AMENDMENT #5 TO THE

FISHERY MANAGEMENT PLAN

FOR ATLANTIC SURF CLAM AND OCEAN QUAHOG FISHERIES

August 1984

Mid-Atlantic Fishery Management Council

in cooperation with the

National Marine Fisheries Service

and the

New England Fishery Management Council

Draft adopted by MAFMC: 21 June 1984 and 1 August 1984
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II. SUMMARY

This Amendment to the Surf Clam and Ocean Quahog Fishery Management Plan (FMP) is intended to revise the surf clam minimum size limit provision to minimize discarding necessary to comply with the current size limit. The FMP currently contains a 5.5" minimum surf clam size limit in the Mid-Atlantic Area. Amendment #4, when implemented, will extend the size limit to the New England Area. The regulations implementing the FMP set a tolerance on the size limit in that 10% of the cages on board a vessel (at least 1 cage) may be reserved from inspection and no more than 240 clams in the remaining cages may be under 5.5", the effect being a combined tolerance of about 19%. When the size limit provision was developed it was understood that it was necessary to tradeoff against conflicting goals. The 5.5" size was considered optimum in terms of the value of the product although maximum yield per recruit (YPR) is 4.75". Clams in any bed generally are mixed in size, so that even the most competent fishermen will catch smaller clams. Therefore, a tolerance was considered necessary to minimize discarding. Discarding was considered wasteful since a considerable portion (perhaps 50-60%) of the discarded clams probably die. The current distribution of the stock has led to discard rates of up to 50% to meet the 5.5" size limit with the current tolerance. This level is considered unacceptable.

The management unit is all surf clams (Spisula solidissima) and all ocean quahogs (Arctica islandica) in the Atlantic FCZ. The objectives of the FMP are:

1. Rebuild the surf clam populations to allow eventual harvest approaching the 50 million pound level, which is the estimate of maximum sustainable yield over the range of the resource, based on the average yearly catch from 1960 to 1976.

2. Minimize economic dislocation to the extent possible consistent with objective 1 and encourage efficiency in the fishery.

3. Prevent the harvest of ocean quahogs from exceeding maximum sustainable yield and direct the fishery toward achieving Optimum Yield.

4. Provide the greatest degrees of freedom and flexibility to all harvesters of these resources consistent with the attainment of the other objectives of this Plan.

5. Optimize yield per recruit.

6. Increase understanding of the conditions of the stocks and fishery.

The FMP currently states: "No person shall harvest or possess surf clams smaller than 5.5" in length". This Amendment would change that provision to read:

> There is a surf clam minimum size limit. After consultation with the Council and opportunity for public comment, the Regional Director shall adjust, by increments no less than 0.25", the surf clam minimum size limit to a value less than 5.5" as necessary, so that discards on average do not exceed 30% of the trip catch. In no event shall the size limit be less than 4.75". When data indicate the clams have grown sufficiently, the limit would be increased, ultimately reaching the 5.5" limit. There is a tolerance of 240 undersized clams per cage but no more than 50 clams per cage under 4.75". If any cage is in violation of the size limit, the entire load is in violation. In adjusting the size limit the Regional Director shall consider current stock assessments, catch reports, and other relevant information concerning the size distribution of the surf clam resource. No person shall harvest or possess surf clams smaller than the minimum size limit.

The Amendment also adds the requirement that all surf clam cages must be tagged before leaving the vessel and that tags may not be removed until cages are emptied at the processing plant. Also, the Amendment adds the provision that all surf clams landed on an authorized FCZ fishing day are assumed to have been caught in the FCZ and are subject to the Federal size limit.

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IV. INTRODUCTION

IV.A. Development of the FMP

The original Surf Clam and Ocean Quahog FMP was approved in November 1977 for the period through September 1979. Amendment #1 extended it through 31 December 1979. Amendment #2 extended it through the end of calendar year 1981. Amendment #3, approved 13 November 1981, extended the FMP indefinitely. Amendment #4, currently in the Secretarial review process, will increase the Optimum Yield (OY) in the New England Area and review the New England Area management regime to minimize the chances of closures.

IV.B. Problem Addressed by this Amendment

The FMP currently contains a 5.5" minimum surf clam size limit in the Mid-Atlantic Area. Amendment #4, when implemented, will extend the size limit to the New England Area. The regulations implementing the FMP set a tolerance on the size limit in that 10% of the cages on board a vessel (at least 1 cage) may be reserved from inspection and no more than 240 clams in the remaining cages may be under 5.5", the effect being a combined tolerance of about 19%.

When the size limit provision was developed it was understood that it was necessary to tradeoff against conflicting goals. The 5.5" size was considered optimum in terms of the value of the product although maximum yield per recruit (YPR) is 4.75". Clams in any bed generally are mixed in size, so that even the most competent fishermen will catch smaller clams. Therefore, a tolerance was considered necessary to minimize discarding. Discarding was considered wasteful since a considerable portion (perhaps 50-60%) of the discarded clams probably die (Haskin, 1975). Haskin (1975) considered the 50-60% to be a minimum estimate. Discard mortality may be greater than the Haskin (1975) estimate since it is likely that more shells would be broken (killing the clams) while sorting and discarding during production fishing operations than occurred during the research operation.

The current distribution of the stock has led to discard rates of up to 50% to meet the 5.5" size limit with the current tolerance (Figure 8). This level is considered unacceptable.

It was the Council's intent when the size limit provision was developed that the tolerance in the regulations could be changed over time as the size distribution of the stock changed in order to minimize discarding. However, the FMP did not include the parameters within which the tolerance adjustment could be made since the concept of framework management measures was not fully developed when the size limit was added to the FMP. Current interpretations of the characteristics of a framework measure conclude that the FMP does not provide an adequate basis for tolerance adjustments of a magnitude adequate to solve at least the current discarding problem.

Enforcement is also a consideration in terms of how much work is necessary to determine if a violation has occurred. Large tolerances mean that a large number of clams must be measured or that subsampling must occur. Subsampling is not as straight forward when developing legal cases as an overall measure, since a conviction depends not only on whether the clams were undersized but also on whether the subsampling was done appropriately.

In summary, the problem is to revise the size limit provision to reduce the waste of discarding to the greatest extent possible. Solving this problem should lead to reduced costs to NMFS and the industry and make it more likely that the objectives of the FMP and OY can be achieved.

IV.C. Management Objectives

The objectives of the FMP are:

1. Rebuild the surf clam populations to allow eventual harvest approaching the 50 million pound level, which is the estimate of maximum sustainable yield over the range of the resource, based on the average yearly catch from 1960 to 1976.

2. Minimize economic dislocation to the extent possible consistent with objective 1 and encourage efficiency in the fishery.

3. Prevent the harvest of ocean quahogs from exceeding maximum sustainable yield and direct the fishery toward achieving Optimum Yield.

4. Provide the greatest degrees of freedom and flexibility to all harvesters of these resources consistent with the attainment of the other objectives of this Plan.

5. Optimize yield per recruit.

6. Increase understanding of the conditions of the stocks and fishery.

IV.D. Management Measures Currently in Effect

IV.D.1. Permits

A vessel owner or operator must obtain a permit in order to conduct a directed fishery for surf clams or ocean quahogs within the FCZ or land or transfer to another vessel any surf clams or ocean quahogs or part thereof caught within the FCZ. Vessels taking surf clams or ocean quahogs for personal use are exempt from this requirement.

A vessel is eligible for a permit to harvest surf clams in both the New England and Mid-Atlantic Areas if it meets any of the following criteria:

1. The vessel has landed surf clams in the course of conducting a directed fishery for surf clams between 18 November 1976 and 17 November 1977; or

2. The vessel was under construction for, or was being rerigged for, use in the directed fishery for surf clams on 17 November 1977. For the purpose of this paragraph, "under construction" means that the keel has been laid; "being rerigged" means physical alteration of the vessel or its gear had begun to transform the vessel into one capable of fishing commercially for surf clams; or

3. The vessel is replacing a vessel of substantially similar harvesting capacity which involuntarily left the surf clam fishery during the moratorium, and both the entering and replaced vessels are owned by the same person.

Any US vessel is eligible for a permit allowing it to harvest surf clams in the New England Area only or for a permit allowing it to harvest ocean quahogs only.

IV.D.2. Recordkeeping and reporting requirements

Any person who buys surf clams and ocean quahogs from a fishing vessel subject to the regulations must submit weekly and annual reports to NMFS. The owner or operator of any vessel conducting any fishing operations subject to the regulations must maintain, on board the vessel, a daily fishing log for each fishing trip and submit weekly and annual reports to NMFS.

IV.D.3. Catch quotas

The annual surf clam quota in the Mid-Atlantic Area is between 1.8 and 2.9 million bu. This quota is divided into equal quarterly quotas, the quarters being January-March, April-June, July-September, and October-December. Each fishing quarter begins on the first Sunday of the new calendar quarter. If the actual catch of surf clams in any one quarter falls more than 5,000 bu short of the specified quarterly quota, NMFS adds the amount of the shortfall to the succeeding quarterly quotas. If the actual catch of surf clams in any quarter exceeds the specified quarterly quota, NMFS subtracts the amount of the excess from the succeeding quarterly quotas.

The annual surf clam quota in the New England Area is between 25,000 and 100,000 bu. This will

be changed to between 25,000 and 200,000 bu following implementation of Amendment #4, with the annual quota divided into bimonthly harvest guidelines: January-February 8%, March-April 8%, May-June 28%, July-August 16%,

The annual ocean quahog quota is between 4,000,000 and 6,000,000 bu. If necessary, NMFS may establish quarterly quotas for ocean quahogs, which will be based on historical fishing patterns. In the event that NMFS establishes quarterly quotas for ocean quahogs, if the actual catch of ocean quahogs falls more than 5,000 bu short of the specified quarterly quota, the amount of the shortfall is added to the succeeding quarterly quotas. If the actual catch of ocean quahogs in any quarter exceeds the specified quarterly quota, the amount of the excess is subtracted from the succeeding quarterly quotas.

IV.D.4. Effort restrictions

Surf clams - Mid-Atlantic Area. Fishing for surf clams may be authorized only during the period beginning 0001 hours Sunday and ending 1800 hours Thursday. NMFS notifies each owner or operator of a fishing vessel engaged in the surf clam fishery in the Mid-Atlantic Area concerning the allowable combinations of fishing periods for varying levels of allowable fishing time. All fishing periods end at 1800 hours. The vessel owner or operator must send NMFS written notice of the owner or operator's selection of allowable surf clam fishing periods for that vessel. All selections must be provided to NMFS no less than 15 days prior to the intended effective date. NMFS sends a letter of authorization to each owner or operator stating the periods during which the vessel is authorized to fish for surf clams. The letter of authorization must be kept aboard the vessel at all times. Fishing may be conducted only during the times and under those conditions authorized by NMFS in the letter of authorization. Fishing for any part of an authorized period is counted as one day of fishing. NMFS may revise allowable fishing times (hours per week, hours per month, or hours per quarter) to allow fishing for surf clams to be conducted throughout the entire year with the minimum number of changes to fishing times.

During November, December, January, February, March, and April, fishermen may claim a make-up period if, in the opinion of the vessel operator, weather or sea conditions would prevent effective fishing or endanger the vessel or crew.

Surf clams - New England Area. Fishing for surf clams is allowed seven days per week. When 50% of the quota for surf clams for the New England Area has been caught, NMFS determines whether the total catch of surf clams during the remainder of the year will exceed the annual quota. If NMFS determines that the quota probably will be exceeded, NMFS may reduce the number of days per week, or establish authorized periods, during which fishing for surf clams is permitted.

Following implementation of Amendment #4, the effort limitations for the New England Area are replaced with the following: The Regional Director, working in consultation with the New England Council, is charged with managing the fishery to minimize the chances of a closure through a tiered system of regulation, the first tier being no regulation, the second being trip limits, the third being weekly landing limits, and the fourth being closure. The Regional Director must move through the tiers, except that he may close the fishery at any time if necessary. The trip and weekly landing limits must be established based on vessel classes, the ratios being based on relative fishing power: Class 1 = 1.0, Class 2 = 1.8, and Class 3 = 3.4.

Ocean Quahogs. Fishing for ocean quahogs is allowed seven days per week. When 50% of the quota for ocean quahogs for any time period has been caught, NMFS determines whether the total catch of ocean quahogs during the applicable time period will exceed the quota for that time period. If NMFS determines that the quota will be exceeded, NMFS may reduce the number of days during which fishing for ocean quahogs is allowed.

IV.D.5. Closed areas

Certain areas are closed to all surf clam and ocean quahog fishing because of adverse

environmental conditions. These areas will remain closed until NOAA determines that the adverse environmental conditions have been corrected. If additional areas, due to the presence or introduction of hazardous materials or pollutants, are identified as being contaminated, they may be closed by notice published by NOAA after a public hearing is held to discuss and assess the effects of such a closure.

Areas may be closed to surf clam and ocean quahog fishing if it is determined that the area contains surf clams of which 60% or more are smaller than 4.5" in size and not more than 15% are larger than 5.5" in size. Such areas or parts of areas may be reopened if the average length of the dominant (in terms of weight) size class in the area to be reopened is 5.5" or more or the yield or rate of growth of the dominant size class in the area to be reopened would be significantly enhanced through selective, controlled or limited harvest of surf clams in the area. The harvest of surf clams from reopened areas is controlled separate from the management of the general fishery until the catch per unit of effort in the reopened area is comparable to the average catch per unit of effort in the general fishery, at which time the reopened area becomes part of the general fishery.

IV.D.6. Size restriction

A minimum size limit for surf clams of 5.5" in length is imposed on the Mid-Atlantic Area fishery. The size limit will apply in the New England Area following implementation of Amendment #4.

V. DESCRIPTION OF THE STOCKS

V.A. Surf Clam Distribution and Abundance

Surf clams are distributed in western Atlantic waters from the southern Gulf of St. Lawrence to Cape Hatteras. Commercial concentrations are found primarily off New Jersey and the Delmarva Peninsula, although some fishable quantities exist in southern New England waters. In the Mid-Atlantic region, surf clams are found from the beach zone to a depth of about 200'; beyond 130', however, abundance is low (USDC, 1983).

Total surf clam landings have continued to increase from a 1979 low of 35 million lbs of shucked meats to 56 million lbs in 1983 (Table 1). Total 1983 landings rose 12% over the 1982 level and 60% since 1979 (Table 1). Landings from the FCZ increased 21% between 1979 and 1980 and 6% between 1980 and 1981, remained constant between 1981 and 1982, and increased 22% between 1982 and 1983, for a 55% increase over the last five years (Table 2). The proportion of total landings taken from the FCZ during 1983 was 80%, which is not significantly different from the 13 year (1971-1983) average of 81%.

Research vessel surveys of the mid-Atlantic surf clam resource have been conducted since 1965. Commercial-type hydraulic clam dredges, modified to retain pre-recruit sizes, were used as survey gear. Indices of abundance (number of clams per tow) were adjusted to reflect differences in the dimensions of gear and operational procedures employed. Survey strata were grouped into four sets corresponding to the geographical boundaries of the principal Mid-Atlantic FCZ surf clam fishery areas (Northern New Jersey, Southern New Jersey, Delmarva, and Southern Virginia - North Carolina; Figure 1). Limited research surveys of the surf clam resource in New England waters have also been conducted since the late 1960s.

In August 1983 NMFS sampled 168 stations between Northern New Jersey and Albemarle Sound, an area of roughly 12,740 square nautical miles. Fifty-three of the 168 stations had no catch of surf clams. Thirty-six of the 168 stations had clams in "commercially harvestable" quantities (40 or more clams). Six of the stations were in the Federal closed areas (4 in Atlantic City and 2 in Chincoteague). Although the extrapolation of these sampling data to the entire region may have limitations (i.e., extremely large variabilities and distribution of stations somewhat allocated by importance to fishermen) the comparisons across years are valid and informative.

Total Mid-Atlantic FCZ clam biomass has recovered to levels slightly higher (Figure 2) than those of the mid-1960s (prior to the rapid increase in landings). Given annual harvest levels in the 40 - 50

million pound range (including discards), there appears adequate clam stock to prosecute the fishery until the early 1990s (at least a 10 year supply). This conclusion is based on the observations that total clam biomass has recovered and exceeds mid-1960s levels, and that number-per-tow indices for the 1976 and 1977 year classes remain stable despite significant catch and discard of these cohorts (Murawski and Serchuk, 1984).

