. Management measures have been designed to generate the greatest possible economic and social benefits from the harvest and utilization of northern shrimp over time.

Environmental Setting

The Gulf of Maine is a partially enclosed sea, bounded on the landward side by the coasts of Massachusetts, New Hampshire, Maine, and Nova Scotia and seaward by Georges and Browns Banks (Figure 1). Its offshore bottom features are complex and are characterized by a number of basins, low swells and banks. The average depth is 150 m, but many areas are considerably deeper. The major connection to the outer continental shelf is through the Northeast Channel, between Browns Bank and Georges Bank. A coastal shelf 30-50 km wide which

Figure 1. Western Gulf of Maine indicating location of ports and geographical features mentioned in this plan.



bounds the landward perimeter of the Gulf is characterized by frequent rock outcrops and sporadic pockets of sediment. The rocky coastline north of Portland is extremely irregular and indented by a series of estuaries and embayments. Offshore bottom types vary from silt in the deep basins to sand gravel and rock on the shallower banks and ledges.

Surface currents in the Gulf of Maine generally flow in a large counter-clockwise gyre which produces a net non-tidal flow to the southwest along the coast (Bigelow, 1927). This gyre is most prominent in the spring and summer, but is reduced in size in the fall and winter when it is limited to the northern region of the Gulf. There is a slow inshore drift at the bottom out to 100 m; in deeper water, the bottom currents generally flow in the same direction as the surface currents, but at greatly reduced velocities. Tides increase in magnitude from west to east along the coast, from 2-3 m north of Cape Cod to 15 m in parts of the Bay of Fundy, causing increased vertical mixing and tidal current velocities in eastern Maine and New Brunswick coastal waters. As a result, vertical stratification (warm surface water overlaying colder bottom water) develops in the spring and summer in the southwest region of the Gulf, but not along the eastern Maine and New Brunswick coast or off southwest Nova Scotia. Consequently, bottom temperatures in the western Gulf of Maine are generally lower than the eastern section of the Gulf (Colton and Stoddard 1973). Salinities in the Gulf of Maine do not vary much except in coastal surface waters in the spring during periods of maximum river runoff, when salinities may be reduced below 32 ‰.

Surface temperatures range from 3 to 18°C in offshore waters of the Gulf (Colton and Stoddard 1973) and from -1.8 to 18.1°C inshore (Boothbay Harbor) (Churchill 1985). Bottom temperatures are lower and less variable than surface temperatures. Average bottom temperatures for the Gulf of Maine

during 1968-1983 ranged from 5.2 to 7.2°C in the spring and from 5.7 to 9.0°C in the fall (Davis 1978; NMFS unpublished). Bottom waters are coldest in shallower water along the coast in the wintertime and in deep basins in the southwestern Gulf where temperatures as low as 1 to 2°C have been recorded (Apollonio et al. 1986). During cold years, minimum bottom temperatures of zero or less are probably common in inshore waters (Churchill 1985).

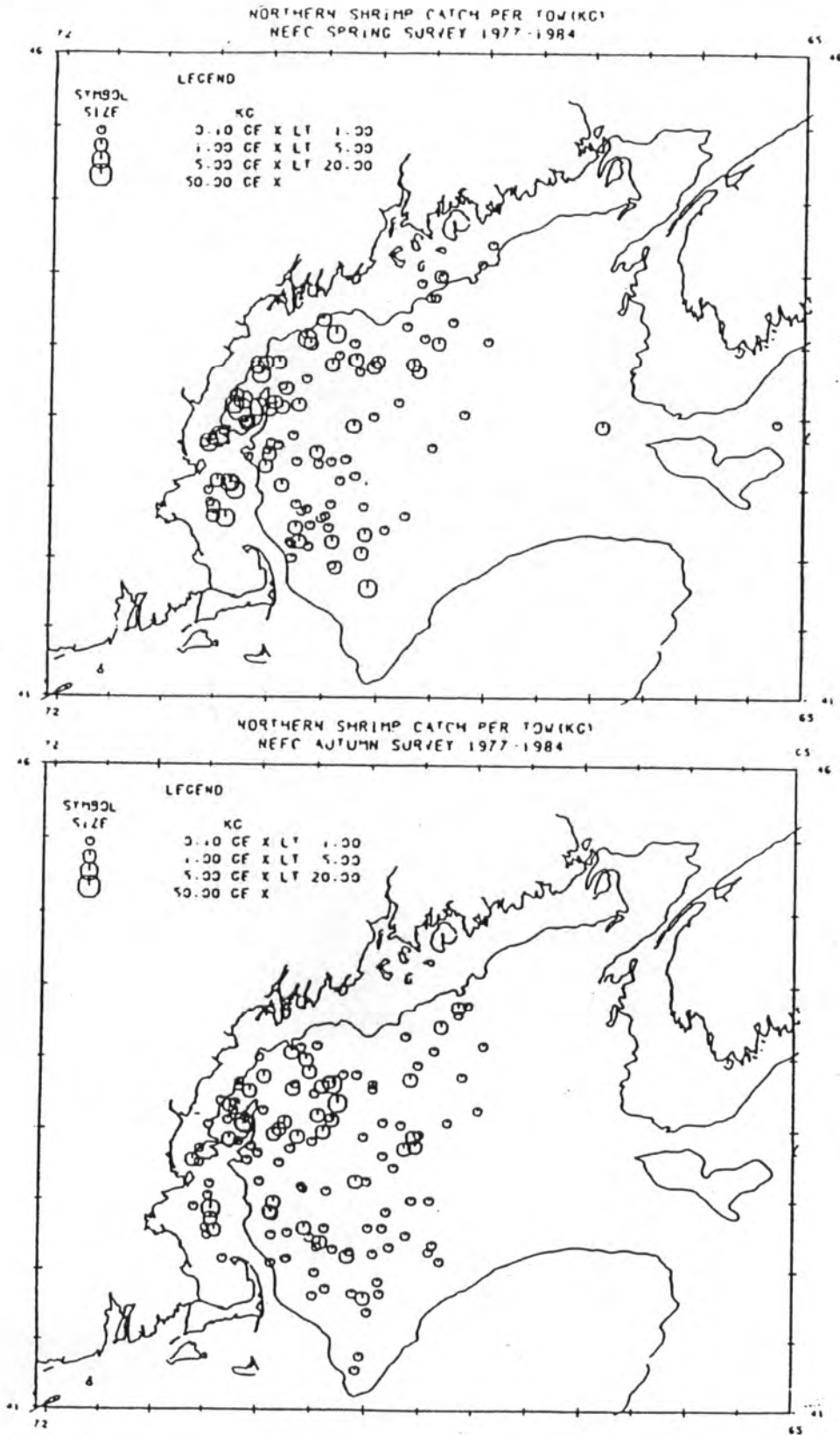
Distribution

The northern shrimp is a circumboreal species occurring in both the Pacific and Atlantic Oceans. In the Pacific, populations occur in the Sea of Okhotsk, the Bering Sea, and the Gulf of Alaska and southward along the west coast of North America to San Diego, California. Atlantic Ocean populations occur in the Barents Sea, the Norwegian Sea, and the North Sea, off the coast of Iceland, Greenland, and Labrador, and from the Gulf of St. Lawrence southward along the Scotian Shelf to the Gulf of Maine (Shumway et al. 1985).

Throughout their range, northern shrimp have been reported in waters with temperatures of -1.6 to 12.1°C, but are most common at temperatures of zero to 5°C. Extended exposure to temperatures below -1°C have been observed to cause mass mortalities. They prefer waters of fairly high salinity, although the species has been reported in salinities ranging from 23 ‰ to 36 ‰. Northern shrimp have been found in depths of 9 to 1,450 m, but are most common from 50 to 500 m, predominately in soft mud or sand/silt substrates (Shumway et al. 1985).

In the Gulf of Maine, Northeast Fisheries Center (NEFC) bottom trawl survey data collected during 1977-1984 indicate that northern shrimp are most abundant in the vicinity of Jeffreys Ledge, and eastward to Cashes Ledge and Jeffreys Bank (Figure 2). Summer shrimp surveys conducted by the Maine

Figure 2. NEFC survey plots of northern shrimp distribution for the Gulf of Maine.



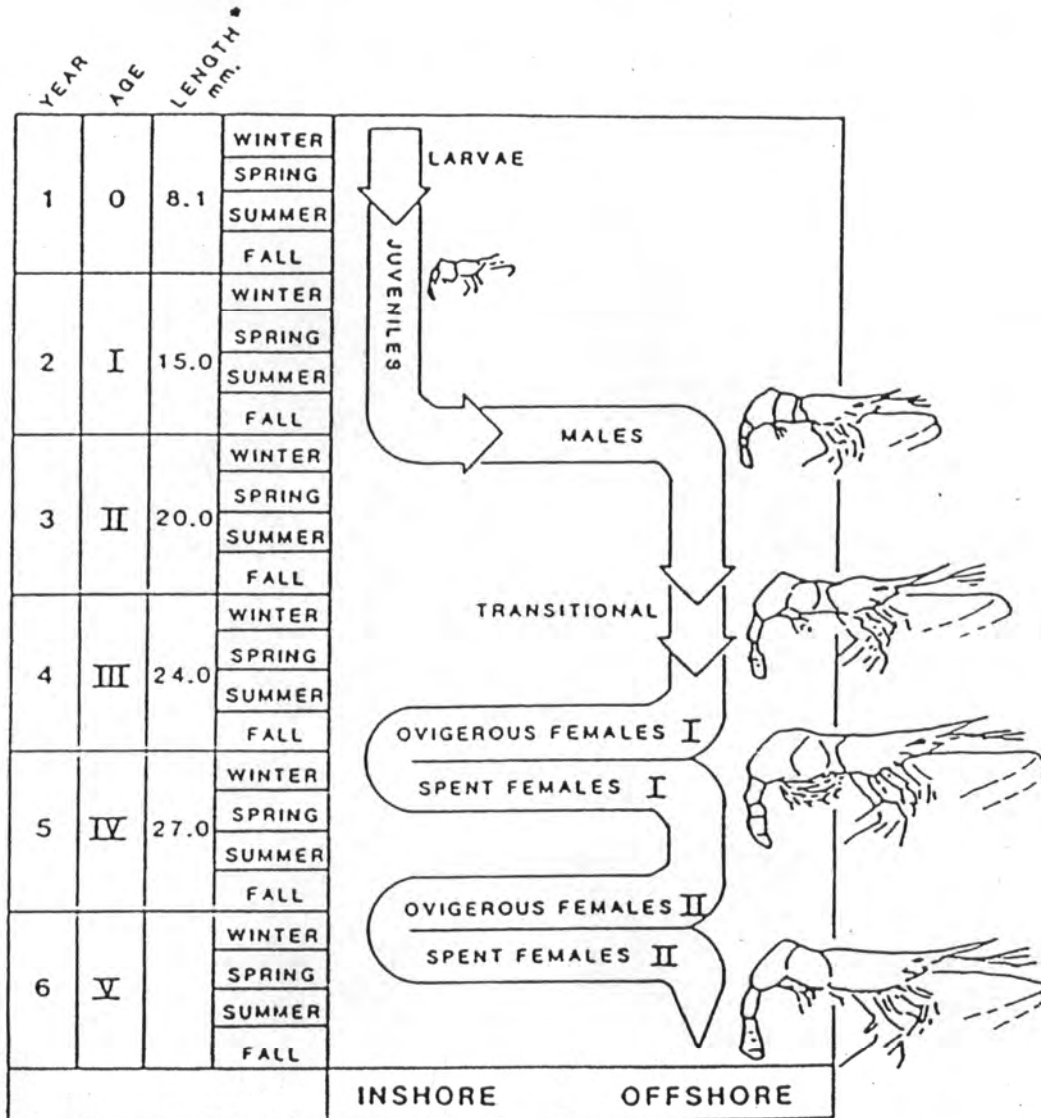
Department of Marine Resources showed considerably higher catch rates in Jeffreys and Scantum Basins than at nine other locations in the Gulf during the period 1975-78 (Schick et al. 1980). Abundance off southwest Nova Scotia appears to be low and there is no evidence from seasonal distribution patterns to indicate movement of shrimp into or out of the Gulf. For management purposes, the Gulf of Maine population is considered to be a single unit stock (Clark and Anthony 1981).

The distribution of northern shrimp in the Gulf of Maine has been related to temperature and substrate. Shrimp are concentrated in the western Gulf where stratification of the water column is more pronounced and where there are a large number of deep basins that retain cold bottom waters which do not mix with warmer surface waters in the summer. There is some indication that shrimp are more abundant where bottom temperatures are lower (Apollonio et al. 1986). Colder bottom waters probably provide more favorable conditions for this boreal species since the Gulf of Maine represents the southern limit of its distribution in the Atlantic. The distribution of northern shrimp in the Gulf of Maine has also been related to the amount of organic matter in the sediments (Haynes and Wigley 1969).

Biology and Life History

Northern shrimp are protandric hermaphrodites; that is, individuals function first as males and then change sex to become females (Figure 3). Seasonal inshore and offshore migrations in the Gulf of Maine are associated with changes in age and stage of sexual development. Older female shrimp undergo gonadal development in offshore waters where mating occurs during summertime. Fully developed eggs are extruded from the ovaries and fertilized shortly thereafter; fertilized eggs are carried on the abdomen for several

Figure 3. Schematic diagram of the life cycle of Pandalus borealis in the Gulf of Maine (modified from Shumway et. al. 1985)



months until they hatch. Fecundity varies from approximately 1,000 to 3,000 eggs per female, depending on size (Apollonio et al. 1986). The egg-bearing or "ovigerous" females migrate inshore in the fall and early winter; hatching occurs in late winter after which the females move immediately offshore. Some eggs are infested with parasitic organisms and die before hatching. The larvae are pelagic until they metamorphose during their first summer, at which time the juvenile shrimp become bottom dwellers. The majority of individuals migrate offshore during their second year of life, but some migrate as early as their first winter or as late as the third summer, or even later (Apollonio et al. 1986). Juvenile shrimp usually mature as functional males around the beginning of their third year of life (Figure 3).

After mating with older females during summer, males go through a sex change and remain for a brief time in an intermediate condition called "transitional". Sex transition normally begins in autumn during the third year of life and is complete by the following spring (Figure 3) although some individuals change sex a year earlier than others (Haynes and Wigley 1969). There is some evidence that increased growth rate is associated with earlier sex transition. Transition normally occurs offshore, although it has also been shown to take place in inshore waters (Apollonio et al. 1986). Some females may survive to make one or two additional inshore spawning migrations before they die, although natural mortality appears to increase sharply following first hatching. The ability of individuals of this species to mature first as males and later as females allows the species to maximize egg production since larger individuals can carry more eggs.

Northern shrimp are omnivores, functioning both as predators and scavengers. Their diet is determined essentially by the prey available, the time of day, and their developmental stage (Weinberg 1981). In the Gulf of

Maine, the winter diet is predominately molluscs, while in the summer the bulk of the diet consists of crustaceans (Apollonio et al. 1986). A variety of finfish and invertebrates prey upon northern shrimp. Finfish species which feed heavily on pandalid shrimp include four species of hake (red hake, silver hake, longfin hake, and white hake) and two species of flounder (fourspot and windowpane flounder) (Langton and Bowman 1980; 1981). A number of other finfish also feed on northern shrimp, but not as selectively.

Two important life history characteristics which vary over the geographic range of the species are growth and life span. Northern shrimp which live in sub-arctic waters grow more slowly and live longer than shrimp from southern locations such as the Gulf of Maine (Shumway et al. 1985). Shrimp exposed to colder temperatures also mature at more advanced ages. Northern shrimp in the Gulf of Maine grow rapidly, especially during their first two years of life, reaching 8 mm carapace length (CL) at age six months, 16.7 mm CL at 18 months, and 22.4 mm CL at age 30 months (Haynes and Wigley 1969); a maximum size of approximately 32 mm CL is attained by older females. Shrimp grow more rapidly in the spring and summer than in the winter (Berkeley 1930). Warmer bottom water temperatures have been associated with more rapid growth and earlier (or more rapid) sex transition in the Gulf of Maine (Apollonio et al. 1986).

DESCRIPTION OF THE FISHERY

History

Observations in the latter part of the 19th century confirmed the presence of northern shrimp in the Gulf of Maine (Rathbun 1883). At that time it was proposed that once the proper harvesting methods were perfected, the Gulf of Maine would support a lucrative fishery for northern shrimp. A suitable harvesting technique became available in 1905 when otter trawls were first introduced to the New England groundfish fishery, but since larger mesh trawls were employed and effort was directed toward finfish, shrimp catches were initially quite small.

In 1922, General Seafood Corporation, a Gloucester based seafood company, noted that many Gloucester vessels were landing small amounts of shrimp, intended primarily for home consumption. This observation prompted the company to launch a series of exploratory surveys between 1927 and 1928. These surveys found shrimp to be abundant over wide areas of the Gulf, but consumer demand at that time was not sufficient to stimulate development of a commercial fishery (Birdseye 1928). The results of these exploratory surveys were confirmed by additional surveys in 1936 in which catch rates compared favorably to those observed in European fisheries (Scattergood 1952).

The first large scale fishery began in 1938, when 13 draggers began fishing out of Portland, Maine (Scattergood 1952). This early fishery, exploited inshore concentrations of egg bearing females. From 1939 to 1942 catches were limited by demand and fishing effort was modest. As consumer demand increased, the fishery expanded rapidly and from 1943-1945 several canneries began processing and quick freezing shrimp. In 1945 landings rose to over 250 t. Records indicate 31 vessels were involved in the fishery with Maine landing over 95 percent of the total catch (Table 1). In the late 1940's, catches

Table 1. Commercial landings (metric tons) of northern shrimp in the western Gulf of Maine by state, 1938-1986.

Year	Maine	New Hampshire	Massachusetts	Total
1938	37.6	-	10.4	48.0
1939	8.2	-	16.3	24.5
1940	3.2	-	1.4	4.6
1941	25.9	-	0.0	25.9
1942	49.4	-	0.9	50.3
1943	132.5	-	1.4	133.9
1944	207.7	-	1.8	209.5
1945	263.5	-	0.5	264.0
1946	73.5	-	1.8	75.3
1947	88.0	-	0.5	88.5
1948	12.3	-	0.0	12.3
1949	4.5	-	0.0	4.5
1950	3.2	-	0.5	3.7
1951	20.4	-	5.9	26.3
1952	47.2	-	0.0	47.2
1953	17.2	-	0.5	17.7
1954	0.0	-	0.0	0.0
1955	0.0	-	0.0	0.0
1956	0.0	-	0.0	0.0
1957	0.0	-	0.0	0.0
1958	2.3	-	0.0	2.3
1959	5.4	-	2.3	7.7
1960	40.4	-	0.5	40.9
1961	30.4	-	0.5	30.9
1962	159.7	-	16.3	176.0
1963	244.0	-	10.4	254.4
1964	419.4	-	3.1	422.5
1965	947.0	-	8.0	955.0
1966	1,737.8	18.1	10.5	1,766.4
1967	3,141.1	20.0	10.0	3,171.1
1968	6,515.0	43.1	51.9	6,610.0
1969	10,992.9	58.1	1,772.9	12,823.8
1970	7,712.8	54.4	2,902.1	10,669.5
1971	8,354.7	50.8	2,723.8	11,129.4
1972	7,515.6	74.8	3,504.5	11,094.9
1973	5,476.7	59.9	3,868.2	9,404.8
1974	4,430.7	36.7	3,477.3	7,944.7
1975	3,177.0	29.5	2,080.2	5,286.7
1976	617.2	7.3	397.8	1,022.3
1977	148.0	2.3	236.9	387.2
1978	-	-	-	-
1979	32.9	2.3	451.3	486.5
1980	69.5	5.4	256.9	331.8
1981	528.6	4.5	538.1	1,071.2
1982	883.2 (853.3) ¹	32.7 (22.3)	658.6(655.3)	1,574.5(1,530.9)
1983	1,029.0 (892.5)	36.5 (46.2)	508.0(460.1)	1,573.5(1,398.8)
1984	2,564.1(2,394.9)	96.8 (30.7)	565.2(525.1)	3,226.1(2,950.7)
1985	2,956.9(2,946.4)	207.4(216.5)	1,030.6(968.0)	4,194.9(4,130.9)
1986 ²	3,407.4(3,268.3)	191.1(230.8)	1,085.6(1136.5)	4,684.1(4,635.6)

¹Numbers in parenthesis are computed on a seasonal basis, e.g. 1983 includes December 1982 but does not include December 1983

²Preliminary

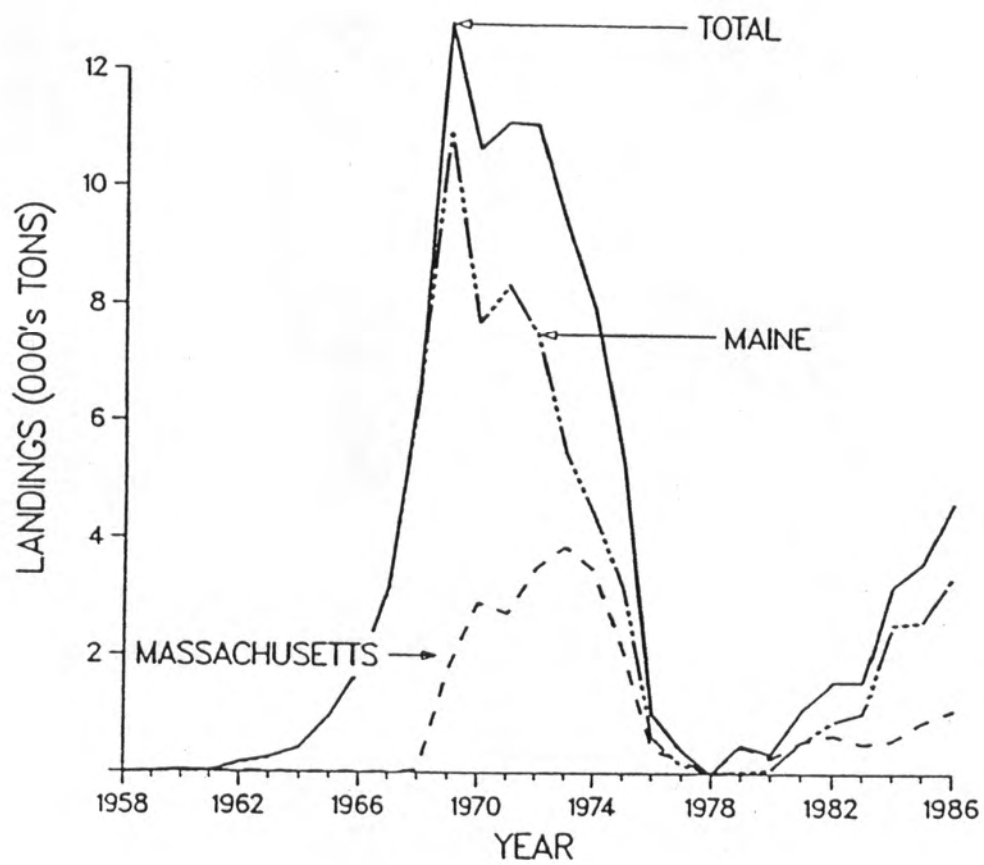
declined until the fishery stopped altogether between 1954 and 1957. Reports from fishermen at the time indicate that this decline was associated with low shrimp abundance and the fishery did not provide enough economic return to encourage continued fishing.

The fishery resumed in 1958, and landings rose from 2 t in that year to a peak of 12,800 t in 1969 (Table 1, Figure 4). Annual landings declined to about 400 t in the late 1970's, resulting in a closure of the fishery by the Northern Shrimp Section of ASMFC in 1978 (Northern Shrimp Scientific Committee 1979). The fishery was reopened in 1979 for a limited period (2 months); and the season has since been extended in response to improving conditions. Over 300 vessels participated in the 1986 season and landings totalled approximately 4,700 t.

The shrimp fishery in the Gulf of Maine has been conducted exclusively by the United States; fishermen from Maine, New Hampshire and Massachusetts are presently the only participants. Canada has occasionally taken shrimp on eastern Georges Bank and in 1975 the Soviet Union reported a 7 t catch from approximately the same area (Clark 1982).

Prior to 1975, Massachusetts fishermen landed approximately 34 percent of their shrimp during the winter. The Massachusetts fleet is composed primarily of Gloucester otter trawlers that find fishing for shrimp to be a profitable supplement to groundfishing. Prior to seasonal restrictions, Gloucester vessels were the primary harvesters of shrimp during the warmer months. The warm weather fishery concentrated harvest in the more offshore areas of Jeffreys Basin, Stellwagen Bank and Scantum Basin exploited shrimp of all age groups; juveniles, mature males, transitionals and mature females. Although it could be argued that both winter and summer fisheries could have a

Figure 4. Commercial landings of northern shrimp in the western Gulf of Maine (Maine, New Hampshire, and Massachusetts) 1958 - 1986.



deleterious effect on shrimp stocks, the summer fishery clearly has the potential to decrease yield and product quality and increase fishing mortality relative to the traditional winter fishery.

Current Status

The major fishery in the Gulf occurs in an area from Stellwagen Bank extending northward as far as the central Maine Coast. The Maine winter fishery has occurred primarily in near-shore areas from Portland to Rockland (Figure 1). In recent years fishing activity has expanded further east along the Maine coast. Vessels from New Hampshire, Massachusetts and Portland, Maine, concentrate their effort in near-shore areas from Portland to Scantum Basin. Gloucester vessels are also known to fish in these regions and also further south as far as Stellwagen Bank. The seasonal distribution of effort observed from commercial interview data is given in Figure 5.

Vessel characteristics of the shrimp fleet were determined in 1976 (Dunham and Mueller 1976). The Massachusetts vessels, all small to mid-size draggers, tend to be older and larger than the Maine vessels (Table 2). The Maine fleet consists mostly of converted lobster boats with a number of small to large draggers as well. Characteristically, these lobster boats have been wooden vessels 30-40 feet in length, modified for side or stern trawling (Wigley 1973). The New Hampshire fleet, like Massachusetts, consists of small and medium size draggers.

The otter trawl has been and remains the principal gear used in the Gulf of Maine northern shrimp fishery. Several sizes and styles of trawls are commonly used, depending on the size of the vessel, the experience of the crews, bottom type and other factors (Wigley 1973). A limited trap fishery was initiated in

Figure 5. Principal areas fished in the Gulf of Maine northern shrimp fishery in winter (December-February) and spring (March-May) based on commercial interview data collected during 1980-1984.

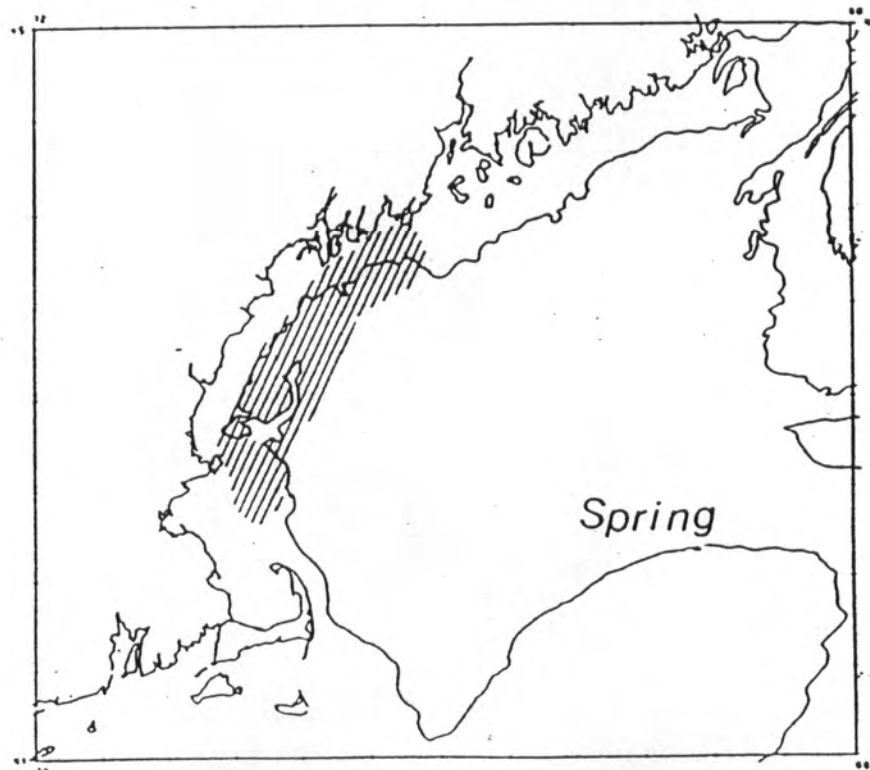
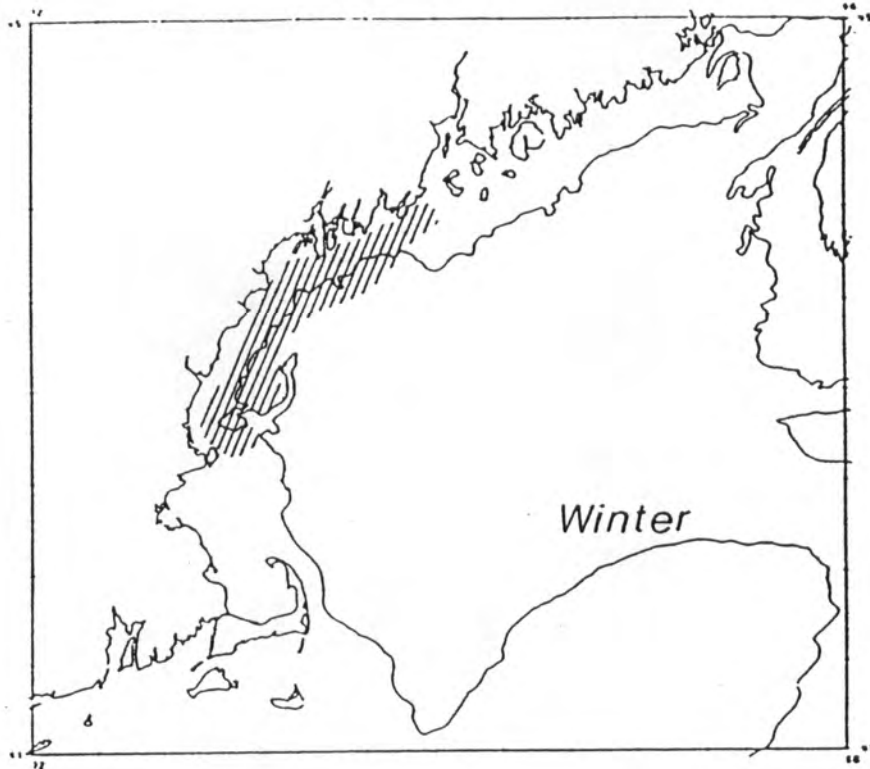


TABLE 2. Physical characteristics of vessels in the Gulf of Maine northern shrimp fishery (Modified from Dunham and Mueller 1976).

<u>Characteristic</u>	<u>Maine Vessels</u>	<u>Massachusetts Vessels</u>	<u>All Vessels</u>
Number of Vessels ¹	53	11	64
<u>Gross Tonnage</u>			
Average	26.6 tons	50.7 tons	31.0 tons
Range	(4-113)	(28-81)	(4-113)
<u>Length</u>			
Average	44 feet	70 feet	49 feet
Range	(29-71)	(56-95)	(29-92)
<u>Crew Size²</u>			
Average	2.0	5.0	2.5
Range	(1-4)	(4-6)	(1-6)
<u>Age</u>			
Average	17.3 years	34.1 years	19.5 years
Range	(1-35)	(20-48)	(1-48)
<u>Horsepower</u>			
Average	236.3	325.0	252.8
Range	(95-424)	(195-400)	(95-425)

¹ Number of vessels involved in each of the calculations: Gross tonnage - Maine 40, Mass. 9; Length - Maine 52, Mass. 11; Crew Size - Maine 52, Mass. 11; Age - Maine 52, Mass. 11; Horsepower - Maine 48, Mass. 11

² Including the captain.

Maine coastal waters during the early 1970's; however, trap landings never exceeded 2 percent of the total landings and declined to negligible levels by 1976. Interest in the trap fishery has been renewed in recent years but landings have remained low. This fishery is now confined primarily to the central coast of Maine.

The life history and migratory behavior of the shrimp have greatly affected fishing practices. Historically, the inshore migration of egg-bearing females has resulted in the development of an extensive fishery from December through March in coastal waters. Shrimp landings for each state by month from 1979-1985 indicate the majority of shrimp are caught during January, February, and March (Table 3). This seasonality in respect to landings has been consistent before and after implementation of seasonal management measures.

Fishermen from Maine, New Hampshire, and Massachusetts are presently the primary participants in the Gulf of Maine northern shrimp fishery. Since 1982, Maine has accounted for approximately 70 percent of the total landings for the three states. Massachusetts and New Hampshire landings fluctuated in the early 1980's; 1985 brought a significant increase for both states. Levels for 1986 were comparable to 1985 in both cases with Massachusetts vessels landing 1,100 t and New Hampshire vessels landing approximately 200 t. Coast-wide landings have shown an upward trend since 1980 with 1986 landings approximating 4,700 t.

Commercial effort has increased from about 400 trips in 1979 to over 8,000 trips during the 1986 fishing season (Table 4). Maine, with as many as 240 vessels participating in the fishery, accounted for approximately 80 percent of this total in 1986, Massachusetts with 39 vessels, and New Hampshire with 18, accounted for 14 and 16 percent of the total number of trips, respectively.

TABLE 3. Distribution of landings (metric tons) in the Gulf of Maine northern shrimp fishery by state and month, 1979-1986.

	Dec	Jan	Feb	Mar	Apr	May	Other	Total
1979 Season			1st-----31st					
Maine			6.7	20.6			5.6	32.9
Mass.			177.9	233.5			49.9	451.3
N.H.							2.3	2.3
Total			184.6	244.1			57.8	486.5
1980 Season			15th-----31st					
Maine			43.7	25.6	0.1			69.5
Mass.			43.5	24.5	84.1	102.8	2.0	256.9
N.H.							5.4	5.4
Total			87.2	50.2	84.2	102.8	7.4	331.8
1981 Season			1st-----15th					
Maine		24.1	214.2	183.3	68.7	0.7	37.6	528.6
Mass.		205.5	147.1	148.7	27.8	7.0	1.9	538.0
N.H.							4.5	4.5
Total		229.6	361.3	332.0	96.5	7.7	44.0	1,071.1
1982 Season			1st-----15th ¹					
Maine		340.4	298.4	203.1	11.4			853.3
Mass.		114.5	156.9	146.7	217.2	20.0		655.3
N.H.		11.2	7.7	2.7			0.7	22.3
Total		466.1	463.0	352.5	228.6	20.0	0.7	1,530.9
1983 Season	15th-----15th							
Maine	30.0	258.5	394.3	140.7	67.5	1.4		892.5
Mass.	3.5	108.8	100.8	57.4	126.2	61.7	1.7	460.1
N.H.	10.6	21.5	10.0	4.1				46.2
Total	44.1	388.8	505.1	202.2	193.7	63.1	1.7	1,398.8
1984 Season	15th-----30th							
Maine	166.5	609.4	1,067.7	498.9	52.4			2,394.9
Mass.	51.6	231.3	186.9	39.3	15.7			525.1
N.H.	0.9	15.8	13.9					30.7
Total	219.0	856.5	1,268.5	538.2	68.1			2,950.7
1985 Season	1st-----15th							
Maine	335.7	851.8	1,095.5	525.1	116.8	21.5		2,946.4
Mass.	91.7	283.9	283.9	239.3	57.8	57.0		968.0
N.H.	67.0	86.2	50.4	11.6	1.3			216.5
Total	494.4	1,221.9	1,384.2	776.0	175.9	78.5		4,130.9
1986 Season ²	1st-----31st ³							
Maine	347.0	747.8	1,405.3	415.4	104.2	149.2	99.4	3,268.3
Mass.	154.2	213.4	221.2	200.9	111.2	84.7	150.7	1,136.3
N.H.	57.7	76.2	70.8	14.2	1.3		10.6	230.8
Total	558.9	1,037.4	1,697.3	630.5	216.7	233.9	260.7	4,635.4

¹ Season extended to May 1st

² Preliminary data

³ Season extended for two weeks June 8 to June 21.

TABLE 4. Distribution of fishing effort (number of trips) in the Gulf of Maine northern shrimp fishery by state and month, 1979-1986.

	Dec	Jan	Feb	Mar	Apr	May	June	Total
1979 Season			1st-----31st					
Maine			71	101				172
Mass.			92	139				231
N.H.								
Total			163	240				403
1980 Season			15th-----31st					
Maine			247	212	6	7		472
Mass.			84	107	159	239		589
N.H.								
Total			331	319	165	246		1,061
1981 Season		1st-----15th						
Maine		104	434	702	292	31		1,563
Mass.		200	171	155	45	21		592
N.H.								
Total		304	605	857	337	52		2,155
1982 Season		1st-----15th ¹						
Maine		717	854	1,002	70			2,643
Mass.		145	156	161	186	26		674
N.H.		19	22	19				60
Total		881	1,032	1,182	256	26		3,377
1983 Season		15th-----15th						
Maine	160	993	874	672	133	6		2,773
Mass.	10	158	155	115	171	89		698
N.H.	53	57	30	19		15		174
Total	223	1,148	1,059	806	304	110		3,650
1984 Season		15th-----30th						
Maine	378	1,526	2,090	1,468	163			5,625
Mass.	138	311	286	79	32			846
N.H.	7	39	39					85
Total	523	1,876	2,415	1,547	195			6,556
1985 Season		1st-----15th						
Maine	555	1,434	1,997	1,195	257	36		5,454
Mass.	140	270	233	231	92	72		1,082
N.H.	106	125	76	26	4			339
Total	801	1,829	2,298	1,452	353	108		6,841
1986 Season		1st-----31st ²						
Maine	584	1,311	2,826	1,185	362	133	68	6,469
Mass.	138	226	179	184	143	115	132	1,117
N.H.	109	119	142	53	3		17	443
Total	831	1,656	3,147	1,422	508	248	217	8,029

¹ Season extended to May 1st

² Season extended two weeks June 8 to June 21

Length frequency data from biological sampling of commercial landings from Maine, New Hampshire, and Massachusetts are given in Figures 6, 7, and 8, respectively. These figures demonstrate the general trend that landings from Maine and New Hampshire contain a greater percentage of large, mature, female shrimp when compared with Massachusetts landings. For 1983-1985, Massachusetts landings of mature females averaged 69 percent by number and 86 percent by weight; corresponding figures for Maine were 92 percent by number and 97 percent by weight, respectively. New Hampshire's landings are again comparable to Maine's: 97 percent by number of mature female shrimp (no length frequency information from New Hampshire is available for preceding years).