The 1983 NMFS stratified index for Northern New Jersey was the second highest recorded (Table 3) during the 18 year time series, however, only 14% of the numbers of clams were legal size. The index for Southern New Jersey was less than 20% of the Northern New Jersey index but 87% of the clams were legal size (Table 4). Delmarva was similar to Northern New Jersey with many (index of 51) sublegal (only 23% legal) clams (Table 5). Abundance has decreased in Southern Virginia-North Carolina from January 1980 (87 to 10) while the percentage (number) of legal sized clams has increased from 1% to 11% (Table 6). If weight of clams is considered rather than numbers, then 26% of the Northern New Jersey resource, 95% of the Southern New Jersey resource, and 44% of the Delmarva resource is comprised of clams greater than 5.5" (Tables 3-5). The NMFS survey estimates of relative abundance from the four survey areas have become variable in recent years (Tables 3-6), primarily as a result of the highly aggregated nature of the distribution of individual year classes.

V.B. Surf Clam Size Composition and Growth in the Mid-Atlantic

These stratified mean catch per tow indices (Tables 3-6) indicate large increases in surf clam abundance in Northern New Jersey and Delmarva. Pre-recruit indices and survey length-frequency (Figure 3) data imply that these increases are due to a relatively strong 1976 year-class in Northern New Jersey and a strong 1977 year-class in Delmarva.

While surf clam resources in the Mid-Atlantic FCZ continue to be dominated by the strong 1976 and 1977 cohorts, subsequent year classes appear to be relatively weak. Survey sampling during 1978 - 1983 have failed to document any additionally strong year classes spawned after the 1977 cohort off Delmarva. Although the historical periodicity of good recruitment occurring in FCZ populations is unknown the lack of significant spawning since 1978 and the long period between spawning and recruitment (7 years) implies that the 1976 and 1977 year classes will have to support the fishery until at least the end of the decade.

During 1982, the Northern New Jersey population began to enter the legal size (5.5") with at least one to two more years of good growth needed to get the majority of the population to the legal limit. The Delmarva population is at least one year behind the Northern New Jersey population in growth (Figure 3).

The average Delmarva clam shell length is slightly larger at each age for ages 2 through 10 than is its New Jersey counterpart (Figure 4A). While the mean shell lengths for FCZ New Jersey clams are slightly smaller than comparably aged Delmarva clams, the mean meat weight of New Jersey surf clams is significantly more than Delmarva individuals (Figure 4B). Average individuals in both areas become legal sized clams by their seventh year (Table 7).

Assuming the relationship between age and shell length presented in Serchuk and Murawski (1980) remains valid, the 1976 year class off Northern New Jersey will be seven years old and will average 5.6" in October of 1984. The 1977 year class off Delmarva will average 5.4" as six year olds in October 1984 and will add an average of a quarter of an inch by autumn 1985 (Table 7).

However, there is evidence that suggests the age-length relationship developed by Serchuk and Murawski (1980) may not be totally valid for all areas populated by the 1976 and 1977 year classes. The growth rates seem to have declined significantly in areas of very high clam densities. According to NMFS 1983 research survey some of the highest clam densities (i.e., 1955 and 710 clams per tow) occurred in the Atlantic City and Chincoteague closed areas. Haskin (1984, pers. comm.) developed growth curves which differ significantly based upon the density and water depth (Figure 5). Calculating the mean size of clams from the 1976 cohort in Northern New Jersey yields a mean projected shell length of 4.8" in August 1981, 5.2" in August 1982, and 5.5" in August 1983. Examining Haskin's extensive (over 100 tows annually per 120 sq. n. mi. area) survey of the

Atlantic City closed area produces a mean shell length of 4.6" in August 1981, 5.0" in August 1982 and 5.1" in August 1983. Consistently, the measured mean shell length in the closed area is less than the projected rate for the entire region. This density dependent growth phenomenon appears real but at present is not fully quantified.

The August 1983 NMFS surf clam survey found that about half (51%) the resource (numbers) in the Mid-Atlantic is less than 4.75" (Table 8) with 46% of the resource less than 4.75" in opened areas (i.e., not Atlantic City, Chincoteague and Ocean City closed area). Twenty-nine percent of the total resource fell between 4.75" and 5.5" while 31% of the resource in the open areas were within this 0.75" length interval. Thus, 23% of the resource in the opened areas and 19% of the total resource was greater than 5.5". By summer of 1984 another one quarter inch of growth is projected so the total number of clams greater than 5.5" should be roughly 30%. It must be recognized that this survey covers the entire range of the resource and, therefore, the size distribution in any bed that a vessel might be fishing on will not contain clams that match the survey distribution.

Commercial catch sampling and processor sampling by NMFS indicates that 1% of the catch landed during the fall of 1983 was below 4.75" with 30% of the catch sampling and 36% of the processor sampling between 4.75" and 5.5" (Table 8).

V.C. New England Surf Clam Resource

Since the late 1960s, NMFS has performed 219 sample tows in the New England Area for surf clams (Murawski and Serchuk, 1983). This area has been sampled less frequently in the past than the Mid-Atlantic because of rugged bottom topography, sporadic distribution of beds, and lack of commercial fishing interest.

The surf clam resource in New England (according to these 219 sample tows) is located in the Southern New England area at the periphery of Nantucket Shoals (Figure 6), which is an area difficult to survey and fish. According to Murawski and Serchuk (1983) there is little in terms of a significant surf clam resource on Georges Bank, however, this conclusion may be changed with the recent undocumented discovery of commercial quality beds in the Cultivator Shoal region. The NMFS is currently investigating these reports. The remainder of the New England resource is distributed in the territorial waters of Rhode Island, Massachusetts, and Maine.

New England surf clams are large in comparison to the Mid-Atlantic catch, with an average size of about 6.5" and ranging from 5.75" to 7.5". This population is dominated by clams 7-10 years old with relatively poor recruitment during the last 5-6 years. Southern New England clams appear slightly faster growing than their Mid-Atlantic counterparts, and have meat yields which are slightly greater for similar sized clams (Murawski and Serchuk, 1983). Based on Murawski and Serchuk (1983), about 5% of the total surf clam resource in numbers and 10% in weight is found in the Southern New England Area.

V.D. Estimate of Surf Clam Maximum Sustainable Yield and Biomass

The estimate of maximum sustainable yield (MSY) in the original FMP was 2.9 million bu (approximately 50 million lbs of shucked meats) over the range of the resource, which was based upon commercial landings from 1960-1976.

Although tremendous variability and uncertainty exists concerning the absolute size of the pre-recruit and recruited resources off New Jersey, Delmarva and Southern Virginia - North Carolina, it is probable that the strong 1976 and 1977 year classes can be shepherded through wise management to support the fishery for at least the next 10 years. This 10 year time frame has been selected to provide stability to the fishery rather than allow catch levels to rise and fall significantly as clams are fished out over time or recruit to the fishery.

Extrapolating the mean catch per tow indices developed from the August 1983 NMFS research survey yields a very rough estimate of 900 million lbs of meats as a crude standing stock (Table 9). With the current estimates of landings, discards, discard associated mortalities and natural mortalities this crude standing stock estimate (large year to year variability) should be sufficient

to support the current fishery for 10 - 12 years. This estimate is equivalent to those presented in Murawski and Serchuk (1984) where they state "adequate resource currently exists to support the fishery for about 14 years at 40 million lbs per year or 11 years at 50 million lbs per year". (This also includes discards.) Murawski and Serchuk (1984) did not calculate a total standing stock estimate but rather compared the average biomass index (Figure 2) from the late 1960s (during years which the landings produced the MSY estimate) to the early 1980s.

The standing stock estimate of clams greater than 5.5" derived from the August 1983 survey is roughly 340 million lbs (Table 9). This estimate increased slightly from the 320 million lb estimate that was developed from the 1982 survey. While over 50 million lbs of meats were landed in 1983 (Table 1) large numbers of individuals from the 1976 and 1977 cohorts were becoming available to the fishery (Figure 3) and thus this increase is logical.

Population growth parameters in the past have been significantly different between New Jersey and Delmarva surf clams and thus warrant separate yield per recruit (YPR) analyses (Serchuk and Murawski, 1980). The YPR analyses were performed on both populations by varying the instantaneous fishing mortality (F) between 0.1 and 2.0 (Figure 7) and examining five minimum sizes at entry into the fishery (4.50", 4.75", 5.00", 5.25", and 5.50").

For both populations, maximum YPR occurs at an instantaneous fishing mortality rate of 2.0 (Table 10). This unrealistically high instantaneous rate (corresponding to an annual rate of 0.86) results from the shape of the YPR curve; the curve is asymptotic with the right hand segment becoming nearly flat as fishing mortality increases (Serchuk and Murawski, 1980). Approximately 95% of maximum YPR is achieved at F = 0.75 in each of the FCZ surf clam populations. The F0.1 (the fishing mortality rate at which the additional catch produced by one additional unit of effort is only 10% of the catch produced by the same unit of effort in a new fishery) value (0.35) is approximately 90% of the maximum YPR on a long term basis from both area resources.

Although the YPR analyses of the Delmarva and New Jersey populations show similar trends, the absolute value of YPR (in grams of meat weight) is slightly greater for the more northern area (Table 10). In general, the Delmarva area population will yield 2 or 3 grams less meat per recruit for any given fishing rate and harvest size.

Overall, the maximum YPR occurs at 4.75". Further growth of clams beyond this size is offset by loss of clams due to natural mortality. The YPR for a 5.5" minimum size is approximately 10% less than that at 4.75".

Although maximum YPR values were generally realized at F levels near 2.0, such intense fishing levels would have serious impacts on the age composition of the spawning population and on total reproductive potential. At relatively high F values, few clams greater than 5.5" survive to spawn. Although 5.5" clams have typically spawned 4 or 5 times (Table 11), the proportional contribution of spawning products by these clams is considerably greater than those of smaller (younger) individuals. Moderate F levels may also be desirable to maintain a heterogenous age distribution in the spawning population as a buffer against successive poor year classes (Serchuk and Murawski, 1980).

V.E. Surf Clam Probable Future Condition

Results of 1983 NMFS biological assessments indicate that surf clam biomass off both Northern New Jersey and Delmarva has been increasing due to strong 1976 and 1977 year-classes off Northern New Jersey and Delmarva, respectively. The 1976 year-class off Northern New Jersey began to reach commercial size (5.5") in 1981 while the 1977 year-class off Delmarva began to reach that size in 1983 (Figure 3).

Significant changes in the areal distribution of FCZ surf clam fishing effort and landings occurred starting in the fourth calendar quarter of 1980. Prior to that time, and for several successive years, between 80 and 90% of FCZ landings were derived from Delmarva (Table 12). During 1983, however, the Delmarva proportion of total landings declined to 42%, while Northern New Jersey increased from 10% in 1980 to 35% in 1983. The proportion of landings from Southern New Jersey

remained relatively low and constant over the last few years while Southern Virginia-North Carolina landings have increased from less than 1% to 16%.

The shift of effort from Delmarva to Northern New Jersey resulted primarily from recruitment to harvestable size (Figure 3) of a portion of the relatively strong 1976 year class of which virtually the entire Northern New Jersey FCZ surf clam resource is comprised. Implementation of the surf clam minimum size limit on 26 July 1981 resulted in a rapid decline (48% for all of 1981 vs. 35% in 1983) in the proportion of total clam catch derived from Northern New Jersey and a concomitant increase in the proportion of landings taken from the other three assessment areas.

Pre-recruit indices for the Northern New Jersey assessment area remained relatively high during the 1983 survey (second highest in number and weight in the survey time-series) indicative of the strong 1976 year class (Table 3). Not all the Northern New Jersey clams were located in the high density area off Atlantic City, and there was significant recruitment of these faster growing, less dense, clams to the harvestable range. Indices for recruit-sized clams (equal to or greater than 5.5") were 14% in numbers and 26% in weight. However, while total numbers are higher, biomass of harvestable sizes remains substantially below the levels of the mid-late 1960s (Table 3) when fishing was relatively intense off Northern New Jersey.

Given that the productivity potential of the 1976 cohort has nearly been reached (considering YPR), further significant increases in total biomass from the 1976 year class are unlikely (Murawski and Serchuk, 1984). Rather, there will be a continued transfer of biomass from the pre-recruit to harvestable size. No strong year class since 1976 has been detected.

Harvestable biomass levels off Southern New Jersey increased slightly from 1981-83, but these increases are probably not statistically significant (Table 6). Average harvestable biomass off Southern New Jersey remains well below that of the mid-late 1960s. Significant pre-recruit size resources in the region are not evident. Thus, because of the recent increases in effort in the Southern New Jersey area, due to the large size of clams there (Figure 3), abundance of harvestable size clams will decline during 1984.

A parallel situation to Northern New Jersey exists off Delmarva, where the YPR potential of the 1977 year class has also nearly been realized (Murawski and Serchuk, 1984). However, given the somewhat more rapid rate of growth of Delmarva clams (considering the probable growth-density relationship of clams in the Atlantic City Area) overall recruitment to the fishery may be somewhat more rapid off Delmarva. Analyses of the growth rates of the 1977 year class off Delmarva indicate that biomass of recruit-sized surf clams should increase somewhat during 1984 due to recruitment of the fastest growing individuals of the cohort. The bulk of the year class, however, will probably not reach the 5.5" minimum size until 1985. Significant rebuilding of the harvestable portion of the Delmarva surf clam stock should begin in 1985-86. During 1981 a significant portion of Delmarva landings was comprised of clams from the relatively strong 1977 year class. With implementation of the minimum size limit, however, the fraction of small clams in landings was sharply reduced. The weight per tow index of harvestable surf clams off Delmarva during the August 1983 survey decreased from the August 1981 peak value (Table 5). Pre-recruit indices from the 1983 survey continue to substantiate a relatively strong incoming 1977 year class (Figure 3).

Landings of FCZ surf clams from the Southern Virginia-North Carolina assessment area increased abruptly during the last half of 1982 and 1983, primarily as a result of discarding problems in the Northern New Jersey and Delmarva regions (Figure 8). Survey tows from the Southern Virginia-North Carolina area were, however, also dominated by small individuals (Table 6). Thus, considering the long travel time to the Southern Virginia-North Carolina grounds, and the lack of significant quantities of exploitable surf clams, it is likely that fishing effort and landings from the Southern Virginia-North Carolina area may not continue to increase significantly.

Catch sampling and research surveys reveal that the increased fishery catch rates are only partially due to the recruitment of harvestable sized clams (Murawski, 1984). Most increases in catch rates are due to greater utilization of sublegal clams. NEFC data for 1984 (January through early August) show that 65% of Mid-Atlantic surf clam landings were 5.5" or more, whereas 21%

were between 5.25-5.5", 10% were between 5-5.25", and 4% were less than 5" (Murawski, 1984). This trend in increasing landings of small clams has been associated with large decreases in the proportion of the catch discarded at sea as undersized: from about 50% of landings during the last quarter of 1982 to about 20% during the final quarter of 1983 and in mid-1984 (Figure 8). Given a presumed high mortality rate (50%) of discarded clams (Haskin, 1975) it is certain that at least some of the current landings of sublegal or undersized clams represents production that would otherwise be lost through discarding. Murawski (1984) noted "If, however, the minimum size limit was enforced absolutely, discarding rates would markedly increase since substantial quantities of sub-legal clams are now landed rather than culled overboard at sea. Such a response by the fishery to more rigorous enforcement of the size limit regulations occurred during the fourth quarter of 1982 when discard rates approached 50% of the landings." In the Atlantic City closure area, inferential evidence suggests that growth rates may have declined significantly in areas of very high clam density. It is likely that some clams in this area may not reach the minimum fishery size at current clam densities, and may thus be discarded heavily for the next several years. Whether reduction of clam densities ("thinning") would result in increased growth rates of these clams is unknown at this time.

Results from the August 1983 research vessel survey suggest that 1977, 1978, 1979, 1980, and 1981 year classes off Northern New Jersey and 1978, 1979, 1980, and 1981 year classes off Delmarva are relatively weak. Thus, for at least the next seven years, Mid-Atlantic FCZ landings will be sustained from accumulated stock in all regions and the 1976 and 1977 year classes off Northern New Jersey and Delmarva, respectively.