The production of different processed forms of northern shrimp is dependent on both seasonal quality and market outlets. From January through April, when large shrimp are available, multiple market forms can be produced. Shrimp caught in other months are of lower quality and are not easily processed.

While northern shrimp is the principal component of the commercial catch, other pandalid species, such as the striped pink shrimp (Pandalus montagui) and Dichelopandalus leptocerus, are also taken and processed. These species are of minor consequence, however, seldom exceeding three percent by weight of the total catch (Rinaldo and Dunton 1973). Dichelopandalus leptocerus accounts for most of the catch of other pandalids in summer research vessel surveys in the western Gulf of Maine (discussed below).

Economic Aspects

The total catch of all pandalid species in the northern hemisphere in 1983 was 173,000 t. The Eastern Atlantic contributed 61 percent to the total catch and the Western Atlantic, 33 percent. The Gulf of Maine shrimp catch of

Figure 6. Length - frequency distributions of northern shrimp derived from biological sampling of Maine landings during the 1982-1983 season (Northern Shrimp Technical Committee MS 1983).

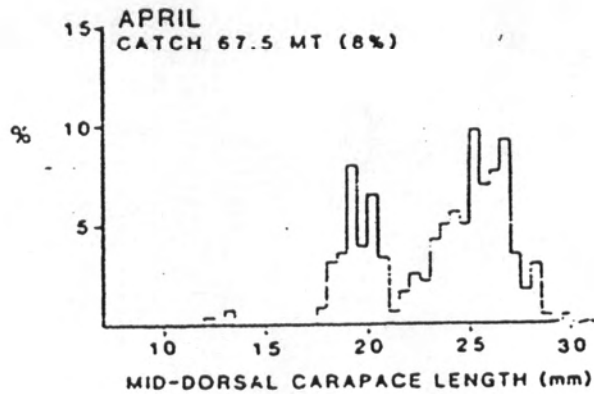
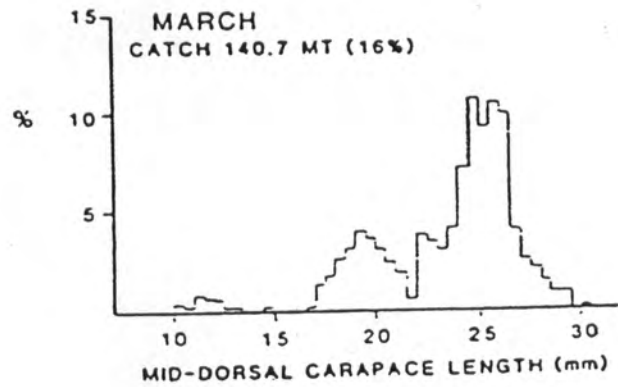
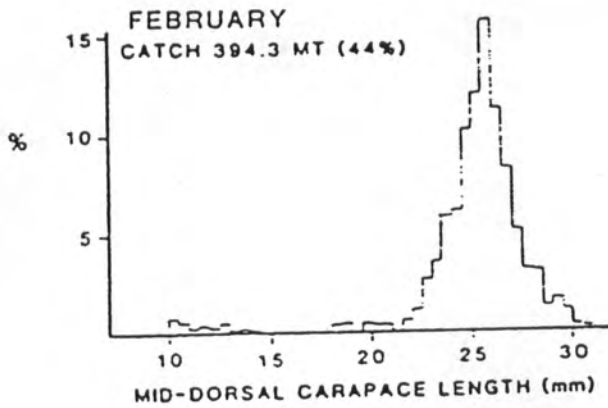
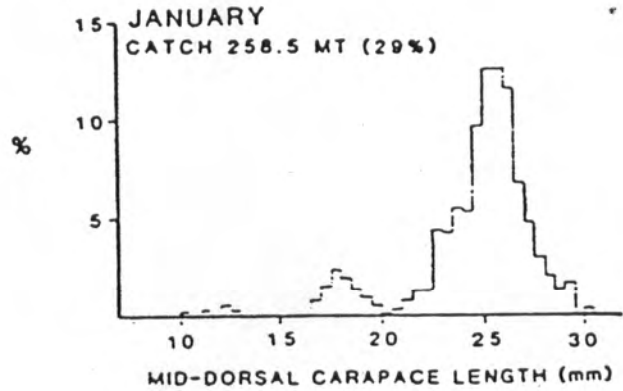
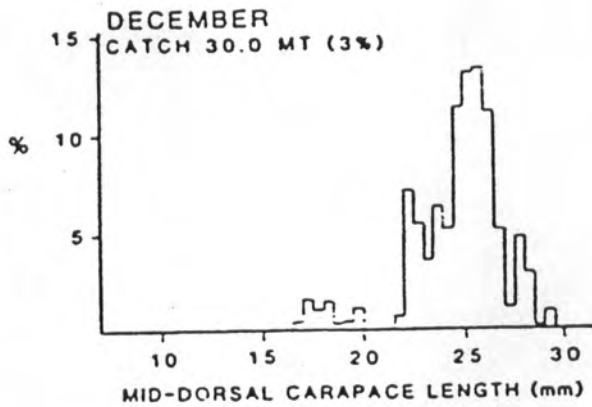


Figure 7. Length - frequency distributions of northern shrimp derived from biological sampling of New Hampshire landings during the 1984-1985 season (Northern Shrimp Technical Committee MS 1985).

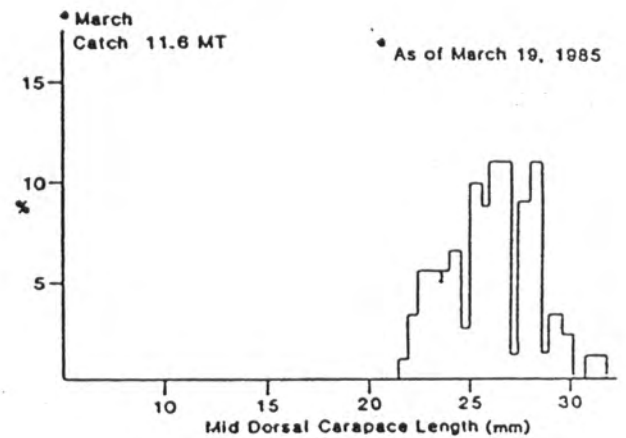
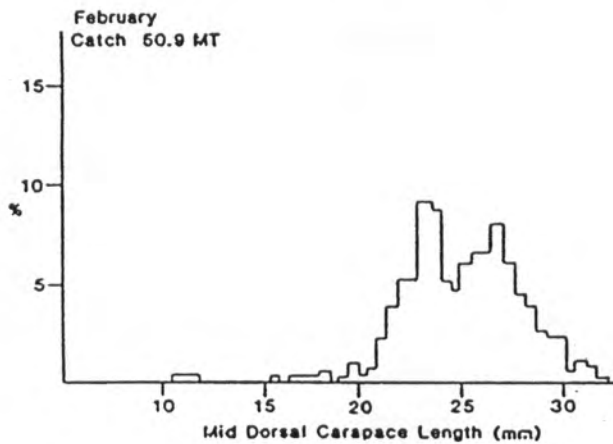
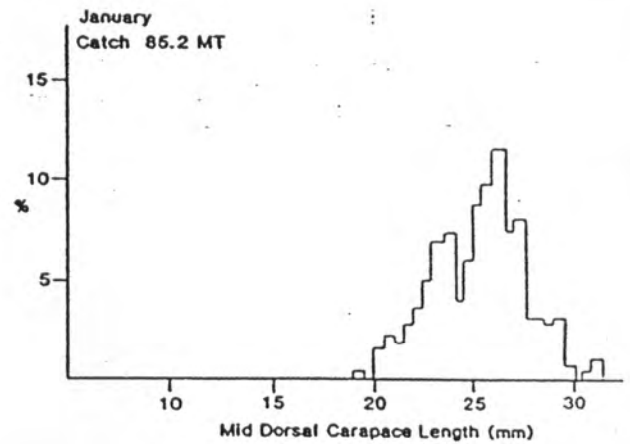
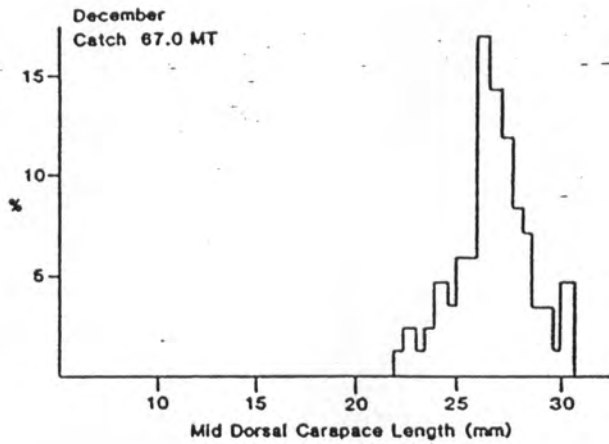
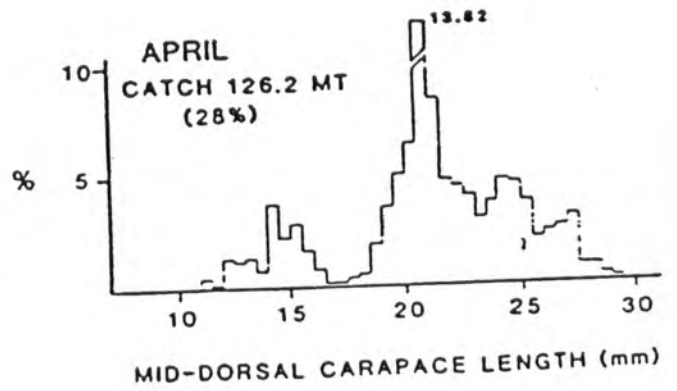
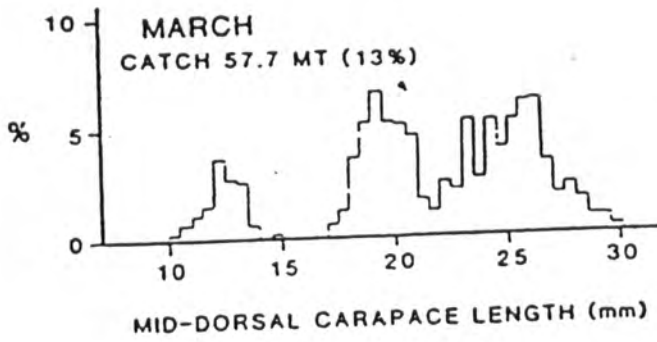
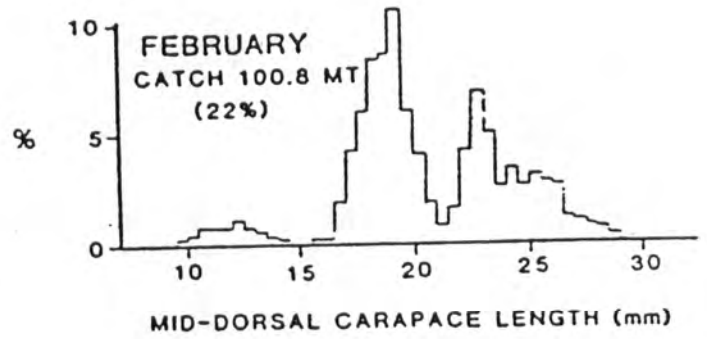
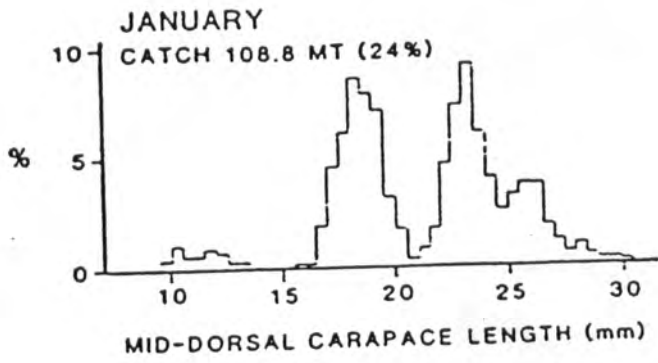


Figure 8. Length - frequency distributions of northern shrimp derived from biological sampling of Massachusetts landings during the 1982-1983 season (Northern Shrimp Technical Committee MS 1985).



1,600 t was approximately 2.8 percent of the Western Atlantic total. In terms of total U.S. production, the Gulf of Maine northern shrimp component has been small--approximately one percent of total U.S. shrimp production on a live weight basis since 1980.

Although Gulf of Maine landings are inconsequential when compared to total U.S. production or imports, the timing and location of this fishery make it important to the fishermen of Maine, Massachusetts and more recently New Hampshire. Landings are concentrated in the winter months, when the shrimp have moved to the inshore areas along the coast of Maine and in areas near Jeffreys Ledge, Scantum Basin and Stellwagen Bank. The winter inshore fishery contributes to the coastal economies of the three states, as it provides an income opportunity during a period when other fishing activities are at a low point. During its peak years, the northern shrimp fishery contributed an estimated ten million dollars annually to the Gulf of Maine coastal economy in manufactured product value (Northern Shrimp Scientific Committee 1979).

Table 5 presents total reported landings, ex-vessel value and prices for northern shrimp from 1958 to 1985. For 1982 to 1985 seasonal landings (defined as those falling within the seasonal limits established by ASMFC) are given in parentheses as well. For example, the 1984 season includes December, 1983 catches but not those made in December of 1984. In addition, the table shows the ex-vessel value and the price series in real terms, i.e., adjusted for inflation. These figures reflect the relative purchasing power of a dollar made from shrimping using 1967 as the base year.

Following a period of zero landings in the mid-1950's, the fishery resumed in 1958 with landings averaging \$0.40/lb. The price decreased to \$0.12/lb by 1963, and remained that way for approximately six years. Landings rose to a

TABLE 5. Commercial landings, ex-vessel value and price information for Gulf of Maine northern shrimp, 1958-1985.

Year	Annual landings (t)	Ex-vessel value \$000.00	Price/lb	Consumer Price Index	Inflation adjusted value	Inflation adjusted price/lb ¹
1958	2.3	2.0	.40	93.9	2.1	.42
1959	7.7	5.0	.30	90.3	5.5	.33
1960	40.9	21.0	.23	89.1	23.6	.26
1961	30.9	15.0	.22	89.3	16.8	.25
1962	176.0	57.0	.15	91.5	62.3	.16
1963	254.4	67.0	.12	90.1	74.4	.13
1964	433.5	113.0	.12	88.7	127.4	.13
1965	955.0	245.0	.12	94.5	259.3	.12
1966	1,766.4	549.5	.14	102.6	535.6	.14
1967	3,171.0	871.9	.13	100.0	871.9	.13
1968	6,610.0	1,610.5	.11	102.2	1,575.8	.11
1969	12,823.8	3,478.9	.12	110.8	3,139.8	.11
1970	10,699.5	5,197.4	.22	116.5	4,460.9	.19
1971	11,219.4	4,653.2	.19	116.9	3,980.5	.16
1972	11,094.9	4,585.8	.19	128.0	3,582.7	.15
1973	9,404.7	5,657.0	.27	160.4	3,526.8	.17
1974	7,496.5	5,764.1	.35	163.9	3,516.8	.21
1975	5,299.7	3,555.0	.30	178.0	1,997.2	.17
1976	1,022.3	795.4	.35	179.4	443.4	.20
1977	387.2	459.0	.54	190.2	241.3	.28
1978	--	--	--	204.3	--	--
1979	486.5	338.0	.32	234.2	144.3	.13
1980	331.8	477.0	.65	242.2	197.0	.27
1981	1,071.2	1,494.9	.63	252.8	591.3	.25
1982	1,574.5 (1,530.9) ²	2,061.2	.59	262.1	786.4	.23
1983	1,573.5 (1,398.8)	2,312.0	.67	261.0	885.2	.26
1984	3,226.8 ¹ (2,950.7)	3,475.0	.49	266.6	1,303.5	.18
1985	4,194.9 (4,130.9)	4,047.0	.43	263.4	1,536.5	.17

¹ Figures deflated using Consumer Price Index (CPI) for fish and food commodities using 1967 as the base year. Bureau of Economic Statistics, Inc. 1986.

² Figures in parentheses are for the shrimping season. The 1982 season, for example, includes December, 1981 but not December, 1982.

record 12,800 t in 1969 while the price remained stable at about \$0.12 in actual and real terms.

With subsequent declines in harvests during the 1970's, the ex-vessel price increased considerably. But, since landings declined at a faster rate, ex-vessel value declined sharply as well. The maximum ex-vessel revenue generated by the fishery, \$5.76 million, occurred in 1974. Following the 1978 closure, the price increased sharply to \$0.65/lb in 1980. Since then, the price of shrimp has seen a downward trend--with 1983 the exception--as landings have increased.

While local supply conditions play a significant role in determining prices received at the dock, other factors can also be important. Shrimp landings in the remainder of the country declined from a 1981 high of slightly less than 160,000 t to 112,000 t in 1983, but have recovered since. Direct shrimp imports to New England, though constituting only four percent of the U.S. total, have risen in this decade from 2,300 t (live weight equivalent of all forms) to over 12,000 t. This increase in imports appears to have contributed to the declining trend in price/lb observed since 1980.

The major supplier to New England from 1980 through 1985 was Canada, which accounted for 74 percent of the New England total in 1982. Since that year, however, the proportion contributed by Canada has declined to only 21 percent in 1985. Norway is now the primary supplier.

Exports of shrimp products have been small. In 1985, for example, less than 300 t (product weight) valued at \$2.0 million was exported. This total included imported shrimp which was further processed and then exported. Canada, through 1985, has been the major recipient.

At the height of the fishery (1969-1973), there were twenty-one shrimp processors, twenty of which were in Maine. With the subsequent decline in

landings, the number of processors dropped to nine in 1976. In 1977, only three processors remained, and by 1979, only one processor was active on a full time basis. In 1985, there were four active processors of northern shrimp, two in Maine and two in Massachusetts. The 1986 total is thought to be somewhat larger.

The fishery is currently conducted by approximately 300 vessels, one third of which measure less than 5 gross registered tons (GRT). The majority are in the 5-50 GRT range, with some sixty vessels even larger. Table 6 indicates the increase in the number of vessels of ≥ 5 GRT, which landed shrimp since 1979, together with the average percentage of total revenue provided by shrimp landings. The 5-50 GRT class shows the most dramatic increase in numbers and greatest reliance on northern shrimp. To some extent the increased percentage of revenue attributable to shrimp landings reflects the general decline in revenue from other fisheries. Similar information for vessels of less than 5 GRT is unavailable.

Fisheries Interactions

Since the northern shrimp fishery is conducted primarily by trawling with small-mesh gear, by-catch and discard of unmarketable finfish would be expected. MacIsaac and Diodati (1978) reported average finfish discard of 22-27 percent of the total catch (shrimp and finfish included) based on interview data for Gloucester and Portland vessels, respectively, during 1976 and 1977. Additional work by the Massachusetts Division of Marine Fisheries in Gloucester during these years indicated a discard of 21 percent of the total catch, consisting primarily of American plaice, whiting, redfish, silver and red hake, and cod (MacIsaac and Diodati 1978). Additional information is available from results of past selectivity studies (Northern Shrimp Scientific

TABLE 6. The value of the northern shrimp catch expressed as a percentage of total landed value for vessels (>5 GRT) landing shrimp in New England by tonnage class, 1979-1985.

Year	Tonnage Class						All Vessels	
	5-50 GRT		51-151 GRT		151+ GRT		No.	% Value
	No.	% Value	No.	% Value	No.	% Value		
1979	21	1.9	20	1.4	--	--	41	1.6
1980	37	2.6	19	1.7	--	--	56	2.1
1981	81	7.2	26	4.5	--	--	107	5.9
1982	123	8.7	30	4.1	1	.5	154	6.4
1983	118	9.1	25	3.5	--	--	143	6.6
1984	149	13.8	41	5.0	--	--	190	10.0
1985	154	15.5	57	10.1	5	1.5	216	12.1

Committee 1974) in which a range of codend mesh sizes were tested for possible use in commercial shrimp trawls. By-catch of finfish in these tests totalled over 20 t, substantially higher than the total shrimp catch of 13.7 t (Table 7). Whiting, red and white hake, cod, and redfish accounted for 90 percent of the finfish catch. Much of this would have been unmarketable commercially due to small size. Similarly, catches of juvenile finfish in summer survey cruises in the western Gulf of Maine (discussed below) have often been substantial.

Direct observations on finfish discard in the shrimp fishery are limited. Some information is available from 11 sea sampling trips performed by NEFC personnel aboard commercial vessels since 1983; discard was observed to be negligible in 3 trips out of Rockland, Maine (<2 percent by weight of the total shrimp catch) but considerable quantities (>50 percent of the total weight of shrimp catch) were discarded during trips from other ports. Most of this discard consisted of small flatfish (primarily American plaice), whiting, red and white hake, and cod. Similarly, Langan and Howell (in press) reported that discard of small flatfish totalled approximately 50 percent of the shrimp catch in two western Gulf of Maine trips and also noted substantial discard of whiting, cod and other species (apparently, with the flatfish discard, exceeding the amount of shrimp landed). Similar results were reported by MacIsaac and Diodati (1978) for one sea sampling trip from Gloucester.

Further information is needed to document trends by area and season although some inferences can be made based on commercial landings trends, e.g., for directed shrimp trips from ports east of Portland, Maine. In 1985 finfish landings approximate 15 percent by weight of the total catch of shrimp while the corresponding figure for vessels fishing further south was 52 percent. The higher by-catch in the latter area clearly implies a greater

Table 7. Total shrimp catch and by-catch of other invertebrates and finfish in northern shrimp gear evaluation studies, July-December 1973 (Northern Shrimp Scientific Committee 1979).

Species	Weight Caught (kg)
Shrimp	13,676
Whiting	5,950
Hakes	4,530
Redfish	4,493
Cod	3,222
Flatfish	258
Haddock	5
Pollock	301
Herring	286
Monkfish	397
Alewife	30
Skate	331
Spiny dogfish	266
Squid	30
Crab	34
Shad	31
Miscellaneous	9
TOTAL	33,849

potential for finfish discard.

The above data suggest that incidental mortality to juvenile groundfish in the Gulf of Maine shrimp fishery and concomitant reductions in yield could be substantial. There is little documentation on possible impacts of such discards although Anderson (1975) has shown that discard of small whiting in the Gulf of Maine shrimp and whiting fisheries can cause significant reductions in whiting abundance and may have contributed to the general failure of this stock to recover from low levels of abundance in the early 1970's. Presumably, incidental mortality on other species, particularly redfish, various flatfish species, and red and white hake could also be significant.

Attempts to reduce finfish discard in the Gulf of Maine shrimp fishery have focused on use of shrimp separator trawls (SSTs) designed to retain most of the shrimp catch while excluding all or most of the finfish. A number of SSTs have been developed and successfully used in crustacean trawl fisheries in many parts of the world; and in the Gulf of Maine fishery the Maine Department of Marine Resources (DMR) Fisheries Technology Service has experimented with a modified "50-70" design employing a 7.6 cm (3 inch) mesh separator panel. This is hung so as to guide finfish vertically into a separate 14 cm (5.5 inch) mesh codend where the juveniles can escape. The shrimp pass through the panel and are retained in the lower 4.5 cm (1.75 inch) mesh codend (Maine Department of Marine Resources 1986). In tests conducted to date, the DMR SST has retained an average of 90-95 percent of the shrimp caught while eliminating approximately 80 percent of the finfish by-catch. Further experiments to develop a completely workable design for general use under Gulf of Maine conditions are in progress. Other gear configurations, e.g., the trawl efficiency device or TED developed for the Gulf of Mexico shrimp

fishery, and radial escape sections (RES) used successfully in European fisheries are also being evaluated. Such devices depend on lateral and forward movement and may be particularly applicable to reducing by-catch of whiting and other swiftly swimming species (Averill, pers. comm.).

The potential for by-catch of shrimp in directed finfish fisheries has also been of concern, particularly during years of low shrimp abundance. There is little evidence of appreciable by-catch and discard of shrimp in demersal trawl fisheries with the exception of the whiting fishery (Northern Shrimp Scientific Committee MS 1977a; MacIsaac and Diodati 1978). The whiting fishery has been of primary interest due to mesh sizes used and areas fished. Many fishermen use shrimp trawls in directed operations for whiting; and in addition, concentrations of whiting and shrimp tend to overlap, particularly in late summer and fall when the whiting fishing is at its peak. Data for 1971-1975 (prior to imposition of extended seasonal closures) indicate the potential for an annual shrimp by-catch of several hundred t annually (Northern Shrimp Scientific Committee MS 1977a). Subsequent analyses by the Committee indicate that such by-catch could be reduced to insignificant levels by use of 6 cm (2.4 inch) stretched mesh trawls (Northern Shrimp Scientific Committee MS 1977b). Diodati (1986) observed negligible levels of shrimp by-catch in 9 sea sampling trips aboard Gloucester whiting vessels in 1978 in which ≥ 6 cm mesh trawls were used.

RESEARCH

History

Early papers by Scattergood (1952), Apollonio and Dunton (1969), Haynes and Wigley (1969), Wigley (1973), and others have provided considerable information relative to biology and life history, distribution movements, trends in abundance and development of the fishery from 1923-1973. Information about subsequent events in the harvesting and processing sectors, stock assessment, and management appears in the Draft Northern Shrimp Management Plan and Environmental Impact Statement (Northern Shrimp Scientific Committee 1979) and in annual assessment reports; see also Clark and Anthony 1981, Shumway et al. 1985, and Apollonio et al 1986. The gear evaluation study completed by the Scientific Committee in 1974 provided the basis for current mesh size regulations. These papers provide considerable information for implementing management programs.

Current Research

Biologists from the participating states and the NMFS, collectively comprising the Northern Shrimp Technical Committee, continue to cooperate in annual stock assessment work. These assessments utilize data gathered from:

- 1) commercial landings and catch-effort data collected by NMFS port agents;
- 2) biological data gathered from commercial landings by personnel from the Massachusetts Division of Marine Fisheries(DMF), the New Hampshire Fish and Game Department(F&G), and the Maine Department of Marine Resources(DMR); and
- 3) research vessel survey data collected by the Committee during the summer and by the NEFC during the spring and fall.

The Committee enhanced its predictive and monitoring capabilities in 1983 with the development and implementation of an annual summer survey for

northern shrimp. Gear design and testing were performed in cooperation with the NEFC's Fisheries Engineering Group (FEG), and the survey has since been conducted annually in July and August by the Committee and FEG personnel using the NEFC research vessel GLORIA MICHELLE. The survey is conducted during summer because the sexual characteristics of the shrimp are identifiable at this time. Most age groups can be sampled except for the juveniles in inshore areas and reliable indices of recruitment can be obtained. Detailed information about the survey is given below under Research Vessel Survey Indices.

Maine DMR researchers have undertaken studies on the energetics of shrimp larval development including metabolic requirements, growth rates, and chemical composition. Currently, researchers are trying to correlate these findings with field data on food availability and temperature fluctuations in the Gulf of Maine. These data should provide an understanding of energy flow through the shrimp population and will further the goal of developing a reliable method to predict shrimp stock size in the Gulf of Maine. Much work has also been done in recent years on the development of a separator trawl by the Maine DMR Fisheries Technology Service. This type of trawl has shown promise on a trial basis and on initial demonstrations to the industry; however, further evaluation is necessary.

University of New Hampshire researchers are examining commercial trawl discards in both the shrimp and groundfish fisheries in the Gulf of Maine to determine what factors contribute to the discard rate. The Massachusetts Institute of Technology Sea Grant Program has had an on-going study to examine the efficiency and selectivity of various types of trawl designs. The work has included testing of nontraditional trawl types for use in the northern shrimp fishery.

The NEFC is engaged in several research projects involving the Gulf of Maine northern shrimp population. By-catch analysis is underway; and progress has been made in development of commercial and survey abundance indices, estimates of population parameters including growth, mortality and population age structure, estimation of population size and time series modeling to evaluate the relative impacts of environmental factors and exploitation on historical trends in abundance.

Research Needs

The Technical Committee has identified the following research priorities for effective management:

1. Socio-Economics

- a. Characterize demographics of the fishing fleet by area and season; perform comparative analysis of fishing practices between areas.
- b. Develop an understanding of product flow and utilization through the marketplace; identify performance indicators for various sectors of the shrimp industry.
- c. Perform cost-benefit analyses to evaluate management measures.

2. Community Dynamics

- a. Evaluate competition and predator-prey relationships between species.

3. Biological Parameters

- a. Growth, including frequency of molting and variation in growth rates as a function of environmental factors and population density.
- b. Larval growth and survival in response to environmental conditions.

- c. Maturation, fecundity and lifetime spawning potential.
- d. Natural mortality, including relative impacts of predation and disease and variation at age and over time.

4. Gear Selectivity

- a. Vulnerability of shrimp to various fishing gear.
- b. Vulnerability of finfish to various shrimp fishing gear; discard of juvenile finfish in the shrimp fishery by area and season.
- c. Further evaluation of separator and mid-water trawl gear for use in the Gulf of Maine fishery.

5. Migration and Distribution

- a. Seasonal distribution of juveniles and adults.
- b. Distribution of larval shrimp.
- c. Migration and local movements.

STATUS OF THE RESOURCE

Abundance

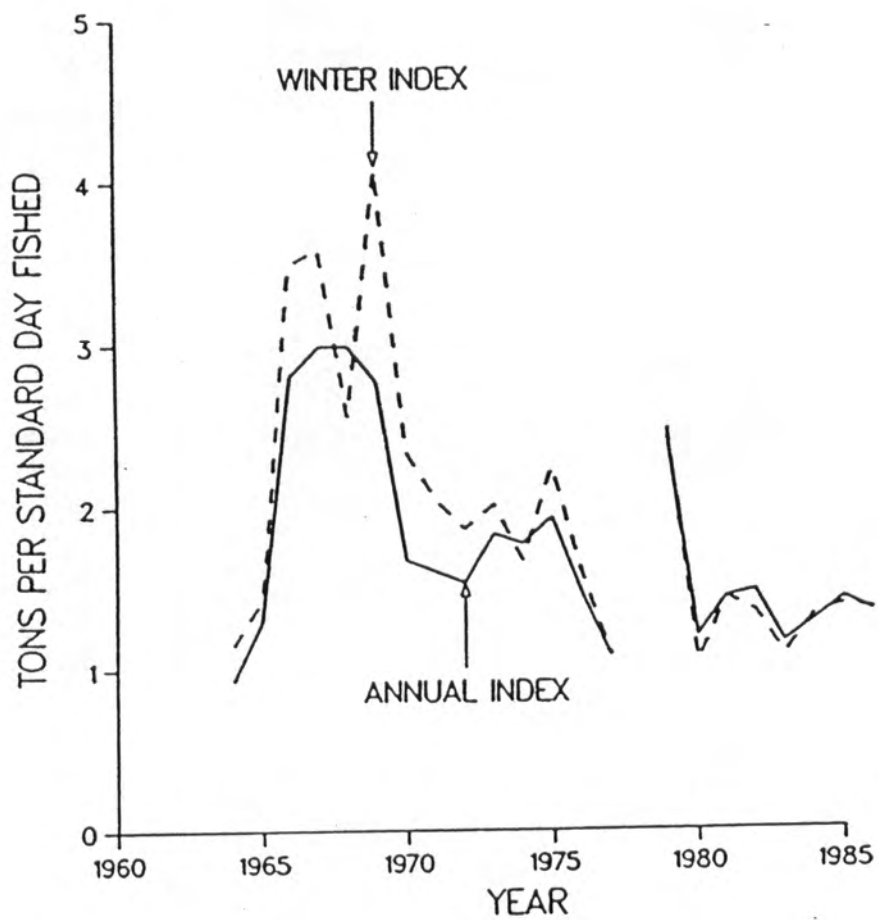
The Northern Shrimp Technical Committee has relied on three primary sources of data for formulating annual stock assessments: 1) commercial landing and catch-effort data collected by NMFS port agents, 2) biological data obtained during sampling of commercial landings by personnel from the Massachusetts DMF, the New Hampshire F&G, and the Maine DMR, and 3) research vessel survey data collected by the Committee during the summer and by the Northeast Fisheries Center (NEFC) during spring and fall.

1. Commercial Landings and Indices of Abundance

Historical landings data (Table 1, Figure 4) indicate that the abundance of the Gulf of Maine northern shrimp resource has fluctuated considerably since the fishery began. Landings peaked at 264 t in 1945, declined to zero from 1954-1957, and increased to a high of 12,800 t in 1969. This was followed by a stable period from 1970-1972 and then a precipitous decline in the mid-1970's. The collapse of the fishery in the mid-1970's has been attributed primarily to high exploitation combined with adverse environmental conditions. Since 1980, landings have shown a steady upward trend. Approximately 4700 t were landed in 1986.

Indices of abundance have been developed using NMFS catch-effort data for 1964-1984. An annual index has been developed using standardized effort data for which 50 percent or more of the total catch consisted of shrimp. Data were standardized by vessel class using 34-50 GRT vessels as standard (Clark 1982). A similar index was developed for the winter fishery based on February-March trip data in an attempt to compensate for possible bias from changes in exploitation patterns by area and season between years (Figure 9)

Figure 9. Commercial indices of abundance for the Gulf of Maine northern shrimp stock, 1964 - 1986.



(Northern Shrimp Technical Committee MS 1984).

The annual index for Portland and Gloucester peaked at 3 t per standard day fished in 1967-68 and then declined to 1.1 t in 1977. High index values for 1979 may reflect the closure of the fishery in 1978 or changes in availability or exploitation patterns by area (Northern Shrimp Technical Committee MS 1985). The winter index exhibits similar trends although values for years of peak abundance are higher. In recent years, both indices have fluctuated without a definite trend, although values observed since 1980 are well below those observed during the peak years of the fishery (Northern Shrimp Technical Committee MS 1985). However, catch-effort data for other Maine ports (between Portland and Rockland) show a substantial increase in 1984-1985 over 1982-1983 levels.

Failure of the index to show a more definite upward trend in recent years is surprising in view of ancillary evidence from the commercial fishery and research vessel surveys indicating increased abundance since the early 1980's. This suggests that these indices may be more representative of localized trends rather than trends for the resource as a whole.

2. Research Vessel Survey Indices

Indices of abundance have been developed for this stock from NEFC spring and autumn bottom trawl survey data (1968-present), from State of Maine summer survey data (1968-1983) and from a more recent summer survey developed by the Northern Shrimp Technical Committee (1983-present). NEFC bottom trawl surveys are general in nature, utilizing a stratified random design and employing groundfish gear equipped with rollers and 1.3 cm (0.5 inch) codend liners. Indices for northern shrimp developed from these data appear to have tracked

abundance trends reasonably well (Clark and Anthony 1981) although attempts to predict recruitment or evaluate biological parameters, e.g., mortality, have generally been unsuccessful due to variability in catch per tow at age. The Maine summer survey involved sampling a limited number of fixed stations with a shrimp research trawl (Apollonio and Dunton 1969); resulting data have been used to derive abundance indices and information on population age structure and mortality rates. Results of these surveys indicate a pronounced decline in abundance from the late 1960's to the late 1970's. More recent data suggest an increase although abundance is below levels observed during the late 1960's (Table 8, Figure 10).

Survey efforts for this stock were expanded considerably in 1983 with the implementation of a stratified random trawl survey directed specifically towards northern shrimp during summer. Gear used consists of a modified 4-seam commercial shrimp trawl developed and tested by the Northern Shrimp Technical Committee and the NEFC Fisheries Engineering Group (Blott et al. 1983). The trawl is constructed of nylon twine with 3.5 cm (1.4 inch) stretch mesh in the body and 3.2 cm (1.3 inch) stretch mesh in the extension piece and codend and is equipped with "rockhopper" ground gear to make it suitable for use on rough bottom. The survey area is bounded by 68° W longitude to the east and the 50 fathom contour to the west, with the exception of the Massachusetts Bay/Stellwagen Bank area where the survey region was extended inshore to the 30 fathom contour (Figure 11). This region has produced all of the NEFC summer and autumn survey catch since the mid-1970's. All survey work to date has been conducted during late July and August by personnel from the participating states and NMFS aboard the Center's R/V GLORIA MICHELLE.

Results of this survey indicate an increase in abundance and biomass since 1983 (Table 8). This trend is associated primarily with recruitment and

Table 8. Research vessel survey abundance indices for Gulf of Maine northern shrimp, 1968 -1986.