The impacts of future harvest quota levels on the abundance and productivity of surf clam resources in the Mid-Atlantic FCZ can be inferred from relative abundance indices (based on research surveys) and fishery performance data. Significant short-term (1985) increases in the quota (1984 = 40 million lbs of shucked meats) will reduce the long-term potential yields of pre-recruit resources (off Northern New Jersey, Delmarva, and Southern Virginia-North Carolina) due to current discarding necessary to land legal-sized clams (Figure 3). The inability of the fishery to harvest the entire 1982 quota was in part due to relatively low abundance of legal clams, coupled with their coincident distribution with pre-recruits (particularly off Northern New Jersey). In 1983 the entire quota was harvested, but many sublegal clams were caught. Harvestable biomass will increase off Northern New Jersey during 1984 as modal size of the 1976 year class approaches the minimum legal size. Catch per effort in the Northern New Jersey area will likely increase in 1984. Thus, adequate harvestable size resource will be present in 1984 to support a 40 million lb quota given current fishing practices (effort levels and discarding practices). Catch per effort levels in other areas (Southern New Jersey, Delmarva, and Southern Virginia-North Carolina), however, may not increase significantly, due to minimal recruitment to legal size.

Harvestable biomass off both Northern New Jersey and Delmarva will likely increase significantly in 1985. Thus, quota increases in future years (i.e., 1986-87) are likely to result in greater utilization of the productivity potential of the two strong cohorts than quota increases in the short-term (1985), because of decreased mortality (discarding) on pre-recruit sizes.

Although the absolute size of pre-recruit resources off Northern New Jersey, Delmarva, and Southern Virginia-North Carolina are not known, it is clear that adequate resource currently exists to support the fishery at current levels until the early 1990s. Based upon the 1983 NMFS survey, Northern New Jersey has approximately 47% of the total resource (Table 9) and 32% of the resource of clams greater than 5.5". Delmarva region has over half (51%) of the current legal size clams and 44% of the total resource. Overall, these two areas had very similar catch per tow estimates of legally sized clams during August 1983 (Table 9). However, as the quota is increased in the short term (1985-87) the risk of a resource shortfall in later years is increased due to the lack of additional new recruitment until at least 1990-91.

VI. DESCRIPTION OF HABITAT

There is no need to amend this section at this time.

VII. FISHERY MANAGEMENT JURISDICTION, LAWS, AND POLICIES

Current surf clam minimum size limits for States involved in the surf clam fishery are: Massachusetts - 5", Rhode Island - 5.5", New York - 4", New Jersey - none, Maryland - 5.5", and Virginia - 5.5".

VIII. DESCRIPTION OF FISHING ACTIVITIES

VIII.A. Domestic Fishing Activity

VIII.A.1. Total landings

In 1950, 8 million lbs of surf clam meats were landed, with New York and New Jersey ports accounting for 97% of the total (Table 1). The Maryland fishery developed in the early 1950s, but New Jersey dominated the fishery until the early 1970s. Significant Virginia landings first occurred in 1972 when that state accounted for 37% of the total 64 million lbs landed. Since that time, New Jersey, Maryland, and Virginia have been the major harvesting states, although the share of total landings for each state changed from year to year (Table 1). There have been landings in New England throughout the period since 1950, although landings have been small relative to the total fishery, in most years amounting to less than 0.5% of the total, with a peak of 7% in 1983 (Table 1).

The surf clam fleet typically concentrates its efforts in one area until the catch rates decline, and then moves to more productive grounds. Decreasing abundance of surf clams off New Jersey and discovery of large beds off Virginia resulted in a shift of effort to the latter area in the early 1970s. The introduction of mechanical shucking devices around 1970 greatly increased the capacity of processing plants. These devices, coupled with the expansion of the fishing grounds, are the major reasons for most of the industry's growth after 1970.

Surf clam landings peaked at approximately 96 million lbs in 1974, about 2.5 times the weight landed only a decade earlier (Table 1). After 1974, landings began to decline rapidly and, except for 1977, declined continuously to a low of 35 million lbs in 1979. The FMP was implemented in November, 1977, and the slight increase (Table 1) in total surf clam landings that year, to about 52 million lbs, was due at least in part to greatly increased effort by the industry. There was a significant increase in the number of vessels which entered the fishery that year in anticipation of the stringent quota management and the vessel moratorium to be imposed by the FMP. Total landings increased 9% between 1979 and 1980, 21% between 1980 and 1981, 9% between 1981 and 1982, and 12% between 1982 and 1983, to a 1983 level of 56 million lbs, 60% more than 1979 (Table 1).

Total surf clam and ocean quahog landings more than doubled between 1967 and 1974, from 45 to 97 million lbs of meats (Table 2), with ocean quahogs contributing about 1 million lbs to the 1974 total. Landings dropped rapidly to about 55 million lbs in 1976, with quahogs contributing almost 6 million lbs. Since then landings have generally increased, although there have been year-to-year fluctuations. Landings in 1983 were approximately 91 million lbs, a 7% increase from the 1982 level.

The ocean quahog fishery was traditionally a small industry operated out of Rhode Island ports, with annual landings through 1975 amounting to 200,000 bu or less. Total quahog landings increased from 600,000 bu in 1976 to 3.5 million bu in 1979, and remained at about that level through 1983 (Table 2). The development of the fishery is attributable to advances in ocean quahog processing technology, the relatively high value of surf clams, the effects of surf clam quota management, and the excess harvesting capacity of the Mid-Atlantic surf clam fleet.

The ocean quahog share of the total clam meat supply has increased significantly, from less than 1% in 1967, 4% or less between 1968 and 1975, 11% in 1976, 26% in 1977, 37% in 1978, 50% in 1979, 47% in 1980, 44% in 1981, 41% in 1982, and 38% in 1983. The significant increases in the ocean quahog share of total landings in the late 1970s came during a period of decreased surf clam landings (Table 2). When surf clam landings began to recover in 1980, the ocean quahog share decreased, but the amount of meats remained stable.

VIII.A.2. FCZ Landings

FCZ surf clam landings in 1981 and 1982 were approximately 37 million lbs, half of the peak 1974 level and 93% of the 40 million lbs 1982 quota. FCZ landings for 1983 were 45 million lbs relative to a quota of 41.7 million lbs. Landings from the FCZ increased 21% between 1979 and 1980 and 6% between 1980 and 1981, remained constant between 1981 and 1982, and increased 22% between 1982 and 1983, for a 55% increase over the last five years (Table 2). The proportion of total landings taken from the FCZ during 1983 was 80%, which is not significantly different from the 13 year (1971-1983) average of 81%. Reported Mid-Atlantic FCZ landings for 1984 (through 1 June) total about 1.2 million bu, 52% of the annual quota at 42% of the year.

Annual New England surf clam landings were less than 500,000 lbs between 1950 and 1976 and 1 million lbs between 1977 and 1981 (Table 1). In 1982 landings increased to 3 million lbs, or 6% of total landings. In 1983, 2.5 million lbs were harvested from the FCZ during the first half of the year, which prompted a closure of the New England Area for the remainder of the year. New England reported FCZ landings for 1984 (through 1 June) were 49,000 bu.

The FCZ ocean quahog fishery began in New Jersey in 1976 (400,000 bu) and grew rapidly until 1979 (3.2 million bu, Table 2). During the last five years landings have been quite stable, accounting for 97% of the total quahog catch in 1983. However, landings began increasing in 1984, with the catch through 1 June of 1.6 million bu, 46% of the annual quota taken in 42% of the year, a level not achieved until July in 1983.

VIII.A.3. Surf clam vessel performance

Total Mid-Atlantic FCZ landings for 1983 were about 2.3 million bu (equal to the annual quota), with yearly estimates of 1.7, 1.9, 2.0, and 2.0 million bu in 1979, 1980, 1981, and 1982, respectively (Table 13). Average annual catch per vessel was about 10,000 bu in 1979, 15,000 bu in 1980, 16,000 bu in 1981, 18,000 bu in 1982, and 21,000 bu in 1983.

Average annual Mid-Atlantic surf clam vessel catch per unit of effort (CPUE) increased from 1979 through 1981, decreased in 1982, and increased in 1983 (Table 13). Average CPUE was 26 bu/hr in 1979, 32 bu/hr in 1980, 48 bu/hr in 1981, 36 bu/hr in 1982, and 48 bu/hr in 1983. The increase in 1981 was due to catches dominated by small clams from the relatively strong 1976 and 1977 year classes off New Jersey and Delmarva, respectively. These small clams were targeted because of their very high abundance; traditionally, however, the fishery targeted on clams at least as large as the current minimum size limit. In 1982, CPUE decreased after implementation of the 5.5" minimum surf clam size limit effective 26 July 1981. In 1983 it returned to the 1981 level because of increased availability of harvestable clams due to growth of the 1976 and 1977 dominant year classes even though many clams were sublegal (5.0-5.5") when harvested.

CPUE has changed differently for each of the three vessel classes (Class 1 = less than 50 Gross Registered Tons, Class 2 = 51-100 GRT, and Class 3 = greater than 100 GRT; Table 13). For Class 1 vessels, CPUE was 17 bu/hr in 1979, 21 bu/hr in 1980, 22 bu/hr in 1981, 19 bu/hr in 1982, and 28 bu/hr in 1983. Class 2 CPUE was 19 bu/hr, 24 bu/hr, 38 bu/hr, 27 bu/hr, and 41 bu/hr in 1979-1983, respectively. Class 3 CPUE was 31 bu/hr, 38 bu/hr, 55 bu/hr, 43 bu/hr, and 56 bu/hr in 1979-1983, respectively.

Performance has continued to increase during 1984, following the pattern of recent years, with fewer vessels catching more clams in fewer hours (Table 14). CPUE for the surf clam fleet peaked in April at 74 bu/hour (94 bu/hour for Class 3).

Average annual CPUE data (Table 13) is not directly comparable with monthly average CPUE data (Table 14). To provide more meaningful comparisons between the rapid increase in CPUE during 1984 with historical data, a review of quarterly CPUE is useful (Table 15.) There was a gradual and consistent increase in CPUE for all vessels fishing for surf clams only and for each of the vessel classes between 1979 and the third quarter of 1981 (25 to 51 bu/hour for the fleet). Imposition of the minimum size limit kept CPUE at between 33 and 40 bu/hour through the first quarter of 1983. CPUE increased to 50 bu/hour in the second quarter of 1983 and continued to increase to 74

bu/hour (on a monthly basis) in April 1984.

Relative fishing power (catch per vessel by class divided by Class 1 catch per vessel) was 1.0, 1.7, and 3.9 for Classes 1, 2, and 3, respectively, in 1979, 1.0, 1.8, and 3.6 in 1980, 1.0, 2.5, and 5.2 in 1981, 1.0, 1.7, and 3.7 in 1982, and 1.0, 1.8, and 3.2 in 1983. Relative CPUE (CPUE by class divided by CPUE for Class 1) was 1.0, 1.1, and 1.8 for Classes 1, 2, and 3, respectively, in 1979, 1.0, 1.1, and 1.8 in 1980, 1.0, 1.7, and 2.5 in 1981, 1.0, 1.4, and 2.3 in 1982, and 1.0, 1.4, and 2.0 in 1983 (Table 13).

Vessel performance as expressed as the ratio of hours at sea to fishing hours has been fairly constant since 1979 for each vessel class (Table 16). For Class 1 it has ranged from 1.4 to 1.7; for Class 2, from 1.4 to 1.8; for Class 3 from 1.7 to 2.0; and for the fleet average from 1.6 to 1.9. The ratios on a monthly basis for 1984 are slightly lower than the annual averages for 1979-1983, but this could be the effects of averaging rather than anything significant.

In summary, the shifts in CPUE and relative fishing power are most likely attributable to an increase in the surf clam resource, mostly made up of smaller clams, between 1979 and 1981, tempered with the imposition of the minimum size limit in mid-1981. Following implementation of the size limit, fishing practices changed because most of the clams in the largest year classes were sublegal, leading to culling or searching for beds of legal clams, all of which apparently reduced the effectiveness of the larger vessels relative to the smaller vessels. By 1983, the growth of the clams as well as reported landing of sublegal clams, pushed CPUE back to about the 1981 level.

VIII.A.4. Ocean quahog vessel performance

Ocean quahog vessels are divided into two classes for purposes of analysis: Class A (100 GRT or less) and Class B (larger than 100 GRT). This breakdown is necessary because there are so few Class 1 (0-50 GRT) ocean quahog vessels publishing the data using the surf clam classes would violate confidentiality rules.

Most of the ocean quahog vessels are Class B (39 of 58 in 1979, 36 of 53 in 1980, 39 of 48 in 1981, 34 of 44 in 1982, and 30 of 37 in 1983). These vessels account for the vast majority of the ocean quahog catch. The relative fishing power (bu/hr for Class B divided by bu/hr for Class A) was 3.8, 5.8, 3.9, 5.7, and 5.1 in 1979, 1980, 1981, 1982, and 1983, respectively (Table 17).

The number of active ocean quahog vessels declined from 58 in 1979 to 37 in 1983, while the catch was about 3 million bu annually throughout the period (Table 17). The hours that each vessel fished on average increased consistently from 437 in 1979 to 619 in 1983. Average CPUE was 119 bu/hr in 1979, 115 bu/hr in 1980, 122 bu/hr in 1981, 135 bu/hr in 1982, and 139 bu/hr in 1983.

On a quarterly and monthly basis, ocean quahog CPUE (Table 15) has exhibited no consistent trend, although for the fleet it has varied from 107 to 169 bu/hour.

VIII.A.5. Vessel data

There have been significant changes to the Mid-Atlantic surf clam fleet over time. In 1965 there were 68 vessels; 33 Class 1, 33 Class 2, and 2 Class 3 (Table 18). Fleet size increased rapidly in the mid-1970s, to 122 vessels in 1976, 155 in 1977, 157 in 1978, and a peak of 165 in 1979. From that level, it decreased by 22% to 128 vessels in 1980, by 5% to 122 vessels in 1981, by 7% to 114 vessels in 1982, and by 1% to 113 vessels in 1983 (13 Class 1, 43 Class 2, and 57 Class 3).

The composition of the Mid-Atlantic fleet has also changed. In 1965 48% of the vessels were Class 1, 48% Class 2, and 3% Class 3. In 1978 the distribution was 13% Class 1, 37% Class 2, and 50% Class 3. The 1983 distribution was 12% Class 1, 38% Class 2, and 50% Class 3 (Table 18).

The physical characteristics of Mid-Atlantic surf clam vessels vary greatly (Table 19). In 1979 the tonnage per vessel ranged from 6 to 306 tons, with an average of 112 tons. Vessel length ranged from 28' to 146', with an average of 79'. The horsepower of the surf clam vessels ranged from 60 to 1,330 with an average of 389. Crew size ranged from 1 to 11 men, with an average of 4. Dredge

size ranged from 16" to 240" with an average length of 90" (Table 19). The characteristics of the fleet did not change significantly during the period 1979-1983 except for dredge size, horsepower, and crew size (Table 19). Average dredge size increased from 90" to 108". Average horsepower increased from 389 to 560, although the maximum decreased to 1,000. Crew size changed from a range of 1-11, average 4, to a range of 2-6, average 5.

There are significant differences between the number of vessels that are permitted and the number of active vessels. As of 31 December 1983, 148 vessels had permits for surf clams and ocean quahogs for the Mid-Atlantic Area, 156 vessels had permits to fish for ocean quahogs only, and 362 vessels were permitted for the surf clam fishery in the New England Area (Table 20). The Mid-Atlantic Area surf clam and ocean quahog permits are accounted for primarily by vessels from New Jersey (44%), Maryland (27%), and Virginia (14%). The ocean quahog only permits are held primarily by vessels from Massachusetts (46%) and Maine (23%). The New England Area only surf clam permits have been issued primarily to vessels from Massachusetts (58%), Maine (15%), and Rhode Island (10%).

VIII.A.6. Fishing Trips

Another measure of fishing activity is the number of trips vessels make. As noted above, the number of vessels involved in the Mid-Atlantic Area surf clam fishery has been declining on an average annual basis (Table 18). However, if quarterly data are examined (Table 21), a more precise picture of the active fleet develops.

For example, during 1979, 112 vessels landed Mid-Atlantic Area surf clams at some time during the year. However, the number of vessels active during any quarter ranged from 82 to 97. For 1983, the annual count was 86, while the quarterly range was 71-82 (Table 21).

If vessels that land both Mid-Atlantic Area surf clams and ocean quahogs are added to the vessels landing only Mid-Atlantic Area surf clams, the 1979 fleet was 162 active vessels, with a quarterly range of 106-129 and the 1983 fleet was 113 with a quarterly range of 78-95 (Table 21).

During April 1984 there were only 62 vessels fishing for Mid-Atlantic Area surf clams only and 18 vessels fishing for both surf clams and ocean quahogs (Table 21).

Clearly, the number of active vessels changes on a quarterly basis, suggesting that at least some vessels fish only part of the year. In fact, many of the vessels fish only part of the year (Table 22).

Logbook data for 1983 indicate that 38% of the Class 1, 22% of the Class 2, and 6% of the Class 3 vessels fishing for only Mid-Atlantic Area surf clams made between 1 and 10 trips (Table 22). All of the Class 1 vessels made 60 or fewer trips. The Class 2 vessels made 90 or fewer trips and the Class 3 vessels made 100 or fewer trips. The mean number of trips was 28 for Class 1, 39 for Class 2, and 54 of Class 3. The median number of trips (half the vessels made more and half less) was 28 for Class 1, 40 for Class 2, and 61 for Class 3, with the maximum number of trips for any vessel 52, 95, and 93 for Classes 1, 2, and 3, respectively. Remember that during 1983 the Mid-Atlantic Area surf clam fishery was restricted to 24 hours per week, which amounts to two 12 hour trips, or essentially a maximum of 104 allowable trips for the year.

For Class 3 vessels fishing only for ocean quahogs (there are not enough Class 1 and 2 vessels in the fishery to analyze, Table 15), the average number of trips was 95, the peak was 131, and the median was 107 (Table 22).

Class 3 vessels fishing for both Mid-Atlantic Area surf clams and ocean quahogs on average made 96 trips, with a maximum of 160 and a median of 93 (12%) made 60 or fewer trips (Table 22).

Since the Mid-Atlantic Area surf clam fishery is managed by time, it is useful to examine the relationship between trips and hours fished. During 1984, for the total Mid-Atlantic Area surf clam fleet, from 1 January through 25 February (24 hours per week allowed), only 54% of the trips were for 12 hours of fishing. This increased to 55% between 26 February through 22 May when the allowed maximum was 12 hours per week (Table 23). The rates were 45% and 46% for Class 1, 43%

and 45% for Class 2, and 66% and 67% for Class 3 for the 1 January-25 February and 26 February-22 May periods, respectively.

The number of active vessels decreased in each class after 26 February, as did the average number of trips (but not by 50%, although the allowed time decreased by 50%), while the hours fished per trip remained constant (Table 23). The average catch per trip for Class 1 was almost unchanged between the 1 January-25 February and 26 February-22 May periods, while the Class 2 catch increased slightly (534 to 578 bu) and the Class 3 catch increased from 763 to 829 bu.

Mid-Atlantic Area surf clam fishing is restricted to Sunday through Thursday. During 1984, Monday and Tuesday each accounted for 24% of the trips, with 21% on Wednesday, 19% on Sunday, and 12% on Thursday (Table 24).

While the above discussion presents only a summary of the data contained in the referenced tables, it is clear that only a portion of the permitted fleet is actually fishing and the vessels that are fishing are generally fishing only part time, both in terms of trips and hours. This must be considered in light of the the catch through 1 June 1984, 52% of the surf clam quota and 40% of the ocean quahog quota has been caught with only 42% of the year having elapsed.

VIII.A.7. Surf clam fishing time

Surf clam fishing effort in the Mid-Atlantic Area is regulated by adjusting the number of hours per week that vessels are permitted to fish. Between 1 January 1978 and 7 July 1984, allowable times ranged from 0 (closure) to 96 hours per week (Table 25), but these extremes have been the exception. There have been only three closures, one for 3 weeks and one for 1 week in 1978 and one for two weeks thus far in 1984. The 96 hours per week period lasted for only 4 weeks (in 1978).

During the period 1 January 1978 through 7 July 1984, of the total 339 weeks, 233 (69%) were at 24 hours per week, 40 (12%) were at 12 hours per week, 30 (9%) were at 36 hours per week, 26 (8%) were at 48 hours per week, 6 (2%) were accounted for by closures, and 4 (1%) were at 96 hours per week (Table 26).

There were 8,784 hours of fishing possible from 1 January 1978 through 7 July 1984, 64% of it in periods of 24 hours per week, 14% in periods of 48 hours per week, 12% in periods of 36 hours per week, 5% in periods of 12 hours per week, and 4% in periods of 96 hours per week (Table 26).

Allowable fishing hours have changed from 1,752 hours in 1978 to 1,440 hours in 1979 (-18%), to 1,728 hours in 1980 (+20%), to 972 hours in 1981 (-44%), to 1,248 hours (+28%) in 1982 and 1983. There has also been a decrease in the time periods (i.e., hours per week) during which fishing is allowed. In 1978, 40% of the hours were at 24 hours per week, 30% at 48 hours per week, 22% at 96 hours per week, and 8% at 36 hours per week. In 1979 allowable fishing hours were split between 24 hours per week (60%) and 36 hours per week (40%). In 1980, 42% of the time was at 48 hours per week, 38% at 24 hours per week, and 21% at 36 hours per week. During 1981 allowable hours decreased significantly to 72% at 24 hours per week and 28% at 12 hours per week. For 1982 there was an increase to 100% at 24 hours per week (Table 26). The rate continued at 24 hours per week through all of 1983, but was cut to 12 hours per week on 26 February 1984.

The reduction of allowed time to 12 hours per week on 26 February did not reduce catch rates enough to eliminate the need to close the fishery for two weeks beginning 24 June 1984. It is useful to examine catch relative to time to understand the situation in 1984. When the fishery was reduced to 12 hours per week, 17% of the year had elapsed with 26% of the surf clam quota taken (17% of the quahog quota taken). When 17% of 1983 had gone by, 12% of the surf clam and 9% of the quahog quotas had been caught. By the time 42% of 1984 had lapsed (1 June), 52% of the surf clam and 40% of the quahog quotas had been taken (at 50% of 1983, the catch was 40% and 37% of the surf clam and quahog quotas, respectively).

Ever since the New England Area was created, the FMP has provided for a possible imposition of effort limitations in that Area. That provision was not used until 1 April 1983, when effort was reduced to 12 hours per week. The fishery was closed on 1 July 1983 because the catch reached

114,000 bu as of 1 June 1983 against a quota of 100,000 bu.

VIII.B. Foreign Fishing Activity

The surf clam and ocean quahog fisheries are domestic fisheries only.

VIII.C. Interaction between Domestic and Foreign Participants in the Fishery

There are no records of foreign (including Canadian) catches of either species in the northwest Atlantic.

IX. DESCRIPTION OF ECONOMIC CHARACTERISTICS OF THE FISHERY

IX.A. Domestic Harvesting Sector

IX.A.1. Surf clam ex-vessel value and price

Surf clam ex-vessel value for the period 1950-1983 (Table 27) peaked at approximately $27 million in 1977, declined consistently to a 1980 level of approximately $19 million, and increased to approximately $23 million in 1981, $26 million in 1982, and $25 million in 1983. On a state by state basis, value has moved in a pattern similar to landings, with total 1982 value shared primarily by New Jersey (45%), Maryland (21%), and Virginia (24%).

The ex-vessel value of the surf clam catch in current dollars, both total and in the FCZ, about doubled between 1974 and 1977 and has since remained fairly stable (Table 28). The FCZ has consistently accounted for a greater share of the value than of landings: 83% of the value and 77% of landings in 1974; 81% of the value and 74% of landings in 1982, and 84% of the value and 80% of the landings in 1983.

Surf clam ex-vessel value, when adjusted for inflation, was $8 million in 1974. It peaked at $14 million in 1977, then declined to a low of $7 million in 1980. In 1981, 1982, and 1983 it was $8 million. FCZ value was approximately $6 million in 1974 and $7 million in 1979-1983 (Table 28).

Surf clam price per pound (adjusted for inflation) remained fairly stable from 1950-1975, ranging between $.07 and $.14 (Table 29). In 1976 it increased to $.26 and peaked in 1977 at $.27, from which it has declined steadily to $.15 in 1983 and $.14 for the first quarter of 1984. FCZ deflated prices have moved in the same pattern as total prices, but have generally been slightly higher ($.19/lb in 1980, 1981, and 1982 and $.16 in 1983).

Average gross revenues (adjusted for inflation) show an upward trend during the last 5 years for the FCZ surf clam fleet (Table 30). For the total FCZ surf clam fleet, the average was $43,000 in 1979, $48,000 in 1980, $52,000 in 1981, $57,000 in 1982, and $56,000 in 1983. The average for Class 1 vessels (under 50 Gross Registered Tons) increased 20% between 1979 and 1980, declined 22% between 1980 and 1981, increased 50% between 1981 and 1982, and increased 10% between 1982 and 1983. Class 2 vessels (50-100 GRT) changed +18%, +6%, +3%, and +17% for the same years. The changes for Class 3 vessels (greater than 100 GRT) were +6%, +9%, +10%, and -8%, respectively.

IX.A.2. Ocean quahog ex-vessel value and price

Ocean quahog ex-vessel value (Table 31), in current dollars, was less than $500,000 for 1967 through 1975. It then increased to $2 million in 1976, $6 million in 1977, $7 million in 1978, $10 million in 1979 through 1981 and $11 million in 1982 and 1983. The FCZ share increased from 77% when the fishery began in 1976 to 98% in 1981 and 1982, and 95% in 1983 (Table 31). There has been little change in deflated value since 1979.

Price per pound, adjusted for inflation, fell from a 1976 and 1977 high of $.16 to $.10 in 1981-1983 (Table 32). It remained at $.10 for the first quarter of 1984.

IX.A.3. Market indicators

To analyze the supply and demand for surf clams and ocean quahogs, three sets of indicators were developed: those which are primarily supply related, those which are primarily demand related, and those reflective of the interactions of supply and demand. A review of these indicators leads to the conclusion that demand is expanding relative to supply.

Basic supply or production indicators are: available biomass, availability of clams greater than 5.5", the number of vessels fishing, their combined effort, their CPUE, and the cost of fishing. All of these indicators except the cost of fishing have been previously discussed. There is no new recruitment to the biomass at this time while the proportion of 5.5" clams, which dramatically decreased in the past, is slowly showing some signs of increasing (Figure 2). Also discussed previously was the rise and subsequent decline in the number of vessels fishing for surf clams with the corresponding increase in the average size of the active vessel. These vessels are currently fishing less than 12 hours a day and do not fish all of their allowed fishing days.

The only supply indicator not previously discussed is unit vessel costs. Vessel costs over time are not available. However, one of the most significant components of vessel cost is fuel. Fuel costs range from 11-17% of a vessel's operating costs (MAFMC, 1981). Since catch rates have been increasing (Table 15), the average cost of harvesting a bushel of surf clams must be declining. In 1979, the average Class 3 vessel fished 2.7 hours to catch 100 bu of clams. In 1983 it took the average Class 3 vessel only 1.4 hours to catch 100 bu of clams. Fewer hours needed to fish imply lower fuel costs. Furthermore, over the past few year the deflated price of fuel has been decreasing after reaching a peak in 1981 (Figure 10). (For reference purposes, Figure 9 shows the trend in inflation. It takes approximately $3 in 1983 to purchase what it took $1 to purchase in 1965-1967.) Vessel operating costs should also be reduced as catch rates increase and regulated hours decrease for less maintenance will be required. Fewer hours fished imply fewer vessel breakdowns and less need for routine overhaul. Maintenance costs range from 33-50% of a vessel's operating costs (MAFMC, 1981).

In summation, not only are fuel costs and maintenance costs declining because there is less fishing time required to harvest a fixed amount of bushels, but additionally, fuel costs are declining because of a reduction in the price of fuel.

Two groups of demand indicators were developed. The first set of indicators primarily reflects the overall market for edible fish and shellfish. As the overall market increases, so should surf clam and ocean quahog demand. The second group of demand indicators reflects the prices of possible competing products for surf clams and ocean quahogs. Both groups of indicators imply a growing demand for surf clam and ocean quahog products.

The overall demand for edible fish and shellfish products has been increasing. Average per capita consumption of fish and shellfish has increased from 10.8 lbs in 1965 to 12.9 lbs in 1983 (Figure 11). The population has grown 21% since 1965 from 192 to 232 million in 1983 (Figure 12). Consumer after-tax disposable incomes have grown 47% since 1965 in 1972 dollars (29% in 1967 dollars, Figure 13) while their expenditures at retail eating and drinking establishments have increased 50% since 1965. These expenditures seem to be rising as a percentage of disposable income.

These indicators show that the overall market for all fish and shellfish products is expanding. There are more potential consumers with increasing incomes that are spending more in retail eating and drinking establishments, major outlets for processed fish and shellfish (especially surf clams), while in general consuming more fish and shellfish in their diets.

The second set of demand indicators consists of the unit prices of potential competing products such as the retail price of canned and semi-prepared soups; the prices of canned shrimp and breaded shrimp; and the ex-vessel prices of sea scallops, gulf shrimp, finfish, and hard clams. All of these products can be found with surf clam and ocean quahog products on many restaurant menus or along side surf clam and ocean quahog products on grocery market shelves. They are correspondingly substitutes for clam chowder and juices, breaded clam strips, and canned minced and whole clams. These products show, in current prices, rising trends from 1967 to 1981 (Figure

14). However, in 1982 and 1983, the prices of minced and canned clams declined sharply, probably due to the increased landing of surf clams in general, as well as the increase in small clam landings. Strip clam prices for 1983 are not available, but it is likely, with the decline in large clam availability in 1983, that it will have exceeded the 1983 minced and whole clam price.

The price of breaded shrimp has increased remarkably since the mid-1970s, increasing at a faster rate than the price of breaded clams (Figure 15). This is also true of the retail soup price index relative to the price of clam chowder and juices (Figure 16). While the price of canned shrimp has also increased remarkably, for the last three years canned and minced clam prices have declined. Again, this is primarily due to the recent increased landings of small clams. In all of these instances indications are that the prices of competing products are relatively higher than surf clam and ocean quahog product prices. Higher relative prices imply that consumers will be more likely to switch from the higher priced products to the lower priced products. Therefore, the demand for surf clam and ocean quahog products is increasing. A similar conclusion is reached if surf clam ex-vessel prices are compared to the ex-vessel prices of sea scallops, hard clams, gulf shrimp, summer flounder, and cod (Figure 17).

The final set of indicators are surf clam ex-vessel prices and revenues, ocean quahog prices and revenues, and total clam supply. These indicators are simultaneously reflective of supply and demand. Prices, and thus revenues, reflect situations where quantity demanded equals quantity supplied. The total clam supply shows not only the production levels of surf clams, but the availability of competing clam products as well. Surf clam and ocean quahog prices and revenues have been previously discussed. In deflated terms, surf clam prices show a decreasing trend since 1978 while ocean quahog prices have been relatively stable over the past four years (Tables 29 and 32). Ocean quahog revenues show a similar trend as quahog prices, but surf clam revenues after their decline from the peak in 1977 have been increasing slightly (Tables 28 and 29).

What has yet to be discussed is the total clam supply. This consists of not only surf clams and ocean quahogs but also hard clams, soft clams, inventories (frozen meats only), and imports (Figure 18). Inventory levels show a leveling off from 1978 to 1983 but a sharp decline beginning 1984, an early indication of the tremendous increase in landings in 1984 (Table 14). Imports of clam products have increased from 2 million lbs in 1975 to 11 million lbs in 1983. Landings of soft and hard clams have either remained level or exhibit a slow long term decline since 1965. Ocean quahogs have grown remarkably to 35 million lbs a year in 1979, and then leveled off (preliminary data indicate that 1984 may show an increase over earlier years). Surf clam landings have been increasing steadily since 1979. Total clam supply, while mirroring surf clam supply, is now at the peak 129 million lb level. However, in 1974 surf clams were 74% of the clam supply of 129 million lbs, while in 1983 they were only 43% of the 129 million lb supply.