Year	Mean Catch Per Tow (kg)		Stratified Mean Catch Per Tow (kg)		
	Maine Summer Survey ¹		GLORIA MICHELLE Summer Survey ²	NEFC BOTTOM Trawl ³ Spring Summer	Autumn
1968	45.8			10.57	3.16
1969	31.2			4.46	2.69
1970	40.9			2.09	3.66
1971	9.4			1.86	2.95
1972	7.0			1.44	3.33
1973	7.8			1.31	1.89
1974	4.9			2.16	0.75
1975	6.7			5.40	0.93
1976	4.8			0.67	0.58
1977	1.6			0.90	0.15
1978	3.2			0.27	0.41
1979	4.4			1.00	0.51
1980	2.7 ⁴			0.82	0.53
1981	3.0			2.61	1.48
1982	2.0			1.10	0.30
1983	4.2			1.28	1.02
1984			22.6	1.86	1.99
1985			29.4	0.52	1.60
1986			30.1	0.71	

¹ Mean catch per 30 minute tow (daytime)

² Stratified mean catch per 15 minute tow (daytime)

³ Stratified mean catch per 30 minute tow (day and night tows included)

⁴ Based on incomplete sampling

Figure 10. Indices of abundance (stratified mean catch per tow, kg) developed from NEFC spring and autumn bottom trawl surveys, 1968 - 1986.

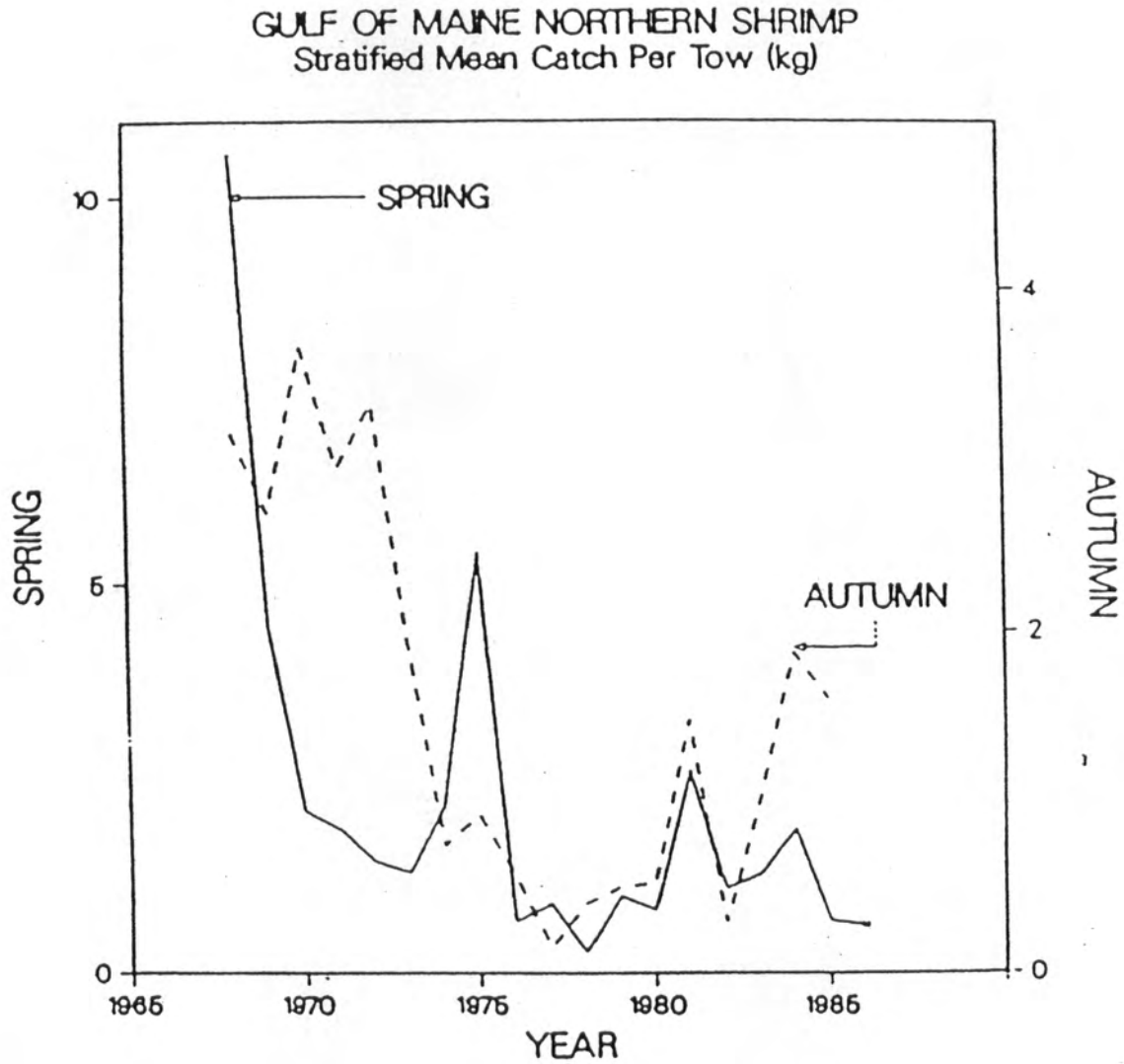
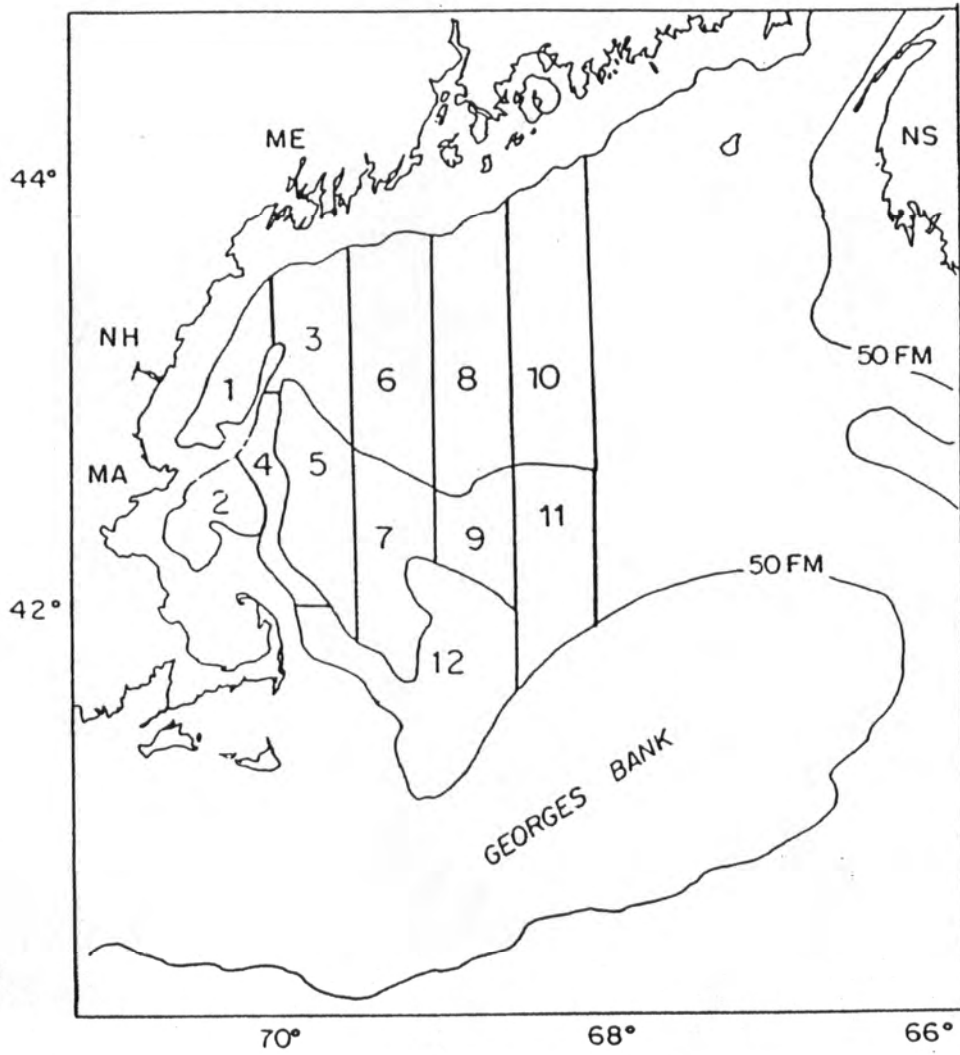


Figure 11. Stratification scheme used for the Gulf of Maine northern shrimp survey.



growth of the strong 1982 year class which can be tracked throughout the time series (Figure 12). Index values for 1986 are comparable to those observed for 1985 (Table 8), possibly reflecting attainment of maximum individual size, increasing mortality on the 1982 year class and poorer recruitment from subsequent cohorts (Northern Shrimp Technical Committee MS 1986). Distinct differences in sex and age structure and spawning stage are also evident by area (Figures 13 and 14). Sampling precision has been relatively high (with coefficients of variation averaging 0.13 and 0.12 for numbers and weight, respectively, over all strata since 1983).

The above results indicate that the summer shrimp survey offers considerable promise as a monitoring and predictive tool. It provides a basis for monitoring trends in abundance and harvestable biomass over time and for determining stock size and exploitation rates through application of swept-area techniques (Parsons 1983; discussed further below). In addition, survey results can be used to predict recruitment and to some extent the catch composition of the forthcoming winter fishery. The surveys also provide a platform for the collection of biological and environmental data.

Temperature Effects on Population Size

The size of the Gulf of Maine northern shrimp stock appears to respond to both changes in temperature and fishing pressure. It would be expected that the Gulf of Maine population, being the southernmost in the Northwest Atlantic, would be particularly subject to environmental factors; and considerable attention has been focused on environmental influences (i.e., temperature) on trends in abundance. Dow (1963; 1964; 1966; 1977) noted an inverse relationship between sea surface temperature measured at Boothbay

Figure 12. Length frequencies (stratified mean catch per tow) for northern shrimp observed during summer survey cruises in the western Gulf of Maine, 1984 - 1986.

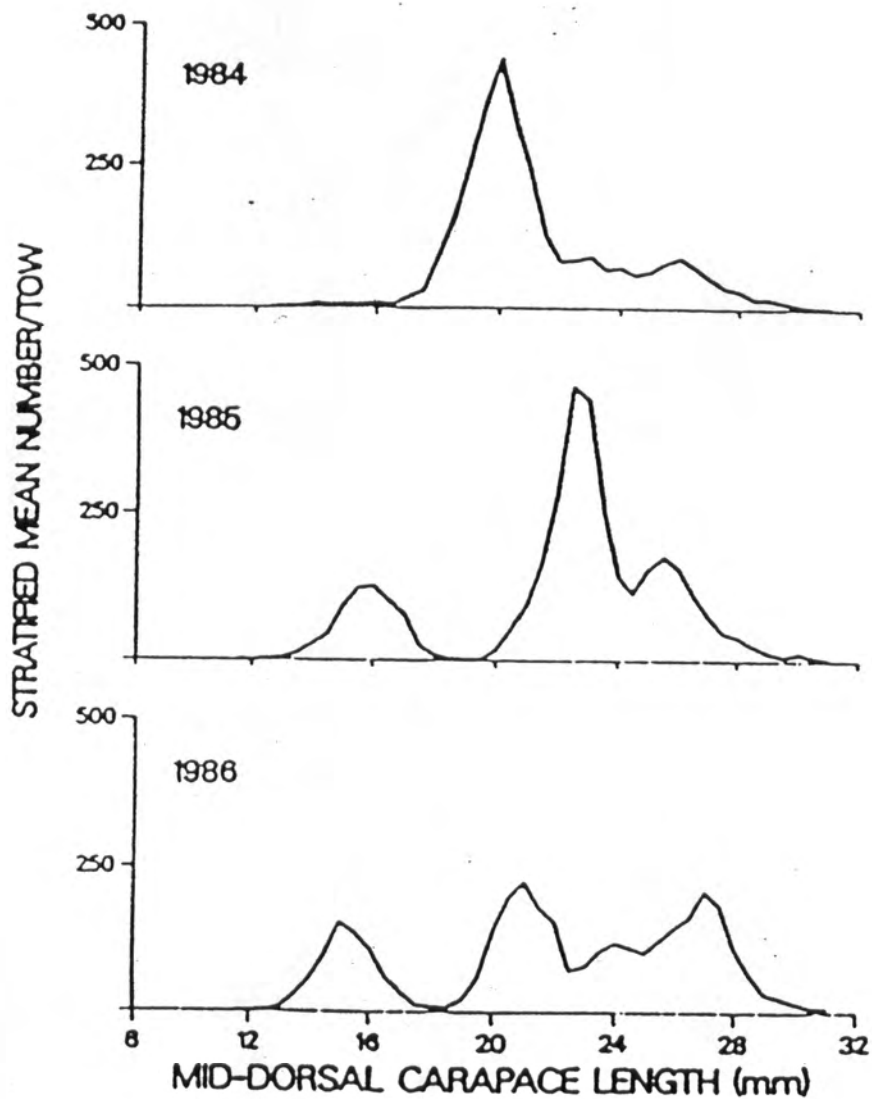


Figure 13. Sex and spawning stage data obtained from biological sampling of northern shrimp catches by stratum during the 1985 summer survey cruise in the western Gulf of Maine.

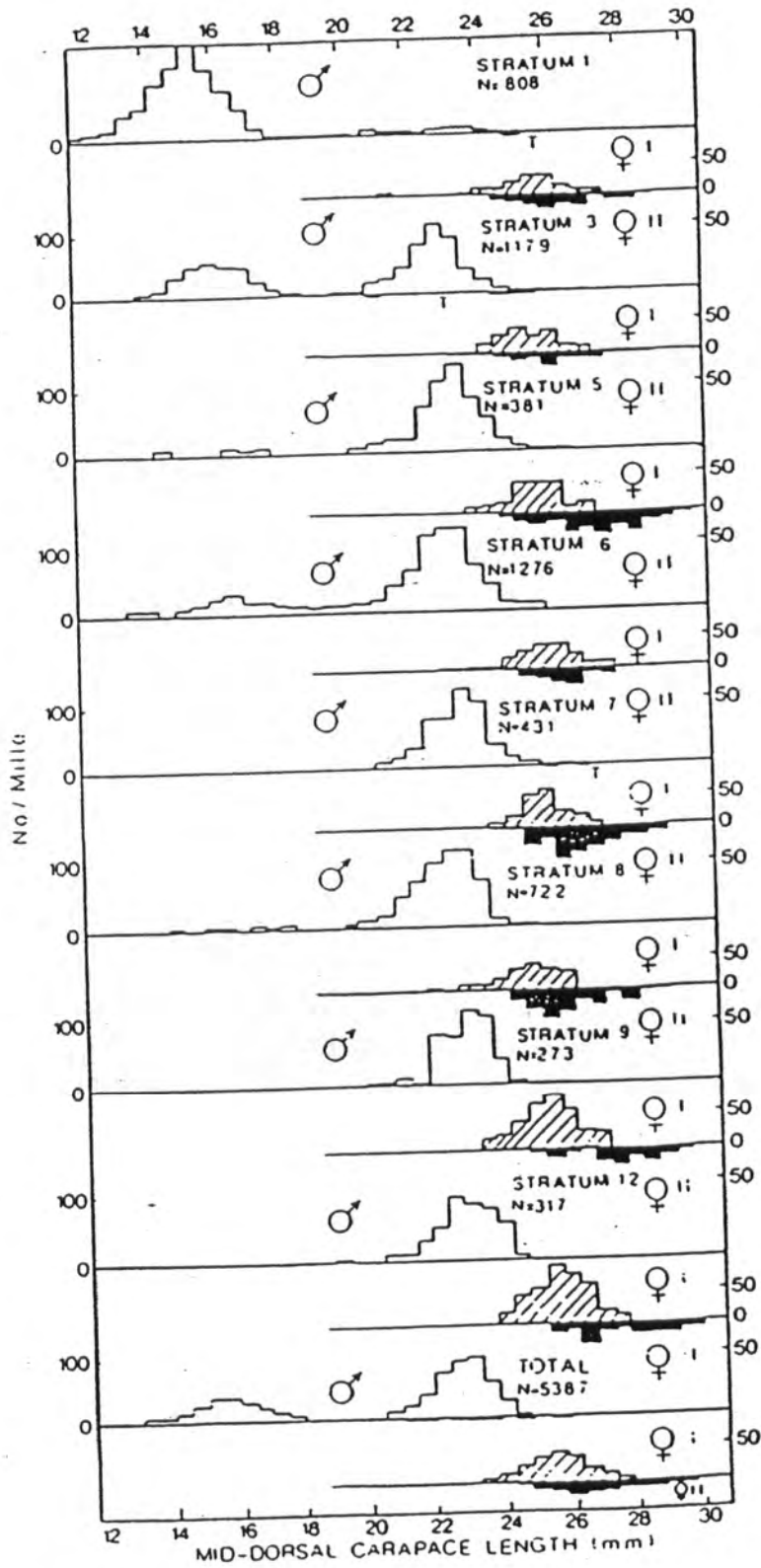
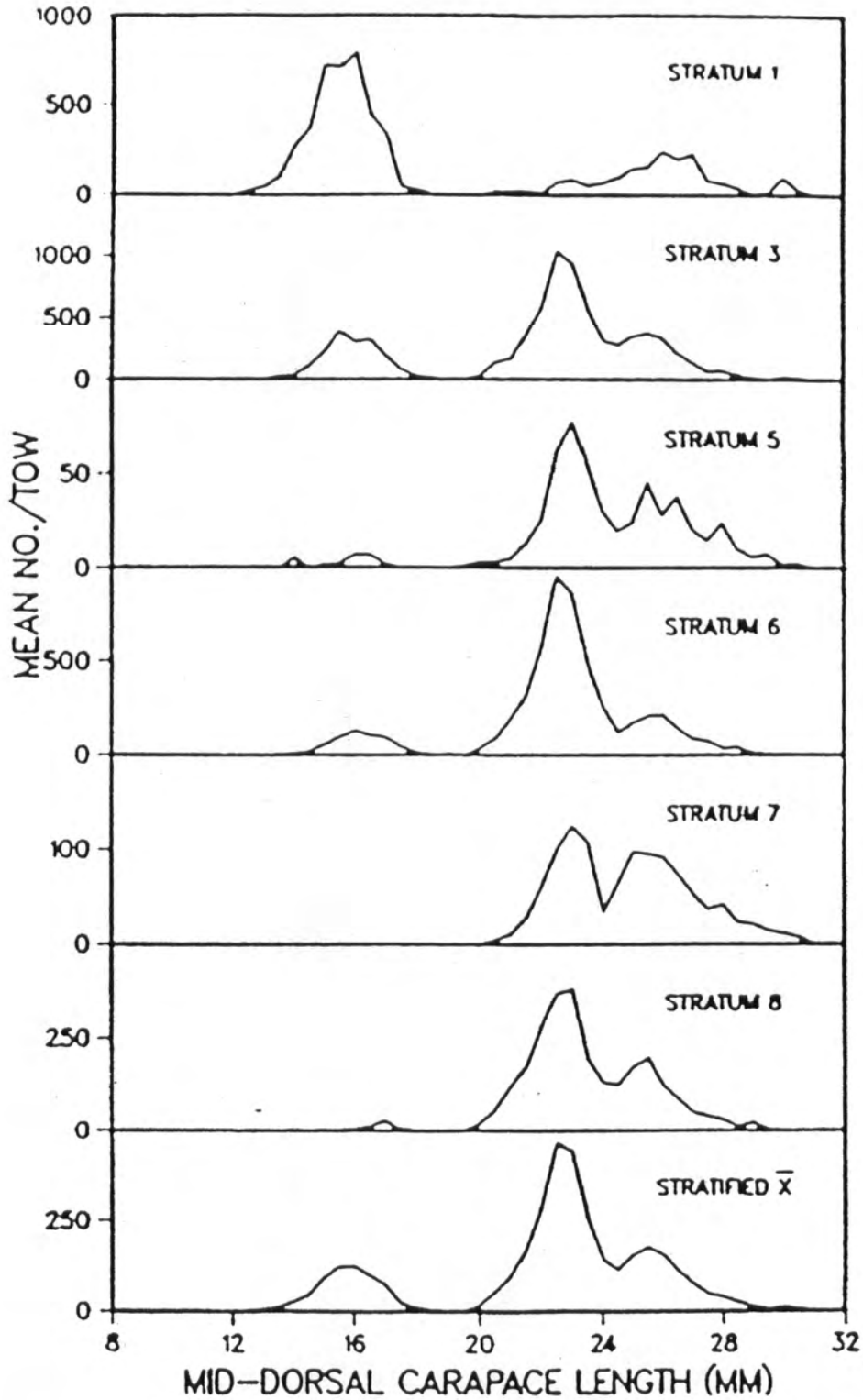


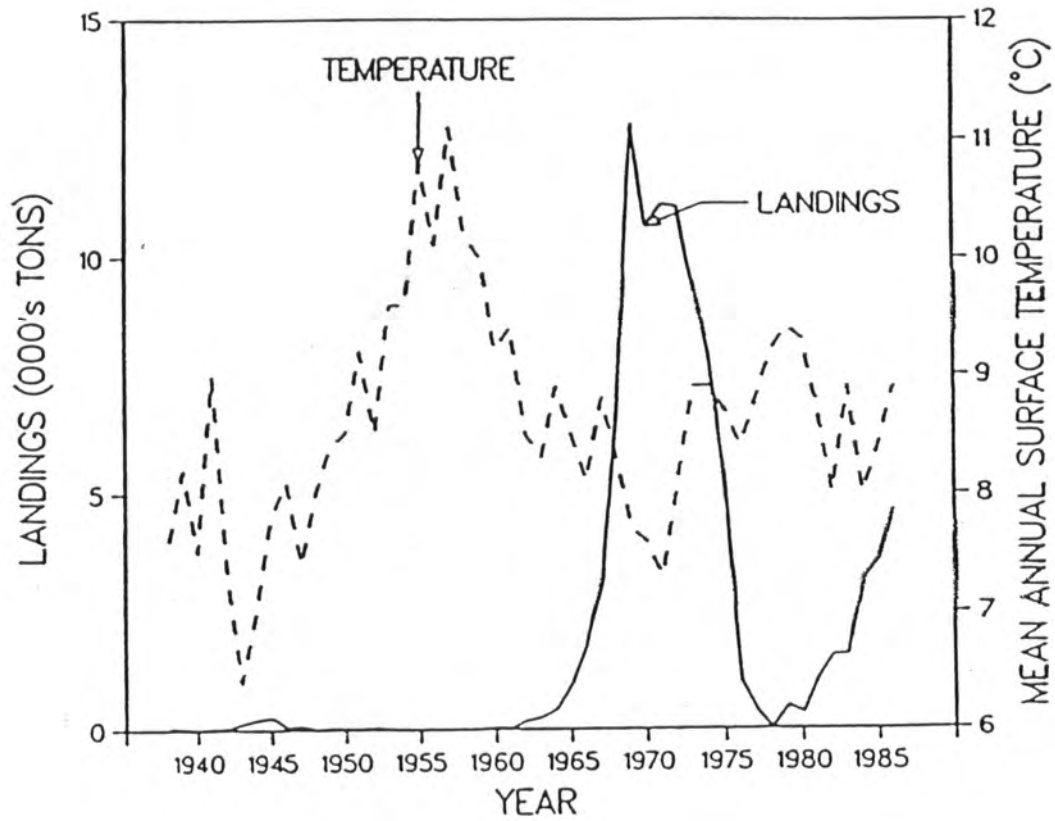
Figure 14. Length frequencies (mean catch per tow) for northern shrimp by stratum observed during the 1985 summer survey cruise in the western Gulf of Maine.



Harbor, Maine and abundance (as measured by trends in Maine landings). Low levels of abundance were associated with high (or widely fluctuating) monthly water temperatures, while high levels of abundance were associated with low to intermediate temperature levels. Apollonio and Dunton (1969) and Apollonio et al. (1986) have demonstrated the importance of temperature influences upon the biology and distribution of northern shrimp in the Gulf of Maine and the apparent relationship between high (winter) temperatures from 1950-1953 and subsequent failure of the fishery during the mid-1950's. This is evident in the data presented in Figure 15 (note that temperature data were lagged by a period of 4 years under the assumption that temperature impacts would be most significant during the first year of life). For example, 1950-1953 temperature data are plotted against landing data for 1954-1957. On the other hand, peak landings during 1969-1972 were associated with below normal temperatures (Figure 15). Subsequent collapse of the fishery during the mid-1970's occurred during a period of unusually warm bottom temperatures (Davis 1978). Thus temperature appears to have exerted an important controlling influence on historical trends in abundance for the Gulf of Maine northern shrimp stock (Anthony and Clark 1980).

The manner by which temperature affects abundance is unclear. Stickney (1977) could not detect significant egg mortality under laboratory conditions at temperatures of up to 12°C, and as ovigerous females would rarely if ever encounter such high temperatures in the western Gulf of Maine, a direct mortality effect appears unlikely. Similarly, there is no evidence for direct temperature induced larval mortality at temperatures likely to be encountered in the western Gulf of Maine (Stickney 1977). However, temperature does exert a pronounced influence on the incubation period, e.g., at a temperature of 6°C the incubation period lasted 120 days, while at 4°C incubation required 147

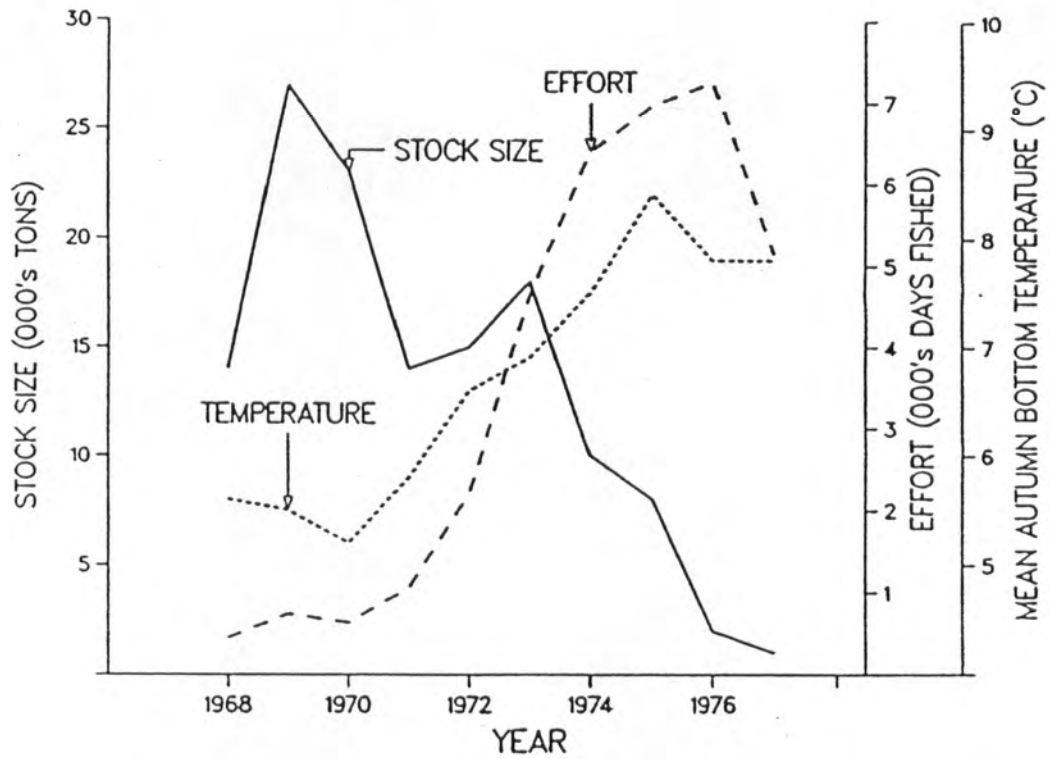
Figure 15. Annual landings of Gulf of Maine northern shrimp plotted against mean annual sea surface temperature ($^{\circ}\text{C}$) as measured at Boothbay Harbour, Maine. Temperature data are lagged by a period of four years.



days. This difference, which approximates the difference between a moderately warm and a moderately cold winter, implies a considerable advancement in the hatching date and, should peak hatching occur prior to the annual spring plankton bloom, high larval mortality could result. Egg masses carried by ovigerous females are also subject to infestations by a number of epizoic organisms (e.g. bacteria and peritrich protozoans, see Apollonio et al. (1986) and by an internal peridinian dinoflagellate parasite (Stickney 1978). There is some evidence that warmer temperatures enhance survival of such organisms, thereby resulting in egg mortality. Apollonio et al. (1986) have also reported an inverse relationship between temperature and fecundity for this population which correlates quite well with historical landings trends. Any one or all of these factors could explain at least in part the historical fluctuations in abundance observed over the past half-century.

The relative impact of both exploitation and temperature conditions on trends in stock abundance is uncertain. A sixteenfold increase in standardized effort (thousand of days fished) occurred between the mid-1960's and the early 1970's (i.e., from 0.5 to 7.3 thousand days fished from 1964-1972); and exploitation rates reached very high levels during the early to mid-70's as evidenced by Maine summer survey data (Clark and Anthony 1981). The extensive offshore fishery which developed during the early 1970's apparently resulted in a significant increase in mortality at all ages and a significant reduction in the age at which shrimp entry the fishery (see Description of the Fishery: History). This would certainly have reduced recruitment to the winter fishery even under favorable environmental conditions. In any case, a precipitous decline in recruitment and stock size occurred during the early to mid-1970's which was associated with both sharply increasing fishing effort and sharply rising bottom temperatures (Figure 16).

Figure 16. Stock size for Gulf of Maine northern shrimp (000's tons) plotted against fishing effort (000's tons) and mean bottom temperatures as measured in NEFC autumn surveys, 1968-1979. Both temperature and effort data were lagged by a period of 4 years.



The relative impact of these variables on abundance and recruitment have been difficult to elucidate (Clark and Anthony 1981); but it appears evident that both unfavorable environmental conditions and high exploitation rates played a part in the mid-1970's collapse.

Stock Assessment

Biological Parameter Estimates

Since shrimp and other crustaceans cannot be aged directly, biological parameter estimates have been based primarily on analysis of length-frequency data. For the Gulf of Maine population, four assumed age groups are generally evident from visual inspection or statistical analysis of length-frequency data using Hasselblad's (1966) maximum likelihood method (computer program NORMSEP; Abramson 1971). Such analyses are normally supplemented by examination of sexual characteristics (Allen 1959) and examination of sternal spine characteristics to distinguish between first year and second year females (McCrary 1971).

Attempts to develop growth and mortality estimates from such data are subject to bias from changes in availability, differences in growth rates by area and depth and over time, incomplete recruitment to survey and commercial gear and other factors (Frechette and Parsons 1983). In addition, it is often difficult or impossible to assign ages accurately to older individuals, i.e., the last modal group typically contains individuals from more than one year class. Intensive research vessel surveys employing stratified random and/or systematic sampling designs to ensure representative coverage of the population by area and depth would appear essential for obtaining adequate data for such analyses.

The von Bertalanffy growth equation has often been used to represent

growth of shrimp; and while it is not strictly applicable due to discontinuous growth patterns (associated with molting) it appears to provide a reasonable approximation (Frechette and Parsons 1983). Application of the von Bertalanffy growth equation to length-at-age data from NEFC bottom-trawl surveys yielded the following parameter estimates: L_{∞} , 35.2 mm (mid-dorsal carapace length); K , 0.362; and t_0 , 0.06 (NEFC, unpublished). These results agree with those of Haynes and Wigley (1969) in indicating a relatively rapid growth rate for this stock.

Estimates of instantaneous natural mortality (M) are of primary importance in northern shrimp assessments (Shumway et al. 1985). Unfortunately, conventional methods for estimating M are difficult or impossible to employ due to aging problems, changes in availability and other factors; and furthermore, little is known as to variation over time in response to predation. Values from 0.25-1.50 have been reported or assumed in the literature (Parsons 1983). Studies in the Gulf of St. Lawrence suggest $M = 0.5-0.8$ for age 3 and older shrimp (Frechette and Labonte 1981) while values of 0.5 or lower have been estimated or assumed for Icelandic stocks ICES 1977; Skuladottir 1979). Rinaldo (1973) estimated $M = 0.25$ based upon regressions of Z on total effort (note however that M appears to increase sharply after first hatching at age 4; see Haynes and Wigley 1969). Research vessel survey data for the Gulf of Maine suggest a relatively low M value (≤ 0.25) prior to age 4.

Surplus-Production and Yield per Recruit

Surplus-production models have been used to estimate maximum sustainable yield (MSY) for a limited number of pandalid stocks (Abramson and Tomlinson 1972; Skuladottir 1979; 1981). As a rule, such models appear to be of limited

value due to overriding environmental influences on recruitment (Geibel and Heimann 1976; Balsiger 1981). Indeed, it has generally been conceded that since shrimp abundance can change dramatically in response to factors other than fishing, the concept of MSY is not relevant (Parsons 1983).

Yield-per-recruit models are likewise of limited applicability in northern shrimp assessments due to uncertainty concerning biological parameters that must be used. Such models have been used in a number of cases (Tomlinson 1970; Rinaldo 1976; ICES 1977; Northern Shrimp Scientific Committee MS 1979; Clark 1982). They are, however, extremely sensitive to M (see Figures 17 and 18) and cannot be used with complete confidence until more definitive information on this parameter is available. The apparent tendency for M to increase sharply after age 4 (Haynes and Wigley 1969) is an additional complicating factor implying the need for use of models incorporating a variable M -vector (Ricker 1975).

Assuming $M = 0.25$ prior to first hatching at age 4, biomass for a given cohort will increase continually up to that age (Rinaldo 1976; Clark 1982; see Figure 17). This suggests that a management goal of maximizing yield per recruit would be enhanced both by strict enforcement of the uniform 44.5 mm (1.75 inch) stretched mesh regulation and by harvesting during late winter when age 4 females are more readily available in inshore or shoaler areas (and where catches of smaller shrimp would generally be minimal). Yield curves for the Gulf of Maine stock assuming use of 4.5 cm (1.75 inch) mesh trawls (for which mean age at recruitment is approximately 2.6 years) are asymptotic with little increase in yield evident at higher levels of F (Rinaldo 1976; Clark 1982; see Figure 15). The history of this fishery suggests that the modest gains in yield achieved by intensive exploitation could be offset by recruitment overfishing.

Figure 17. Biomass at age per 1,000 recruits (kg) for Gulf of Maine northern shrimp in the absence of fishing calculated under different assumptions relative to instantaneous natural mortality (M).

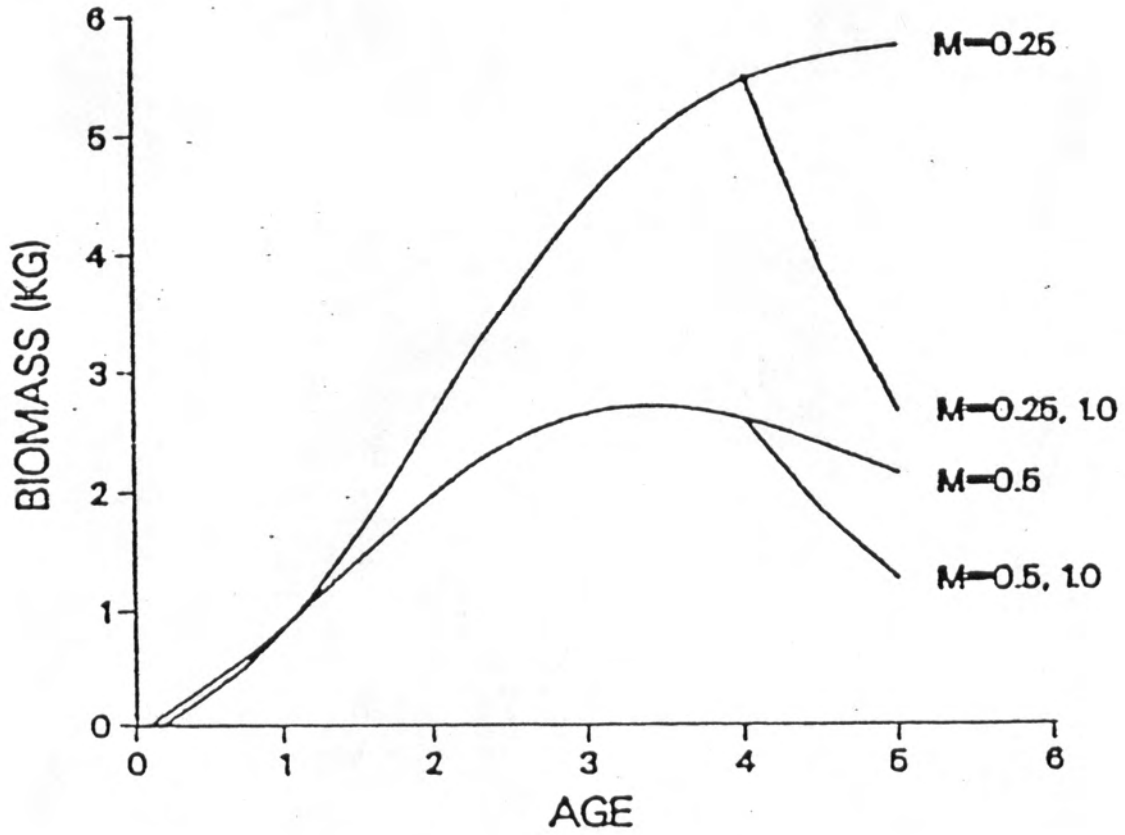
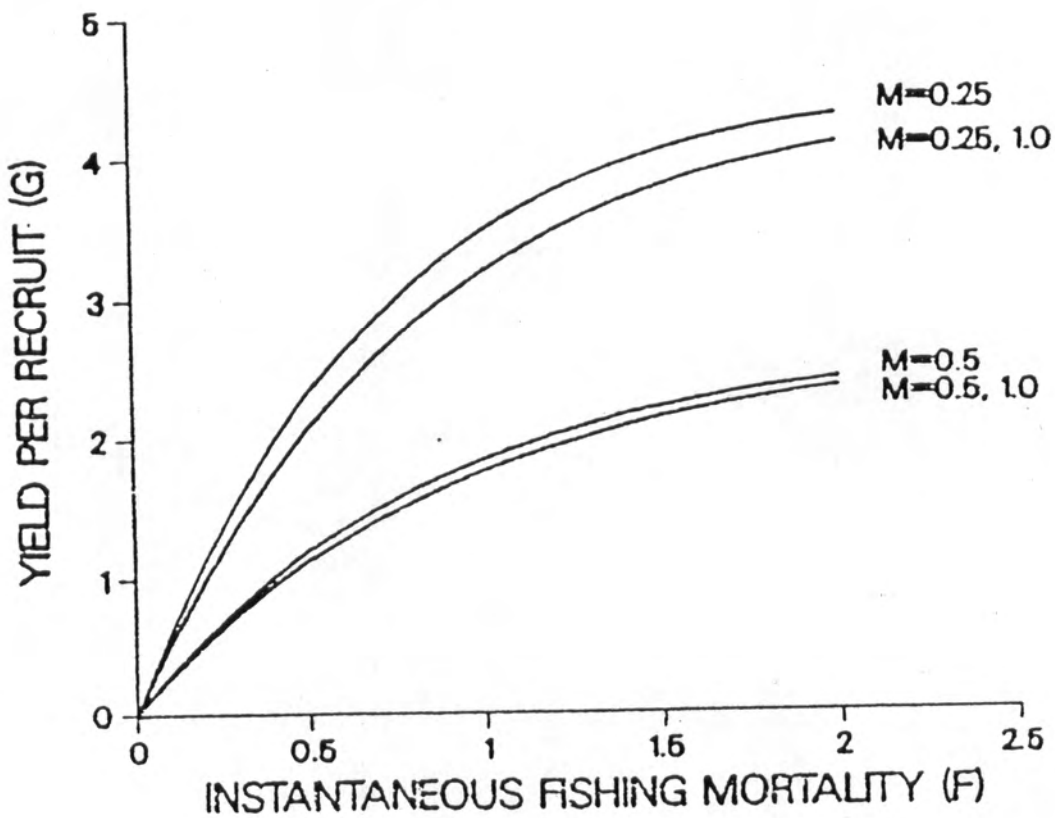


Figure 18. Yield per recruit (g) for Gulf of Maine northern shrimp assuming use of 44 mm (1.75 inch) trawls.



Current Assessment Techniques

The general inapplicability of traditional yield models to northern shrimp stock assessments has led to development of strategies for maintaining yield and stock size by restricting harvests to levels judged to be sustainable under a given set of conditions. A range of options has been utilized for Canadian stocks (Parsons 1983); currently, a total allowable catch (TAC) of 35 percent of the exploitable biomass, i.e., mature females subjected to directed fishing, is recommended in most cases. Exploitable biomass estimates are in turn derived from swept-area calculations applied to research vessel survey data. Assessments for West Greenland stocks have involved determination of a TAC designed to maintain population levels of spawning (hatching) females at 40 percent of the virgin level (Ulltang 1978).

Assessments for the Gulf of Maine resource have been based on (1) commercial landings, catch-effort and biological sampling data collected by personnel from the participating states and by NMFS port agents, and (2) research vessel survey data. Assessments during the mid-to-late 1970's documented high exploitation rates (>0.75 in some years) and pronounced declines in abundance and recruitment (Northern Shrimp Scientific Committee 1979; Clark and Anthony 1981). Under restrictive management, exploitation declined considerably and abundance stabilized; later assessments indicated a gradual recovery (Northern Shrimp Technical Committee MS 1983).

Recent assessments have been designed to monitor trends in abundance and mortality so as to provide a basis for evaluating management measures and adjusting them as appropriate. The Technical Committee's 1983 assessment indicated a continued slow increase in biomass and documented the presence of a strong 1982 year class based on summer survey results (Northern Shrimp Technical Committee MS 1983). The 1984 and 1985 assessments indicated low

mortality rates and a further increase in harvestable biomass (primarily due to growth of individuals within the 1982 year class); for the 1985-1986 season the Committee recommended the maximum allowable season of 183 days under current ASMFC policy (Northern Shrimp Technical Committee MS 1984; MS 1985). The Committee's 1986 assessment again indicated relatively low mortality in 1986 ($Z = 0.53$) and a strong potential contribution to the 1987 fishery from the remnant of the 1982 year class, leading to a similar recommendation (Northern Shrimp Technical Committee MS 1986)(see Table 9). In making this recommendation the Committee noted that more recent year classes appeared weaker, making prospects for future seasons more problematic.

MANAGEMENT

History

The Gulf of Maine northern shrimp fishery is managed through interstate agreement between the States of Maine, New Hampshire, and Massachusetts. From 1972-1979, northern shrimp management was administered under the framework of the State/Federal Fisheries Management Program conceived by NMFS. In 1980, this program in the Northeast Region was restructured as the Interstate Fisheries Management Program (ISFMP) of ASMFC. The ISFMP provides the States with a mechanism to coordinate assessment and management efforts for a variety of fisheries, including northern shrimp, that occur along the Atlantic seaboard and are harvested by fishermen of more than one State. Regulations promulgated since the beginning of the program (1973) appear in Appendix I.

Under the ISFMP's organizational framework, the Northern Shrimp Technical Committee, consisting of fishery scientists from the state marine fisheries agencies of Maine, New Hampshire, and Massachusetts, and NMFS provides stock assessment and related scientific information to the ASMFC Northern Shrimp Section. Each state involved in northern shrimp management has three members on the Section: the primary administrator of the marine fishery agency, an appointed State legislator, and a Governor's citizen appointee knowledgeable in marine fisheries. Each state, however, has only a single vote. (A roster of current Technical Committee and Section members is given in Appendix II). The Section considers management options and policy based on Technical Committee recommendations arising from results of its assessment activities, and industry comments about catches and general status of the fishery. The Section weighs this information before adopting regulations governing the fishery. Maine, New Hampshire, and Massachusetts have designated ASMFC as the joint regulatory body for northern shrimp under provisions of Amendment One to

the ASMFC Compact, and as a result, all regulations are promulgated in the name of the Commission. Further, fishery enforcement is done in the name of the Commission, but operationally, enforcement remains the responsibility of the member states. This arrangement is unique from a fishery perspective, and is considered one of the few instances of continuous interstate cooperation in the history of USA fishery management (Rieser and Ziegler 1982).

Northern shrimp landings from the Gulf of Maine increased rapidly in the late 1960s--reaching a peak in 1969--and then as quickly plummeted in the early 1970s. Industry's concern over declines, in both landings and product quality prompted representatives from Maine, New Hampshire, Massachusetts, and NMFS to meet in 1972 to discuss possible remedies to these issues. Government and industry representatives reached consensus that managing the resource would be beneficial provided that the states retained ultimate control over management of the fishery. The states designated ASFMC to be the joint regulatory agency, thus providing the necessary mechanism for a cooperative interstate arrangement. During 1972-1973, further discussions focused on possible management options that would reduce the harvest of small, nonmarketable shrimp, and thereby increase yield per recruit. Regulation of mesh size was identified as a viable option and, accordingly, the Scientific Committee began a cooperative research effort in 1973 on gear evaluation studies. Results indicated that a uniform stretched mesh of 44.5 mm (1.75 inches) in both the body and codend of the trawl to be appropriate for retention of age 3 and older females and release of smaller males and immature shrimp. The Section implemented a regulation in 1975 requiring the use of the 44.5 mm mesh size, which has been continued to the present.

The status of the shrimp stock has been assessed annually since 1974, and the Scientific/Technical Committee has made management recommendations based

on these results (Table 9). Commercial and research vessel survey data for 1974-1976 indicated stock size and recruitment were declining and immediate control on the level of mortality was needed to help stabilize abundance. The Scientific Committee recommended combined use of catch quotas and closed seasons for 1975 and 1976 to prevent further declines in resource abundance. These recommendations met with considerable industry opposition; the need for quotas was disputed and it was argued that closed seasons would only favor one state's fishermen over another. As a compromise, the Section adopted a summer closure in 1975 and a January 1-May 15 fishing season for 1976, followed by indefinite closure. Following its 1976 assessment, which indicated a continued deterioration of the resource, the Committee recommended the closure of the fishery be maintained through 1977. This recommendation met with vigorous industry opposition; industry spokesmen challenged the accuracy of assessment results and their general relevance in view of environmental impacts on the resource which could not be controlled. After a series of meetings with the Scientific Committee and industry the Section adopted an open season from January 1 - May 15 and a quota of 1,600 t (Table 9). Failure of the fishery to achieve this quota, and evidence for continued declines in abundance, led to closure of the fishery in 1978 on recommendation by the Committee, the fishery was reopened for two months (February and March) in 1979 (Table 9).

The allowable fishing season has been extended in subsequent years. The Technical Committee advised that the season be restricted to a two-three month period centering around February and March for 1981-1984. Based on estimates of increased abundance, the Committee supported a four month winter/spring season for 1984-1985, and for the 1985-1986 and 1986-1987 fishing seasons, the Committee recommended the maximum allowable (i.e., December 1-May 31) under

TABLE 9. Management of the Gulf of Maine Northern Shrimp Resource, 1973-1987 (Modified from Clark 1981).

Season	Recommendation	Action Taken
1973	<ul style="list-style-type: none"> • Adoption of mesh regulation • Establishment of count/lb limits • Establishment of closed season 	<ul style="list-style-type: none"> • Provisions for gear evaluation studies
1974		<ul style="list-style-type: none"> • Adoption of interim minimum mesh size regulation requiring use of trawls with stretched mesh sizes of not less than 38 mm (1.5 inches) in body and 44.5 mm (1.75) inches in the codend
1975	<ul style="list-style-type: none"> • Adoption of final minimum size regulation • Restriction of 1975 harvest to 4,200 tons (9.2 million lbs) by seasonal closure and quota management 	<ul style="list-style-type: none"> • Establishment of regulations requiring use of trawls with stretched mesh sizes of not less than 44.5 mm (1.75 inches) in the body and codend (effective October, 1975) • Closure of the fishery from July-September, 1975
1976	<ul style="list-style-type: none"> • Restriction of 1976 harvest to 2,300 tons (5 million lbs) by seasonal closure and quota management • Continuation of mesh regulations 	<ul style="list-style-type: none"> • Open season from January 1-May 15, 1976, followed by indefinite closure • Continuation of mesh regulations
1977	<ul style="list-style-type: none"> • Continuation of closure through 1977 	<ul style="list-style-type: none"> • Open season from January 1-May 15, 1977, followed by indefinite closure • Restriction of 1977 harvest to 1,600 tons (3.5 million lbs) • Continuation of mesh regulations
1978	<ul style="list-style-type: none"> • Continuation of closure through 1978 	<ul style="list-style-type: none"> • Continuation of closure through 1978
1979	<ul style="list-style-type: none"> • Continuation of closure through 1979 	<ul style="list-style-type: none"> • Open season from February 1-March 31, 1979, followed by indefinite closure • Continuation of mesh regulations

1980	<ul style="list-style-type: none"> • Continuation of closure through 1980, • Continuation of mesh regulations 	<ul style="list-style-type: none"> • Open season from February 15-May 31, 1980, followed by indefinite closure • Continuation of mesh regulations
1981	<ul style="list-style-type: none"> • Restriction of fishing to late winter and early spring (February-March) • Continuations of mesh regulations 	<ul style="list-style-type: none"> • Open season from January 1-May 15, 1981, followed by indefinite closure • Continuation of mesh regulations
1982	<ul style="list-style-type: none"> • Restriction of fishing to winter and early spring • Continuation of mesh regulations 	<ul style="list-style-type: none"> • Open season from January 1-April 15, 1982 • Continuation of mesh regulations
1983	<ul style="list-style-type: none"> • Restriction of fishing to winter and early spring • Continuation of mesh regulations • Continuation of reporting regulations 	<ul style="list-style-type: none"> • Open season December 15, 1982-April 30, 1983 • Continuation of mesh regulations
1984	<ul style="list-style-type: none"> • Restriction of fishing to winter and early spring • Continuation of mesh regulations • Continuation of reporting regulations 	<ul style="list-style-type: none"> • Open season December 15, 1983-April 30, 1984 with a possible extension of 15 days or until count exceeds 70/pound for any one trip • Continuation of mesh regulations
1985	<ul style="list-style-type: none"> • Restriction of fishing to winter and spring • Continuation of mesh regulations • Continuation of reporting regulations 	<ul style="list-style-type: none"> • Open season December 1, 1984-May 15, 1985. During May, landed count shall not exceed 70/pound or season closed immediately • Continuation of mesh regulations
1986	<ul style="list-style-type: none"> • Restriction of season to maximum allowed under policy statement • Continuation of mesh regulations 	<ul style="list-style-type: none"> • Open season December 1, 1985-May 31, 1986 • Continuation of mesh regulations • Two week emergency opening June 8-June 21
1987	<ul style="list-style-type: none"> • Restriction of season to maximum allowed under policy statement • Continuation of mesh regulations 	<ul style="list-style-type: none"> • Open season December 1, 1986-May 31, 1987 • Continuation of mesh regulations • Eliminate mesh size tolerance (1/4 inch) in codend by 1988 season

the current policy statement for management of the northern shrimp fishery which the Section established in 1981.

Current management recommendations for the Gulf of Maine northern shrimp resource are based on an annual assessment that uses: (1) commercial landings and catch-effort data collected by NMFS and the states; (2) biological data obtained during sampling of commercial landings; and (3) bottom trawl survey data collected by the Technical Committee during the summer and by the NEFC during spring and autumn. The Technical Committee prepares this assessment and formally presents it to the ASMFC Northern Shrimp Section at a public hearing each autumn at which time comments are solicited from industry representatives (fishermen, processors, and dealers) and the general public. Management actions of the Section have been directed primarily toward reduction of fishing mortality on young shrimp. Regulations of ASMFC now include: (1) a minimum mesh size of 44.5 mm (1.75 inches) in the body and codend; (2) allowable fishing seasons; (3) possession limitations; and (4) catch reporting requirements.

Current Management Issues

The distribution of northern shrimp in the western Gulf of Maine and the seasonal nature of the fishery make it imperative that northern shrimp management be viewed in the context of overall management of the Gulf of Maine resource. For example, the reduced abundance of traditional groundfish species such as cod, haddock, and flounders may lead to increased shifts in fishing effort away from groundfish toward shrimp, especially for larger trawlers. As shrimp fishing is conducted with small mesh nets, any increased effort will likely place increased stress on juvenile finfish through by-catch, which could hinder recovery of the fish stocks. This situation, in

turn, could heighten concern about the impacts small mesh fisheries have on finfish abundance, and the need to employ effective separator trawls for harvesting shrimp. The current version of the Maine separator trawl has shown considerable promise during initial fishing industry trials, with further trials under a variety of fishing conditions scheduled.

The New England Fishery Management Council's Northeast Multi-species Fishery Management Plan (FMP) prepared under the Magnuson Act and implemented by NOAA in autumn 1986 established, as part of its management program, a minimum mesh size of 5-1/2 inches for all trawl gear used in the Gulf of Maine. In so doing, however, the Council recognized that legitimate small mesh fisheries exist in the Gulf of Maine for species not directly regulated under provisions of its FMP; northern shrimp and whiting (silver hake) are two of these fisheries. Shrimp fishermen must obtain a federal fisheries permit for groundfish and then enroll in the FMP's exempted fishery program to legally fish small mesh gear. Part of the requirement is that any incidental catch of regulated species cannot exceed 10 percent by weight of the exempted fishery species; in this case, northern shrimp. The Technical Monitoring Group set up under the FMP to assess overall effectiveness of the FMP's management measures is examining the workings of the exempted fishery program and industry's concerns.

Statement of Policy

The Northern Shrimp Fishery Management Board/ASMFC Northern Shrimp Section Policy Statement was adopted in 1981 (Appendix I). The Statement of Policy was amended on October 17, 1986 to read:

STATEMENT OF POLICY

ASMFC NORTHERN SHRIMP SECTION

1. The Section agrees that, despite natural fluctuations in stock abundance, the northern shrimp fishery is manageable.
2. The Section will provide for a continuing management program based on recommendations of the Technical Committee to: a) maintain and eventually rebuild the stock, and b) to ensure a viable northern shrimp fishery in the Gulf of Maine over time.
3. The Section intends to allow a northern shrimp fishery through the mechanism of an annual open season recognizing that, a) stock abundance will tend to fluctuate, b) the fishery interacts with other fisheries through by-catch of juveniles, and c) the fishery is economically important to the fishing industry.
4. The Section endorses the following measures as appropriate for regulating the harvest of northern shrimp in the Gulf of Maine:
 - a) Gear limitations - A minimum mesh size will be incorporated as an integral part of the plan and will be consistent with the Northern Shrimp Gear Evaluation Study of 1974 (Appendix III).

- b) Seasonal limitations - An open season, not to exceed 183 days, will be set on an annual basis. The fishery shall not begin sooner than December 1 nor end later than May 31 for any one year. The Section shall determine the exact length of the season after considering recommendations from the Technical Committee on a season designed towards achieving Item #2 above.
 - c) Possession limitations - The count per pound for all shrimp landed and subsequently possessed by fishermen and dealers/processors shall be consistent with the selectivity of the minimum mesh size specified by regulation based on 4a above.
 - d) Information collection provisions - There shall be a method of determining participants in the fishery (e.g., vessel licensing). All primary dealers/processors shall report periodically their transactions involving northern shrimp. The information reported shall be that which is determined necessary to manage the fishery. Dockside and sea sampling of the shrimp catch shall be conducted.
5. The Section will reexamine, periodically, the allowed mesh size and the possible by-catch of northern shrimp in other directed fisheries as management programs for other small mesh net fisheries (e.g., silver hake and Illex squid) are developed and implemented.

Adopted April 17, 1981; Amended Oct. 5, 1981; Amended Nov. 12, 1981; Amended October 7, 1986.

This policy, as established has been reviewed by the Northern Shrimp Technical Committee and the ASMFC Northern Shrimp Section and both reaffirm their support for the overall management concepts it embodies. Furthermore, it should be emphasized that the management concepts embodied in the Statement of Policy are applicable for managing this resource regardless of stock abundance.

In addition, during the 1986 review, the following management objectives have been identified:

1. Offer adequate protection to the stock to enhance egg production and future recruitment.
2. Reduce the adverse impacts the shrimp fishery may have on other fishery resources.
3. Optimize the yield and reproductive capabilities of strong year classes.
4. Maintain a high product standard by eliminating the harvest of low quality shrimp during those periods when quality is known to be poor.
5. Minimize the adverse impacts of regulations, including increased costs to the shrimp industry and the associated coastal community.

ACKNOWLEDGEMENTS

I wish to thank members of the Northern Shrimp Technical Committee for their contributions to the format and contents of this plan. I thank Dr. Stephen Clark NMFS-NEFC, and Ms Judith Krauthamer Maryland Tidewater Administration for their advice and review of the manuscript. Special appreciation is due Cynthia Perry and Natalie Carleton for typing this report.

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APPENDIX I

Regulations promulgated since the beginning of cooperative management of northern shrimp.

Memorandum of Understanding

The States of Maine, Massachusetts, and New Hampshire and the National Marine Fisheries Service, in order to assure the conservation of the North-ern Shrimp resources and to protect the industry dependent thereon, have herein agreed to cooperate in coordinated management effort.

Under the auspices of the State-Federal Fishery Management Program, objectives are:

1. Establish a regional management program for conservation and management of Northern Shrimp.
2. Develop mechanism for coordination of State, Federal and industry interest in management plan formulation and implementation.

April 20, 1973

Accepted on behalf of the State of Maine, Department of Sea and Shore Fisheries.


Spencer Apollonio, Commissioner

Northern shrimp

Atlantic States Marine Fisheries Commission

Suite 703

1717 Massachusetts Avenue, N.W.

Washington, D. C. 20036

CHAIRMAN:
JAMES E. DOUGLAS, JR.
VIRGINIA MARINE RESOURCES COMMISSION
2401 WEST AVENUE
NEWPORT NEWS, VIRGINIA 23607

EXECUTIVE DIRECTOR:
IRWIN M. ALPERIN
(202) 387-8330

VICE-CHAIRMAN:
SPENCER APOLLONIO
DEPARTMENT OF MARINE RESOURCES
STATE HOUSE ANNEX
AUGUSTA, MAINE 04330

Northern Shrimp Sub-Committee

AN ACT Relating to Nets to Catch Northern Shrimp

Preamble. Whereas, the northern shrimp fishery generates more than \$10,000,000 to the Gulf of Maine coastal economy annually in manufactured product value; and

Whereas, the fishing intensity on Pandalus borealis in the Gulf of Maine has greatly increased during the past few years; and

Whereas, research indicates that the older-year class of shrimp may be seriously depleted; therefore, we are in grave danger of destroying the fishery by overfishing the younger-year classes with present mesh size nets; and

Whereas, continued overfishing will destroy the reproductive ability and eliminate the ability of the stocks to recover from the heavy fishing pressure; and

Whereas, resource extends beyond territorial seas into the Gulf of Maine and provides viable fisheries for three states, Maine, New Hampshire, and Massachusetts; and

Whereas, mesh size regulations must be established to protect small shrimp for the best conservation and management; and

Whereas, in the judgment of the Atlantic States Marine Fisheries Commission, Northern Shrimp Sub-Committee, these facts require the following regulation as immediately necessary for the preservation of the public peace, health and safety; now, therefore, Be it enacted by the Atlantic States Marine Fisheries Commission as follows:

NORTHERN SHRIMP MESH REGULATION

Netting

It is unlawful to fish for, take, transport or have in possession any shrimp (Pandalidae) on board any boat rigged for otter trawling with a mesh opening of less than 1 3/4 inches stretched mesh opening between knots for the body and wings and 1 1/2 inches stretched mesh opening between knots for the extension piece and cod end, or to have on board any net, netting, or portions thereof, with an opening less than 1 1/2 inches stretched mesh opening between knots.

Tolerance: Due to the differences of net manufacturer mesh measurements and the mesh measurements used for enforcement of this law, and other inherent variables, a tolerance of 1/8 inch may be applied to the average mesh size.

All netting used to catch shrimp shall be of one layer only, with no liners of any kind attached. It shall be lawful to attach chafing gear to the lower half of the circumference of the cod end.

Exception: Herring seines or purse seines may be transported from one location to another provided a permit is obtained from a fisheries enforcement officer or the state fisheries agency.

1. Method of measurements. Mesh sizes are measured by a flat wedge-shaped gauge having a taper of 4 cm in 20 cm and a thickness of 2.3 mm, inserted into the meshes under a pressure or pull of 1.90 kg. The mesh size of a net shall be taken to be the average of the measurements of a series of any 20 consecutive meshes, at least 10 meshes from the lacings, and when measured in the cod end of the net beginning at the after end and running parallel to the long axis.

2. Regulations in effect. This interim regulation shall take effect when approved by the Commissioners of the Northern Shrimp Sub-Committee of the Atlantic States Marine Fisheries Commission, and this interim regulation shall remain in effect until optimum mesh size is determined and repromulgated by the Northern Shrimp Sub-Committee of the Atlantic States Marine Fisheries Commission.

3. Penalty. Whoever violates any provision of this regulation shall be punished by a fine of not less than \$500 nor more than \$1,000, or forfeiture of netting used in the violation, or by imprisonment for not more than six month, or by any combination thereof.

November 19, 1973

The undersigned Commissioners of the Atlantic States Marine Fisheries Commission hereby affirm that the foregoing instrument is an authentic copy of the regulations of the Northern Shrimp Section (ASMFC) executed at Portsmouth, New Hampshire, November 19, 1973.

Spencer Apollonio
Spencer Apollonio
Commissioner from Maine

Robert H. Forste
Robert H. Forste
Commissioner from New Hampshire

Edward B. Lewis
Edward B. Lewis
Commissioner from Maine

Philip G. Coates
Philip G. Coates
Proxy for Arthur W. Brownell
Commissioner from Massachusetts

Bernard J. Lewis
Bernard J. Lewis
Commissioner from Maine

Stanley J. Zarod
Stanley J. Zarod
Commissioner from Massachusetts

Richard G. Seamans, Jr.
Richard G. Seamans, Jr.
Commissioner from New Hampshire

Frank J. Bachoff
Frank J. Bachoff
Commissioner from Massachusetts

Eileen Poloy
Eileen Poloy
Commissioner from New Hampshire

ATTEST: Irwin M. Alperin
Irwin M. Alperin
Executive Director
Atlantic States Marine Fisheries
Commission
Washington, D. C.

Wash. D.C.
Subscribed and sworn to before me by
Irwin M. Alperin, Exec. Dir. this 5th day
of August 1974

A. Stanley Wolfe
NOTARY PUBLIC, D. C.

My Commission Expires Feb. 14, 1976

Atlantic States Marine Fisheries Commission

Suite 703

1717 Massachusetts Avenue, N.W.

Washington, D. C. 20036

CHAIRMAN:
JAMES E. DOUGLAS, JR.
VIRGINIA MARINE RESOURCES COMMISSION
2401 WEST AVENUE
NEWPORT NEWS, VIRGINIA 23607

EXECUTIVE DIRECTOR:
IRWIN M. ALPERIN
(202) 387-5330

VICE-CHAIRMAN:
SPENCER APOLLONIO
DEPARTMENT OF MARINE RESOURCES
STATE HOUSE ANNEX
AUGUSTA, MAINE 04330

Northern Shrimp Section

AN ACT Relating to a Closed Season for the Catching of Northern Shrimp in the Gulf of Maine

Preamble. Whereas, the northern shrimp fishery generates more than \$10,000,000 to the Gulf of Maine coastal economy annually in manufactured product value, and

Whereas, the fishing intensity on Pandalidae in the Gulf of Maine has greatly increased in recent years; and

Whereas, a reduction in fishing effort in summer months would promote the conservation and perpetuation of the shrimp stocks; and

Whereas, the quality of summer shrimp is marginal, resulting in reduced market value; and

Whereas, the resource extends beyond territorial seas into the Gulf of Maine and provides viable fisheries for

three states, Maine, New Hampshire, and Massachusetts;
and

Whereas, a closed season for the taking of shrimp
would benefit the shrimp resources and the shrimp fisheries
of the three states; and

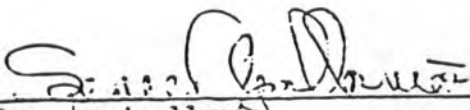
Whereas, in the judgment of the Atlantic States Marine
Fisheries Commission, Northern Shrimp Section, these facts
require the following regulation as immediately necessary
for the preservation of the public peace, health and safety;
now, therefore, Be it enacted by the Atlantic States Marine
Fisheries Commission as follows:


NORTHERN SHRIMP CLOSED SEASON REGULATION

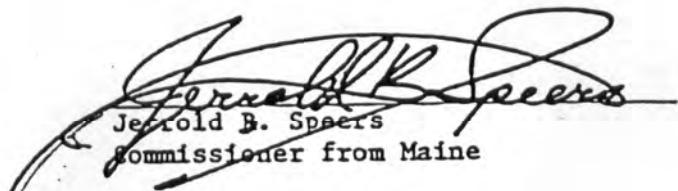
1. It is unlawful to fish for, take or land any shrimp (Pandalidae) in Maine, New Hampshire and Massachusetts during the period from July 5 to September 27, 1975, both days inclusive.
2. It is unlawful to process shrimp (Pandalidae) in Maine, New Hampshire and Massachusetts during the period from July 5 to September 27, 1975, both days inclusive, without a permit issued by the State Department responsible for issuing licenses or permits in Maine, New Hampshire or Massachusetts.
 - A. Permittee must present documented proof showing the country or State of origin of the shrimp (Pandalidae) to be processed.
3. Penalty. Whoever violates any provision of this regulation shall be punished by a fine of not less than \$500 nor more than \$1,000, or forfeiture of netting used in the violation, or by imprisonment for not more than six months, or by any combination thereof.

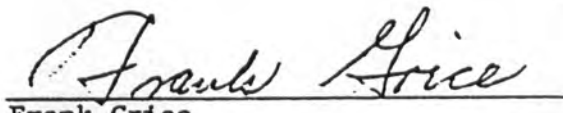
June 23, 1975

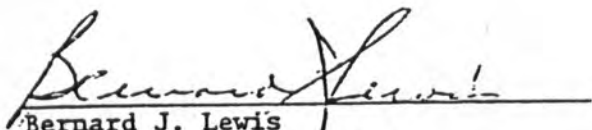
The undersigned Commissioners of the Atlantic States Marine Fisheries Commission hereby affirm that the foregoing instrument is an authentic copy of the regulations of the Northern Shrimp Section (ASMFC) executed at Portsmouth, New Hampshire, June 23, 1975.


Spencer Apollonio
Commissioner from Maine

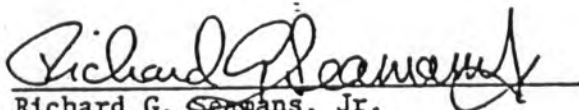

Charles Lincoln
Commissioner from New Hampshire



Jerrold B. Speers
Commissioner from Maine


Frank Grice
Commissioner from Massachusetts

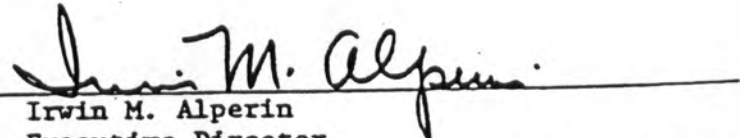

Bernard J. Lewis
Commissioner from Maine

Stanley J. Zarod
Commissioner from Massachusetts


Richard G. Seaman, Jr.
Commissioner from New Hampshire


Frank J. Bachof
Commissioner from Massachusetts

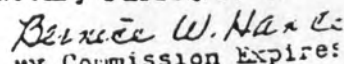

Eileen Foley
Commissioner from New Hampshire

ATTEST: 
Irwin M. Alperin
Executive Director
Atlantic States Marine Fisheries Commission
Washington, D.C.

Washington, D. C.

Subscribed and sworn to before me
this 5th day of August 1975

Notary Public, D. C.


Bernice W. Hance
my Commission Expires:
Aug. 14, 1979

Atlantic States Marine Fisheries Commission

1717 Massachusetts Avenue, N.W.

Washington, D. C. 20036

CHAIRMAN:
EDWIN B. JOSEPH
SOUTH CAROLINA WILDLIFE AND
MARINE RESOURCES DEPARTMENT
P. O. BOX 12559
CHARLESTON, SOUTH CAROLINA 29412

EXECUTIVE DIRECTOR:
IRWIN M. ALPERIN
(202) 387-5330

VICE-CHAIRMAN:
FRANK GRICE
DIVISION OF MARINE FISHERIES
100 CAMBRIDGE STREET
BOSTON, MASSACHUSETTS 02202

MEMBER STATES:
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NEW HAMPSHIRE
NEW JERSEY
NEW YORK
NORTH CAROLINA
PENNSYLVANIA
RHODE ISLAND
SOUTH CAROLINA
VIRGINIA

Northern Shrimp Section

AN ACT Relating to a Closed Season for the Catching
of Northern Shrimp in the Gulf of Maine

Preamble. Whereas, the northern shrimp fishery has
generated more than \$10,000,000 to the Gulf
of Maine coastal economy in manufactured
product value; and

Whereas, the fishing intensity on Pandalidae
has greatly reduced the harvestable stock in
the past seven years; and

Whereas, research indicates that if landings
exceed the recommended catch level of five
million pounds in 1976, stock levels would fall
below the present 10.4 million pounds; and

Whereas, the shrimp fishery is shared among
three states - Maine, New Hampshire, and Massa-
chusetts; and

Whereas, a closed season for taking of shrimp would benefit the shrimp resources and prolong the existence of the New England shrimp fishery; and

Whereas, in the judgement of the Atlantic States Marine Fisheries Commission, Northern Shrimp Section, these facts require the following regulation as immediately necessary for the preservation of the public peace, health, and safety; now, therefore, Be it enacted by the Atlantic States Marine Fisheries Commission as follows:

NORTHERN SHRIMP CLOSED SEASON REGULATION

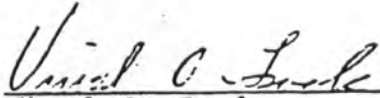
1. It is unlawful to fish for, take, or land any shrimp (Pandalidae) in Maine, New Hampshire, and Massachusetts on or after April 15, 1976.
2. It is unlawful to process shrimp (Pandalidae) in Maine, New Hampshire, and Massachusetts landed on or after April 15, 1976, without a permit issued by the state department responsible for issuing licenses or permits in Maine, New Hampshire, or Massachusetts.

Note: Permittee must present documented proof, showing the country or state of origin of the shrimp (Pandalidae) to be processed.

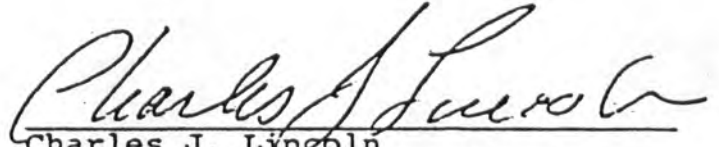
3. A review of the fishery shall be conducted during the fall, 1976, by the Northern Shrimp Section, and recommendations for the 1977 fishery, if any, shall be made at that time.
4. Penalty. Whoever violates any provision of this regulation shall be punished by a fine of not less than \$500 nor more than \$1,000, or forfeiture of netting used in the violation, or by imprisonment for not more than six months, or by any combination thereof.

November 26, 1975

The undersigned Commissioners of the Atlantic States Marine Fisheries Commission, hereby affirm that the foregoing instrument is an authentic copy of the regulations of the Northern Shrimp Section (ASMFC) executed at Portsmouth, New Hampshire, November 26, 1975.



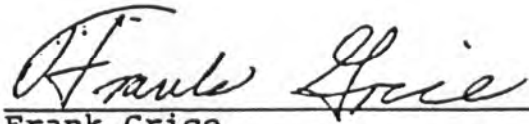
Vinal O. Look
Commissioner from Maine



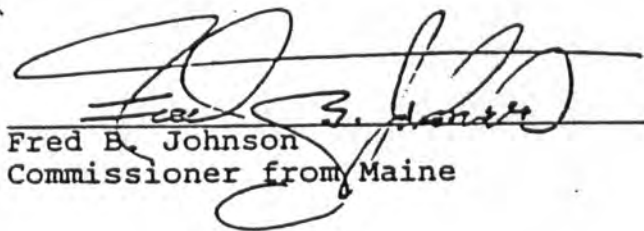
Charles J. Lincoln
Commissioner from New Hampshire



Jerrold B. Speers
Commissioner from Maine



Frank Grice
Commissioner from Massachusetts

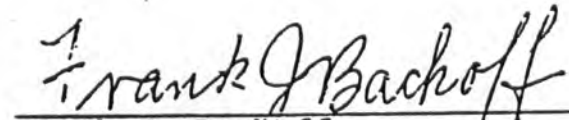


Fred B. Johnson
Commissioner from Maine

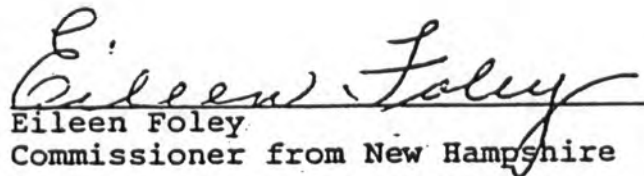
Stanley J. Zarod
Commissioner from Massachusetts



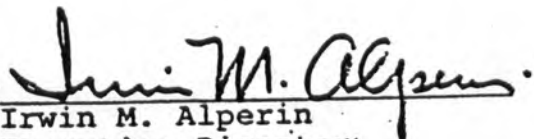
Richard G. Seamans, Jr.
Commissioner from New Hampshire

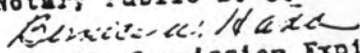


Frank J. Backoff
Commissioner from Massachusetts



Eileen Foley
Commissioner from New Hampshire

ATTEST: 
Irwin M. Alperin
Executive Director
Atlantic States Marine
Fisheries Commission
Washington, DC

Washington, D. C.
Subscribed and sworn to before me
this 15th day of April 1976
Notary Public D. C.

My Commission Expires
Aug. 14, 1979

Atlantic States Marine Fisheries Commission

1717 Massachusetts Avenue, N.W.

Washington, D. C. 20036

CHAIRMAN:
EDWIN B. JOSEPH
SOUTH CAROLINA WILDLIFE AND
MARINE RESOURCES DEPARTMENT
P. O. BOX 12559
CHARLESTON, SOUTH CAROLINA 29412

EXECUTIVE DIRECTOR:
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PENNSYLVANIA
RHODE ISLAND
SOUTH CAROLINA
VIRGINIA

Northern Shrimp Section

AN ACT Relating to a Closed Season for the Catching of Northern Shrimp in the Gulf of Maine

Preamble. Whereas, the northern shrimp fishery has generated more than \$10,000,000 to the Gulf of Maine coastal economy in manufactured product value; and

Whereas, the fishing intensity on Pandalidae has greatly reduced the harvestable stock in the past eight years; and

Whereas, research indicates that if landings exceed the recommended catch level of 3.5 million pounds in 1977, stock levels would fall below the present 10.0 million pounds; and

Whereas, the shrimp fishery is shared among three states - Maine, New Hampshire, and Massachusetts; and

Whereas, a closed season for taking of shrimp would benefit the shrimp resources and prolong the existence of the New England shrimp fishery; and

Whereas, in the judgement of the Atlantic States Marine Fisheries Commission, Northern Shrimp Section, these facts require the following regulation as immediately necessary for the preservation of the public peace, health, and safety; now, therefore, Be it enacted by the Atlantic States Marine Fisheries Commission as follows:

NORTHERN SHRIMP CLOSED SEASON REGULATION

1. It is unlawful to fish for, take, or land any shrimp (Pandalidae) in Maine, New Hampshire, and Massachusetts except between the dates of January 1, 1977, and May 15, 1977.