If the indicators discussed above are compared across the years 1965, 1974, and 1983 (Tables 33-35); years when, respectively, the fishery was small, at peak levels, and heavily regulated, the market picture is sharpened such that the conclusions and trends discussed above become distinct. The supply indicators show decreasing costs, the clams will be supplied at lower prices (unless closures cause a panic among buyers). The demand indicators show that competing products, in general, have rising prices in deflated terms and significant increases relative to surf clam and ocean quahog product prices. In 1974 the surf clam industry generated $7.7 million for 96 million lbs of clams, but in 1983 total surf clam and ocean quahog revenues grew to almost $12 million, even though only 56 million lbs of clams and 34 million lbs of quahogs were landed. It seems evident that the decline in abundance led to a shortfall in supply relative to demand and prices correspondingly increased. Currently increased abundance and the increased percentage of small clam landings are causing prices to fall. Current levels of per capita clam consumption are 9% less than in 1974, even though consumers have increased incomes, are spending a larger percentage of their income outside their homes for food and entertainment, and are consuming more fish and shellfish as part of their diet. Therefore, one would expect that the quantity of surf clam and ocean quahog products should expand as long as prices are stable or decline. The prevailing trend in CPUE indicates that prices will maintain their trends unless closures or the threat of closures causes panic among buyers who want to minimize the chance of having no clam meats to process.

IX.B. Domestic Processing Sector

There is no need to amend this section at this time.

IX.C. International Trade

There is no need to amend this section at this time.

X. DESCRIPTION OF BUSINESSES, MARKETS, AND ORGANIZATIONS ASSOCIATED WITH THE FISHERY

There is no need to amend this section at this time.

XI. DESCRIPTION OF SOCIAL AND CULTURAL FRAMEWORK OF DOMESTIC FISHERMEN AND THEIR COMMUNITIES

There is no need to amend this section at this time.

XII. DETERMINATION OF OPTIMUM YIELD

XII.A. Description of Alternatives

Alternatives for Amendment #5 are:

1. Take no action at this time.

2. Revise the surf clam minimum size limit provision.

The FMP currently states: "No person shall harvest or possess surf clams smaller than 5.5" in length". This alternative would change that provision to read:

> There is a surf clam minimum size limit. After consultation with the Council and opportunity for public comment, the Regional Director shall adjust, by increments no less than 0.25", the surf clam minimum size limit to a value less than 5.5" as necessary, so that discards on average do not exceed 30% of the trip catch. In no event shall the size limit be less than 4.75". When data indicate the clams have grown sufficiently, the limit would be increased, ultimately reaching the 5.5" limit. There is a tolerance of 240 undersized clams per cage but no more than 50 clams per cage under 4.75". If any cage is in violation of the size limit, the entire load is in violation. In adjusting the size limit the Regional Director shall consider current stock assessments, catch reports, and other relevant information concerning the size distribution of the surf clam resource. No person shall harvest or possess surf clams smaller than the minimum size limit.

This alternative adds the requirement that all surf clam cages must be tagged before leaving the vessel and that tags may not be removed until cages are emptied at the processing plant.

Also, this alternative adds the provision that all surf clams landed on an authorized FCZ fishing day are assumed to have been caught in the FCZ and are subject to the Federal size limit.

XII.B. Impacts of Alternatives

XII.B.1. Alternative 1: Take no action at this time.

Maintaining the status quo would not address the problem of discards associated with the surf clam size limit.

The August 1983 NMFS surf clam survey found that about half (51%) the resource (numbers) in the Mid-Atlantic is less than 4.75" (Table 8) with 46% of the resource less than 4.75" outside the closed areas. Twenty-nine percent of the total resource fell between 4.75" and 5.5" while 31% of the

resource in the open areas were within this 0.75" length interval. Thus, 23% of the resource in the opened areas and 19% of the total resource was greater than 5.5". By summer of 1984 another 0.25" of growth is projected so the total number of clams greater than 5.5" should be roughly 30%. Commercial catch sampling and processor sampling by NMFS indicates that 1% of the catch landed during the fall of 1983 was below 4.75" with 30% of the catch sampling and 36% of the processor sampling between 4.75" and 5.5" (Table 8).

There have been a significant number of violations of the size limit: 19 in 1981, 38 in 1982, 50 in 1983, and 26 thus far in 1984. The discard rate has been decreasing (Figure 8), while CPUE has been increasing (Tables 13-15). This information suggests that fishermen are keeping the smaller clams. If the fishermen were to fish so as to meet the current size limit, discards could return to the 50% level of late 1982 (Figure 8), a significant negative impact given the estimated 50-60% mortality of discarded clams.

NEFC data for 1984 (January through early August) show that 65% of Mid-Atlantic surf clam landings were 5.5" or more, whereas 21% were between 5.25-5.5", 10% were between 5-5.25", and 4% were less than 5" (Murawski, 1984). Murawski (1984) noted "If, however, the minimum size limit was enforced absolutely, discarding rates would markedly increase since substantial quantities of sub-legal clams are now landed rather than culled overboard at sea. Such a response by the fishery to more rigorous enforcement of the size limit regulations occurred during the fourth quarter of 1982 when discard rates approached 50% of the landings."

XII.B.2. Alternative 2: Revise the surf clam minimum size limit provision.

XII.B.2.a. Size limit adjustment

This alternative would solve the current size limit problem in a manner consistent with the FMP's objectives. It would retain the current 5.5" minimum size limit as a target, but is a compromise between the size limit objective and the desire to reduce the waste of discards. Essentially, the size limit would stay at 5.5" unless the clam size distribution suggested that excessive discards would result from that limit. The size is then reduced as necessary to keep the discard level around 30% while still maintaining the number of clams an agent must count to get a violation small (no less than 50 and no more than 240). The converse of this is keeping a fixed size limit but changing the tolerance, which can lead to an unacceptably large number of clams needed to get a violation. When data indicate the clams have grown sufficiently, the limit would be increased, ultimately reaching the 5.5" limit.

Specifying the number of clams needed for a violation means the tolerance percentage floats from about 10% (240 clams at 5.5") to about 1% (50 clams at 4.75").

This alternative provides that the size limit may not be adjusted smaller than 4.75", which equals maximum YPR. The YPR for the 5.5" size limit is approximately 10% less than that at 4.75". Therefore, providing for a decrease in the size limit to the maximum YPR value results in an increase in yield of up to about 10%.

The economic impacts of the 5.5" minimum size limit were discussed in the Regulatory Impact Review (RIR) for Amendment #3 to the FMP. If the alternative resulted in a significant decrease in the size limit (i.e., close to 4.75"), negative economic impacts could occur by a decrease in the supply of strip clams, a decrease in clam prices because of increases in the supply of small clams, and transfers of effort from the ocean quahog to the surf clam fishery. The size limit was set at 5.5" to not only protect the resource but also to optimize the use of the clams since 5.5" is about the smallest size clam that has been used for strips (the highest valued clam product). To the extent that the smaller processors and the independent vessels that work with them are more dependent on larger surf clams than are the larger, vertically integrated processors that also use smaller surf clams and ocean quahogs, significant decreases in the size limit with concomitant decreases in the supply of larger clams could negatively impact the smaller firms relative to the larger firms. However, all processors can process both large and small clams with the sizes processed dependent on the processors' markets, so the distributional impacts of this measure should not be significant.

While the mortality of discarded clams has not been determined conclusively, it is generally agreed that it is around 50-60% (Haskin, 1975). Adjusting the size limit to minimize discards will provide insurance against overfishing since discarded clams that die are not counted against the quota even though they are a part of fishing mortality.

The smaller the size limit, the greater the portion of the resource that will be legally harvestable, so the quota will be taken more quickly, resulting in decreases in allowed fishing time and increasing closures. However, if a greater portion of the catch can be landed legally, harvesting costs would be reduced since CPUE would increase and time and effort associated with discarding would decrease. August 1983 data for the whole Mid-Atlantic show that lowering the size limit to 4.75" would increase the legally harvestable clams by 29%. However, given the large number of small clams currently being landed (Murawski, 1984), which are reflected in high catch rates, reduced fishing hours, adjustments to lower the size limit may not result in dramatic short run increases in catch rates.

At all levels of possible size authorized by this Amendment the resource will have had several spawning opportunities. At 4.75" clams will have spawned two or three times, while at 5.5" there will have been four to five spawns (Table 11).

In summary, the 5.5" minimum size limit has positive impacts (MAFMC, 1981). However, the current size distribution of the resource suggests that rigorous enforcement of that limit would lead to unacceptably large discard rates (Murawski, 1984). If half of the catch would be discarded (Murawski, 1984) and half of those discarded would die (Haskin, 1975), and assuming the entire 2.35 million bu 1984 quota were landed under those circumstances, about 1.18 million bu would be wasted, clearly an unacceptable impact. As discussed above, if the limit were reduced to the minimum level, there would be negative economic impacts. Examining the situation in 1984 provides insight into impacts between the 4.75" and 5.5" extremes. Discard rates in 1984 have been around 30% with about 35% of the landings smaller than the current 5.5" limit (Murawski, 1984). If the Amendment were implemented and the limit adjusted to 5.25" and the discard and fishing patterns did not change, 14% of the landings would be less than the 5.25" limit (Murawski, 1984). While it is impossible to estimate these impacts on a vessel or trip basis, it is reasonable to expect that the number of violations should decrease. It is also reasonable to expect that the discard rate should decrease since some portion of the clams currently discarded are likely between 5.25" and 5.5". Clearly, if a larger proportion of the catch is landed, the catch rate will increase, leading to more frequent or longer closures, but the Council has determined that the waste associated with discarding represents a greater cost than that associated with accelerated catch rates.

XII.B.2.b. Cage Tagging

The requirement that surf clam cages be tagged will have a negative impact to the extent that fishermen may need to purchase and are required to use the tags.

The Regional Director has the responsibility for the tagging system. As of this date the specifics of the system have not been determined. Information available to the Council indicates that NMFS is considering a system that would involve supplying the fishermen with prenunbered tags, either at no cost or at a charge of $.10 per tag.

If the tags are sold, the cost to the fishermen is negligible. The maximum quotas are 2.9 million bu for the Mid-Atlantic Area and 200,000 bu (following approval of Amendment #4) for the New England Area, for a total of 3.1 million bu. At 32 bu/cage, if the total quota was set at the maximum level and the entire quota were caught, 96,875 cages would be landed, would require a tag expenditure of $9,687.50 at $.10 per tag.

If the tags are issued free, there would be no cost to the fishermen but a cost to the government. The $.10 per tag sale cost was intended to pay for the government's cost to buy the tags and also recover the government's cost of distributing the tags, so in this case the government would pay the estimated maximum $9,687.50 rather than the fishermen.

The cost of installing tags is considered negligible.

The positive impact will be to facilitate enforcement of the size limit provision. The size limit is a possession regulation, so fishermen and processors are responsible for assuring that clams meet the minimum size limit. Without tagging substantial enforcement effort is needed to assure an evidence trail from the vessel to the processing plant so that all parties to a violation can be cited. Tagging cages will mean that enforcement officers can inspect cages at the processing plants, while being able to enforce the size limit on both vessel operators, processors, and anyone in the transportation chain between the vessels and plants, which is more cost effective than inspecting vessels at the docks and inspecting the processing plants. This is merely a result of the small number of processors relative to the number of vessels and landing ports along with the tags providing the evidence trail. NMFS estimates landings can be monitored at between $28 per vessel for eight inspections per day to $227 per vessel for one inspection per day, whereas their officers can inspect two dealers or processors a day, for a cost per inspection of $114. There are about twelve surf clam processors whereas about 80 vessels (Table 21) are active in the Mid-Atlantic Area in any month (the number of active vessels in the New England Area is unknown because of incomplete logbook reporting). Because of the effort limitations in the Mid-Atlantic Area the number of vessels actually landing surf clams on any given day would be less than 80, but even if the number of vessels landing on a given day equals the number of plants, there are advantages to plant inspections relative to vessel inspections. Primary enforcement at the plant level will optimize the use of the very small number of available enforcement officers simply because they can spend their time enforcing the regulations rather than traveling from dock to dock and waiting for the vessels to land, that is, the locations of the plants is known whereas the vessels land and random times and at ports along essentially the entire coast.

While this measure will make enforcement more efficient and thus perhaps less expensive, the primary benefit will be to increase the likelihood that the FMP can be enforced, and thus that OY can be attained (i.e., achieved but not exceeded).

XII.B.2.c. FCZ catch presumption

The provision that surf clams landed on an authorized FCZ fishing day are assumed to have been caught in the FCZ should have no negative impacts, either environmental or economic. However, it should have a very positive impact from an enforcement standpoint. While several States have size limits, some do not and none of the existing State minimum size limits are the same as the limit that will result from this Amendment. It is necessary to assure that surf clams caught in the FCZ meet the minimum size limit. It is not reasonable to expect that the minimum size limit will be enforced adequately at sea. However, enforcement on land, in the absence of identical size limits for the FCZ and State waters, means that fishermen can claim that undersized clams were caught in State waters, effectively nullifying the FCZ minimum size limit. All of the States are encouraged to adopt size limits similar to the size limit included in this Amendment. However, the provision that surf clams landed on an authorized FCZ fishing day were caught in the FCZ is necessary to eliminate this loophole. It must be recognized that this provision will only be effective in the Mid-Atlantic Area since vessels operating in the New England Area do not have authorized FCZ fishing days. However, given that most of the surf clams are landed in the Mid-Atlantic Area (based on the Optimum Yields for the two Areas), this should not present a major problem relative to size limit enforcement.

The net effect of this alternative is that the size limit may be adjusted so that it will be easier for fishermen to land clams that meet the limit with minimal discarding while it will also be easier to obtain convictions of those who violate the limit.

XII.C. Tradeoffs Between the Beneficial and Adverse Impacts of the Preferred Alternative

The benefits of the preferred alternative are:

1. Being able to adjust the size limit to reduce discards decreases resource waste associated with discard mortality. While the mortality of discarded clams has not been determined conclusively, it is generally agreed that it is around 50-60% (Haskin, 1975). At times the discard rate has been 50% of the catch (Figure 8). While the reported discard rate (Figure 8) has been decreasing, that is considered to be a result of fishermen landing the small clams

rather than discarding them as evidenced by the increase in size limit violations (19 in 1981, 38 in 1982, 50 in 1983, and 26 through mid-June 1984) and by catch sampling data (Murawski, 1984). The size distribution of the resource (Figure 3) clearly indicates a substantial portion of the resource under 5.5".

2. It will be easier to enforce the surf clam minimum size limit relative to vessels, transportation facilities, and processing plants.

3. It will eliminate the loophole of fishermen being able to claim they caught undersized clams in State waters.

4. At all levels of possible size authorized by this Amendment the resource will have had several spawning opportunities. At 4.75" clams will have spawned two or three times, while at 5.5" there will have been four to five spawns (Table 11).

The adverse impacts include:

1. If there were a significant decrease in the size limit, there could be a decrease in the supply of clams at the traditional size for strips, a decrease in clam prices because of increases in the supply of small clams, transfers of effort from the ocean quahog to the surf clam fishery, a greater portion of the resource that will be legally harvestable (increasing the rate at which the quota will be taken), and the greater the need for timely remedial action to assure the quota is not exceeded in light of increased catch rates.

2. The cost of purchasing and installing cage tags.

Given the significant waste associated with discarding and the problems associated with enforcing the size limit, it is the Council's conclusion that the benefits of the preferred alternative, both short and long term, outweigh the adverse impacts. Additionally, given the current size distribution of the resource, major decreases to the size limit in the short run are extremely unlikely (a reduction to 5.25" will likely solve the current problem), so significant distributional impacts between large and small operators are unlikely. The reduced mortality resulting from reduced discards should provide benefits over time that outweigh any short term negative impacts. The positive impacts of the enforcement provisions (cage tagging and the FCZ catch presumption) clearly outweigh any negative impacts.

The Amendment Relative to the National Standards

Section 301(a) of the MFCMA states: "Any fishery management plan prepared, and any regulation promulgated to implement such plan ... shall be consistent with the following national standards for fishery conservation and management." The following is a discussion of the standards and how this Plan meets them:

1. Conservation and management measures shall prevent overfishing while achieving, on a continuous basis, the optimum yield from each fishery.

The Amendment does not change the MSY, OY, or quota setting process and, therefore, does not alter the FMP's consistency with this standard. Adjusting the size limit to minimize discards will provide insurance against overfishing since discarded clams that die are not counted against the quota even though they are a part of fishing mortality. Minimizing discards, along with the measures to facilitate enforcement, should have a positive impact on achieving OY without exceeding it.

2. Conservation and management measures shall be based upon the best scientific information available.

This Amendment is based on the best and most recent scientific information.

3. To the extent practicable, an individual stock of fish shall be managed as a unit throughout its

range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

The Amendment does not alter the FMP's consistency with this standard.

4. **Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such a manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.**

The Amendment does not alter the FMP's consistency with this standard.