2. It is unlawful to process shrimp (Pandalidae) in Maine, New Hampshire, and Massachusetts except between the dates of January 1, 1977, and May 20, 1977, without a permit issued by the state department responsible for issuing licenses or permits in Maine, New Hampshire, or Massachusetts.

Note: Permittees must present documented proof, showing the country or state of origin of the shrimp (Pandalidae) to be processed.

3. A quota of 3.5 million pounds will be allowed during the open season, only 0.5 million pounds of which may be taken during the month of January. Quota figures will be obtained from dealers and processors on a weekly basis by agency personnel of the member states. Dealers and processors must provide accurate up-to-date information relative to shrimp purchases on forms provided by the state. Once the quota has been reached each state will give legal notice that the fishery is closed, with a five day notice of the closure date.

4. Current mesh regulations of 1-3/4 inches in the body and cod end and restricting the use of liners will continue in full force and effect. .

5. Penalty. Whoever violates any provision of this regulation shall be punished by a fine of not less than \$500 nor more than \$1,000, or forfeiture of netting used in the violation, or by imprisonment for not more than six months, or by any combination thereof.

December 8, 1976

The undersigned Commissioners of the Atlantic States Marine Fisheries Commission, hereby affirm that the foregoing instrument is an authentic copy of the regulation of the Northern Shrimp Section (ASMFC) executed at Portsmouth, New Hampshire, December 8, 1976.

Vinal O. Look
Vinal O. Look
Commissioner from Maine
By: *Richard P. Clark, Secy.*

Charles J. Lincoln
Charles J. Lincoln
Commissioner from New Hampshire

Jerrold B. Speers
Jerrold B. Speers
Commissioner from Maine

Allen E. Peterson
Allen E. Peterson
Commissioner from Massachusetts

Fred B. Johnson
Fred B. Johnson
Commissioner from Maine

Stanley J. Zarod
Stanley J. Zarod
Commissioner from Massachusetts

Richard P. Seamans, Jr.
Richard P. Seamans, Jr.
Commissioner from New Hampshire

Frank J. Backoff
Frank J. Backoff
Commissioner from Massachusetts

Eileen Foley
Eileen Foley
Commissioner from New Hampshire

ATTEST: Irwin M. Alperin
Irwin M. Alperin
Executive Director
Atlantic States Marine
Fisheries Commission
Washington, DC

Washington, D. C.
Subscribed and sworn to before me
this 14th day of February 1977
by Richard P. Clark
Notary Public, D. C.

ATLANTIC STATES MARINE FISHERIES COMMISSION
1717 Massachusetts Avenue, NW
Washington, D.C. 20036

December 5, 1977

MEMORANDUM & NOTICE

TO: WHOM IT MAY CONCERN

FROM: Irwin M. Alperin, Executive Director

RE: Northern Shrimp Regulations, 1978

The Northern Shrimp Section of ASMFC (=S/F Northern Shrimp Sub-Board) meeting at Portsmouth, NH December 2, 1977, with the S/F Northern Shrimp Scientific Committee and the interested public took no action to make any change in the Northern Shrimp Closed Season Regulations promulgated December 8, 1976. At that time the season was opened for the period January 1, 1977 through May 15, 1977, with a quota of 3.5 million pounds. The fishery in the Gulf of Maine has remained closed since the latter date and by the Section's decision remains so indefinitely.

The Scientific Committee's recommendations of a continued closed season are based on a northern shrimp stock assessment from Maine and NMFS 1977 survey data. Relative abundance indices have continued to decline since 1975 and 1976 and mortality and exploitation rates are extremely high. The stock size for 1978 is in the order of 1-3 million pounds and recruitment prospects for the immediate future are very poor. First year males (1976 and 1977 year classes) were absent from surveys designed to determine abundance and age groups.

The Gulf of Maine Northern Shrimp stocks will continue to be monitored during 1978 under the State/Federal Fisheries Management Program (SFFMP). The Scientific Committee has prepared a Northern Shrimp management plan which will be submitted for the consideration of the Sub-Board (Northern Shrimp Section, ASMFC) about January 1, 1978.

The regulation of the Northern Shrimp Fishery is conducted by the Northern Shrimp Section of ASMFC (comprised of the Commissioners from Maine, New Hampshire and Massachusetts) under the provision of Amendment Number One to the Atlantic States Marine Fisheries Compact.

bc: Kenneth Beal ✓

STATEMENT OF POLICY

NORTHERN SHRIMP FISHERY MANAGEMENT BOARD/ASMFC NORTHERN SHRIMP SECTION

1. The Board/Section agrees that, despite natural fluctuations in stock abundance, the northern shrimp fishery is manageable.
2. The Board/Section will provide for a continuing management program based on recommendations of the Technical Committee to: a) maintain and eventually rebuild the stock, and b) to assure a viable northern shrimp fishery in the Gulf of Maine over time.
3. The Board/Section intends to allow a northern shrimp fishery through the mechanism of an annual open season recognizing that a) stock abundance will tend to fluctuate, b) the fishery interacts with other fisheries through by-catch of juveniles, and c) the fishery is economically important to the fishing industry.
4. The Board/Section endorses the following measures as appropriate for regulating the harvest of northern shrimp in the Gulf of Maine:
 - a) Gear limitations - All trawls used in the fishery shall be of single layer construction without liners and have a minimum stretch size of 1-3/4 inches (44.5 mm) in the body and cod-end.
 - b) Seasonal limitations - An open season not to exceed 183 days will be set on an annual basis. The fishery shall not begin sooner than December 1 nor end later than May 31 for any one year. The Board/Section shall determine the exact length of the season after considering recommendations from the Technical Committee on a season designed towards achieving item #2 above.
 - c) Possession limitations - All shrimp landed and subsequently possessed by fishermen and dealers/processors must have a count per pound less than 60, with a 10% tolerance. Possession of northern shrimp during times other than the open season is not permitted.
 - d) Information collection provisions - There shall be a method of determining participants in the fishery (e.g. vessel licensing). All primary dealers/processors shall report periodically their transactions involving northern shrimp. The information reported shall be that determined necessary to manage the fishery. Dockside and sea sampling of the shrimp catch shall be conducted.
5. The Board/Section will re-examine periodically the allowed mesh size for northern shrimp as management programs for other small mesh net fisheries (e.g. silver hake and *Illex* squid) are developed and implemented.

Adopted April 17, 1981; Amended Oct. 5, 1981; Amended Nov. 12, 1981

Atlantic States Marine Fisheries Commission

1717 Massachusetts Avenue, N.W.

Washington, D. C. 20036

CHAIRMAN:
THEODORE B. BAMPTON
DEPARTMENT OF ENVIRONMENTAL
PROTECTION
STATE OFFICE BUILDING
HARTFORD, CONNECTICUT 06115

EXECUTIVE DIRECTOR:
IRWIN M. ALPERIN
(202) 387-5330

VICE-CHAIRMAN:
RUSSELL A. COOKINGHAM
DIVISION OF FISH, GAME AND
SHELLFISHERIES
P. O. BOX 1809
TRENTON, NEW JERSEY 08625

MEMBER STATES:
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DELAWARE
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NEW JERSEY
NEW YORK
NORTH CAROLINA
PENNSYLVANIA
RHODE ISLAND
SOUTH CAROLINA
VIRGINIA

Northern Shrimp Section

AN ACT Relating to a Closed Season for the Catching of Northern Shrimp in the Gulf of Maine, and Including Netting Regulations and Penalties.

Preamble. Whereas, the northern shrimp fishery has generated more than \$10,000,000 to the Gulf of Maine coastal economy in manufactured product value; and

Whereas, the fishing intensity on Pandalidae has greatly reduced the harvestable stock in the past nine years; and

Whereas, research indicates that if landings exceed the recommended catch level of 0.5 million pounds in 1979, stock levels would fall below the present 3.0 million pounds; and

Whereas, the shrimp fishery is shared among three states - Maine, New Hampshire, and Massachusetts; and

Whereas, a closed season for taking shrimp would benefit the shrimp resources and prolong the existence of the New England shrimp fishery; and

Whereas, in the judgement of the Atlantic States Marine Fisheries Commission, Northern Shrimp Section, these facts require the following regulations as immediately necessary for the preservation of the public peace, health, and safety; now, therefore, Be it enacted by the Atlantic States Marine Fisheries Commission as follows:

NORTHERN SHRIMP REGULATIONS

1. It is unlawful to fish for, take, or land any shrimp (Pandalidae) in Maine, New Hampshire, and Massachusetts except between the dates of February 1, 1979, and March 31, 1979.

2. NETTING

It is unlawful to fish for, take, transport or have in possession any shrimp (Pandalidae) on board any boat rigged for otter trawling with any net with a mesh opening of less than 1-3/4 inches stretched mesh opening between knots, or to have on board any net, netting, or portions thereof, with an opening less than 1-3/4 inches stretched mesh opening between knots.

Tolerance: Due to the differences of net manufacturer mesh measurements and the mesh measurements used for enforcement of this law, and other inherent variables, a tolerance of 1/8 inch may be applied to the average mesh' size in the body and wings and a tolerance of 1/4 inch may be applied to the average mesh size in the extension piece and cod end.

All netting used to catch shrimp shall be of one layer only, with no liners of any kind attached. It shall be

lawful to attach chafing gear to the lower half of the circumference of the cod end.

Exception: Herring seines or purse seines may be transported from one location to another provided a permit is obtained from a fisheries enforcement officer or the state fisheries agency.

A. Method of measurements. Mesh sizes are measured by a flat wedge-shaped gauge having a taper of 4 cm in 20 cm and a thickness of 2.3 mm, inserted into the meshes under a pressure or pull of 1.90 kg. The mesh size of a net shall be taken to be the average of the measurements of a series of any 20 consecutive meshes, at least 10 meshes from the lacings, and when measured in the cod end of the net beginning at the after end and running parallel to the long axis.

3. Penalty. Whoever violates any provision of the regulation shall be punished by a fine of not less than \$500 nor more than \$1,000, or forfeiture of netting used in the violation, or by imprisonment for not more than six months, or by any combination thereof.

December 13, 1978

The undersigned Commissioners of the Atlantic States Marine Fisheries Commission, hereby affirm that the foregoing instrument is an authentic copy of the regulation of the Northern Shrimp Section (ASMFC) executed at Portsmouth, New Hampshire, December 13, 1978.

Vinal O. Look
Commissioner from Maine

Charles J. Lincoln
Commissioner from New Hampshire

Jerrold B. Speers
Commissioner from Maine

Allen E. Peterson
Commissioner from Massachusetts

Ronald W. Green
Commissioner from Maine

Stanley J. Zarod
Commissioner from Massachusetts

Edward W. Spurr

Edward W. Spurr
Commissioner from New Hampshire

Frank J. Backoff
Commissioner from Massachusetts

Eileen Foley
Commissioner from New Hampshire

ATTEST:

Irwin M. Alperin
Executive Director
Atlantic States Marine
Fisheries Commission
Washington, DC

Atlantic States Marine Fisheries Commission

1717 Massachusetts Avenue, N.W.

Washington, D. C. 20036

CHAIRMAN:
RUSSELL A. COOKINGHAM
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SHELLFISHERIES
P. O. BOX 1809
TRENTON, NEW JERSEY 08625

EXECUTIVE DIRECTOR:
IRWIN M. ALPERIN
(202) 387-3330

VICE CHAIRMAN:
SPENCER APOLLONIO
DEPARTMENT OF MARINE
RESOURCES
STATE HOUSE ANNEX
AUGUSTA, MAINE 04330

MEMBER STATES:

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NEW HAMPSHIRE
NEW JERSEY
NEW YORK
NORTH CAROLINA
PENNSYLVANIA
RHODE ISLAND
SOUTH CAROLINA
VIRGINIA

NORTHERN SHRIMP SECTION

AN ACT Relating to a Closed Season for the Catching of Northern Shrimp in the Gulf of Maine, and Including Netting Regulations and Penalties.

Preamble. Whereas, the northern shrimp fishery has generated more than \$10,000,000 to the Gulf of Maine coastal economy in manufactured product value; and

Whereas, the fishing intensity on Pandalidae in the Gulf of Maine has greatly reduced the harvestable stock in the past ten years; and

Whereas, research indicates that if landings exceed the recommended catch level of 0.5 million pounds in 1980, stock levels would fall below the present 3.0 million pounds; and

Whereas, the shrimp fishery is shared among three states - Maine, New Hampshire, and Massachusetts; and

Whereas, a closed season for taking shrimp would benefit the shrimp resources and prolong the existence of the New England shrimp fishery; and

Whereas, the rate of catch during the open season will be monitored and the season can be closed if an emergency condition of the shrimp resources develops; and

Whereas, in the judgement of the Atlantic States Marine Fisheries Commission, Northern Shrimp Section, these facts require the following regulations as immediately necessary for the preservation of the public peace, health, and safety; now, therefore, Be it enacted by the Atlantic States Marine Fisheries Commission as follows:

NORTHERN SHRIMP REGULATIONS

1. It is unlawful to fish for, take, land, transport or have in possession any shrimp (Pandalus borealis) in Maine, New Hampshire, and Massachusetts except between the dates of February 15, 1980 and May 31, 1980.
2. It is unlawful to process shrimp (Pandalidae) in Maine, New Hampshire, and Massachusetts except between the dates of February 15, 1980 and June 5, 1980, without a permit issued by the state department responsible for issuing licenses or permits in Maine, New Hampshire, or Massachusetts.

Note: Permittees must present documented proof, showing the country or state of origin of the shrimp (Pandalidae) to be processed.

3. NETTING

It is unlawful to fish for, take, transport or have in possession, any shrimp (Pandalidae) on board any boat rigged for otter trawling with any net with a mesh opening of less than 1-3/4 inches stretched mesh opening between knots, or to have on board any net, netting, or portions thereof, with an opening less than 1-3/4 inches stretched mesh opening between knots.

Tolerance: Due to the differences of net manufacturer mesh measurements and the mesh measurements used for enforcement of this law, and other inherent variables, a tolerance of 1/8 inch may be applied to

the average mesh size in the body and wings and a tolerance of 1/4 inch may be applied to the average mesh size in the extension piece and cod end.

All netting used to catch shrimp shall be of one layer only, with no liners of any kind attached. It shall be lawful to attach chafing gear to the lower half of the circumference of the cod end.

Exception: Herring seines or purse seines may be transported from one location to another provided a permit is obtained from a fisheries enforcement officer or the state fisheries agency.

A. Method of measurements. Mesh sizes are measured by a flat wedged-shaped gauge having a taper of 4 cm in 20 cm and a thickness of 2.3 mm, inserted into the meshes under a pressure or pull of 1.90 kg. The mesh size of a net shall be taken to be the average of the measurements of a series of any 20 consecutive meshes, at least 10 meshes from the lacings, and when measured in the cod end of the net beginning at the after end and running parallel to the long axis.

4. Reporting

Any person engaged in the processing of shrimp (Pandalidae) shall file with the Chief, Fisheries Management Operations Branch, National Marine Fisheries Service, State Fish Pier, Gloucester, Massachusetts, a weekly report of all shrimp purchased during the preceding week. Said report shall include each purchase by vessel name and the average count per pound of each purchase. The reporting week shall be Sunday through Saturday. Reports must be received by Wednesday of the following week. Forms for reporting will be furnished by the Northern Shrimp Section of the Atlantic States Marine Fisheries Commission. Failure to report as required by this section shall be illegal and shall constitute a violation.

5. Penalty.

Whoever violates any provisions of the regulation shall be punished by a fine of not less than \$500 nor more than \$1,000, or forfeiture of netting used in the violation, or by imprisonment of not more than six months, or by any combination thereof.

January 2, 1980

The undersigned Commissioner of the Atlantic States Marine Fisheries Commission and Chairman of the Northern Shrimp Section, hereby affirms that the foregoing instrument is an authentic copy of the regulations of the Northern Shrimp Section (ASMFC) executed with a quorum present present at Portsmouth, New Hampshire, November 29, 1979.

Edward W. Spurr

Edward W. Spurr
Commissioner from New Hampshire
Chairman, Northern Shrimp Section

ATTEST:

Irwin M. Alperin

Irwin M. Alperin
Executive Director
Atlantic States Marine
Fisheries Commission
Washington, DC

SUBSCRIBED AND SWORN TO BEFORE

ME THIS 25th OF JAN 1980

NOTARY PUBLIC, D. C.

Virginia F. Houley

My Commission Expires Feb. 14, 1983

Atlantic States Marine Fisheries Commission

1717 Massachusetts Avenue, N.W.

Washington, D. C. 20036

CHAIRMAN:
RUSSELL A. COOKINGHAM
DIVISION OF FISH, GAME AND
SHELLFISHERIES
P. O. Box 1809
TRENTON, NEW JERSEY 08625

EXECUTIVE DIRECTOR:
IRWIN M. ALPERIN
(202) 387-5330

VICE CHAIRMAN:
SPENCER APOLLONIO
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SOUTH CAROLINA
VIRGINIA

NORTHERN SHRIMP SECTION

AN ACT Relating to a Closed Season for the Catching of
Northern Shrimp in the Gulf of Maine, and
Including Netting Regulations and Penalties

Preamble. Whereas, the northern shrimp fishery has
generated more than \$10,000,000 to the Gulf of
Maine coastal economy in manufactured product
value; and

Whereas, the fishing intensity on Pandalidae
in the Gulf of Maine has greatly reduced the
harvestable stock in the past ten years; and

Whereas, research indicates that if landings
exceed the recommended catch level in 1981,
stock levels would fall below the present 3.0
million pounds; and

Whereas, the shrimp fishery is shared among
three states - Maine, New Hampshire and Massachu-
setts; and

Whereas, a closed season for taking shrimp would benefit the shrimp resources and prolong the existence of the New England shrimp fishery; and

Whereas, the rate of catch during the open season will be monitored and the season can be closed if an emergency condition of the shrimp resource develops; and

Whereas, in the judgement of the Atlantic States Marine Fisheries Commission, Northern Shrimp Section, these facts require the following regulations as immediately necessary for the preservation of the public peace, health, and safety; now, therefore, Be it enacted by the Atlantic States Marine Fisheries Commission as follows:

NORTHERN SHRIMP REGULATIONS

1. It is unlawful to fish for, take, land, transport or have in possession any shrimp (Pandalus borealis) in Maine, New Hampshire, and Massachusetts except between the dates of January 1, 1981 and May 15, 1981.
2. It is unlawful to process shrimp (Pandalidae) in Maine, New Hampshire, and Massachusetts except between the dates of January 1, 1981 and May 20, 1981, without a permit issued by the state department responsible for issuing licenses or permits in Maine, New Hampshire, or Massachusetts.

Note: Permittees must present documented proof, showing the country or state of origin of the shrimp (Pandalidae) to be processed.

3. NETTING

It is unlawful to fish for, take, transport or have in possession, any shrimp (Pandalidae) on board any boat rigged for otter trawling with any net with a mesh opening of less than 1-3/4 inches stretched mesh opening between knots, or to have on board any net, netting, or portions thereof, with an opening less than 1-3/4 inches stretched mesh opening between knots.

Tolerance: Due to the differences of net manufacturer mesh measurements and the mesh measurements used for enforcement of this law, and other inherent variables, a tolerance of 1/8 inch may be applied to the average mesh size in the body and wings and a tolerance of 1/4 inch may be applied to the average mesh size in the extension piece and cod end.

There shall be no tolerances allowed in the mesh sizes after January 1, 1982.

All netting used to catch shrimp shall be of one layer only, with no liners of any kind attached. It shall be lawful to attach chafing gear to the lower half of the circumference of the cod end.

Exception: Herring seines or purse seines may be transported from one location to another provided a permit is obtained from a fisheries enforcement officer or the state fisheries agency.

A. Method of measurements. Mesh sizes are measured by a flat wedged-shaped guage having a taper of 4 cm in 20 cm and a thickness of 2.3 mm, inserted into the meshes under a pressure or pull of 1.90 kg. The mesh size of a net shall be taken to be the average of the measurements of a series of any 20 consecutive meshes, at least 10 meshes from the lacings, and when measured in the cod end of the net beginning at the after end and running parallel to the long axis.

4. REPORTING

Any person actively engaged as a primary dealer or processor of shrimp (Pandalidae) shall file with the commission/director of the resource agency of the state in which such transactions are made, a weekly report of all shrimp purchased during the preceding week. Said reports shall include such information as determined necessary by the executive director to effectively manage the shrimp fishery. The reporting week shall be Sunday through Saturday. Reports must be received by Wednesday of the following week. Forms for reporting will be furnished by the director or commissioner. Primary dealers as described in this section shall mean any person who purchases shrimp in excess of 120 lb/day as a first purchase from a vessel engaged in the taking of shrimp.

5. PENALTY

Whoever violates any provisions of the regulation shall be punished by a fine of not less than \$500 nor more than \$1,000, or forfeiture of netting used in the violation, or by imprisonment of not more than six months, or by any combination thereof.

The undersigned Commissioner of the Atlantic States Marine Fisheries Commission and Chairman of the Northern Shrimp Section, hereby affirms that the foregoing instrument is an authentic copy of the regulations of the Northern Shrimp Section (ASMFC) executed with a quorum present at Portsmouth, New Hampshire, December 18, 1980.

Edward W. Spurr
Edward W. Spurr
Commissioner from New Hampshire
Chairman, Northern Shrimp Section

ATTEST: Irwin M. Alperin
Irwin M. Alperin
Executive Director
Atlantic States Marine
Fisheries Commission
Washington, DC

Jan. 26, 1981
Viola H. Burke
VIOLA H. BURKE
NOTARY PUBLIC DISTRICT OF COLUMBIA
My Commission Expires January 2, 1986

Atlantic States Marine Fisheries Commission

1717 Massachusetts Avenue, N.W.

Washington, D. C. 20036

CHAIRMAN:
RUSSELL A. COOKINGHAM
DIVISION OF FISH, GAME AND
SHELLFISHERIES
P. O. BOX 1809
TRENTON, NEW JERSEY 08625

EXECUTIVE DIRECTOR:
IRWIN M. ALPERIN
(202) 387-5330

VICE CHAIRMAN:
SPENCER APOLLONIO
DEPARTMENT OF MARINE
RESOURCES
STATE HOUSE ANNEX
AUGUSTA, MAINE 04330

MEMBER STATES:
CONNECTICUT
DELAWARE
FLORIDA
GEORGIA
MAINE
MARYLAND
MASSACHUSETTS
NEW HAMPSHIRE
NEW JERSEY
NEW YORK
NORTH CAROLINA
PENNSYLVANIA
RHODE ISLAND
SOUTH CAROLINA
VIRGINIA

NORTHERN SHRIMP SECTION

AN ACT Relating to a Closed Season for the Catching of Northern Shrimp in the Gulf of Maine, and Including Netting Regulations and Penalties

Preamble. Whereas, the northern shrimp fishery has generated more than \$10,000,000 to the Gulf of Maine coastal economy in manufactured product value; and

Whereas, the fishing intensity on Pandalidae in the Gulf of Maine has greatly reduced the harvestable stock in the past ten years; and

Whereas, the shrimp fishery is shared among three states - Maine, New Hampshire and Massachusetts; and

Whereas, a closed season for taking shrimp would benefit the shrimp resources and prolong the existence of the New England shrimp fishery; and

Whereas, the rate of catch during the open season will be monitored and the season can be closed if an emergency condition of the shrimp resource develops; and

Whereas, in the judgement of the Atlantic States Marine Fisheries Commission, Northern Shrimp Section, these facts require the following regulations as immediately necessary for the preservation of the public peace, health, and safety; now, therefore, Be it enacted by the Atlantic States Marine Fisheries Commission as follows:

NORTHERN SHRIMP REGULATIONS

1. It is unlawful to fish for, take, land, transport or have in possession any shrimp (Pandalus borealis) in Maine, New Hampshire, and Massachusetts except between the dates of January 1, 1982 and April 15, 1982.
2. It is unlawful to process shrimp (Pandalidae) in Maine, New Hampshire, and Massachusetts except between the dates of January 1, 1982 and May 20, 1982, without a permit issued by the state department responsible for issuing licenses or permits in Maine, New Hampshire, or Massachusetts.

Note: Permittees must present documented proof, showing the country or state of origin of the shrimp (Pandalidae) to be processed.

3. NETTING

It is unlawful to fish for, take, transport or have in

possession, any shrimp (Pandalidae) on board any boat rigged for otter trawling with any net with a mesh opening of less than 1-3/4 inches stretched mesh opening between knots, or to have on board any net, netting, or portions thereof, with an opening less than 1-3/4 inches stretched mesh opening between knots.

Tolerance: Due to the differences of net manufacturer mesh measurements and the mesh measurements used for enforcement of this law, and other inherent variables, a tolerance of 1/8 inch may be applied to the average mesh size in the body and wings and a tolerance of 1/4 inch may be applied to the average mesh size in the extension piece and cod end.

All netting used to catch shrimp shall be of one layer only, with no liners of any kind attached. It shall be lawful to attach chafing gear to the lower half of the circumference of the cod end.

Exception: Herring seines or purse seines may be transported from one location to another provided a permit is obtained from a fisheries enforcement officer or the state fisheries agency.

A. Method of measurements. Mesh sizes are measured by a flat wedged-shaped gauge having a taper of 4 cm in 20 cm and a thickness of 2.3 mm, inserted into the meshes under a pressure or pull of 1.90 kg. The mesh size of a net shall be taken to be the average of the measurements of

a series of any 20 consecutive meshes, at least 10 meshes from the lacings, and when measured in the cod end of the net beginning at the after end and running parallel to the long axis.

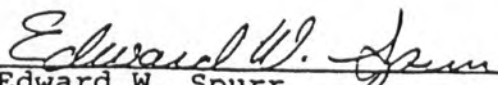
4. REPORTING

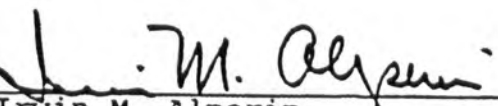
Any person actively engaged as a primary dealer or processor of shrimp (Pandalidae) shall file with the commissioner/director of the resource agency of the state in which such transactions are made, a weekly report of all shrimp purchased during the preceding week. Said reports shall include such information as determined necessary by the executive director to effectively manage the shrimp fishery. The reporting week shall be Sunday through Saturday. Reports must be received by Wednesday of the following week. Forms for reporting will be furnished by the director or commissioner. Primary dealers as described in this section shall mean any person who purchases shrimp in excess of 120 lb/day as a first purchase from a vessel engaged in the taking of shrimp.

5. PENALTY

Whoever violates any provisions of the regulation shall be punished by a fine of not less than \$500 nor more than \$1,000, or forfeiture of netting used in the violation, or by imprisonment of not more than six months, or by any combination thereof.

The undersigned Commissioner of the Atlantic States Marine Fisheries Commission and Chairman of the Northern Shrimp Section, hereby affirms that the foregoing instrument is an authentic copy of the regulations of the Northern Shrimp Section (ASMFC) executed with a quorum present at Portsmouth, New Hampshire, November 12, 1981.


Edward W. Spurr
Commissioner from New Hampshire
Chairman, Northern Shrimp Section

ATTEST: 
Irwin M. Alperin
Executive Director
Atlantic States Marine
Fisheries Commission
Washington, DC

Subscribed and sworn to before
me in Washington, DC this
7th day of December 1981.


Notary Public
My Commission Expires May 31, 1982

M...

NORTHERN SHRIMP SECTION

AN ACT Relating to a Closed Season for the Catching of Northern Shrimp in the Gulf of Maine, and Including Netting Regulations and Penalties.

Preamble. WHEREAS, The northern shrimp fishery has generated more than \$10,000,000 to the Gulf of Maine coastal economy in manufactured product value; and

WHEREAS, the fishing intensity on Pandalidae in the Gulf of Maine has greatly reduced the harvestable stock in the past ten years; and

WHEREAS, research indicates that if landings were uncontrolled in 1983, stock levels could fall below the present low abundance; and

WHEREAS, the shrimp fishery is shared among three states - Maine, New Hampshire, and Massachusetts; and

WHEREAS, a closed season for taking shrimp would benefit the shrimp resources and prolong the existence of the New England shrimp fishery; and

WHEREAS, the rate of catch during the open season will be monitored; and

WHEREAS, in the judgement of the Atlantic States Marine Fisheries Commission, Northern Shrimp Section, these facts require the following regulations as immediately necessary for the preservation of the public peace, health, and safety;

NOW THEREFORE BE IT ENACTED by the Atlantic States Marine Fisheries Commission as follows:

NORTHERN SHRIMP REGULATIONS

1. It is unlawful to fish for, take, land, transport or have in possession any shrimp (Pandalus borealis) in Maine, New Hampshire, and Massachusetts except between the dates of December 15, 1982 and April 30, 1983.

Extension: The Section shall convene in early April to consider an extension of the shrimp season, not to exceed 15 days, nor extend later than May 15, 1983. As a basis for making this decision the Section shall consider the levels of fishing effort, the accumulated catch and the quality of catch. If the Section extends the season, landed product shall not exceed 70 count per pound for any one trip or the fishery shall be immediately closed.

2. It is unlawful to process shrimp (Pandalidae) in Maine, New Hampshire, and Massachusetts except between the dates of December 15, 1982 and May 5, 1983, without a permit issued by the state department responsible for issuing licenses or permits in Maine, New Hampshire, or Massachusetts.

NOTE: Permittees must present documented proof, showing the county or state of origin of the shrimp (Pandalidae) to be processed.

3. NETTING

It is unlawful to fish for, take, transport or have in possession any shrimp (Pandalidae) on board any boat rigged for otter trawling with any net with a mesh opening of less than 1-3/4 inches stretched mesh opening between knots, or to have on board any net, netting, or portions thereof, with an opening less than 1-3/4 inches stretched mesh opening between knots.

Tolerance: Due to the difference of net manufacturer mesh measurements and the mesh measurements used for enforcement of this law, and other inherent variables, a tolerance of 1/8 inch may be applied to the average mesh size in the body and wings and a tolerance of 1/4 inch may be applied to the average mesh size in the extension piece

and cod end. All netting used to catch shrimp shall be of one layer only, with no liners of any kind attached. It shall be lawful to attach chafing gear to the lower half of the circumference of the cod end or to enclose the cod end with single layer of netting of not less than 5-1/8" stretched mesh opening to serve the purpose of chafing gear. Any such netting shall be attached such that the effective mesh opening in the cod end is not diminished.

Cod end shall mean the terminal portion of an otter trawl, pair trawl, beam trawl, scottish seine or mid-water trawl in which the catch is normally retained.

Exception: Herring seines or purse seines may be transported from one location to another provided a permit is obtained from a fisheries enforcement officer or the state fisheries agency.

A. Method of measurements. Mesh sizes are measure by a flat wedged-shaped gauge having a taper of 4 cm in 20 cm and a thickness of 2.3 mm, inserted into the meshes under a pressure or pull of 1.90 kg. The mesh size of a net shall be taken to be the average of the measurements of a series of any 20 consecutive meshes, at least 10 meshes from the lacings, and when measured in the cod end of the net beginning at the after end and running parallel to the long axis.

4. REPORTING

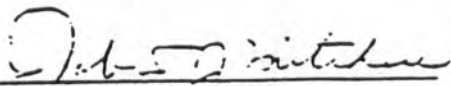
Any person actively engaged as primary dealer or processor of shrimp (Pandalidae) shall file with the commission/director of the resource agency of the state in which such transactions are made, a weekly report of all shrimp purchased during the preceding week. Said reports shall include such information as determined necessary by

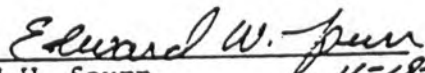
the executive director to effectively manage the shrimp fishery. The reporting week shall be Sunday through Saturday. Reports must be received by Wednesday of the following week. Forms for reporting will be furnished by the director or commissioner. Primary dealers as described in this section shall mean any person who purchases shrimp in excess of 120 lb/day as a first purchase from a vessel engaged in the taking of shrimp.

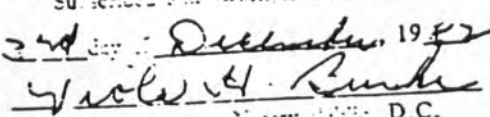
5. PENALTY

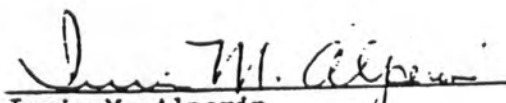
Whoever violates any provisions of the regulation shall be punished by a fine of not less than \$500 nor more than \$1,000, or forfeiture of netting used in the violation, or by imprisonment for not more than six months, or any combination thereof.

The undersigned Commissioner of the Atlantic States Marine Fisheries Commission and the Chairman of the Northern Shrimp Section, hereby affirms that the foregoing instrument is an authentic copy of the regulations of the Northern Shrimp Section (ASMFC) executed with a quorum present at Portsmouth, New Hampshire, November 17, 1982.


Robert J. Mitchell
Justice of the Peace


Edward W. Spurr
Commissioner from New Hampshire
Chairman, Northern Shrimp Section

DISTRICT OF COLUMBIA :ss:
Subscribed and sworn to before me this
24th day of December, 1982

Irwin M. Alperin
Notary Public, D.C.
My Commission Expires 1-2-84


Irwin M. Alperin
Executive Director
Atlantic States Marine
Fisheries Commission
Washington, DC

NORTHERN SHRIMP SECTION

AN ACT Relating to a Closed Season for the Catching of Northern Shrimp in the Gulf of Maine, and Including Netting Regulations and Penalties.

Preamble. WHEREAS, The northern shrimp fishery has generated more than \$10,000,000 to the Gulf of Maine coastal economy in manufactured product value; and

WHEREAS, the fishing intensity on Pandalidae in the Gulf of Maine has greatly reduced the harvestable stock in the past ten years; and

WHEREAS, research indicates that if landings were uncontrolled in 1984, stock levels could fall below the present low abundance; and

WHEREAS, the shrimp fishery is shared among three states - Maine, New Hampshire, and Massachusetts; and

WHEREAS, a closed season for taking shrimp would benefit the shrimp resources and prolong the existence of the New England shrimp fishery; and

WHEREAS, the rate of catch during the open season will be monitored; and

WHEREAS, in the judgement of the Atlantic States Marine Fisheries Commission, Northern Shrimp Section, these facts require the following regulations as immediately necessary for the preservation of the public peace, health, and safety;

NOW THEREFORE BE IT ENACTED by the Atlantic States Marine Fisheries Commission as follows:

NORTHERN SHRIMP REGULATIONS

1. It is unlawful to fish for, take, land, transport or have in possession any shrimp (Pandalus borealis) in Maine, New Hampshire, and Massachusetts except between the dates of December 15, 1983 and April 30, 1984.

Extension: The Section shall convene in early April to consider an extension of the shrimp season, not to exceed 15 days, nor extend later than May 15, 1984. As a basis for making this decision the Section shall consider the levels of fishing effort, the accumulated catch and the quality of catch. If the Section extends the season, landed product shall not exceed 70 count per pound for any one trip or the fishery shall be immediately closed.

2. It is unlawful to process shrimp (Pandalidae) in Maine, New Hampshire, and Massachusetts except between the dates of December 15, 1983 and May 5, 1984, without a permit issued by the state department responsible for issuing licenses or permits in Maine, New Hampshire, or Massachusetts.

NOTE: Permittees must present documented proof, showing the country or state of origin of the shrimp (Pandalidae) to be processed.

3. NETTING

It is unlawful to fish for, take, transport or have in possession any shrimp (Pandalidae) on board any boat rigged for otter trawling with any net with a mesh opening of less than 1-3/4 inches stretched mesh opening between knots, or to have on board any net, netting, or portions thereof, with an opening less than 1-3/4 inches stretched mesh opening between knots.

Tolerance: Due to the difference of net manufacturer mesh measurements and the mesh measurements used for enforcement of this law, and other inherent variables, a tolerance of 1/8 inch may be applied to the average mesh size in the body and wings and a tolerance of 1/4 inch may be applied to the average mesh size in the extension piece

and cod end. All netting used to catch shrimp shall be of one layer only, with no liners of any kind attached. It shall be lawful to attach chafing gear to the lower half of the circumference of the cod end or to enclose the cod end with single layer of netting of not less than 5-1/8" stretched mesh opening to serve the purpose of chafing gear. Any such netting shall be attached such that the effective mesh opening in the cod end is not diminished.

Cod end shall mean the terminal portion of an otter trawl, pair trawl, beam trawl, scottish seine or mid-water trawl in which the catch is normally retained.

Exception: Herring seines or purse seines may be transported from one location to another provided a permit is obtained from a fisheries enforcement officer or the state fishery agency.

A. Method of measurements. Mesh sizes are measured by a flat wedged-shaped gauge having a taper of 4 cm in 20 cm and a thickness of 2.3 mm, inserted into the meshes under a pressure or pull of 1.90 kg. The mesh size of a net shall be taken to be the average of the measurements of a series of any 20 consecutive meshes, at least 10 meshes from the lacings, and when measured in the cod end of the net beginning at the after end and running parallel to the long axis.

4. REPORTING

Any person actively engaged as primary dealer or processor of shrimp (Pandalidae) shall file with the commission/director of the resource agency of the state in which such transactions are made, a weekly report of all shrimp purchased during the preceding week. Said reports shall include such information as determined necessary by

the executive director to effectively manage the shrimp fishery. The reporting week shall be Sunday through Saturday. Reports must be received by Wednesday of the following week. Forms for reporting will be furnished by the director or commissioner. Primary dealers as described in this section shall mean any person who purchases shrimp in excess of 120 lb/day as a first purchase from a vessel engaged in the taking of shrimp.