5. **Conservation and management measures shall, where practicable, promote efficiency in the utilization of the fishery resources; except that no such measure shall have economic allocation as its sole purpose.**

The Amendment does not alter the FMP's consistency with this standard.

6. **Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.**

The Amendment does not alter the FMP's consistency with this standard.

7. **Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.**

The Amendment does not alter the FMP's consistency with this standard.

XII.E. Specification of Optimum Yield

There is no need to amend this section at this time.

XIII. MEASURES, REQUIREMENTS, CONDITIONS, OR RESTRICTIONS SPECIFIED TO ATTAIN MANAGEMENT OBJECTIVES

XIII.A. Permits and Fees

There is no need to amend this section at this time.

XIII.B. Catch Limitations

There is no need to amend this section at this time.

XIII.C. Restrictions

There is a surf clam minimum size limit. After consultation with the Council and opportunity for public comment, the Regional Director shall adjust, by increments no less than 0.25", the surf clam minimum size limit to a value less than 5.5" as necessary, so that discards on average do not exceed 30% of the trip catch. In no event shall the size limit be less than 4.75". When data indicate the clams have grown sufficiently, the limit would be increased, ultimately reaching the 5.5" limit. There is a tolerance of 240 undersized clams per cage but no more than 50 clams per cage under 4.75". If any cage is in violation of the size limit, the entire load is in violation. In adjusting the size limit the Regional Director shall consider current stock assessments, catch reports, and other relevant information concerning the size distribution of the surf clam resource. No person shall harvest or possess surf clams smaller than the minimum size limit.

All surf clam cages shall be tagged before leaving the vessel and tags shall not be removed until cages are emptied at the processing plant. Information to be shown on the tags shall be determined by the Regional Director, in consultation with the Council, but will include at least the information

needed to establish a chain of evidence adequate for enforcement of the surf clam minimum size limit from the vessel through the transportation system to the processor, inclusive. The Regional Director shall determine the minimum specifications of the tags, which as a minimum shall assure that markings are not erased prior to the cages being emptied at the processing plant.

All surf clams landed on an authorized FCZ fishing day are assumed to have been caught in the FCZ and are subject to the Federal size limit.

There is no need to amend the remainder of this section at this time.

XIII.D. Effort Restrictions

There is no need to amend this section at this time.

XIII.E. Closed Areas

There is no need to amend this section at this time.

XIII.F. Vessel Identification

There is no need to amend this section at this time.

XIII.G. Facilitation of Enforcement

There is no need to amend this section at this time.

XIII.H. Habitat Preservation, Protection and Restoration

There is no need to amend this section at this time.

XIII.I. Development of Fishery Resources

No government action is needed at this time.

XIII.J. Management Costs and Revenues

It is expected that the governmental costs of implementing the recommended alternative will be similar to those experienced in enforcing the current FMP. Council and NMFS administrative costs would increase slightly because of the need to periodically evaluate whether size limit adjustments were necessary and to make those changes. NMFS enforcement costs should decrease to the extent that the size limit more nearly approximates what the fishermen are catching, so that while the enforcement effort should not decrease, the number of violations and the time needed to process them should decrease and as a result of the cage tagging and FCZ catch presumption provisions.

XIV. SPECIFICATIONS AND SOURCES OF PERTINENT FISHERY DATA

There is no need to amend this section at this time.

XV. RELATIONSHIP OF THE RECOMMENDED MEASURES TO EXISTING APPLICABLE LAWS AND POLICIES

XV.A. Fishery Management Plans

This FMP is related to other FMPs to the extent that all fisheries of the northwest Atlantic are part of the same general geophysical, biological, social, and economic setting. US fishermen often are active in more than a single fishery. Thus regulations implemented to govern harvesting of one species or a group of related species may impact on other fisheries by causing transfers of effort.

Many fisheries of the northwest Atlantic result in significant non-target species fishing mortality.

Therefore, each FMP must consider the impact of non-target species fishing mortality on other stocks and as a result of other fisheries.

XV.B. Treaties or International Agreements

No treaties or international agreements, other than GIFAs entered into pursuant to the MFCMA, relate to this fishery.

XV.C. Federal Laws and Policies

The only Federal Law that controls the fishery covered by this FMP is the MFCMA.

Marine Sanctuary and Other Special Management Systems

The USS Monitor National Marine Sanctuary off North Carolina is in the area covered by the FMP. The Sanctuary was officially established on 30 January 1975 under the Marine Protection, Research, and Sanctuaries Act of 1972. Rules and regulations have been issued for the Sanctuary (15 CFR 924) that prohibit deploying any equipment in the Sanctuary, fishing activities which involve "anchoring in any manner, stopping, remaining, or drifting without power at any time" (924.3 (a)), and "trawling" (924.3(h)). The Sanctuary is clearly designated on all National Ocean Survey charts by the caption "protected area", which minimizes the potential for damage to the Sanctuary by fishing operations. Details on sanctuary regulations may be obtained from the Director, Sanctuary Programs Office, Office of Coastal Zone Management, NOAA, 3300 Whitehaven Street NW, Washington, D.C. 20235.

Potential Impact on Marine Mammals and Endangered Species

Numerous species of marine mammals and sea turtles occur in the northwest Atlantic Ocean. The most recent comprehensive survey in this region was done in 1979 by the Cetacean and Turtle Assessment Program (CeTap), at the University of Rhode Island (University of Rhode Island, 1981), under contract to the Minerals Management Service (MMS), Department of the Interior. The following is a summary of some of the information gathered in that study, which covered the area from Cape Sable, Nova Scotia, to Cape Hatteras, North Carolina, from the coastline to 5 nautical miles seaward of the 1000 fathom isobath.

Twenty one cetaceans and the 4 turtle species were encountered in the 1979 survey (Table 36). Also presented in Table 36 are the study team's "estimated minimum population number" for the area, as calculated, and those species currently included under the Endangered Species Act. All information is preliminary.

The study team concluded that "both large and small cetaceans are widely distributed throughout the study area in all four seasons," and grouped the 13 most commonly seen species into three categories, based on geographical distribution. The first group contains only the harbor porpoise, which is distributed only over the shelf and throughout the Gulf of Maine, Cape Cod, and Georges Bank, but probably not southwest of Nantucket. The second group contains the most frequently encountered baleen whales (fin, humpback, minke, and right whales) and the white-sided dolphin. These are found in the same areas as the harbor porpoise, and also occasionally over the shelf at least to Cape Hatteras or out to the shelf edge. The third group "shows a strong tendency for association with the shelf edge" and includes the grampus, striped, spotted, saddleback, and bottlenose dolphins, and the sperm and pilot whales.

Loggerhead turtles were found throughout the study area, but appear to migrate north to about Massachusetts in summer and south in winter. Leatherbacks appear to have a more northerly distribution. The study team hypothesized a "northward migration in the Gulf Stream with a southward return in continental shelf waters nearer to shore." Both species usually were found "over the shoreward half of the slope" and in depths less than 200 feet. No live green or Kemp's ridley turtles were found, and the latter's population has been estimated at only about 500 adults. The study area may be important for sea turtle feeding or migrations, but the nesting areas for these species generally are in the South Atlantic and Gulf of Mexico.

The only other endangered species occurring in the northwest Atlantic is the shortnose sturgeon (Acipenser brevirostrum). The Council urges fishermen to report any incidental catches of this species to the Regional Director, NMFS, Federal Building, 14 Elm Street, Gloucester, MA 01930, who can forward the information to the active sturgeon data base.

The range of surf clams and ocean quahogs and the above marine mammals and endangered species overlap to a large degree, and there always exists a potential for an incidental kill. Except in unique situations (e.g., tuna-porpoise in the central Pacific), such accidental catches should have a negligible impact on marine mammal/endangered species abundances, and the Council does not believe that implementation of this FMP will have any adverse impact upon these populations. As additional information on this subject becomes available, it will be integrated into future Amendments to this FMP. The regulation of commercial landings by this FMP should reduce the potential for the capture of endangered species.

Oil, Gas, Mineral, and Deep Water Port Development

While Outer Continental Shelf (OCS) development plans may involve areas overlapping those contemplated for offshore fishery management, no major conflicts have been identified to date. The Council, through involvement in the Intergovernmental Planning Program of the MMS monitors OCS activities and has opportunity to comment and to advise MMS of the Council's activities. Certainly, the potential for conflict exists if communication between interests is not maintained or appreciation of each other's efforts is lacking. Potential conflicts include, from a fishery management position: exclusion areas, adverse impacts to sensitive biologically important areas, oil contamination, substrate hazards to fishing gear, and competition for crews and harbor space. The Council is unaware of pending deep water port plans which would directly impact offshore fishery management goals in the areas under consideration, and is unaware of potential effects of offshore fishery management plans upon future development of deep water port facilities.

XV.D. State, Local, and Other Applicable Laws and Policies

Current State surf clam minimum size limits are: Massachusetts - 5", Rhode Island - 5.5", New York - 4", New Jersey - none, Maryland - 5.5", and Virginia - 5.5".

Coastal Zone Management (CZM) Programs

The CZM Act of 1972, as amended, provides measures for ensuring stability of productive fishery habitat while striving to balance development pressures with social, economic, cultural, and other impacts on the coastal zone. It is recognized that responsible management of both coastal zones and fish stocks must involve mutually supportive goals. The Council must determine whether the Amendment will affect a State's coastal zone. If it will, the Amendment must be evaluated relative to the State's approved CZM program to determine whether it is consistent to the maximum extent practicable. The States have 45 days in which to agree or disagree with the Council's evaluation. If a State fails to respond within 45 days, the State's agreement may be presumed. If a State disagrees, the issue may be resolved through negotiation or, if that fails, by the Secretary.

In order to comply with the CZM Act, this Amendment was reviewed relative to the approved CZM programs of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, and Maryland. On 7 August 1984 letters were sent to all of the States listed above stating that the Council concluded that the Amendment is consistent to the maximum extent practicable with the State's CZM program as understood by the Council. Maryland and Rhode Island have 5.5" surf clam minimum size limits, Massachusetts has a 5" minimum size limit, and New York as a 4" minimum size limit. The letters to those States recommended the State minimum size limits be revised to match the proposed size limit to facilitate enforcement while also noting that the FCZ catch presumption is intended to minimize the impact of these differences.

Maryland responded on 10 August that they will change their size limit to conform with the Amendment. Delaware responded on 16 August, Pennsylvania responded on 4 September,

Massachusetts responded on 12 September, Maine responded on 13 September, and New York and Connecticut responded on 24 September. All agreed with the consistency determination. As of the date of this document no responses had been received from the other States.

XVI. COUNCIL REVIEW AND MONITORING OF THE PLAN

There is no need to amend this section at this time.

XVII. REFERENCES

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XVIII. TABLES AND FIGURES

Table 1. Surf Clam Landings and Distribution by State, 1950-1983 (millions of lbs of meat)

	New England		NY		NJ		DE		MD		VA		Total#		
	Land	%	Land	%	Land	%	Land	%	Land	%	Land	%	Land	%	Change
1950	*	1	3	42	4	55	-	-	*	2	-	-	8	100	
1951	*	*	4	34	6	53	-	-	2	13	-	-	12	100	50%
1952	*	*	4	33	7	59	-	-	1	9	-	-	13	100	8
1953	-	-	3	27	7	53	-	-	2	20	-	-	12	100	-8
1954	*	3	3	28	7	58	-	-	1	11	-	-	12	100	*
1955	*	*	2	17	8	69	-	-	2	14	-	-	12	100	*
1956	*	1	2	15	12	72	*	*	2	12	-	-	16	100	33
1957	*	*	2	9	15	85	*	1	1	5	-	-	18	100	13
1958	*	*	*	3	13	85	1	5	1	5	-	-	15	100	-17
1959	*	*	1	2	20	87	2	7	1	4	-	-	23	100	53
1960	*	*	1	3	23	94	*	2	*	2	-	-	25	100	9
1961	*	*	1	3	27	97	-	-	*	*	-	-	28	100	12
1962	*	*	1	3	30	97	*	*	*	*	-	-	31	100	11
1963	-	-	1	3	38	97	-	-	*	*	-	-	39	100	26
1964	*	*	1	3	37	97	-	-	*	*	-	-	38	100	-3
1965	*	-	2	3	42	96	-	-	*	1	-	-	44	100	16
1966	*	*	2	4	43	96	-	-	*	*	-	-	45	100	2
1967	*	*	2	5	42	92	-	-	1	3	-	-	45	100	*
1968	*	*	3	7	32	79	-	-	5	13	*	*	41	100	-9
1969	*	*	3	7	36	73	3	6	7	1	*	*	50	100	22
1970	*	*	4	6	40	59	9	13	14	20	1	1	67	100	34
1971	*	1	4	7	29	55	8	15	8	15	5	9	53	100	-21
1972	*	*	3	4	21	34	9	14	7	12	23	37	64	100	21
1973	*	*	3	4	22	26	7	8	7	9	43	53	82	100	28
1974	*	*	4	4	23	24	6	6	5	6	58	61	96	100	17
1975	*	*	5	5	36	41	2	3	5	6	39	45	87	100	-9
1976	*	*	3	7	24	50	-	-	7	15	14	29	49	100	-44
1977	1	2	3	7	23	45	-	-	8	16	16	31	52	100	6
1978	1	2	2	6	15	39	-	-	8	21	13	32	40	100	-23
1979	1	4	2	4	12	35	-	-	8	22	13	35	35	100	-13
1980	1	2	2	5	10	25	-	-	11	30	14	38	38	100	9
1981	1	1	2	5	20	44	-	-	12	25	11	24	46	100	21
1982	3	6	2	5	24	49	-	-	10	19	10	21	50	100	9
1983	4	7	2	4	24	43	-	-	7	13	18	32	56	100	12

% = % of total annual landings.
% Change = % change in total landings from previous year.
# Includes any unallocated catch.
- = zero.
* = less than 500,000 lbs or .5%.
Rows may not add to Total because of rounding and unallocated catch.

Note: data collected as bu of clams landed and converted to lbs of meats based on 17 lbs/bu. Surf clam landings in New England have traditionally been converted using 11 lbs/bu. The larger factor approximates the weight of the complete shucked meats; the smaller factor approximates the meat weight per bu which is used by the processing plants. Therefore, New England surf clam landings are given in 17 lbs/bu form, in order to facilitate comparisons with the Mid-Atlantic fishery.

Source: USDC, 1984 and unpub. prelim. NMFS data.

Table 2. FCZ and Total Surf Clam and Ocean Quahog Landings, 1967-1983 (millions of lbs of meat)

	Surf Clam					Ocean Quahog					Surf Clam + Ocean Quahog	
	FCZ			Total		FCZ			Total			
	Land	% of Total	% Change	Land	% Change	Land	% of Total	% Change	Land	% Change	Land	% Change
1967	na	na	na	45		-	-		*		45	
1968	na	na	na	41	-9	-	-	-	*	*	41	-9
1969	na	na	na	50	22	-	-	-	1	*	50	22
1970	na	na	na	67	34	-	-	-	2	200	69	38
1971	50	95	na	53	-21	-	-	-	2	*	55	-20
1972	64	87	28	64	21	-	-	-	1	-50	65	18
1973	73	88	14	82	28	-	-	-	1	*	84	29
1974	74	77	1	96	17	-	-	-	1	*	97	15
1975	44	50	-41	87	-9	-	-	-	1	*	88	-9
1976	43	86	-2	49	-44	4	73	-	6	600	55	-38
1977	43	84	*	52	6	16	86	400	18	300	70	27
1978	31	79	-28	40	-23	20	88	25	23	28	63	-10
1979	29	82	-6	35	-13	32	91	60	35	52	70	11
1980	35	92	21	38	9	31	90	-3	34	-3	72	3
1981	37	80	6	46	21	35	98	13	36	6	82	14
1982	37	74	*	50	9	34	99	-3	35	-3	85	4
1983	45	80	22	56	12	34	97	*	35	*	91	7

- = zero.
* = less than 500,000 lbs or .5%.
na = data not available.
Source: USDC, 1984 and unpub. prelim. NMFS data.

Table 3. Northern New Jersey Stratified Mean Number and Weight (meats only, lbs) per Tow of Surf Clams from NMFS Surveys, 1965-1983 (Data are standardized to a 60" wide dredge towed for 5 minutes.)