5. PENALTY

Whoever violates any provisions of the regulation shall be punished by a fine of not less than \$500 nor more than \$1,000, or forfeiture of netting used in the violation, or by imprisonment for not more than six months, or any combination thereof.

The undersigned Commissioner of the Atlantic States Marine Fisheries Commission and the Chairman of the Northern Shrimp Section hereby affirms that the foregoing instrument is an authentic copy of the regulations of the Northern Shrimp Section (ASMFC) executed with a quorum present at Portsmouth, New Hampshire, November 23, 1983.

Justin P. Pease
Justin P. Pease

Edward W. Spurr
Edward W. Spurr
Commissioner from New Hampshire
Chairman, Northern Shrimp Section

Attest:

Irwin M. Alperin
Irwin M. Alperin
Executive Director
Atlantic States Marine
Fisheries Commission
Washington, DC

DISTRICT OF COLUMBIA :ss:
Subscribed and sworn to before me this
5th day of January, 1984
Justin P. Pease
Notary Public, D.C.
My Commission Expires 3-14-86

NORTHERN SHRIMP SECTION

AN ACT Relating to a Closed Season for the Catching of Northern Shrimp in the Gulf of Maine, and Including Netting Regulations and Penalties.

Preamble. WHEREAS, The northern shrimp fishery has generated more than \$10,000,000 to the Gulf of Maine coastal economy in manufactured product value; and

WHEREAS, the fishing intensity on Pandalidae in the Gulf of Maine has greatly reduced the harvestable stock in the past ten years; and

WHEREAS, research indicates that if landings were uncontrolled in 1985, stock levels could fall below the present low abundance; and

WHEREAS, the shrimp fishery is shared among three states - Maine, New Hampshire, and Massachusetts; and

WHEREAS, a closed season for taking shrimp would benefit the shrimp resources and prolong the existence of the New England shrimp fishery; and

WHEREAS, the rate of catch during the open season will be monitored; and

WHEREAS, in the judgement of the Atlantic States Marine Fisheries Commission, Northern Shrimp Section, these facts require the following regulations as immediately necessary for the preservation of the public peace, health, and safety;

NOW THEREFORE BE IT ENACTED by the Atlantic States Marine Fisheries Commission as follows:

NORTHERN SHRIMP REGULATIONS

1. It is unlawful to fish for, take, land, transport or have in possession any shrimp (Pandalus borealis) in Maine, New Hampshire, and Massachusetts except between the dates of December 1, 1984 and

May 15, 1985. During the month of May, the landed product shall not exceed 70 count per pound for any one trip or the fishery shall be immediately closed.

2. It is unlawful to process shrimp (Pandalidae) in Maine, New Hampshire, and Massachusetts except between the dates of December 1, 1984 and May 20, 1984, without a permit issued by the state department responsible for issuing licenses or permits in Maine, New Hampshire, or Massachusetts.

NOTE: Permittees must present documented proof, showing the country or state of origin of the shrimp (Pandalidae) to be processed.

3. NETTING

It is unlawful to fish for, take, transport or have in possession any shrimp (Pandalidae) on board any boat rigged for otter trawling with any net with a mesh opening of less than 1-3/4 inches stretched mesh opening between knots, or to have on board any net, netting, or portions thereof, with an opening less than 1-3/4 inches stretched mesh opening between knots.

Tolerance: Due to the differences of net manufacturer mesh measurements and the mesh measurements used for enforcement of this law, and other inherent variables, a tolerance of 1/8 inch may be applied to the average mesh size in the body and wings and a tolerance of 1/4 inch may be applied to the average mesh size in the extension piece and cod end. All netting used to catch shrimp shall be of one layer only, with no liners of any kind attached. It shall be lawful to attach chafing gear to the lower half of the circumference of the cod end or to enclose the cod end with single layer of netting of not less than 5-1/8" stretched mesh opening to serve the purpose of

chafing gear. Any such netting shall be attached such that the effective mesh opening in the cod end is not diminished.

Cod end shall mean the terminal portion of an otter trawl, pair trawl, beam trawl, scottish seine or mid-water trawl in which the catch is normally retained.

Exception: Herring seines or purse seines may be transported from one location to another provided a permit is obtained from a fisheries enforcement officer or the state fishery agency.

A. Method of measurements. Mesh sizes are measured by a flat wedged-shaped gauge having a taper of 4 cm in 20 cm and a thickness of 2.3 mm, inserted into the meshes under a pressure or pull of 1.90 kg. The mesh size of a net shall be taken to be the average of the measurements of a series of any 20 consecutive meshes, at least 10 meshes from the lacings, and when measured in the cod end of the net beginning at the after end and running parallel to the long axis.

4. REPORTING


Any person actively engaged as primary dealer or processor of shrimp (Pandalidae) shall file with the commission/director of the resource agency of the state in which such transactions are made, a weekly report of all shrimp purchased during the preceding week. Said reports shall include such information as determined necessary by the executive director to effectively manage the shrimp fishery. The reporting week shall be Sunday through Saturday. Reports must be received by Wednesday of the following week. Forms for reporting will be furnished by the director or commissioner. Primary dealers as described in this section shall mean any person who purchases shrimp in excess of 120 lb/day as a first purchase from a

vessel engaged in the taking of shrimp.

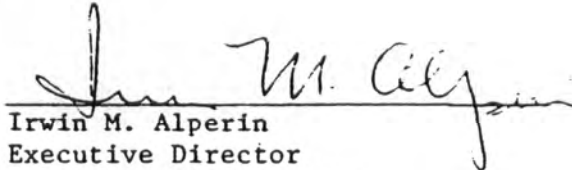
5. PENALTY

Whoever violates any provisions of the regulation shall be punished by a fine of not less than \$500 nor more than \$1,000, or forfeiture of netting used in the violation, or by imprisonment for not more than six months, or any combination thereof.

The undersigned Commissioner of the Atlantic States Marine Fisheries Commission and the Chairman of the Northern Shrimp Section, hereby affirms that the foregoing instrument is an authentic copy of the regulations of the Northern Shrimp Section (ASMFC) executed with a quorum present at Portsmouth, New Hampshire, November 21, 1984.


Edward W. Spurr
Commissioner from New Hampshire
Chairman, Northern Shrimp Section

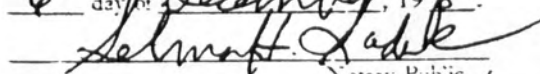
Attest:


Irwin M. Alperin
Executive Director
Atlantic States Marine
Fisheries Commission
Washington, DC

DISTRICT OF COLUMBIA

SS:

Subscribed and sworn to before me

6th day of December, 1984

Notary Public

My Commission Expires

3-14-86

NORTHERN SHRIMP SECTION

AN ACT Relating to a Closed Season for the Catching of Northern Shrimp in the Gulf of Maine, and Including Netting Regulations and Penalties.

Preamble. WHEREAS, during its peak years, the northern shrimp fishery contributed \$10,000,000 annually to the Gulf of Maine coastal economy in manufactured value; and

WHEREAS, the fishing intensity on Pandalidae in the Gulf of Maine has greatly reduced the harvestable stock in the past; and

WHEREAS, research indicates that current management strategies have been appropriate, and the Gulf of Maine shrimp resource is recovering; and

WHEREAS, if commercial landing were uncontrolled in the 1985-1986 season, improving stock levels could be adversely affected; and

WHEREAS, the shrimp fishery is shared among three states - Maine, New Hampshire and Massachusetts; and

WHEREAS, a closed season for the taking of shrimp would benefit the shrimp resources, and prolong the existence of the New England shrimp fishery; and;

WHEREAS, on the judgement of the Atlantic States Marine Fisheries Commission, Northern Shrimp Section, these facts require the following regulations as immediately necessary for the preservation of the public peace, health and safety;

NOW THEREFORE BE IT ENACTED by the Atlantic States Marine Fisheries Commission as follows:

NORTHERN SHRIMP REGULATIONS

1. It is unlawful to fish for, take, land, transport or have in possession any shrimp (Pandalus borealis) in Maine, New Hampshire, and Massachusetts except between the dates of December 1, 1985 and May 31, 1986.

2. It is unlawful to process shrimp (Pandalidae) in Maine, New Hampshire and Massachusetts except between the dates of December 1, 1985 and June 5, 1986, without a permit issued by the state department responsible for issuing licenses or permits in Maine, New Hampshire, or Massachusetts.

NOTE: Permittees must present documented proof, showing the country or state of origin of the shrimp (Pandalidae) to be processed.

3. NETTING

It is unlawful to fish for, take, transport or have in possession any shrimp (Pandalidae) on board any boat rigged for otter trawling with any net with a mesh opening of less than 1-3/4 inches stretched mesh opening between knots, or to have on board any net, netting, or portions thereof, with an opening less than 1-3/4 inches stretched mesh opening between knots.

Tolerance: Due to the differences of net manufacturer mesh measurements and the mesh measurements used for enforcement of this law, and other inherent variables, a tolerance of 1/8 inch may be applied to the average mesh size in the body and wings and a tolerance of 1/4 inch may be applied to the average mesh size in the extension piece and cod end. All netting used to catch shrimp shall be of one layer only, with no liners of any kind attached. It shall be lawful to attach chafing gear to the lower half of the circumference of the cod end or to enclose the cod end with single layer of netting of not less than 5-1/8" stretched mesh opening to serve the purpose of

chafing gear. Any such netting shall be attached such that the effective mesh opening in the cod end is not diminished. Cod end shall mean the terminal portion of an otter trawl, pair trawl, beam trawl, scottish seine or mid-water trawl in which the catch is normally retained.

Exception: Herring seines or purse seines may be transported from one location to another provided a permit is obtained from a fisheries enforcement officer or the state fishery agency.

A. Method of measurements. Mesh sizes are measured by a flat wedge-shaped gauge having a taper of 4 cm in 20 cm and a thickness of 2.3 mm, inserted into the meshes under a pressure or pull of 1.90 kg. The mesh size of a net shall be taken to be the average of the measurements of a series of any 20 consecutive meshes, at least 10 meshes from the lacings, and when measured in the cod end of the net beginning at the after end and running parallel to the long axis.

4. REPORTING

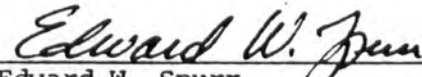
Any person actively engaged as primary dealer or processor of shrimp (Pandalidae) shall file with the commission/director of the resource agency of the state in which such transactions are made, a weekly report of all shrimp purchased during the preceding week. Said reports shall include such information as determined necessary by the executive director to effectively manage the shrimp fishery. The reporting week shall be Sunday through Saturday. Reports must be received by Wednesday of the following week. Forms for reporting will be furnished by the director or commissioner. Primarily dealers as described in this section shall mean any person who purchases shrimp in excess of 120 lb/day as a first

purchase from a vessel engaged in the taking of shrimp.

5. PENALTY

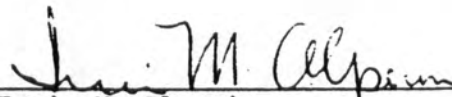
Whoever violates any provisions of the regulation shall be punished by a fine of not less than \$500 nor more than \$1,000 or forfeiture of netting used in the violation, or by imprisonment for not more than six months, or any combination thereof.

The undersigned Commissioner of the Atlantic States Marine Fisheries Commission and the Chairman of the Northern Shrimp Section, hereby affirms that the foregoing instrument is an authentic copy of the regulations of the Northern Shrimp Section (ASMFC) executed with a quorum present at Gloucester, Massachusetts, November 6, 1985.

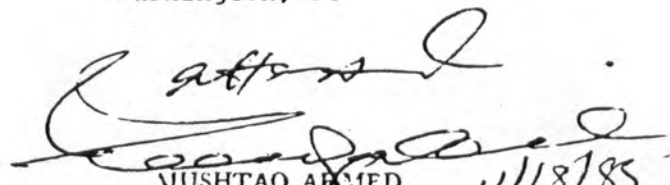


Edward W. Spurr
Commissioner from New Hampshire
Chairman, Northern Shrimp Section

Attest:



Irwin M. Alperin
Executive Director
Atlantic States Marine
Fisheries Commission
Washington, DC



MUSHTAQ AHMED
Notary Public, District of Columbia
1913 Massachusetts Avenue, N.W.
Washington, D.C. 20036

My Commission Expires March 14, 1989

NORTHERN SHRIMP SECTION

AN ACT Relating to a Limited Reopening of the Season for the Catching of Northern Shrimp in the Gulf of Maine, and Including Netting Regulations and Penalties.

Preamble. WHEREAS, the Atlantic States Marine Fisheries Commission, Northern Shrimp Section, has found an economic emergency as a result of the shrimp season closing on May 31, 1986; and

WHEREAS, there could be an economic disaster to the small boat fishing community in New England; and

WHEREAS, research indicates that current management strategies have been appropriate, and the Gulf of Maine shrimp resource is recovering; and

WHEREAS, the shrimp fishery is shared among three states - Maine, New Hampshire and Massachusetts; and

WHEREAS, on the judgement of the Atlantic States Marine Fisheries Commission, Northern Shrimp Section, these facts require the following regulations as immediately necessary for the preservation of the public peace, health and safety;

NOW THEREFORE BE IT ENACTED by the Atlantic States Marine Fisheries Commission the following:

NORTHERN SHRIMP REGULATIONS

1. It is lawful to fish for, take, land, transport or have in possession, any shrimp (Pandalus borealis) in Maine, New Hampshire, and Massachusetts between the dates of June 8, 1986 (beginning at 0001 hr) and June 21, 1986 (ending at 2400 hr). During this period the landed product shall not exceed 70 count per pound for any one trip or the fishery shall be immediately closed.

2. It is unlawful to process shrimp (Pandalidae) in Maine, New Hampshire, and Massachusetts except between the dates of December 1, 1986 and June 26, 1986 without a permit by the state department responsible for issuing licenses or permits in Maine, New Hampshire, or Massachusetts.

NOTE: Permittees must present document proof, showing the country or state of origin of the shrimp (Pandalidae) to be processed.

3. NETTING

It is unlawful to fish for, take, transport or have in possession any shrimp (Pandalidae) on board any boat rigged for otter trawling with any net with a mesh opening of less than 1-3/4 inches stretched mesh opening between knots, or to have on board any net, netting, or portions thereof, with an opening less than 1-3/4 inches stretched mesh opening between knots.

Tolerance: Due to the differences of net manufacturer mesh measurements and the mesh measurements used for enforcement of this law, and other inherent variables, a tolerance of 1/8 inch may be applied to the average mesh size in the body and wings and a tolerance of 1/4 inch may be applied to the average mesh size in the extension piece and cod end. All netting used to catch shrimp shall be of one layer only, with no liners of any kind attached. It shall be lawful to attach chafing gear to the lower half of the circumference of the cod end or to enclose the cod end with single layer of netting of not less than 5-1/8 inch stretched mesh opening to serve the purpose of chafing gear. Any such netting shall be attached such that the effective mesh opening in the cod end is not diminished. Cod end

shall mean the terminal portion of an otter trawl, pair trawl, beam trawl, scottish seine or mid-water trawl in which the catch is normally retained.

Exception: Herring seines or purse seines may be transported from one location to another provided a permit is obtained from a fisheries enforcement officer or the state fishery agency.

A. Method of measurements. Mesh sizes are measured by a flat wedge-shaped gauge having a taper of 4 cm in 20 cm and a thickness of 2.3 mm, inserted into the meshes under a pressure or pull of 1.90 kg. The mesh size of a net shall be taken to be the average of the measurements of a series of any 20 consecutive meshes, at least 10 meshes from the lacings, and when measured in the cod end of the net beginning at the after end and running parallel to the long axis.

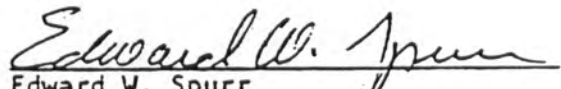
4. REPORTING

Any person actively engaged as primary dealer or processor of shrimp (Pandalidae) shall file with the commission/director of the resource agency of the state in which such transactions are made, a weekly report of all shrimp purchased during the preceding week. Said reports shall include such information as determined necessary by the executive director to effectively manage the shrimp fishery. The reporting week shall be Sunday through Saturday. Reports must be received by Wednesday of the following week. Forms for reporting will be furnished by the director or commissioner. Primary dealers as described in this section shall mean any person who purchases shrimp in excess of 120 lb/day as a first purchase from a vessel engaged in the taking of shrimp.

5. PENALTY

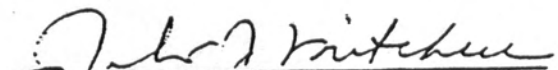
Whoever violates any provisions of the regulation shall be punished by a fine of not less than \$500 nor more than \$1,000 or forfeiture of netting used in the violation, or by imprisonment for not more than six months, or any combination thereof.

The undersigned Commissioner of the Atlantic States Marine Fisheries Commission and the Chairman of the Northern Shrimp Section, hereby affirm that the foregoing instrument is an authentic copy of the regulations of the Northern Shrimp Section (ASMFC) executed with a quorum present at Portsmouth, New Hampshire, June 4, 1986.


Edward W. Spurr
Commissioner from New Hampshire
Chairman, Northern Shrimp Section

Attest:

Irwin M. Alperin
Executive Director
Atlantic States Marine
Fisheries Commission
Washington, DC


Robert J. Mitchell
Justice of the Peace

APPENDIX II

Listing of members of the Northern Shrimp Technical Committee and
Northern Shrimp Section ASMFC.

INTERSTATE FISHERIES MANAGEMENT PROGRAM
NORTHERN SHRIMP TECHNICAL COMMITTEE

MAINE:

Joseph Graham
Acting Director
ME Department of Marine Resources
Boothbay Harbor Marine Laboratory
West Boothbay Harbor, ME 04575

NEW HAMPSHIRE:

Douglas E. Grout
Fisheries Biologist
NH Fish & Game Department
34 Bridge Street
Concord, NH 03301

MASSACHUSETTS:

Paul J. Diodati
Senior Marine Fisheries Biologist
MA Division of Marine Fisheries
Cat Cove Marine Laboratory
92 Fort Avenue
Salem, MA 01970

NMFS:NEFC

Stephen H. Clark
Chief, Population Biology Branch
National Marine Fisheries Service
Northeast Fisheries Center
Woods Hole, MA 02543

NMFS:NER

Glen K. Mahoney
Fishery Biologist
National Marine Fisheries Service
Northeast Region/State Federal Relations Branch
2 State Fish Pier
Gloucester, MA 01930

ASFMC:

Paul Perra
ISFMP Program Coordinator
Atlantic States Marine Fisheries Commission
Suite 703
1717 Massachusetts Avenue
Washington, DC 20036

ATLANTIC STATES MARINE FISHERIES COMMISSION

NORTHERN SHRIMP SECTION

LEGISLATOR

GOVERNOR'S APPOINTEE

ADMINISTRATOR

Maine

Spencer Apollonio, Commissioner
ME Department of Marine Resources
State House - Station 21
Augusta, ME 04333

Donald V. Carter
Representative
7 Baker Street, Boc 544
Winslow, ME 04901

Louis Zglobicki
31 Harding Avenue
Falmouth, ME 04105

New Hampshire

Edward W. Spurr
Supervisor of Fisheries Research
NH Fish and Game Department
34 Bridge Street
Concord, NH 03301

George I. Wiggins
State Senator
Legislative Office Bldg.
Room 212
Concord, NH 03301

Herbert Drake
130 Harbor Road
Rye, NH 03870

Massachusetts

Philip G. Coates, Director
MA Division of Marine Fisheries
Department of Fisheries, Wildlife,
and Environmental Law Enforcement
Leverett Saltonstall State Office Bldg.
100 Cambridge Street
Boston, MA 02202

Elizabeth R. Stromeyer
36 Nye Lane
Buzzards Bay, MA 02532

EX OFFICIO

Atlantic States Marine Fisheries Commission

Irwin M. Alperin
Executive Director
Atlantic States Marine Fisheries Commission
Suite 703
1717 Massachusetts Avenue, NW
Washington, DC 20036

National Marine Fisheries Service

Richard G. Seamans, Jr.
Fishery Administrator
Management Division, Northeast Region
National Marine Fisheries Service
2 State Fish Pier
Gloucester, MA 01930

APPENDIX III

Northern Shrimp Gear Evaluation Study.

SUMMARY AND RECOMMENDATIONS

Northern shrimp, *Pandalus borealis*, is a valuable New England fishery that has developed rapidly during the last decade. Exvessel landings of 28.2 million pounds valued at 3.5 million dollars were recorded in 1969. Since then, symptoms of distress have become evident; count per pound and fishing pressure has increased while total landings have continued to decline. Recognizing a need for management action, the shrimp industry, in unison with the States of Maine, New Hampshire, and Massachusetts and the National Marine Fisheries Service reviewed potential conservation alternatives and selected regulation of gear as a biologically acceptable and economically practical approach to resource management. Based on past research, an interim mesh size regulation was drafted and uniformly adopted by the three States through the Atlantic States Marine Fisheries Commission. In addition, a Northern Shrimp Gear Evaluation study was funded and cooperatively executed by the three States and the National Marine Fisheries Service to determine the most optimum mesh size for shrimping. A Scientific Committee was established to conduct the study and report findings. The study has been completed and the Scientific Committee herein recommends:

1. That the existing interim mesh size regulation be modified to prohibit use of any trawl net, with a stretched mesh opening between knots of less than 1.75 inches;
2. That the above modification provide for tolerances not exceeding 0.15 inches in the body, 0.25 inches in the cod end, and 0.22 inches between any two portions of the same net;
3. That the States of Maine, New Hampshire, and Massachusetts uniformly and expeditiously repromulgate through the Northern Shrimp Section of the Atlantic States Marine Fisheries Commission recommendations 1 and 2 commensurate with consideration for scarcity of twine materials; and
4. That follow-up and monitoring investigations be initiated cooperatively by the three States and the National Marine Fisheries Service at the time the modified regulations are imposed.

Final Report
Northern Shrimp Gear Evaluation Study
Grant In Aid Award No. 04-3043-59
June 1, 1973 to May 31, 1974

Submitted May, 1974

Scientific Committee:

Ronald G. Rinaldo - Haine - Chairman
Dr. B. E. Barrett - New Hampshire
Donald B. MacIsaac - Massachusetts
Keith Smith - National Marine Fisheries Service
Peter D. Colosi, Jr. - NMFS - Shrimp Project Coordinator

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INTRODUCTION

Rational management of a renewable resource requires the cooperation of all groups concerned with the resource. Such is the case with the Northern Shrimp fishery in the Gulf of Maine. In December 1972, action was initiated between the States of Maine, New Hampshire, Massachusetts, industry, and the National Marine Fisheries Service to develop a management program for the Northern Shrimp (*Pandalus borealis*).

A major step taken to control the overexploitation of the shrimp population began in March 1973 with a proposal to study the effects of various trawl designs and mesh sizes on the harvest of shrimp. The proposal was approved by all cooperators and funding was provided by the National Marine Fisheries Service under the State-Federal Fisheries Management Program. The investigation began in July of 1973 after chartering the 60 foot R/V *FRANCIS R* out of Gloucester. Data collection ended in December, 1973.

The three states entered into an interim uniform mesh size agreement by adopting regulations promulgated by the Northern Shrimp Section of the Atlantic States Marine Fisheries Commission (Appendix I). Provision for joint regulatory authority is conveyed through consent to Amendment Number One to the Atlantic States Marine Fisheries Compact (Appendix II). The mesh size adopted was suggested by industry and agreeable to the members of the scientific committee. It will stay in effect until the results and recommendations from this study can be implemented.

The basis for selection of an optimum mesh size resides in the need to permit escapement of a sufficient size to ensure continued recruitment to the fishery. Based on work done and data collected by the State of Maine (Rinaldo, 1973), it is the opinion of the scientific committee that the mesh selected should minimize retention of male shrimp with a carapace length of less than 22 mm.

METHODS AND MATERIALS

To ensure applicability of results, the equipment and techniques employed duplicated as closely as possible the commercial fishery. The areas fished (Jeffreys Basin, Scantum Basin and Stellwagen Bank) were the major shrimping grounds for the fleet during the summer, fall and early winter (Fig. 1). The *FRANCIS R* was under instructions to follow the commercial fleet whenever possible to conduct the experimental tows. The six month period from July to December, 1973, spanned the summer Gloucester fishery into the winter Maine fishery.

The trawl and sampling schedules were designed by the scientific committee. Tows were conducted on the first eight to ten good fishing days of each month. All scheduled one-half hour experimental tows were completed before the two to three hour commercial length tows were conducted. At least one one-half hour control tow was mandatory on all sampling days. The captain of the *FRANCIS R* made the decision where to trawl with the commercial fleet on the shrimping ground. The field director, a Maine Extension Agent, supervised and assisted in the trawl changing. Sampling and data taking were done only by the field director.

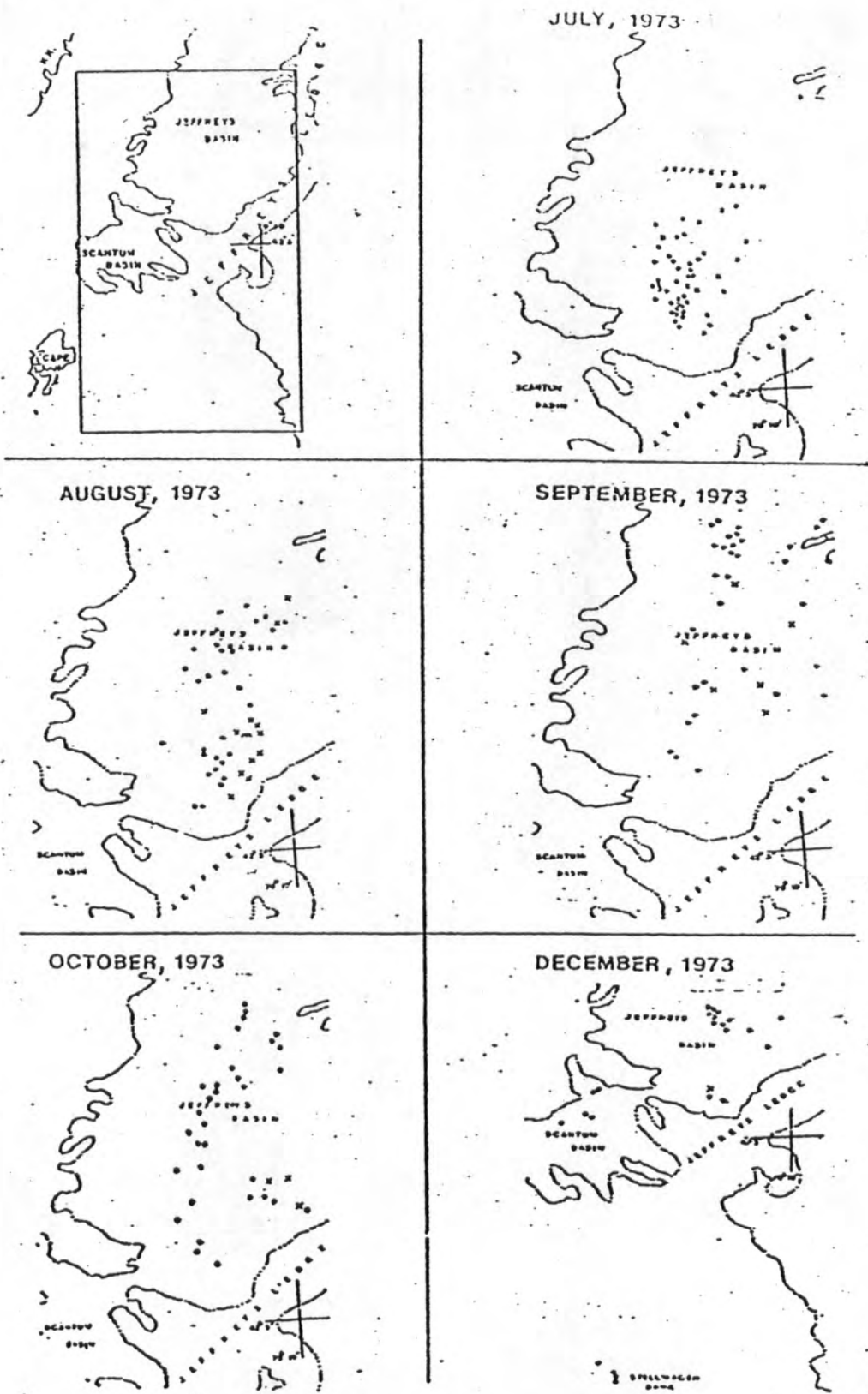


Figure 1, A-E Sampling areas of R/V FRANCIS R. Locations and numbers of research tows are presented by month.

O = one-half hour tow
 X = two hour tow

After N.O.A.A., N.O.S. Chart #1105.

There were three variations in the types and purpose of the tows made during this study. The one-half hour control tow used the 1.25 body and 1.25 inch cod end of 42 thread twine (1.25 x 1.25 H). This trawl caught a representative sample of the population in the towing area. To make this method statistically representative, at least one control tow was made for every area and every day fished with a larger meshed trawl. A minimum of two tows each of the two seam trawl combinations were made, weather permitting. Commercial length tows were made using the trawl configurations outlined in Table 1. These tows were assumed to indicate the amount of plugging by trash fish and mud.

Six trawl bodies and eight cod ends were built. During the study, thirteen combinations of body and cod end were employed. The five, two seam (Yankee 35) trawls with 50' head rope and 70' foot rope rigging ranged from 1.25 to 2.00 inch stretched mesh size. Two 1.25 inch trawls with a 1.25 inch mesh cod end attached were used as the control trawls. The three experimental two seam bodies were 1.50, 1.75 and 2.00 inch stretched mesh. One four seam or box trawl body of 1.75 inch mesh was used with both a 1.50 and 1.75 inch cod end. The eight cod ends, two 1.25, two 1.50, three 1.75, and one 2.00 inch stretched mesh twine were built with thread sizes of 21, 30, 42 and 54 thread (Table 2).

Trawls 1.25 to 2.00 inch mesh size were constructed by a trawl manufacturer according to commercial shrimp trawl standards with minor exceptions. The aft end of the trawl bodies and the mouth of the cod ends had 15 or more two inch steel rings seized to the twine to form a zipper which would facilitate rapid cod end changes.

Table 1. List of trawl body and cod end combinations
of commercial length tows in inches, July-
December 1973.

BODY		COD END (Heavy 42 thread)
1.75	X	1.50 H
1.75	X	1.75 H
1.75 Box	X	1.50 H
1.75 Box	X	1.75 H
2.00	X	1.50 H
2.00	X	1.75 H

Table 2. List of two seam (Yankee 35) trawl body and cod end combinations of research tows, July - December, 1973.

No.	Designation	Wing & Body Mesh & Twine Nominal (commercial) Measure	Cod end mesh & twine Nominal (commercial) measure
1.	1.25x1.25L	1 $\frac{1}{4}$ " 21 thread	1 $\frac{1}{4}$ " 21 thread
2.	1.25x1.25H	1 $\frac{1}{4}$ " 21 thread	1 $\frac{1}{4}$ " 42 thread
3.	1.50x1.50L	1 $\frac{1}{2}$ " 21 thread	1 $\frac{1}{2}$ " 21 thread
4.	1.50x1.50H	1 $\frac{1}{2}$ " 21 thread	1 $\frac{1}{2}$ " 42 thread
5.	1.50x1.25H	1 $\frac{1}{2}$ " 21 thread	1 $\frac{1}{4}$ " 42 thread
6.	1.75x1.75L	1 3/4" 21 thread	1 3/4" 21 thread
7.	1.75x1.75H	1 3/4" 21 thread	1 3/4" 42 thread*
8.	1.75x1.50H**	1 3/4" 21 thread	1 $\frac{1}{2}$ " 42 thread
9.	2.00x2.00L	2" 30 thread	2" 30 thread
10.	2.00x1.75H	2" 30 thread	1 3/4" 42 thread*
11.	2.00x1.50H	2" 30 thread	1 $\frac{1}{2}$ " 42 thread

* Several tows made with 54 thread 1 3/4" cod end.

** Interim mesh

The body rings were attached exteriorly 20 meshes forward of the end forming a skirt inside the cod end. This prevented escape-ment through the zipper (Fig. 2).

Three inch rings spaced two feet apart were seized to the foot rope. This provided a zipper mechanism for attaching the roll gear. The roll gear was constructed in five sections using six 12 inch diameter bosom rollers. Each section adjacent to the bosom section was constructed with alternating rubber and plastic spacers. The end sections were wrapped with 3/4 inch nylon rope. This roll gear was considerably lighter than that normally used by the fishery and prevented mudding of the lighter trawls (Fig. 3).

Net manufacturers measure mesh size from center of knot to center of knot. Thus, a net with a manufacturer's measurement of 1.75 inch stretched mesh may have an actual stretched mesh opening of 1.62 inch or less. Mesh size may increase after use, in warm weather and decrease during cold weather. The degree of increase or decrease depends upon the material, construction technique, and whether it has been dipped in a stiffener or preservative. A larger twine size decreases the mesh opening but the manufacturer's measurement does not change. The effect of these variables required correlation of actual mesh size openings as a means of identifying trawl sizes. All trawls were labeled using manufacturers' designations for mesh size. The stretch mesh opening was measured with the standardized gauge before, during and after the study (Table 3).

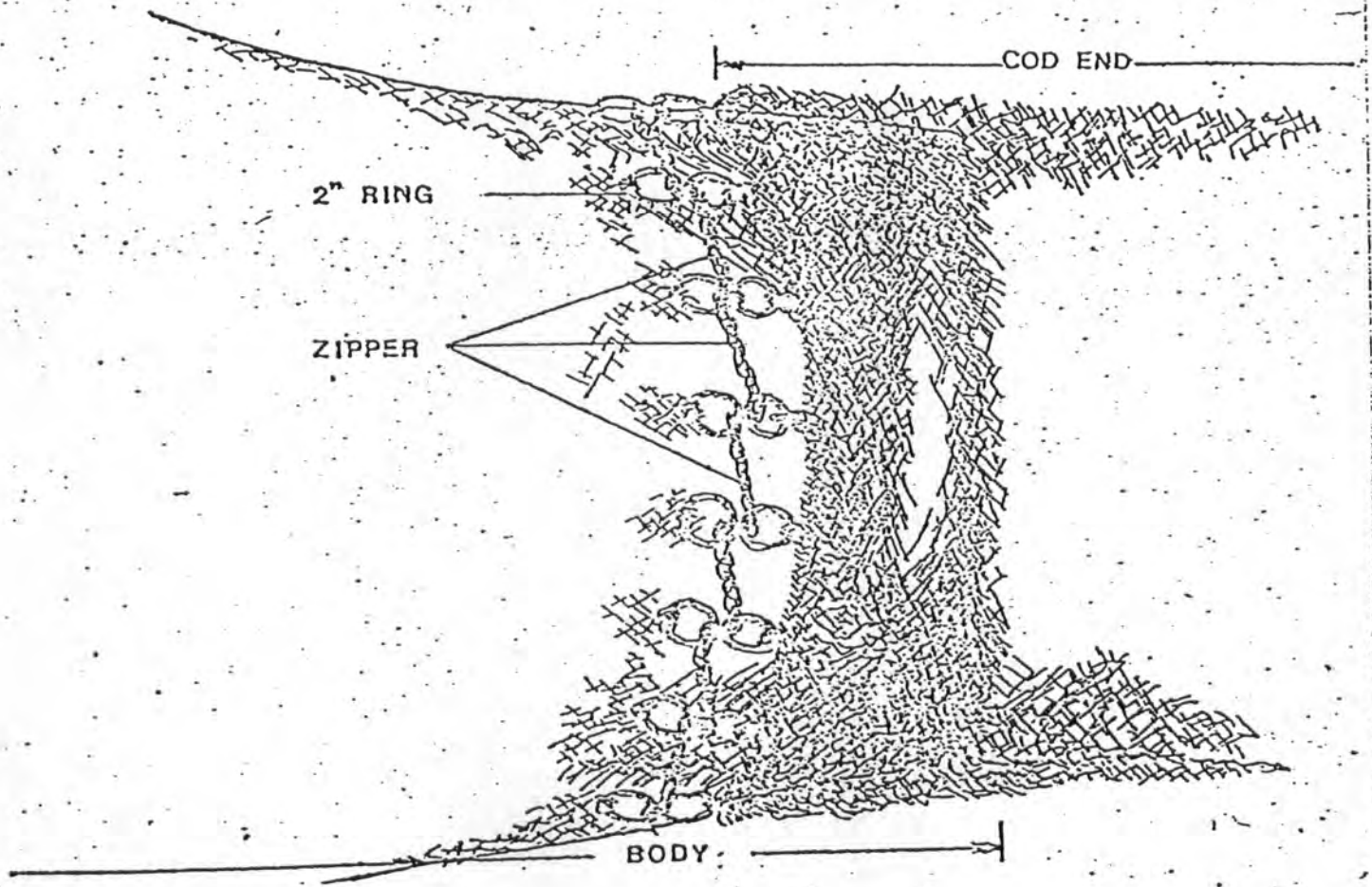


Figure 2 Body and cod end of research trawl showing ring zipper construction.

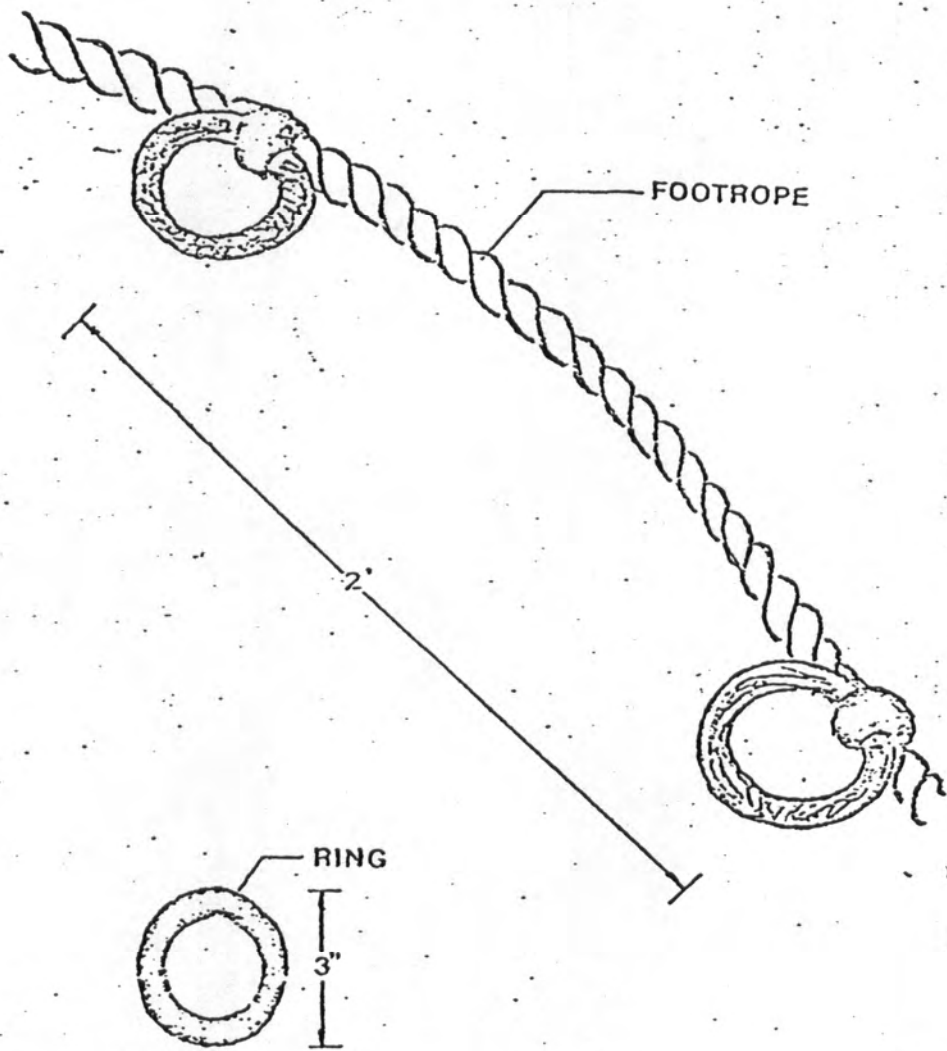


Figure 3 Portion of research trawl footrope showing ring zipper construction.

Table 3: Stretch mesh measurements determined by the standardized wedge gauge, July 6, 1973 (new), November 1, 1973 (used, wet).

		Stretch Mesh Opening (Inches)			
		New Mean Value*	S.E.**	Used Mean Value	S.E.**
2 Seam Nets					
2" 30 thread					
Upper belly		1.90	0.01	--	--
Wings		1.88	0.02	--	--
Cod end		1.92	0.01	1.88	0.00
1-3/4" 21 thread					
Upper belly		1.71	0.01	1.63	0.01
Wings		1.69	0.01	1.63	0.01
Cod end		1.71	0.01	1.63	0.02
1-1/2" 21 thread (dipped)					
Upper belly		1.36	0.05	--	--
Wings		1.29	0.02	--	--
Cod end (not dipped)		1.48	0.01	1.38	0.06
1-1/4" 21 thread (dipped)					
Upper belly		1.04	0.01	0.93	0.03
Wings		1.11	0.01	--	--
Cod end (not dipped)		1.17	0.01	--	--
Box Net					
1-3/4" 21 thread					
Upper belly		1.69	0.01	1.63	0.02
Wings		1.74	0.01	--	--
Cod Ends					
Mesh	Thread				
1"	15	1.09	0.01	Never Used	
1-1/4"	42	1.28	0.01	1.08	0.03
1-1/2"	42	1.49	0.02	1.37	0.05
1-3/4"	42	1.56	0.02	1.50	0.00
1-3/4"	54	1.46	0.03	1.46	0.06

* inches

** standard error

The *FRANCIS R* fished with the commercial fleet until they terminated their shrimping on Jeffreys in October. Adverse weather conditions in November and December forced the *FRANCIS R* to fish closer to port on Scantum Basin and Stellwagen Bank.

The *FRANCIS R* left port and arrived on the grounds approximately one-half hour before sunrise. The captain contacted the fleet to determine the most productive fishing area and the first tow began one hour after sunrise. If the weather remained fair, operations continued to one hour before sunset and the vessel remained on the grounds throughout the night. At sunrise the captain contacted the fleet and resumed operations until dusk. After operations ceased the *FRANCIS R* headed for port.

The crew encountered no problem in completing the required tows within the allotted time period for the months of July through October. Bad weather, rough seas and short days in November and December forced cancellation of the smaller meshed trawl tows (1.50 x 1.25 and 1.50 x 1.50). Preliminary findings indicated that these trawls were too small for consideration as a minimum mesh size. A total of 236 tows were completed during the six month study period. Fifty-three tows each were completed for July and August, 41 tows each for September and October. There were 22 tows completed in November and 26 completed in December.

In developing the trawl schedule the scientific committee took into consideration random sampling, trawl changing time and decreasing fishing day length. Utilizing the zipper method on the roll gear and cod end attachments, cod ends were changed in

15 minutes and entire trawls were changed in one hour. Use of a random sampling format would increase the number of trawl changes. This would increase the sea time and costs to a prohibitive level. Shorter days and rough seas made trawl changes a limiting factor in the number of trawls towed.

A Fisheries Bathythermograph (FBK) was employed, when possible, to record time at depth and temperature at depth of tows. The FBK resembles a trawl float and was attached to one of the wings of the trawl being towed.

Data recorded for each tow included the tow number, area name, wind direction and speed, wave height, cloud cover, water and air temperature, trawl size, wire out, course, RPM, starting time, depth and loran bearing. At the completion of the tow, the time, depth, loran bearing, condition of trawl, bottom type, pounds of shrimp and number (or pounds) and species of by-catch were recorded.

A shovel full of shrimp taken randomly from each tow was cleaned of any trash fish and then bagged in two 18"x8"x4" polyethylene bags placed one inside the other with the date, tow number and trawl size written on the outside. The data sheet was placed in a polybag with the shrimp sample. The sample was kept on ice until the trip ended and then frozen.

A fresh sample of shrimp was taken at the end of each month's sampling. These samples were taken using the control trawl. The samples were transported to the Massachusetts Division of Marine Fisheries, Cat Cove Marine Laboratory, at Salem, for immediate analysis by personnel from Maine and Massachusetts. Each sample

consisted of approximately one thousand cleaned and drained shrimp which were measured, sexed and weighed. A length-weight relationship representative of the shrimp population for each month was calculated from these samples.

Frozen samples were weighed to the nearest gram and the value recorded on the enclosed data sheet. The samples were then thawed by washing them with cool water. Thawing samples with warm or hot water rendered the shrimp soft and in many cases, unmeasurable.

Approximately 500 shrimp from each sample were measured to the nearest 0.1 mm. Carapace lengths were determined from the posterior edge of the right orbit to the latero-posterior limit of the carapace (Fig. 4). If this region was in a damaged condition, the left side was measured. Carapace lengths were classified into 0.5 mm categories.

Non-measurable shrimp (those mechanically damaged or very soft due to molting) were assigned to their respective 0.5 mm class by prorating within a year class. The purpose of prorating was to increase the data base and to improve statistical validity and was accomplished by the following formula:

$$\frac{H}{N} = K$$

Where H equals the number of non-measurable shrimp in a year-class, N is the number of measurable shrimp in the corresponding year-class and K equals the ratio of non-measurables per year-class (Gulland 1966).

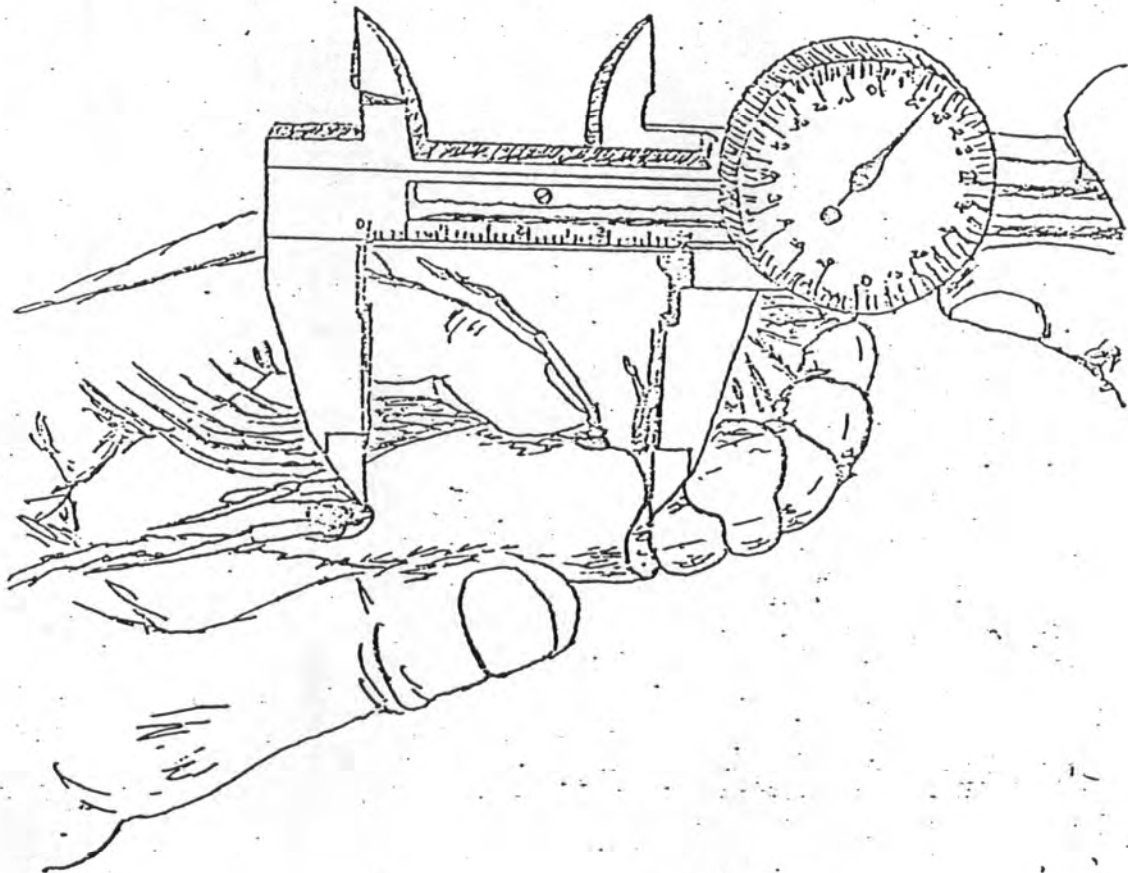


Figure 4 *Pandalus borealis* showing position of carapace measure.

Each 0.5 mm class was tallied and the values were summed to determine the total number of shrimp measured in each sample. Duplicates of all data sheets were made. At the completion of each sampling month, one set of data was sent to the Northeast Fisheries Center at Woods Hole, Massachusetts for calculation and plotting of length frequencies and retention curves. The other set of data was kept on file at Cat Cove Marine Laboratory.

Frequency distributions of carapace lengths and experimental trawl versus control trawl catch selection curves were generated for each two seam trawl for each month. The frequency distributions by 0.5 mm carapace length for each trawl catch were calculated by the formula:

$$f_T = f_S \left(1 + \frac{W_T}{W_S} \right)$$

where f_T = frequency in each 0.5 mm length class for a total catch per one-half hour tow, f_S = frequency in each 0.5 mm length class of the sample measured, W_T = total weight per one-half hour tow and W_S = weight of sample measured per one-half hour tow.

Retention curves for experimental trawls versus control trawls were generated by calculating the percentage retained in each length class of the experimental trawl compared to the control trawl. Trawls with large meshes fished under identical conditions generally envelop more fish (or shrimp) than trawls of the same size and configuration having smaller meshes (Fridman 1969). The superior catching (but not necessarily retaining) power of large mesh trawls required an adjustment factor (λ) to be used as described by Pope (1966) in calculation of retention curves. Thus, for each length class:

$$R = \left(\frac{f_e}{f_c A} \right) 100$$

where $R = \% \text{ retention}$, $f_e = \text{frequency in the experimental tow}$, $f_c = \text{frequency in the control tow}$ and $A = \text{adjustment factor}$.

Factor "A" is explained as follows: small mesh trawls capture and retain more smaller individuals than do larger mesh trawls, but at some size group the retention of the larger mesh trawl "catches up" with the smaller trawl. At this size group (length class) $f_e/f_c = 1$. For larger size groups beyond this point, f_e/f_c is greater than 1. Factor "A" is the sum of all shrimp larger than the size where $f_e/f_c = 1$ taken by the experimental trawl divided by the sum of all shrimp larger than this size taken by the control trawl. Therefore: $A = \Sigma f_e / \Sigma f_c$, beyond size $f_e/f_c = 1$.

RESULTS

Analyses have been made of one-half hour trawl tows made during the tenure of this study. At least two tows were made each month (weather permitting) with each experimental trawl. Catches taken with the experimental trawls were compared with catches taken with the control trawl (designated No. 2 in Table 2). Trawls were numbered as in Table 2 and designated as such on all computer plots of frequency distributions and retention curves.

To permit a graphic overview of the many retention curves produced during the study, summary points and lines were plotted as shown in figures 5 through 11. Our concern here is trawl retention and, for comparison purposes, only the points at 25%, 50%, 75% and 100% are plotted. These points are averages taken

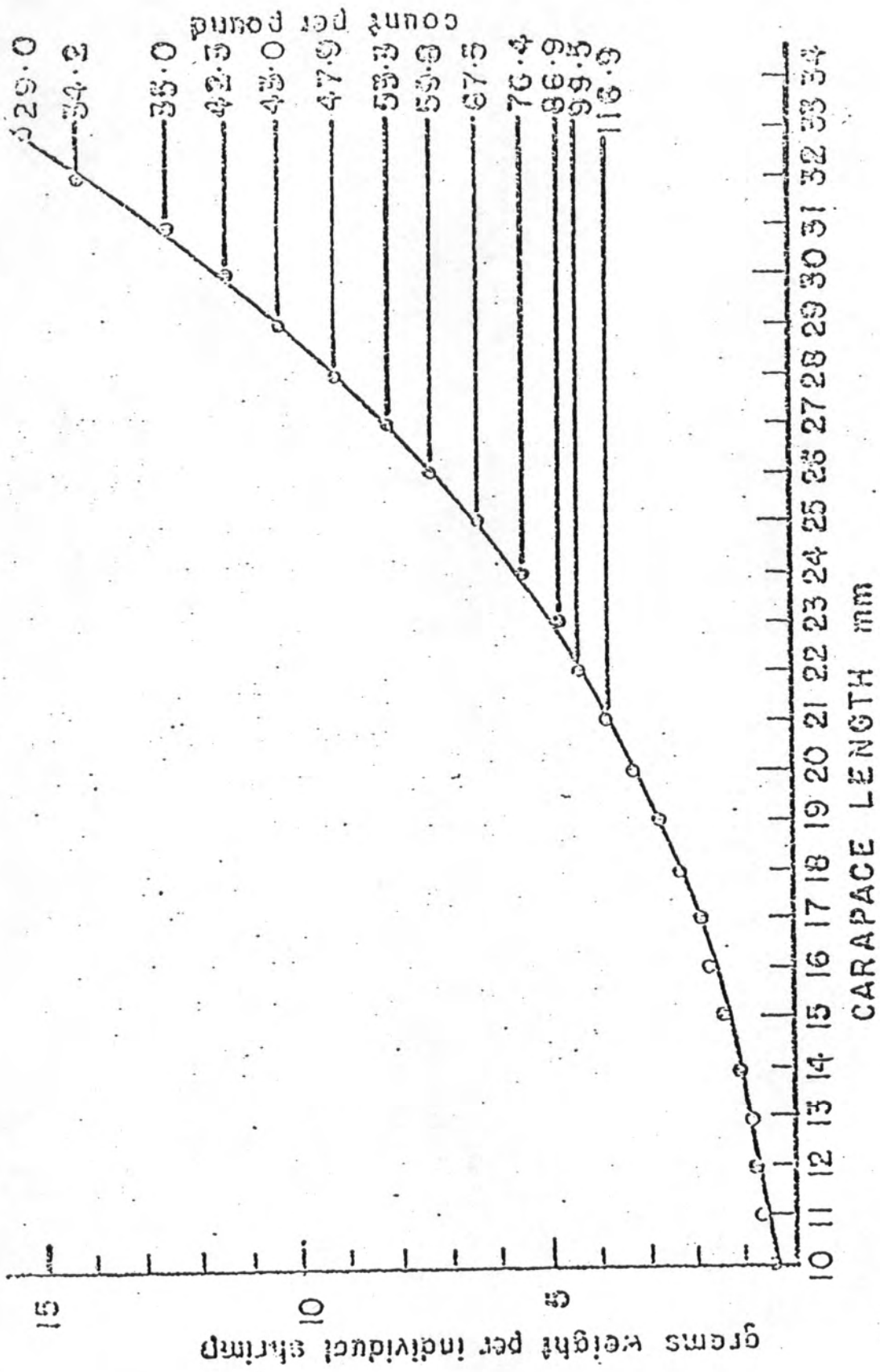


Figure 5 Carapace length, weight, count per pound relationship of total catch, July through December.

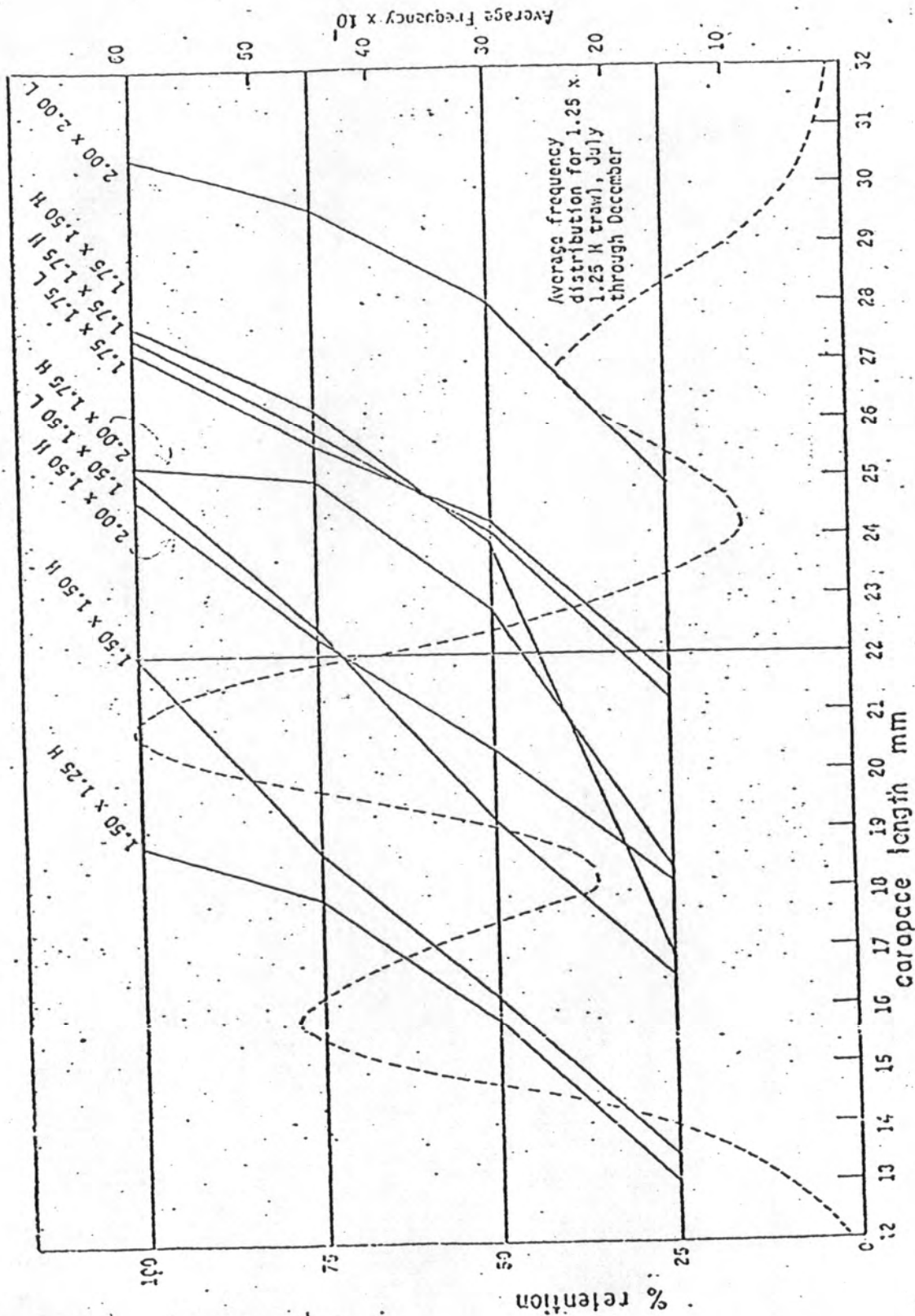


Figure 6 Twenty-five, fifty, seventy-five, and one hundred percent retention indices by carapace length for experimental trawls, July through December.

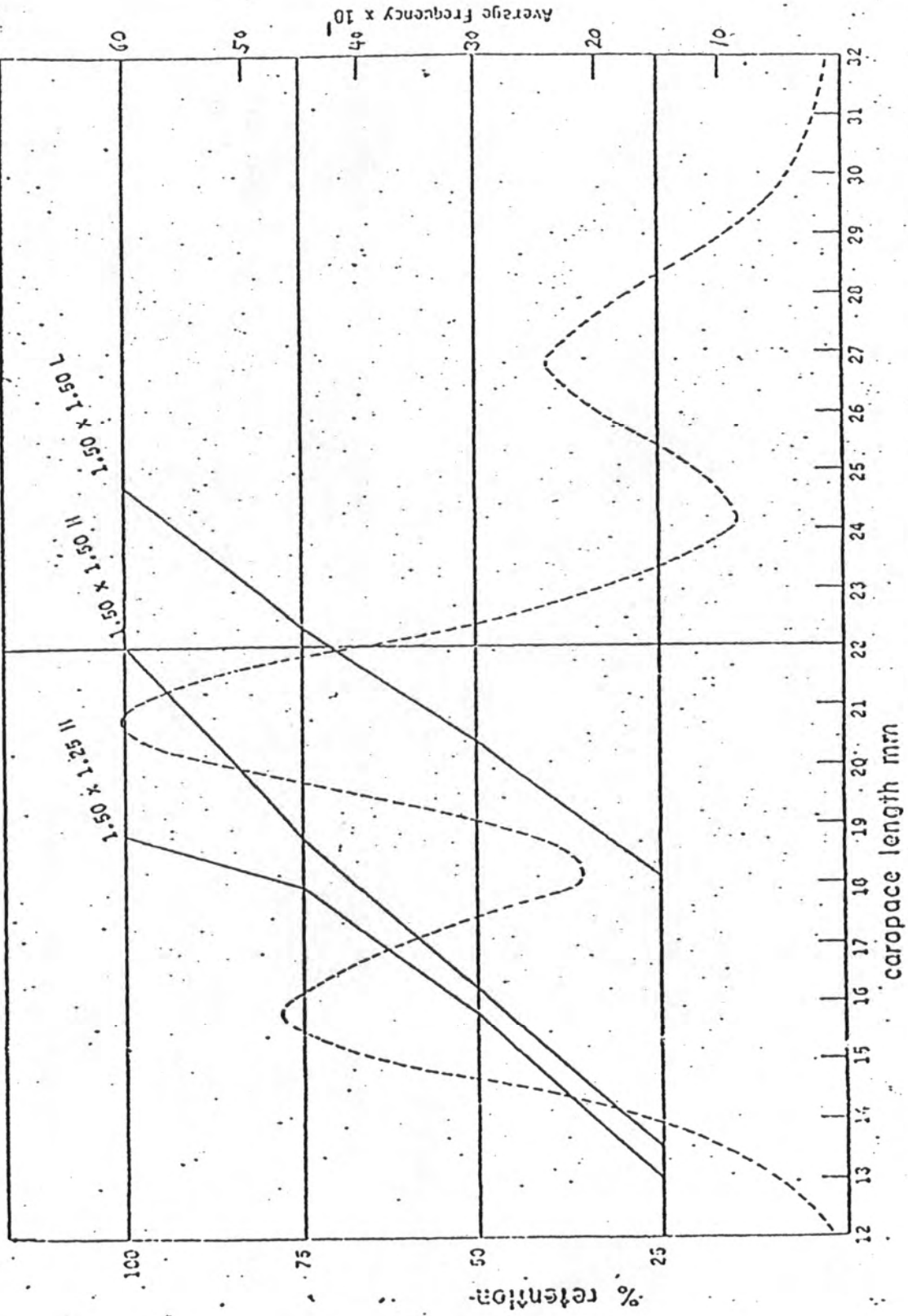


Figure 7 Twenty-five, fifty, seventy-five, and one hundred percent retention indices by carapace length for 1.50 inch body trawls with different cod ends.

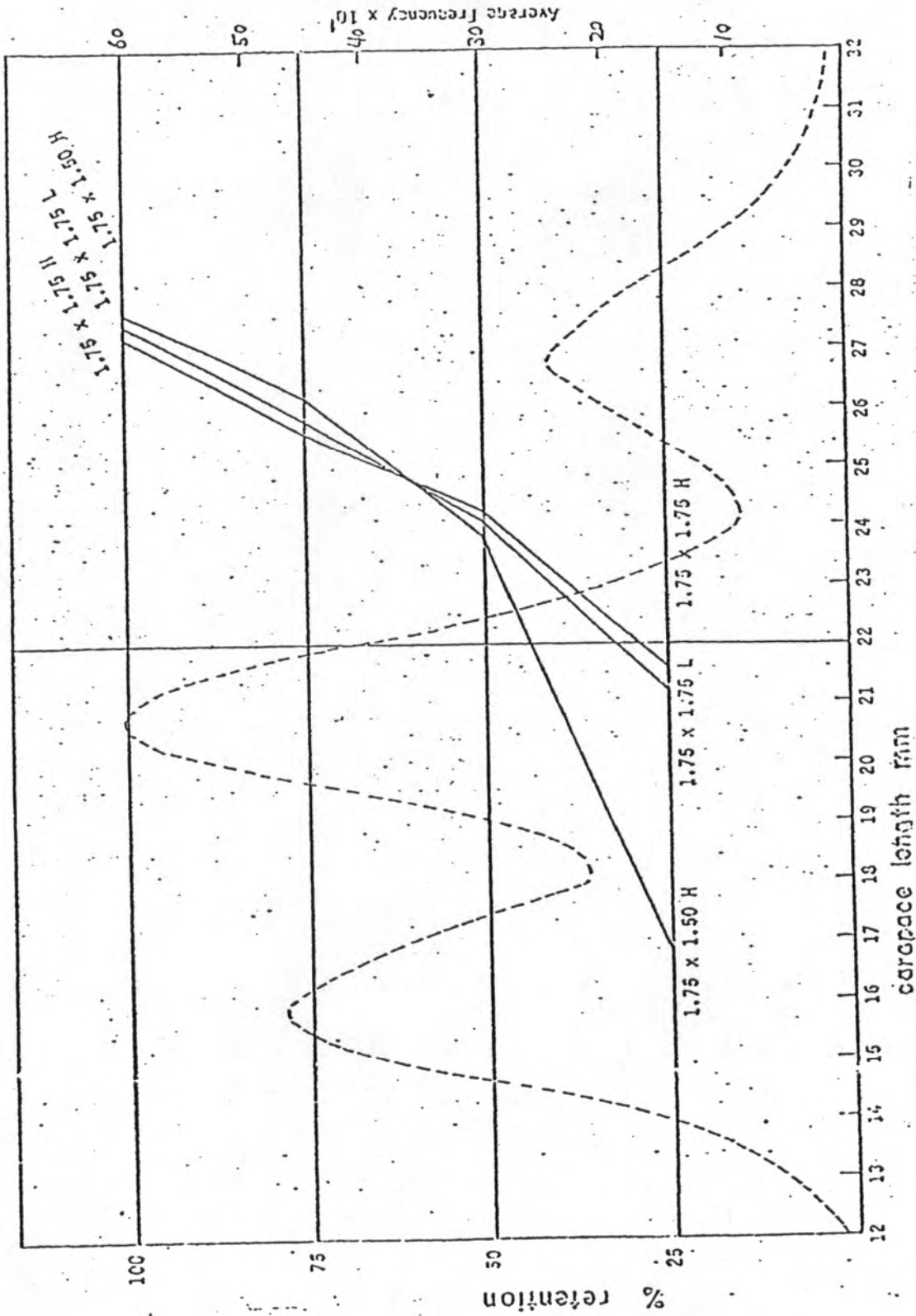


Figure 8 Twenty-five, fifty, seventy-five, and one hundred percent retention indices by carapace length for 1.75 inch body trawls with different cod ends.

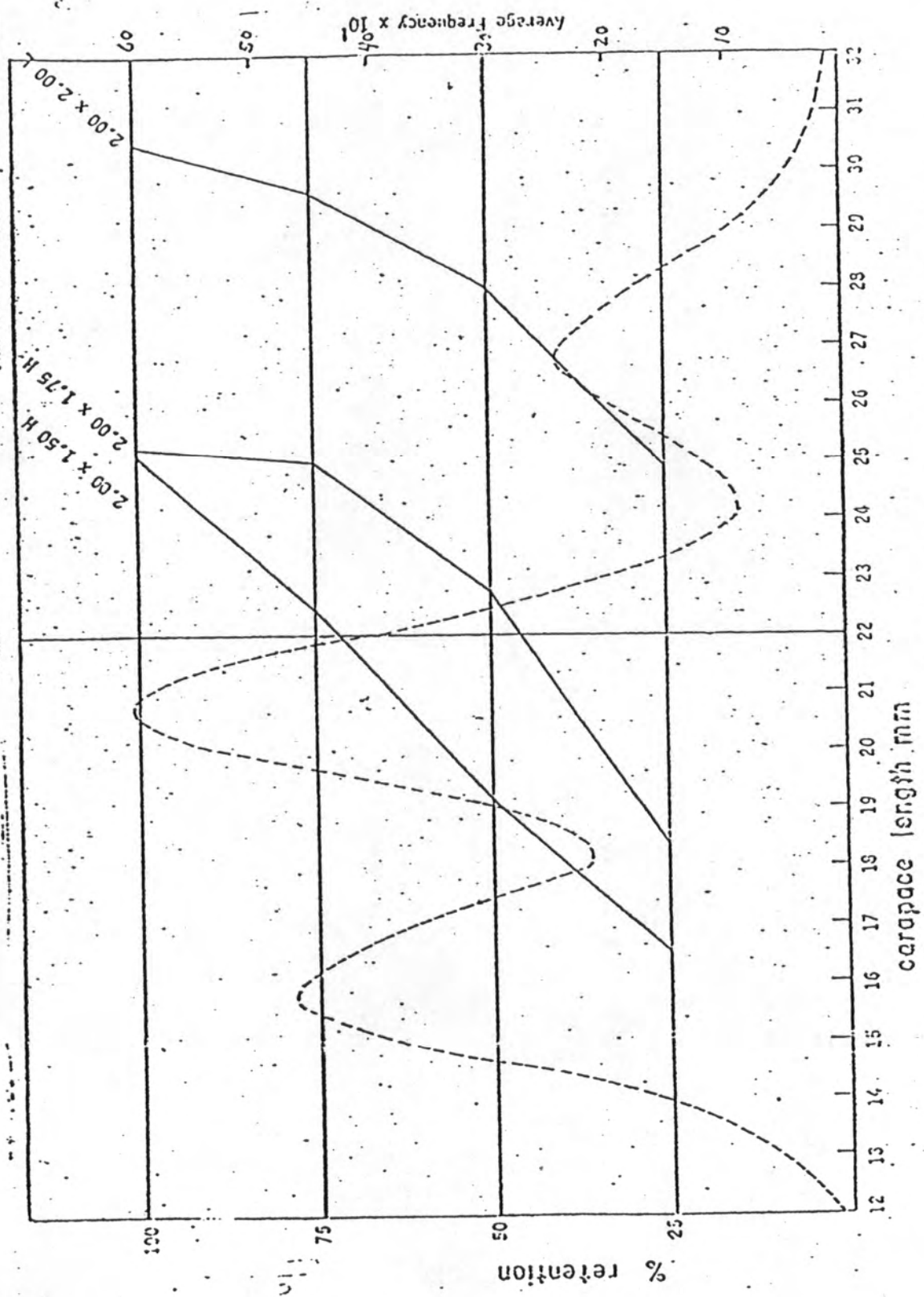


Figure 9 Twenty-five, fifty, seventy-five and one hundred percent retention indices by carapace length for 2.00 inch body trawls with different cod ends,

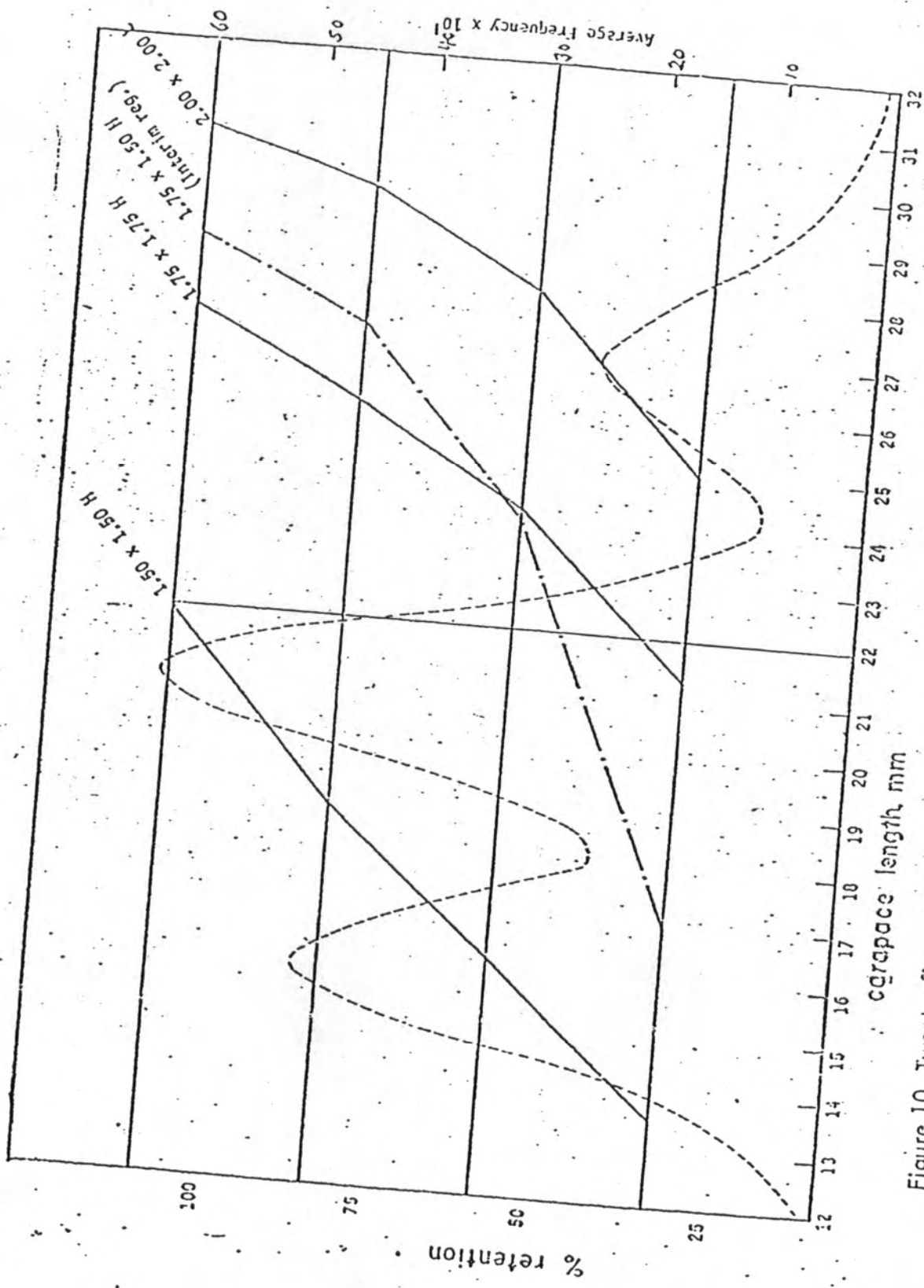


Figure 10 Twenty-five, fifty, seventy-five, and one hundred percent retention indices by carapace length for trawls with uniform body and cod end.