Survey	Total Index		Less than 5½"		Equal to or Greater than 5½"		% Equal to or Greater than 5½"	
	Numbers	Weight	Numbers	Weight	Numbers	Weight	Numbers	Weight
May 65	38	11	15	3	23	8	59	76
Oct 65	36	12	6	1	30	10	83	90
Aug 66	30	10	5	1	25	9	82	92
Jun 69	34	12	4	1	30	11	89	94
Aug 70	26	9	5	1	21	8	81	93
Jun 74	21	7	3	*	19	7	87	94
Apr 76	13	5	2	*	11	4	82	94
Jan 77	2	1	1	*	1	*	43	81
Jan 78	2	*	1	*	1	*	28	65
Dec 78	45	3	44	2	1	*	2	15
Jan 80	32	4	28	3	4	2	13	38
Aug 80	54	8	51	7	3	1	5	14
Aug 81	39	7	31	5	8	3	21	36
Aug 82	113	19	102	16	11	4	10	19
Aug 83	73	13	63	10	10	3	14	26

* = less than .5.
Source: Table 9, Murawski and Serchuk, 1984.

Table 4. Southern New Jersey Stratified Mean Number and Weight (meats only, lbs) per Tow of Surf Clams from NMFS Surveys, 1965-1983 (Data are standardized to a 60" wide dredge towed for 5 minutes.)

Survey	Total Index		Less than 5½"		Equal to or Greater than 5½"		% Equal to or Greater than 5½"	
	Numbers	Weight	Numbers	Weight	Numbers	Weight	Numbers	Weight
May 65	106	20	78	10	28	10	26	51
Oct 65	83	23	33	6	50	17	60	74
Aug 66	70	22	15	3	55	19	79	86
Jun 69	60	20	5	1	54	19	91	95
Aug 70	16	6	3	*	13	5	83	92
Jun 74	49	20	2	*	47	19	96	98
Apr 76	5	2	1	*	5	2	88	96
Jan 77	2	1	1	*	1	*	46	89
Jan 78	15	5	4	*	11	4	74	90
Dec 78	9	2	4	1	4	2	48	76
Jan 80	14	5	3	*	11	5	81	91
Aug 80	15	6	3	*	12	5	80	92
Aug 81	10	5	1	*	10	4	95	99
Aug 82#	21	8	4	*	17	7	83	95
Aug 83	12	5	1	*	10	4	87	95

* = less than .5.
# = Index excludes 1 survey tow made at a depth of 42' that yielded 500 surf clams.
Source: Table 10, Murawski and Serchuk, 1984.

Table 5. Delmarva Stratified Mean Number and Weight (meats only, lbs) per Tow of Surf Clams from NMFS Surveys, 1965-1983 (Data are standardized to a 60" wide dredge towed for 5 minutes.)

Survey	Total Index		Less than 5½"		Equal to or Greater than 5½"		% Equal to or Greater than 5½"	
	Numbers	Weight	Numbers	Weight	Numbers	Weight	Numbers	Weight
May 65	28	5	16	2	12	3	43	63
Oct 65	28	6	11	1	17	5	62	79
Aug 66	33	8	11	1	22	6	67	82
Jun 69	26	6	8	1	18	5	69	82
Aug 70	20	5	5	1	15	5	76	88
Jun 74	37	10	7	1	30	9	82	91
Apr 76	22	5	7	1	15	5	67	90
Jan 77	11	3	3	*	9	3	76	93
Jan 78	12	3	5	*	7	2	58	85
Dec 78	621	13	616	12	5	2	1	88
Jan 80	69	7	58	4	10	3	15	49
Aug 80	49	6	39	3	9	3	19	52
Aug 81	163	15	157	13	6	2	4	13
Aug 82	109	13	103	10	7	2	6	17
Aug 83	51	8	39	5	12	4	23	44

* = less than .5.
Source: Table 11, Murawski and Serchuk, 1984.

Table 6. Stratified Mean Number per Tow of Surf Clams from NMFS Surveys off Southern Virginia - North Carolina, 1965-1983 (Data are standardized to a 60" wide dredge towed for 5 minutes.)

Survey	Total Index	Less than 5½"	Equal to or Greater than 5½"	% Equal to or Greater than 5½"
May 65	4	3	1	24
Oct 65#	12	12	*	1
Aug 66#	18	16	1	7
Jun 69	80	79	1	2
Aug 70#	3	1	2	77
Jun 74	30	13	17	58
Apr 76	6	1	5	82
Jan 78	3	1	2	67
Jan 80#	87	86	1	1
Aug 81#	26	18	8	31
Aug 82#	2	1	1	43
Aug 83	10	9	1	11

* = less than .5.
# = Only a small portion of the total Southern VA - NC area was surveyed.
Source: Table 12, Murawski and Serchuk, 1984.

Table 7. Calculated Mean Shell Lengths (in.) and Drained Meat Weights (lbs) at Age for Middle Atlantic FCZ Surf Clam Populations*

Age	New Jersey		Delmarva	
	Shell Length	Meat Weight	Shell Length	Meat Weight
1	1.6	0.01	1.6	0.01
2	2.8	0.04	2.9	0.03
3	3.7	0.08	3.8	0.08
4	4.4	0.13	4.5	0.12
5	4.9	0.18	5.0	0.16
6	5.3	0.23	5.4	0.20
7	5.6	0.27	5.7	0.24
8	5.8	0.30	5.9	0.26
9	6.0	0.32	6.1	0.28
10	6.1	0.35	6.2	0.29
11	6.2	0.36	6.3	0.31
12	6.3	0.37	6.4	0.32
13	6.4	0.39	6.4	0.32
14	6.4	0.39	6.5	0.33
15	6.5	0.40	6.5	0.33
16	6.5	0.40	6.5	0.33
17	6.5	0.41	6.5	0.34
18	6.5	0.41	6.5	0.34
19	6.5	0.41	6.5	0.34
20	6.5	0.41	6.5	0.34
21	6.5	0.42	6.5	0.34
22	6.6	0.42	6.6	0.34
23	6.6	0.42	6.6	0.34
24	6.6	0.42	6.6	0.34

* = Surf clams are spawned in late summer-autumn, so a 1 October birthdate is assumed.
Source: Table 15, Murawski and Serchuk, 1981.

Table 8. Size Distribution (% by number) of Mid-Atlantic FCZ Surf Clams

Size Interval (inches)	NMFS Surveys* Total %	NMFS Surveys* Total Cum. %	NMFS Surveys* Outside Closed Areas %	NMFS Surveys* Outside Closed Areas Cum. %	NMFS Catch Sampling** %	NMFS Catch Sampling** Cum. %	Processor Sampling*** %	Processor Sampling*** Cum. %
1.50 - 1.75	TR	-	TR	-				
1.75 - 2.00	TR	-	TR	-				
2.00 - 2.25	TR	1	TR	1				
2.25 - 2.50	1	1	1	2				
2.50 - 2.75	1	2	1	3				
2.75 - 3.00	2	4	2	5				
3.00 - 3.25	2	6	2	7				
3.25 - 3.50	2	8	2	9				
3.50 - 3.75	4	12	5	14				
3.75 - 4.00	7	19	5	19				
4.00 - 4.25	9	28	6	26				
4.25 - 4.50	11	38	10	35				
4.50 - 4.75	13	51	11	46	1	1	1	1
4.75 - 5.00	11	62	14	61	1	2	4	5
5.00 - 5.25	9	72	8	69	7	9	14	19
5.25 - 5.50	9	81	9	77	22	31	18	37
5.50 - 5.75	4	85	4	82	37	68	26	63
5.75 - 6.00	4	88	4	86	20	88	15	78
6.00 - 6.25	3	92	4	90	9	97	11	89
6.25 - 6.50	3	94	5	94	2	100	3	92
6.50 - 6.75	2	96	3	97	TR	100	4	96
6.75 - 7.00	2	99	3	99	TR	100	1	97
7.00 - 7.25	1	99	1	100	TR	100	2	99
7.25 - 7.50	TR	100	TR	100				
7.50 - 7.75	TR	100	TR	100				
7.75 - 8.00	TR	100	TR	100				
8.00 - 8.25	TR	100	TR	100				
1.50 - 4.75		51		46		1		1
4.75 - 5.50		30		31		30		36
5.50 - 8.25		19		23		69		62
4.75 - 8.25		49		54		99		98

- = zero.
TR = trace.
* = based on August 1983 data.
** = based on November-December 1983 data.
*** = based on November 1983 data.

Source: Murawski, 1984, pers. comm.

Table 9. Mid-Atlantic Surf Clam Population Estimates (weight) Based upon Areal Expansion of Survey Catch per Tow Data, 1983

Assessment Region	(1) Area of Region (sq n mi)	(2) Mean Catch/Tow (lbs)	Population estimate (millions of lbs)	% of Resource
ALL SURF CLAMS				
Northern New Jersey	3,440	13.1	422	47
Southern New Jersey	1,228	4.7	54	6
Delmarva	5,092	8.4	398	44
Southern Virginia-North Carolina	2,980	1.2	33	4
Total	12,740		907	100
SURF CLAMS GREATER THAN 5.5"				
Northern New Jersey	3,440	3.4	109	32
Southern New Jersey	1,228	4.5	52	15
Delmarva	5,092	3.6	171	51
Southern Virginia-North Carolina	2,980	0.2	6	2
Total	12,740		338	100

(1) Table 8, Murawski and Serchuk, 1984.
(2) Tables 3-6.

Table 10. Yield per Recruit (Y, grams, meat weight) and Proportion (%) of Maximum Yield per Recruit of Surf Clams from New Jersey and Delmarva FCZ Waters for Various Fishing Mortality Rates (F) and Assumed Harvested Sizes

	New Jersey										Delmarva									
	4.50"		4.75"		5.00"		5.25"		5.50"		4.50"		4.75"		5.00"		5.25"		5.50"	
F	Y	%	Y	%	Y	%	Y	%	Y	%	Y	%	Y	%	Y	%	Y	%	Y	%
0.1	12	93	11	89	11	82	10	75	8	66	11	94	10	90	10	84	9	77	8	68
0.2	17	96	17	91	16	86	14	79	13	70	16	96	15	92	14	87	13	81	12	72
0.3	20	97	19	94	18	89	17	82	15	73	18	98	18	95	17	90	16	84	14	76
0.4	22	99	21	96	20	91	19	85	17	76	20	99	19	97	19	93	17	87	16	79
0.5	23	99	22	97	21	93	20	87	18	78	21	100	20	98	20	94	18	89	17	81
0.6	23	100	23	98	22	94	21	88	19	80	21	100	21	99	20	96	19	90	18	82
0.7	24	100	23	99	23	95	21	90	19	81	22	100	21	99	21	96	20	91	18	84
0.8	24	100	24	99	23	96	22	90	20	82	22	100	22	99	21	97	20	92	19	85
0.9	24	100	24	99	23	96	22	91	20	83	22	100	22	100	22	98	21	93	19	86
1.0	24	100	24	100	24	97	22	92	20	84	22	100	22	100	22	98	21	94	19	86
1.1	25	100	25	100	24	97	23	92	21	84	22	100	22	100	22	98	21	94	19	87
1.2	25	100	25	100	24	98	23	93	21	85	22	100	22	100	22	98	21	94	20	87
1.3	25	100	25	100	24	98	23	93	21	86	22	99	23	100	22	99	21	95	20	88
1.4	25	100	25	100	24	98	23	94	21	86	22	99	23	100	22	99	21	95	20	88
1.5	25	100	25	100	24	98	23	94	21	86	22	99	23	100	22	99	22	95	20	89
1.6	25	99	25	100	24	98	23	94	22	87	22	99	23	100	22	99	22	95	20	89
1.7	25	99	25	100	25	98	24	94	22	87	22	99	23	100	23	99	22	96	20	89
1.8	25	99	25	100	25	99	24	94	22	87	22	99	23	100	23	99	22	96	20	89
1.9	25	99	25	100	25	99	24	95	22	87	22	99	23	100	23	99	22	96	20	90
2.0	25	99	25	100	25	99	24	95	22	87	22	98	23	100	23	99	22	96	20	90

Source: Murawski, 1983, pers. comm.

Table 11. Calculated Age and Number of Spawnings for New Jersey and Delmarva Area FCZ Surf Clams

	Clam Length (inches)						
	4.00	4.25	4.50	4.75	5.00	5.25	5.50
New Jersey FCZ							
Calculated Age (years)	3.4	3.8	4.2	4.7	5.2	5.9	6.6
Number of Spawnings*	1+	2+	2+	3+	3+	4+	4-5+
Delmarva FCZ							
Calculated Age (years)	3.2	3.6	4.0	4.4	4.9	5.5	6.2
Number of Spawnings*	1+	1-2+	2+	2-3+	3+	3-4+	4+

* Some surf clams spawn at age 1 year, most do not initiate spawning until age 2.
+ Some individuals have spawned once more than the indicated number.
Source: Murawski, 1983, pers. comm.

Table 12. Estimated Proportion (%) of Mid-Atlantic FCZ Surf Clam Landings Derived from Each of 4 Assessment Areas, 1978-1982

	Northern New Jersey	Southern New Jersey	Delmarva	Southern Virginia - North Carolina	Total
1978	2	6	92	*	100
1979	3	7	90	1	100
1980	10	4	85	*	100
1981	48	1	48	3	100
1982	39	7	44	11	100
1983	35	6	42	16	100

* = less than .5%.
Source: Table 6, Murawski and Serchuk, 1982 and Tables 2-5, Murawski and Serchuk, 1984.

Table 13. Mid-Atlantic Surf Clam Vessel* Performance, 1979 - 1983

	Class	(1) Vessels	(2) Bu (000)	(3) Hours at Sea (000)	(4) Hours Fishing (000)	(5) Bu/ Vessel (000)	(6) Hrs. at Sea/ Vessel	(7) Fishing Hrs./ Vessel	(8) CPUE	(9) Rel. Fishing Power	(10) Rel. CPUE
1979	1	26	100	9	6	4	336	214	17	1.0	1.0
	2	56	374	34	19	7	599	339	19	1.7	1.1
	3	71	1,177	64	38	15	808	479	31	3.9	1.8
	Total	161	1,650	106	62	10	659	386	26		
1980	1	14	80	6	4	6	403	259	21	1.0	1.0
	2	49	495	33	20	10	671	409	24	1.8	1.1
	3	65	1,346	58	35	21	896	532	38	3.6	1.8
	Total	128	1,921	97	58	15	756	455	32		
1981	1	15	65	5	3	4	312	194	22	1.0	1.0
	2	43	469	21	12	11	482	280	38	2.5	1.7
	3	64	1,437	52	26	22	827	403	55	5.2	2.5
	Total	122	1,971	77	41	16	631	334	48		
1982	1	14	93	7	5	7	522	339	19	1.0	1.0
	2	42	469	27	17	11	645	411	27	1.7	1.4
	3	58	1,441	62	33	25	1,064	576	43	3.7	2.3
	Total	114	2,003	96	55	18	843	486	36		
1983	1	13	112	6	4	9	482	306	28	1.0	1.0
	2	43	666	25	16	15	575	375	41	1.8	1.4
	3	57	1,546	52	28	27	913	482	56	3.2	2.0
	Total	113	2,324	83	48	21	734	421	48		

Column Notes:
(1), (2), (3), and (4) from vessel logbook data.
(5) = (2) divided by (1). Total rows = total for (2) divided by total for (1).
(6) = (3) divided by (1). Total rows = total for (3) divided by total for (1).
(7) = (4) divided by (1). Total rows = total for (4) divided by total for (1).
(8) = (2) divided by (4). Total rows = total for (2) divided by total for (4).
(9) = (5) for each Class divided by (5) for Class 1.
(10) = (8) for each Class divided by (8) for Class 1.

Class 1 = less than 50 Gross Registered Tons (GRT); Class 2 = 51-100 GRT; Class 3 = greater than 100 GRT.

* = includes all vessels that landed surf clams; i.e., vessels that landed only surf clams and the clams landed by vessels that caught both surf clams and ocean quahogs.

Source: unpub. prelim. NMFS logbook data.