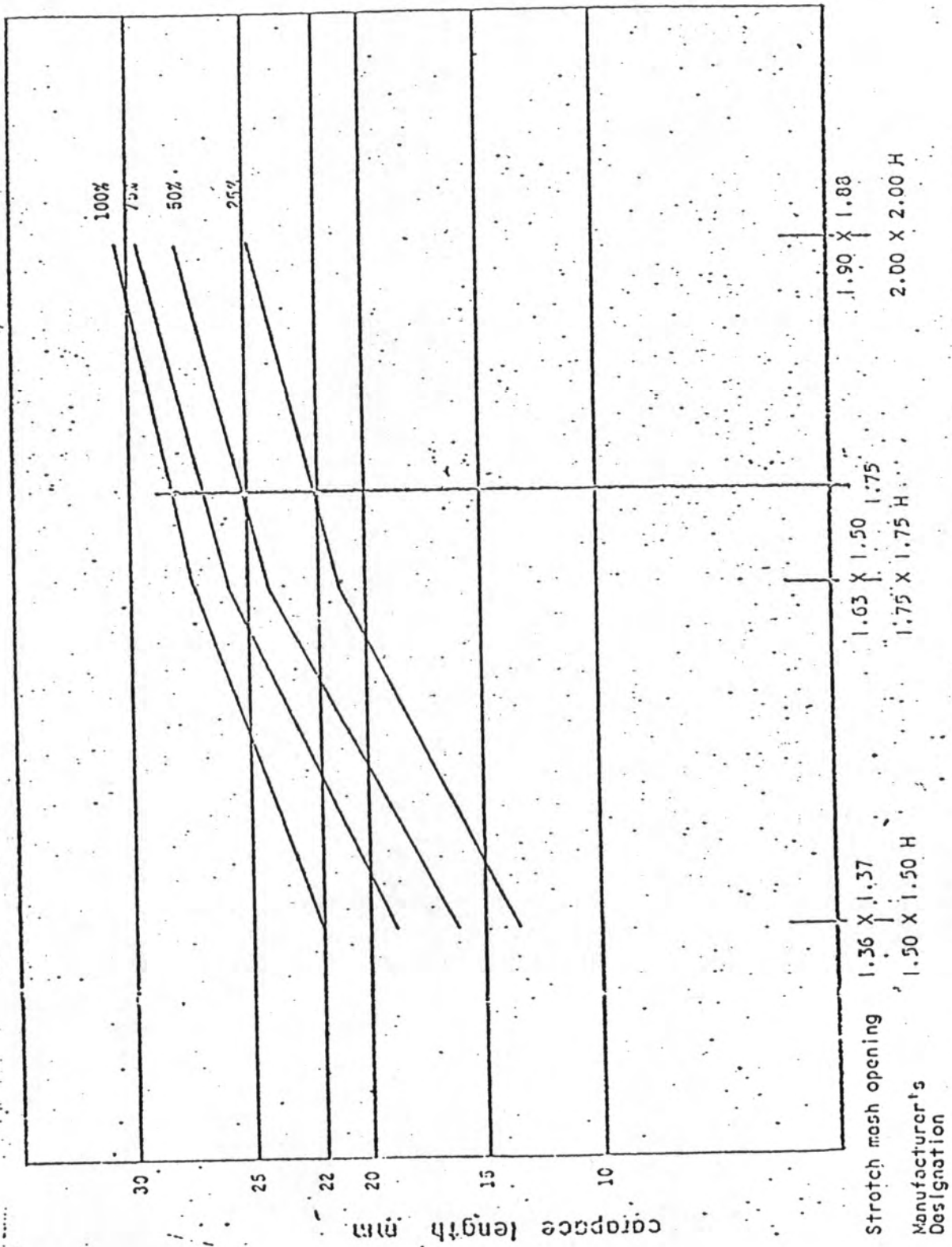


Figure 11 Relationship between twenty-five, fifty, seventy-five, and one hundred percent selection lengths and mesh openings showing the intercepts of uniform trawls and recommended mesh opening.

from each monthly plot of retentions. They were obtained from the individual experimental trawl catch compared to the catches made the same day with the control trawl.

The average frequency distribution of carapace lengths of the shrimp population taken by the control trawl during the entire study period is overlaid in light dashed lines on each retention curve graph. The prominent modes of this curve represent successively the year classes, I (males), II (males), and III and IV (females). The vertical line at the 22 mm carapace length position represents approximately 99 count per pound size.

A length-weight-count per pound curve is presented for reference (Fig. 5). The weights are means of six samples of 1,000 fresh shrimp taken monthly during the study. This may vary from commercial count per pound due to variations in water and trash content. The maximum size shrimp taken in most catches seldom exceeds 33 mm in carapace length.

Retention points for all experimental trawls are plotted in Figure 6 to permit rapid comparison. The numbers on the abscissa represent the carapace lengths of the shrimp expected to be retained and are not trawl designations. The various combinations of trawl bodies and cod ends result in a somewhat irregular pattern of retention.

Figure 7 presents the simplified summary of selection curves for 1.50 inch body trawls with 1.25, 1.50 H and 1.50 L inch cod ends. The relative sequence of retention is as would be expected. The 1.25 H cod end retains a much higher percentage of small shrimp, attaining 100% at the 19 mm length class. The 1.50.H cod end retains 100% at the 22 mm length class and the 1.50 L cod end reaches 70% retention at the 22 mm length.

Curves for 1.75 inch body trawls indicate a very uniform selection at the 50%, 75%, and 100% retention points (Fig. 8). The prominent difference is that the 1.50 H cod end retains more shrimp below the 24 mm length although it retains only 43% of the 22 mm shrimp and 25% at the 16.8 mm length. The 1.75 x 1.50 H trawl represents the current interim mesh regulation. It does not provide as much escapement as the 1.75 H and 1.75 L cod ends. These two cod ends retain better than 50% of all shrimp above 24 mm and releases the recruitment nearly all below 22 mm length.

The 2.00 inch trawls obviously permit extensive escapement, especially the 2.00 x 2.00 L trawl (Fig. 9). The 2.00 x 1.75 H and 2.00 x 1.50 H trawls retained large percentages of small shrimp (22 mm and smaller). It appears from the selection curves that the 2.00 inch body trawl with smaller cod ends are in fact the most efficient of the trawls tested. They take large quantities of all sizes of shrimp and retain a higher proportion of smaller (one and two year olds) as well as larger sizes.

Different combinations of twine change the hydrodynamic character of the trawl. With the change in water flow, tension on the various parts of the trawl produce a different opening force (Fridman, 1969). In addition to the opening of the mesh the flow characteristics in and around the net may be affected (High, 1967). The behavior of shrimp may change with either of these factors (Ko et. al., 1970). If behavior is related to size as was reported for other species of shrimp, it may account for different size selection. Behavior and opening differences could account for the increased retention of smaller sized shrimp in the nets with smaller cod ends.

Therefore, we recommend that a 1.75 inch inside stretch mesh opening throughout the body and the cod end be adopted. Twine exhibits variation in stretch mesh opening and commercial trawl cod ends are often a heavier thread size than the bodies (Table 3). Because of these variations a tolerance of 0.15 inch in the body and 0.25 inch in the cod end is applied to the recommended stretch mesh opening. This provides optimum return to the fishermen with a firm legal basis for measurement, enforcement and the best selectability of the stock.

The 1.75 inch stretch mesh opening trawl provides good escapement for smaller shrimp while efficiently retaining those females exposed to the gear. There is, however, a very narrow margin of tolerance for this retention pattern. The tolerance range for the body is 1.60 inch to 1.90 inch, and the range for the cod end is 1.50 inch to 2.00 inch. If a 1.90 inch body and 1.50 inch cod end were used it would be the same trawl manufacturers designated as 2.00 x 1.75 H. Figures 6 and 9 show that this trawl retains 30-40% of the mature male year class and allows no escapement of the females.

The interim regulation trawl, 1.75 x 1.50 H, selects the same male portion as the 2.00 x 1.75 H trawl, but allows female escapement. The stretched mesh opening of the interim trawl body is 1.63 inches and the cod end is 1.37 inches (Table 3), a difference between body and cod end of 0.26 inch.

If a recommended 1.75 x 1.75 H trawl is used, less than 25% of the mature male size group is retained, with some female escapement occurring. The difference between body and cod end on this trawl is 0.17 inch.

Retention curves of trawls with uniformly meshed bodies and cod ends are plotted in Figure 10, with the 1.75 x 1.50 H interim regulation trawl represented by the dashed lines. The 1.75 inch body trawls satisfactorily provide escapement of one and two year old shrimp. Both lines cross the 50% retention point at the 24 mm carapace length class.

Retention lines at 25%, 50%, 75%, and 100% are plotted for three trawls of uniform body and cod end mesh size (Fig. 11).

The lower curve of Figure 12 is the average frequency distribution of catches taken by the control trawl. The ordinate scale is greatly reduced from that on earlier figures to permit the comparison intended. The upper curve is a plot of the weight in grams of the total number of shrimp in each carapace length class. This curve, combined with the experimental length-weight relation shown in Figure 5 should be considered when evaluating the catch and retention curves.

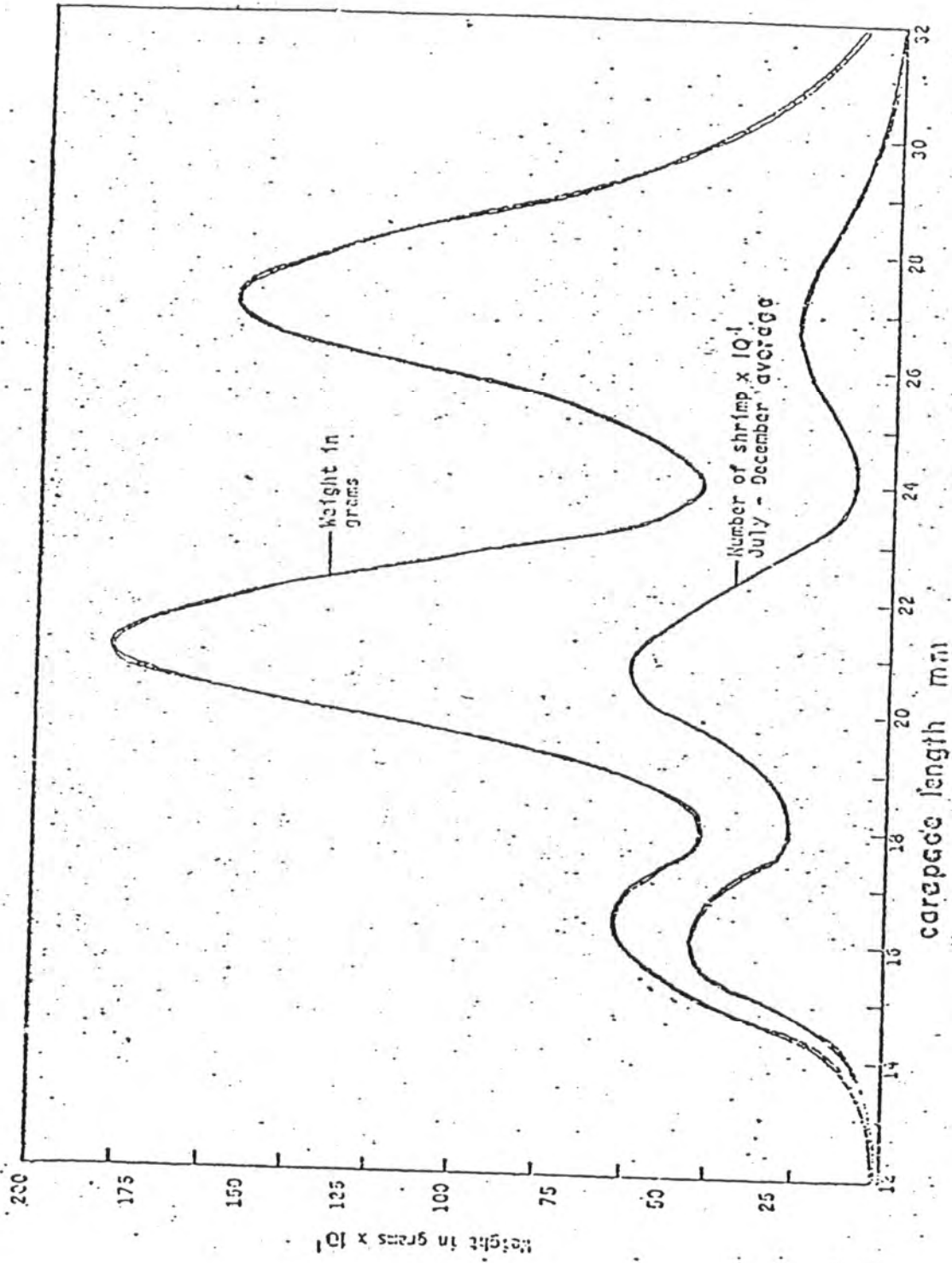


Figure 12 Numbers, and corresponding weight distribution of the total catch by carapace length.

DISCUSSION

This study was designed to determine the selectivity of a range of mesh sizes relative to *Pandalus borealis* count per pound and carapace length. This selectivity was then applied to consideration of optimum resource utilization.

The first objective (the physical aspect of the study) was successfully completed. A series of retention curves relating individual trawl selectability to carapace length and count per pound are presented.

We compared the selectability of the Yankee 35 (two seam) against a four seam box trawl of uniform mesh and thread size and found no significant difference. There was no difference detected between the selectivity of a trawl when it was towed for one-half hour and when it was towed for two or three hours.

An examination of the retention curves showed differences between selectability for trawls with a uniform mesh size and those with combinations of mesh size. Trawls which used smaller mesh in the cod end than in the body often retained more small shrimp. The retention of smaller shrimp does not relate to body or cod end, but rather, the combination of twine sizes. Large mesh sizes select small shrimp when fished in combination. This indicates high total catches, i.e., highest catches per unit effort might be achieved with these trawls. Therefore, uniformity of mesh size is of imperative consideration. The trawl with a 2.00 inch body and a 1.75 inch cod end captured more small shrimp than the 1.75 inch body with any cod end. Trawls with a mixture of mesh sizes do not select in a predictable pattern as do trawls which are of a uniform measure throughout.

The second objective of this study is to recommend a mesh size which would give optimum yield to the fishery and assure adequate recruitment to the stock.

P. borealis is a protandric hermaphrodite. In the Gulf of Maine Apollonio and Dunton (1969) and Rinaldo (1973) indicate that there are no primary females. We are, therefore, dealing with a unit protandric population with larger individuals as females. The large individuals produce a higher population biomass. Relatively small numbers of shrimp represent a relatively high total weight at the upper end of the frequency distribution. This must be kept in mind or the carapace frequency distributions may give the impression that the catch by weight, where predominately larger shrimp are taken, is small. There are two means by which selectability can provide for adequate stock recruitment. One is to take some portion of the female stock. The other is to disregard the concept of harvesting only the females and to harvest some portion of the entire stock. Both methods provide for some escapement of smaller individuals and thus recruitment. The former provides for more escapement of small shrimp than does the latter.

Selection of a portion of the female stock also provides several beneficial aspects not included when harvesting is indiscriminate within the stock. These are the marketability of a uniform and large sized product, a higher price for a superior grade product, and from a biological standpoint, the selection within a given age or size class.

The mesh sizes which select only the female size range are the 2.00 inch mesh trawls. The 2.00 inch meshed trawls select a satisfactory size group; however, the yield in numbers of shrimp is low. The 2.00 x 2.00 L trawl would undoubtedly be unacceptable to the industry. The 1.75 inch body and cod end trawl shows good selectivity and adequate retention plus releasing sufficient numbers of smaller shrimp to ensure recruitment. It retains over 75% of the females available to it.

Some consideration must be given to the tolerances and the real difference in mesh opening between the body and cod end. The difference between the interim and the recommended trawl is the mesh opening of the cod end. The body of both nets is the same. This report demonstrates a significant difference in the selection of mature males by the two nets. This is the reason for recommending a uniform 1.75 trawl. The necessary tolerances of 0.15 inch and 0.25 inch for thread size can produce a trawl which is definitely not a uniform mesh. A uniform net which utilizes the maximum tolerances (0.25 inch) on the cod end and none on the body would catch the same proportion of males as the interim net which has a difference of 0.26 inch between the body and cod end. Ideally the difference between the body and cod end should be 0.17 inch or less, as this was determined to be the difference between the body and cod end of the 1.75 x 1.75 H trawl. In order to provide as much consideration to the commercial fishermen as possible the acceptable difference of 0.17 inch was compromised with the unacceptable difference of 0.26 inch. The midpoint between these two differences (0.22 inch) was considered and found to be acceptable as a maximum difference between the body and cod end of the trawl.

To ensure a relatively uniform mesh size throughout the trawl, there should be a difference of no more than 0.22 inch between the cod end and body measurements. This will provide adequate release of mature males, and sufficient female escapement.

The most obvious and important question is what effect a change in gear selectivity will have on the catch. The answer to this question can be determined by comparing the weight of shrimp escaping and the weight when they again become susceptible to the gear. If the weight of a population of shrimp at mean selection length is less than the exploited portion of the same population when it becomes susceptible to the new mesh size, the landings will increase.

The effect of the new mesh size will be an immediate loss to the fishery. Because the stock will take some time to respond to the new size selection, a time delay will be apparent before the net gain will be realized. The immediate loss will be proportional to the numbers escaping. If a uniform and stable stock is assumed, the immediate loss from the original landings times the gross long term increase will provide an estimate of the new production level. This is compared to the previous landings which are designated as the 100% level. The length of time it takes for these changes to manifest themselves depends upon the growth rate of the escaped shrimp and the rate at which they will be exploited at a later date. Figure 13 represents these findings utilizing the recommended 1.75 inch mesh uniformly constructed trawl. The methods were developed following Gulland (1964).

Immediate loss is expected to be 5 to 6%. Within one-half year, the landings should return to the base level. In 1.5 years the loss experienced during the first half year will be recouped. In three years up to a 22% increase in landings may be realized as the new effective yield.

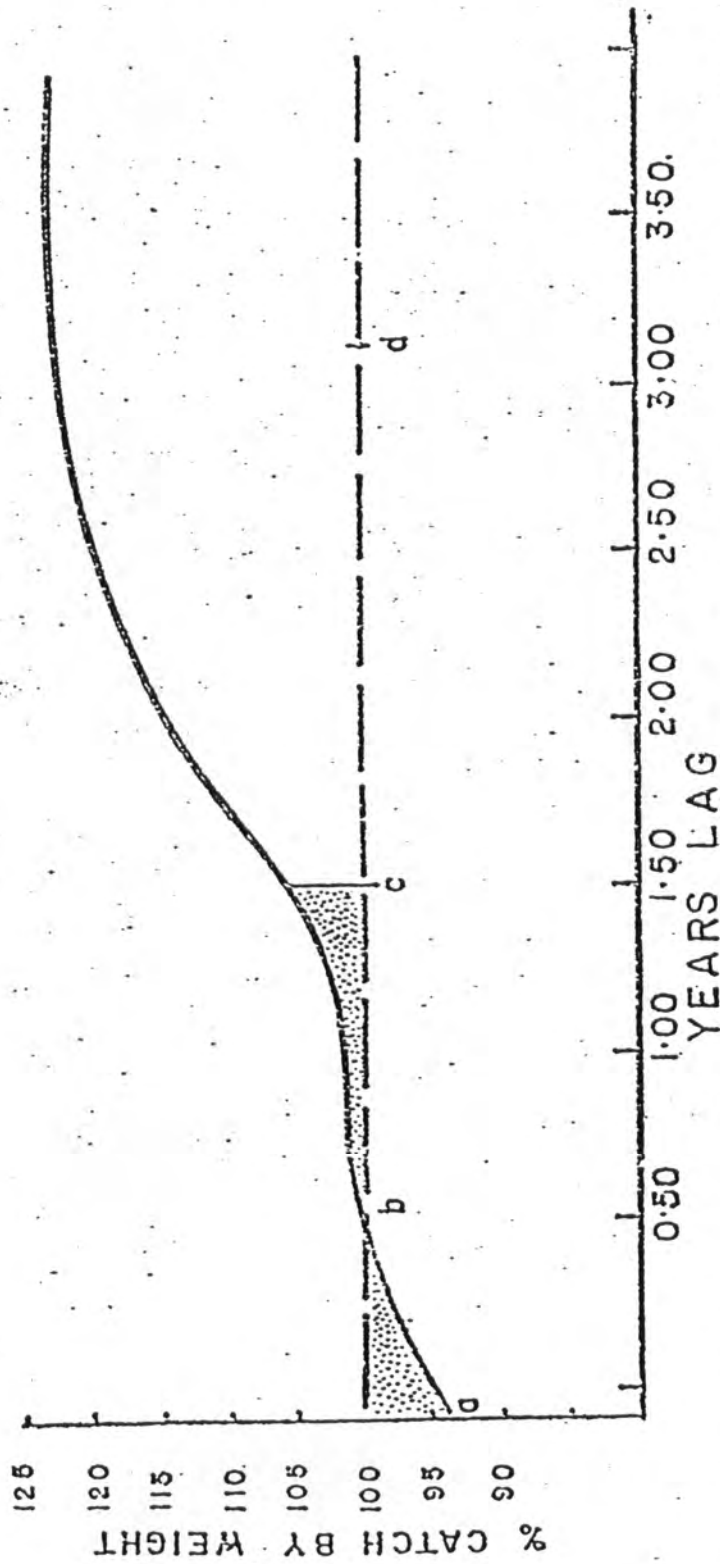


Figure 13 Predicted change in landings subsequent to 1.75 X 1.75 inch mesh regulation: a= initial loss to fishery, b= time at which catch has recovered to previous level, c= point at which biomass is recovered from initial loss, d= time at which new catch level is attained.

These figures represent a predicted time scale with the assumption that the stock remains stable. The current trend in the Gulf of Maine shrimp stock is downward. This trend may offset the predicted increase following the one-half year time lag and this predicted increase could be postponed for up to two years. This postponement is based upon the natural growth period for recruitment. The recommended mesh regulation provides for increased population recruitment and therefore, the landings will begin to increase following one-half a population cycle, e.g., an additional two years.

These projected stock changes may vary with environmental and fishery conditions. Annual assessment of stocks within the Gulf of Maine and changes in the fisheries of the States should be an integral part of sound management. The committee therefore feels that followup and monitoring investigations for purposes of updating data and coordinating projected stock changes with current environmental conditions be initiated at the time the new regulations are imposed.

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ACKNOWLEDGMENTS

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APPENDIX I

Atlantic States Marine Fisheries Commission

Suite 703

1717 Massachusetts Avenue, N.W.

Washington, D. C. 20036

CHAIRMAN:
JAMES E. DOUGLAS, JR.
VIRGINIA MARINE RESOURCES COMMISSION
2401 WEST AVENUE
NEWPORT NEWS, VIRGINIA 23607

EXECUTIVE DIRECTOR:
IRWIN M. ALPERIN
(202) 387-5330

VICE-CHAIRMAN:
SPENCER APOLLONIO
DEPARTMENT OF MARINE RESOURCES
STATE HOUSE ANNEX
AUGUSTA, MAINE 04330

Northern Shrimp Sub-Committee

AN ACT Relating to Nets to Catch Northern Shrimp

Preamble. Whereas, the northern shrimp fishery generates more than \$10,000,000 to the Gulf of Maine coastal economy annually in manufactured product value; and

Whereas, the fishing intensity on Pandalus borealis in the Gulf of Maine has greatly increased during the past few years; and

Whereas, research indicates that the older-year class of shrimp may be seriously depleted; therefore, we are in grave danger of destroying the fishery by overfishing the younger-year classes with present mesh size nets; and

Whereas, continued overfishing will destroy the reproductive ability and eliminate the ability of the stocks to recover from the heavy fishing pressure; and

Whereas, resource extends beyond territorial seas into the Gulf of Maine and provides viable fisheries for three states, Maine, New Hampshire, and Massachusetts; and

Whereas, mesh size regulations must be established to protect small shrimp for the best conservation and management; and

Whereas, in the judgment of the Atlantic States Marine Fisheries Commission, Northern Shrimp Sub-Committee, these facts require the following regulation as immediately necessary for the preservation of the public peace, health and safety; now, therefore, Be it enacted by the Atlantic States Marine Fisheries Commission as follows:

NORTHERN SHRIMP MESH REGULATION

Netting

It is unlawful to fish for, take, transport or have in possession any shrimp (Pandalidae) on board any boat rigged for otter trawling with a mesh opening of less than 1 3/4 inches stretched mesh opening between knots for the body and wings and 1 1/2 inches stretched mesh opening between knots for the extension piece and cod end, or to have on board any net, netting, or portions thereof, with an opening less than 1 1/2 inches stretched mesh opening between knots.

Tolerance: Due to the differences of net manufacturer mesh measurements and the mesh measurements used for enforcement of this law, and other inherent variables, a tolerance of 1/8 inch may be applied to the average mesh size.

All netting used to catch shrimp shall be of one layer only, with no liners of any kind attached. It shall be lawful to attach chafing gear to the lower half of the circumference of the cod end.

Exception: Herring seines or purse seines may be transported from one location to another provided a permit is obtained from a fisheries enforcement officer or the state fisheries agency.

1. Method of measurements. Mesh sizes are measured by a flat wedge-shaped gauge having a taper of 4 cm in 20 cm and a thickness of 2.3 mm, inserted into the meshes under a pressure or pull of 1.90 kg. The mesh size of a net shall be taken to be the average of the measurements of a series of any 20 consecutive meshes, at least 10 meshes from the lacings, and when measured in the cod end of the net beginning at the after end and running parallel to the long axis.

2. Regulations in effect. This interim regulation shall take effect when approved by the Commissioners of the Northern Shrimp Sub-Committee of the Atlantic States Marine Fisheries Commission, and this interim regulation shall remain in effect until optimum mesh size is determined and repromulgated by the Northern Shrimp Sub-Committee of the Atlantic States Marine Fisheries Commission.

3. Penalty. Whoever violates any provision of this regulation shall be punished by a fine of not less than \$500 nor more than \$1,000 or forfeiture of netting used in the violation, or by imprisonment for not more than six month, or by any combination thereof.

November 19, 1973

The undersigned Commissioners of the Atlantic States Marine Fisheries Commission hereby affirm that the foregoing instrument is an authentic copy of the regulations of the Northern Shrimp Section (ASMFC) executed at Portsmouth, New Hampshire, November 19, 1973.

Spencer Apollonio
Commissioner from Maine

Edward B. Lewis
Commissioner from Maine

Bernard J. Lewis
Commissioner from Maine

Richard G. Seamans, Jr.
Commissioner from New Hampshire

Eileen Foley
Commissioner from New Hampshire

Robert H. Forste
Commissioner from New Hampshire

Philip G. Coates
Proxy for Arthur W. Brownell
Commissioner from Massachusetts

Stanley J. Zarod
Commissioner from Massachusetts

Frank J. Bachoff
Commissioner from Massachusetts

ATTEST:

Irwin M. Alperin
Executive Director
Atlantic States Marine Fisheries
Commission
Washington, D. C.

APPENDIX II

Public Law 539, 77th Congress
Chapter 283, 2nd Session, 56 Stat. 267
As Amended by Public Law 721, 81st Congress
Approved August 19, 1950

AN ACT

Granting the consent and approval of Congress to an interstate compact relating to the better utilization of the fisheries (marine, shell, and anadromous) of the Atlantic seaboard and creating the Atlantic States Marine Fisheries Commission.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that the consent and approval of Congress is hereby given to an interstate compact relating to the better utilization of the fisheries (marine, shell, and anadromous) of the Atlantic seaboard and creating the Atlantic States Marine Fisheries Commission, negotiated and entered into or to be entered into under the authority of Public Resolution Numbered 79, Seventy-sixth Congress, approved June 8, 1940, and now ratified by the States of Maine, New Hampshire, Massachusetts, Rhode Island, New York, New Jersey, Delaware, Maryland, and Virginia, which compact reads as follows:

The contracting states solemnly agree:

Article I

The purpose of this compact is to promote the better utilization of the fisheries, marine, shell and anadromous of the Atlantic seaboard by the development of a joint program for the promotion and protection of such fisheries, and by the prevention of the physical waste of the fisheries from any cause. It is not the purpose of this compact to authorize the states joining herein to limit the production of fish or fish products for the purpose of establishing or fixing the price thereof, or creating and perpetuating monopoly.

Article II

This agreement shall become operative immediately as to those states executing it whenever any two or more of the states of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia and Florida have executed it in the form that is in accordance with the laws of the executing state and the Congress has given its consent. Any state contiguous with any of the aforementioned states and riparian

upon waters frequented by anadromous fish, flowing into waters under the jurisdiction of any of the aforementioned states, may become a party hereto as hereinafter provided.

Article III

Each state joining herein shall appoint three representatives to a Commission hereby constituted and designated as the Atlantic States Marine Fisheries Commission. One shall be the executive officer of the administrative agency of such state charged with the conservation of the fisheries resources to which this compact pertains or, if there be more than one officer or agency, the official of that state named by the governor thereof. The second shall be a member of the legislature of such state designated by the Commission or Committee on Interstate Cooperation of such state, or if there be none, or if said Commission on Interstate Cooperation cannot constitutionally designate the said member, such legislator shall be designated by the governor thereof; provided, that if it is constitutionally impossible to appoint a legislator as a commissioner from such state, the second member shall be appointed by the governor of said state in his discretion. The third shall be a citizen who shall have knowledge of and interest in the marine fisheries problem, to be appointed by the governor. The Commission shall be a body corporate with the powers and duties set forth herein.

Article IV

The duty of the said Commission shall be to make inquiry and ascertain from time to time such methods, practices, circumstances and conditions as may be disclosed for bringing about the conservation of the prevention of the depletion and physical waste of the fisheries, marine, shell and anadromous, of the Atlantic seaboard. The Commission shall have power to recommend the coordination of the exercise of the police powers of the several states within their respective jurisdictions to promote the preservation of those fisheries and their protection against overfishing, waste, depletion or any abuse whatsoever and to assure a continuing yield from the fisheries resources of the aforementioned states.

To that end the Commission shall draft and, after consultation with the Advisory Committee hereinafter authorized, recommend to the governors and legislatures of the various signatory states legislation dealing with the conservation of the marine, shell and anadromous fisheries of the Atlantic seaboard. The Commission shall, more than one month prior to

any regular meeting of the legislature in any signatory state, present to the governor of the state its recommendations relating to enactments to be made by the legislature of that state in furthering the intents and purposes of this compact.

The Commission shall consult with and advise the pertinent administrative agencies in the states party hereto with regard to problems connected with the fisheries and recommend the adoption of such regulations as it deems advisable.

The Commission shall have power to recommend to the states party hereto the stocking of the waters of such states with fish and fish eggs, or joint stocking by some or all of the states party hereto, and when two or more of the states shall jointly stock waters the Commission shall act as the coordinating agency for such stocking.

Article V

The Commission shall elect from its number a Chairman and a Vice Chairman and shall appoint and at its pleasure remove or discharge such officers and employees as may be required to carry the provisions of this compact into effect, and shall fix and determine their duties, qualifications and compensation. Said Commission shall adopt rules and regulations for the conduct of its business. It may establish and maintain one or more offices for the transaction of its business and may meet at any time or place but must meet at least once a year.

Article VI

No action shall be taken by the Commission in regard to its general affairs except by the affirmative vote of a majority of the whole number of compacting states present at any meeting. No recommendation shall be made by the Commission in regard to any species of fish except by the affirmative vote of a majority of the compacting states which have an interest in such species. The Commission shall define what shall be an interest.

Article VII

The Fish and Wildlife Service of the Department of the Interior of the Government of the United States shall act as the primary research agency of the Atlantic States Marine Fisheries Commission, cooperating with the research agencies in each state for that purpose. Representatives of the said Fish and Wildlife Service shall attend the meetings of the Commission.

An Advisory Committee to be representative of the commercial fishermen and the salt water anglers and such other interests of each state as the Commission deems advisable shall be established by the Commission as soon as practicable for the purpose of advising the Commission upon such recommendation as it may desire to make.

Article VIII

When any state other than those named specifically in Article II of this compact shall become a party thereto for the purpose of conserving its anadromous fish in accordance with the provisions of Article II the participation of such state in the action of the Commission shall be limited to such species of anadromous fish.

Article IX

Nothing in this compact shall be construed to limit the powers of any signatory state or to repeal or prevent the enactment of any legislation or the enforcement of any requirement by any signatory state imposing additional conditions and restrictions to conserve its fisheries.

Article X

Continued absence of representation or of any representative on the Commission from any state party hereto shall be brought to the attention of the governor thereof.

Article XI

The states party hereto agree to make annual appropriations to the support of the Commission in proportion to the primary market value of the products of their fisheries, exclusive of cod and haddock, as recorded in the most recent published reports of the Fish and Wildlife Service of the United States Department of the Interior, provided no state shall contribute less than two hundred dollars per annum and the annual contribution of each state above the minimum shall be figured to the nearest one hundred dollars.

The compacting states agree to appropriate initially the annual amounts scheduled below, which amounts are calculated in the manner set forth herein, on the basis of the catch record of 1938. Subsequent budgets shall be recommended by a majority of the Commission and the cost thereof allocated equitably among the states in accordance with their respective interests and submitted to the compacting states.

SCHEDULE OF INITIAL STATE CONTRIBUTIONS

Maine.	\$ 700	Delaware.	\$ 200
New Hampshire.	200	Maryland.	700
Massachusetts.	2,300	Virginia.	1,300
Rhode Island	300	North Carolina.	600
Connecticut.	400	South Carolina.	200
New York	1,300	Georgia	200
New Jersey	800	Florida	1,500

Article XII.

This compact shall continue in force and remain binding upon each compacting state until renounced by it. Renunciation of this compact must be preceded by sending six months' notice in writing of intention to withdraw from the compact to the other states party hereto.

SEC. 2. Without further submission of said compact, the consent and approval of Congress is hereby given to the States of Connecticut, North Carolina, South Carolina, Georgia, and Florida, and for the purpose of the better utilization of their anadromous fisheries, to the States of Vermont and Pennsylvania, to enter into said compact as signatory States and as parties thereto, in addition to the States which have now ratified the compact.

SEC. 3. The Atlantic States Marine Fisheries Commission constituted by the compact shall make an annual report to Congress not later than sixty days after the beginning of each regular session thereof. Such report shall set forth the Activities of the Commission during the calendar year ending immediately prior to the beginning of such session.

SEC. 4. The right to alter, amend, or repeal the provisions of sections 1, 2 and 3 is hereby expressly reserved, (approved May 4, 1942); provided that nothing in this compact shall be construed to limit or add to the powers or the proprietary interest of any signatory state or to repeal or prevent the enactment of any legislation or the enforcement of any requirement by a signatory state imposing additional conditions and restrictions to conserve its fisheries. Added by P.L. 721, 81st Congress, 2d Session, approved August 19, 1950.

AMENDMENT NUMBER 1

The States consenting to this amendment agree that any two or more of them may designate the Atlantic States Marine Fisheries Commission as a joint regulatory agency with such powers as they may jointly confer from time to time for the regulation of the fishing operations of the citizens and vessels of such designating States with respect to specific fisheries in which such States have a common interest. The representatives of such States on the Atlantic States Marine Fisheries Commission shall constitute a separate section of such Commission for the exercise of the additional powers so granted provided that the States so acting shall appropriate additional funds for this purpose. The creation of such section as a joint regulatory agency shall not deprive the States participating therein of any of their privileges or powers or responsibilities in the Atlantic States Marine Fisheries Commission under the general compact. (Consented to by Public Law 721, 81st Congress, 2nd Session, approved August 19, 1950.)

Comp. ...
DON FUQUA

Member of Congress
2nd District of Florida

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entitled on account of previous service rendered to the United States or District of Columbia governments."

Approved August 19, 1950.

[CHAPTER 763]

AN ACT

Granting the consent and approval of Congress to an amendment to the Atlantic States Marine Fisheries Compact, and repealing the limitation on the life of such compact.

August 19, 1950
[H. R. 7887]
[Public Law 771]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent and approval of Congress is hereby given to an amendment to the Atlantic States Marine Fisheries Compact, as consented to in Public Law 539, Seventy-seventh Congress (56 Stat. 267), which amendment has now been ratified by the States of Maine, New Hampshire, Massachusetts, Rhode Island, Pennsylvania, and North Carolina and reads substantially as follows:

Atlantic States Marine Fisheries Compact, amendment.

"AMENDMENT NUMBER 1

"The States consenting to this amendment agree that any two or more of them may designate the Atlantic States Marine Fisheries Commission as a joint regulatory agency with such powers as they may jointly confer from time to time for the regulation of the fishing operations of the citizens and vessels of such designating States with respect to specific fisheries in which such States have a common interest. The representatives of such States on the Atlantic States Marine Fisheries Commission shall constitute a separate section of such Commission for the exercise of the additional powers so granted provided that the States so acting shall appropriate additional funds for this purpose. The creation of such section as a joint regulatory agency shall not deprive the States participating therein of any of their privileges or powers or responsibilities in the Atlantic States Marine Fisheries Commission under the general compact."

Joint regulatory agency.

SEC. 2. Without further submission of such amendment to the Atlantic States Marine Fisheries Compact, the consent and approval of Congress is hereby given to the States of Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, South Carolina, Georgia, and Florida, now parties to the Atlantic States Marine Fisheries Compact, and to the State of Vermont when it shall enter such compact for the purpose of the better utilization of its anadromous fisheries, to enter into such amendment as signatory States and as parties thereto, in addition to the States which have now ratified the amendment.

Consent of Congress.

SEC. 3. The first section of Public Law 539 of the Seventy-seventh Congress (56 Stat. 267) is hereby amended by striking out "(which shall be operative for not more than fifteen years from the date of the enactment of this Act)": *Provided*, That nothing in this compact shall be construed to limit or add to the powers or the proprietary interest of any signatory State or to repeal or prevent the enactment of any legislation or the enforcement of any requirement by a signatory State imposing additional conditions and restrictions to conserve its fisheries.

SEC. 4. The right to alter, amend, or repeal the provisions of this Act is hereby expressly reserved.

Approved August 19, 1950.

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