Table 14. Mid-Atlantic Surf Clam Only Vessel* Performance, 1984

	Class	(1) Vessels	(2) Bu (000)	(3) Hours at Sea	(4) Hours Fishing	(5) Bu/ Vessel	(6) Hrs. at Sea/ Vessel	(7) Fishing Hrs./ Vessel	(8) CPUE	(9) Rel. Fishing Power	(10) Rel. CPUE
Jan	1	8	19	752	510	2,430	94	63	38	1.0	1.0
	2	35	119	3,093	2,198	3,399	88	62	54	1.4	1.4
	3	38	191	4,507	2,556	5,034	118	67	74	2.1	2.0
	Total	81	330	8,353	5,265	4,070	103	65	62		
Feb	1	9	12	469	308	1,329	52	34	38	1.0	1.0
	2	35	106	2,517	1,697	3,019	71	48	62	2.3	1.6
	3	32	142	3,368	1,885	4,447	105	58	75	3.4	2.0
	Total	76	260	6,354	3,891	3,420	83	51	66		
Mar	1	7	6	248	169	873	35	24	36	1.0	1.0
	2	30	55	1,366	901	1,820	45	30	60	2.1	1.7
	3	30	71	1,563	928	2,364	52	30	76	2.7	2.1
	Total	67	132	3,177	1,998	1,964	47	29	65		
Apr	1	6	5	179	126	795	29	21	37	1.0	1.0
	2	30	63	1,568	1,022	2,095	52	34	61	2.6	1.7
	3	26	87	1,591	927	3,361	61	35	94	4.2	2.5
	Total	62	155	3,338	2,076	2,500	53	33	74		

Column Notes:
(1), (2), (3), and (4) from vessel logbook data.
(5) = (2) divided by (1). Total rows = total for (2) divided by total for (1).
(6) = (3) divided by (1). Total rows = total for (3) divided by total for (1).
(7) = (4) divided by (1). Total rows = total for (4) divided by total for (1).
(8) = (2) divided by (4). Total rows = total for (2) divided by total for (4).
(9) = (5) for each Class divided by (5) for Class 1.
(10) = (8) for each Class divided by (8) for Class 1.

* = includes all vessels that landed only surf clams but not vessels that caught both surf clams and ocean quahogs.

Source: unpub. prelim. NMFS logbook data.

Table 15. CPUE of Vessels by Class that Made at Least One Trip for Mid-Atlantic Surf Clams, Ocean Quahogs, or both Mid-Atlantic Surf Clams and Ocean Quahogs by Quarter, 1979-1983, and by Month, 1984

Year & Quarter		Surf Clam Only				Ocean Quahog Only				Clam & Quahog			
		1	2	3	All	1	2	3	All	1	2	3	All
1979	1	18	20	28	25	-	C	148	145	-	C	79	79
	2	17	20	31	25	-	C	109	115	-	66	79	77
	3	18	19	37	28	C	C	108	108	-	32	56	51
	4	18	18	35	28	C	C	138	130	-	46	80	75
1980	1	19	19	33	26	-	C	135	134	C	C	69	69
	2	23	18	36	29	-	C	130	127	-	53	66	63
	3	18	21	40	31	-	C	110	107	-	80	86	85
	4	33	25	43	38	-	C	112	111	C	72	85	82
1981	1	24	30	42	37	-	C	125	123	-	C	104	104
	2	24	39	51	44	-	C	141	134	-	C	106	104
	3	22	45	59	51	-	C	129	127	C	59	102	94
	4	14	28	52	40	-	C	127	123	C	45	89	82
1982	1	23	27	41	35	-	C	147	143	-	C	89	86
	2	15	23	42	33	-	C	152	151	-	42	90	79
	3	19	23	46	36	-	-	169	169	C	57	89	78
	4	24	31	48	40	-	-	150	150	-	62	95	87
1983	1	19	34	43	39	-	-	145	145	-	53	91	81
	2	28	39	57	50	-	C	141	138	C	C	74	62
	3	30	41	61	50	-	C	145	141	C	C	118	96
	4	33	50	69	58	-	C	147	141	-	C	110	102
1984	J	38	54	74	62	-	C	143	142	C	C	104	89
	F	38	62	75	66	-	C	140	134	-	-	94	94
	M	36	60	76	65	-	C	142	138	-	C	102	95
	A	37	61	94	74	-	C	146	143	C	74	106	97

- = zero (no vessels in the class fished).
C = data confidential because 3 or fewer vessels fished.
Surf Clam Only = vessels landing only Mid-Atlantic surf clams.
Quahog Only = vessels landing only ocean quahogs.
Clam & Quahog = vessels landing both Mid-Atlantic surf clams and ocean quahogs.

Source: unpub. prelim. NMFS logbook data.

Table 16. Mid-Atlantic Surf Clam Vessels, Hours at Sea/Hours Fishing, by Class, Average Annual 1979 - 1983 and Monthly 1984

		Class			
		1	2	3	Ave
1979		1.6	1.8	1.7	1.7
1980		1.7	1.7	1.7	1.7
1981		1.6	1.8	2.0	1.9
1982		1.4	1.6	1.9	1.7
1983		1.5	1.6	1.9	1.7
1984	Jan	1.5	1.4	1.8	1.6
	Feb	1.5	1.5	1.8	1.6
	Mar	1.5	1.5	1.7	1.6
	Apr	1.4	1.5	1.7	1.6

Source: developed from Tables 16 and 17.

Table 17. Ocean Quahog Vessel Performance, 1979 - 1983

	Class	(1) Vessels	(2) Bu (000)	(3) Hours at Sea (000)	(4) Hours Fishing (000)	(5) Bu/ Vessel (000)	(6) Hrs. at Sea/ Vessel	(7) Fishing Hrs./ Vessel	(8) CPUE	(9) Rel. Fishing Power	(10) Rel. CPUE
1979	A	19	342	8	3	18	396	168	107	1.0	1.0
	B	39	2,694	38	22	69	985	568	121	3.8	1.1
	Total	58	3,036	46	25	52	792	437	119		
1980	A	17	249	5	2	13	319	146	100	1.0	1.0
	B	36	2,702	42	23	75	1,159	638	117	5.8	1.2
	Total	53	2,952	47	25	56	889	480	115		
1981	A	9	161	4	2	18	438	208	86	1.0	1.0
	B	39	2,728	40	22	70	1,025	558	125	3.9	1.5
	Total	48	2,889	44	24	60	914	493	122		
1982	A	10	160	4	2	16	376	210	76	1.0	1.0
	B	34	3,082	41	22	91	1,195	642	141	5.7	1.9
	Total	44	3,242	44	24	74	1,009	543	135		
1983	A	7	140	3	2	20	454	252	79	1.0	1.0
	B	30	3,061	41	21	102	1,363	705	144	5.1	1.8
	Total	37	3,201	44	23	87	1,191	619	139		

* = Class A = 100 GRT or less; Class B = greater than 100 GRT.
(1), (2), (3), and (4) from vessel logbook data.
(5) = (2) divided by (1).
(6) = (3) divided by (1).
(7) = (4) divided by (1).
(8) = (2) divided by (4).
(9) = (5) for each Class B divided by (5) for Class A.
(10) = (8) for each Class B divided by (8) for Class A.

Source: unpub. prelim. NMFS logbook data.

Table 18. Mid-Atlantic Surf Clam Fishery, Vessel Distribution by Class, 1965-1982

	Class 1			Class 2			Class 3			Total	
	No.	% of Total	% Change	No.	% of Total	% Change	No.	% of Total	% Change	No.	% Change
1965	33	48		33	48		2	3		68	
1966	34	46	3	34	46	3	6	8	200	74	9
1967	40	44	18	40	44	18	11	12	83	91	23
1968	38	44	-5	42	49	5	6	7	-46	86	-6
1969	32	35	-16	56	61	33	4	4	-33	92	7
1970	33	32	3	59	57	5	12	12	200	104	13
1971	28	30	-15	46	50	-22	18	20	50	92	-12
1972	29	32	4	44	49	-4	17	19	-6	90	-2
1973	32	34	10	44	47	-	17	18	-	93	3
1974	35	36	9	46	47	5	17	17	-	98	5
1975	35	35	-	46	46	-	18	18	6	99	1
1976	33	27	-6	55	45	20	34	28	89	122	23
1977*	22	14	-33	56	36	2	77	50	126	155	27
1978**	21	13	-5	58	37	4	78	50	1	157	1
1979**	28	17	33	56	34	-3	81	49	4	165	5
1980**	14	11	-50	49	38	-13	65	51	-20	128	-22
1981**	15	12	7	43	35	-12	64	52	-1	122	-5
1982**	14	12	-7	42	37	-2	58	51	-9	114	-7
1983**	13	12	-7	43	38	2	57	50	-2	113	-1

* = licenses issued as of 31 Dec. 1977.

** = vessels active in the fleet as of 31 Dec., based on logbook reports.

- = zero.

Rows may not add to Total because of rounding.

Source: unpub. prelim. NMFS logbook data.

Table 19. Physical Characteristics of Mid-Atlantic Surf Clam Vessels, 1979-1983

	Length (ft.)			Gross Tonnage			Dredge (in.)			Horsepower			Crew Size		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
1979	28	146	79	6	306	112	16	240	90	60	1330	389	1	11	4
1980	43	146	81	24	306	117	16	240	107	60	1000	400	1	9	4
1981	43	146	81	24	306	117	16	240	107	60	1330	389	1	9	4
1982	45	146	82	24	306	115	36	240	105	90	1330	434	1	9	4
1983	54	146	82	34	306	115	60	240	108	225	1000	560	2	6	5

Note: 240" represents double 120" dredges; largest single dredge was 200".
Source: unpub. NMFS data.

Table 20. Surf Clam and Ocean Quahog Permits by State of Registry, 1983

	Surf Clam/Ocean Quahog		Ocean Quahog		Surf Clam/New England	
	Number	%	Number	%	Number	%
ME	-	-	36	23	55	15
NH	-	-	11	7	17	5
MA	2	1	72	46	210	58
RI	4	3	14	9	35	10
CT	-	-	1	1	3	1
NY	5	3	7	4	5	1
NJ	65	44	7	4	7	2
PA	9	6	-	-	-	-
DE	3	2	1	1	1	1
MD	40	27	-	-	19	5
VA	20	14	5	3	7	2
Other	-	-	2	1	3	1
Total	148	100	156	100	362	100

Source: unpub. prelim. NMFS data.

Table 21. Number of Vessels by Class that Made at Least One Trip for Mid-Atlantic Surf Clams, Ocean Quahogs, or both Mid-Atlantic Surf Clams and Ocean Quahogs by Year and Quarter, 1979-1983 and by Month, 1984

	Clam Only				Quahog Only				Clam & Quahog				Clam Only + Clam & Quahog				All			
	1	2	3	All	1	2	3	All	1	2	3	All	1	2	3	All	1	2	3	All
1979																				
1	19	33	41	93	-	3	11	14	-	2	17	19	19	35	58	112	19	38	69	126
2	18	37	42	97	-	1	4	5	-	5	27	32	18	42	69	129	18	43	73	134
3	13	35	36	84	1	2	11	14	-	9	16	25	13	44	52	109	14	46	63	123
4	13	33	36	82	2	3	13	18	-	7	17	24	13	40	53	106	15	43	66	124
Year	25	43	44	112	2	1	5	8	1	14	35	50	26	57	79	162	28	58	84	170
1980																				
1	11	40	30	81	-	2	16	18	1	3	17	21	12	43	47	102	12	45	63	120
2	11	33	28	72	-	2	15	17	-	6	14	20	11	39	42	92	11	41	57	107
3	10	32	30	72	-	2	10	12	-	5	18	23	10	37	48	95	10	39	58	107
4	6	30	34	70	-	2	11	13	3	6	13	24	9	36	47	94	9	38	58	107
Year	9	38	34	81	-	1	5	6	4	11	31	48	13	49	65	129	13	50	70	135
1981																				
1	8	32	34	74	-	1	11	12	-	3	19	22	8	35	53	96	8	36	64	108
2	10	32	32	74	-	2	8	10	-	3	20	23	10	35	52	97	10	37	60	107
3	11	29	34	74	-	2	11	13	1	4	18	23	12	33	52	97	12	35	63	110
4	11	28	30	69	-	2	12	14	1	4	17	22	12	32	47	91	12	34	59	106
Year	14	36	29	79	-	1	4	5	1	7	35	43	15	43	64	122	15	44	68	127
1982																				
1	10	29	33	72	-	2	14	16	-	2	18	20	10	31	51	92	10	33	65	108
2	12	30	36	78	-	1	12	13	-	5	13	18	12	35	49	96	12	36	61	109
3	8	32	32	72	-	-	9	9	2	6	18	26	10	38	50	98	10	38	59	107
4	11	31	38	80	-	-	13	13	-	4	10	14	11	35	48	94	11	35	61	107
Year	12	35	31	78	-	1	7	8	2	7	27	36	14	42	58	114	14	43	65	122
1983																				
1	10	28	36	74	-	-	17	17	-	5	9	14	10	33	45	88	10	33	62	105
2	8	28	35	71	-	3	19	22	1	1	5	7	9	29	40	78	9	32	59	100
3	9	35	35	79	-	1	13	14	1	3	10	14	10	38	45	93	10	39	58	107
4	10	35	37	82	-	1	14	15	-	2	11	13	10	37	48	95	10	38	62	110
Year	12	37	37	86	-	-	10	10	1	6	20	27	13	43	57	113	13	43	67	123
1984																				
Jan	8	35	38	81	-	1	15	16	1	2	7	10	9	37	45	91	9	38	60	107
Feb	9	35	32	76	-	3	17	20	-	-	7	7	9	35	39	83	9	38	56	103
Mar	7	30	30	67	-	2	16	18	-	2	8	10	7	32	38	77	7	34	54	95
Apr	6	30	26	62	-	1	13	14	1	5	12	18	7	35	38	80	7	36	51	94

Clam Only = vessels landing only Mid-Atlantic Area surf clams.
Quahog Only = vessels landing only ocean quahogs.
Clam & Quahog = vessels landing both Mid-Atlantic Area surf clams and ocean quahogs.

Source: unpub. prelim. NMFS logbook data.

Table 22. Distribution of Trips of Vessels Catching Mid-Atlantic Surf Clams Only, Ocean Quahogs Only, and Mid-Atlantic Surf Clams and Ocean Quahogs, by Class, 1983

Number of Trips	Surf Clam Only by Class								Quahog Only Class 3		Clam & Quahog Class 3	
	1		2		3		Total					
	%	Cum	%	Cum	%	Cum	%	Cum	%	Cum	%	Cum
1-10	38%	38%	22%	22%	6%	6%	19%	19%	9%	9%	-%	-%
11-20	-	38	-	22	3	9	1	20	-	9	-	-
21-30	15	54	14	36	22	31	17	37	-	9	6	6
31-40	-	54	17	53	3	34	9	46	9	18	6	12
41-50	31	85	19	72	13	47	19	64	-	18	-	12
51-60	15	100	11	83	9	56	11	75	-	18	-	12
61-70	-	-	14	97	25	81	16	91	-	18	6	18
71-80	-	-	-	97	16	97	6	98	-	18	11	29
81-90	-	-	3	100	-	97	1	99	9	27	22	51
91-100	-	-	-	-	3	100	1	100	18	45	6	57
101+	-	-	-	-	-	-	-	-	55	100	44	100
Per vessel:												
Mean Trips		28		39		54		43		95		96
Peak Trips		52		95		93		95		131		160
Median Trips		28		40		61		47		107		93

Source: unpub. prelim. NMFS logbook data.

Table 23. Number of Trips for Mid-Atlantic Area Surf Clams by Hours Fished, 1984

Hours Fished	Class 1		Class 2		Class 3		Total	
	1/1-2/25	2/26-5/22	1/1-2/25	2/26-5/22	1/1-2/25	2/26-5/22	1/1-2/25	2/26-5/22
1	-	-	-	3	1	1	1	4
2	-	2	2	4	4	2	6	8
3	4	3	2	1	8	2	14	7
4	-	-	10	7	8	1	18	8
5	3	-	14	16	6	5	23	21
6	4	1	20	13	16	9	40	23
7	2	-	25	17	11	8	38	25
8	6	5	78	25	30	18	114	48
9	4	-	12	12	21	10	37	22
10	17	7	38	31	24	22	79	60
11	7	3	24	18	21	17	52	48
12	38	16	172	121	293	194	503	331
13	-	2	-	-	1	-	1	2
Total	85	39	397	268	444	289	926	607
12 hrs+	45%	46%	43%	45%	66%	67%	54%	55%
All Trips								
Vessels	9	7	37	35	44	37	90	79
Trips	85	39	397	268	444	289	926	596
/vessel	9	6	11	8	10	8	10	8
Catch (bu)	30,994	14,112	212,055	154,775	338,785	239,427	581,834	408,314
/trip	365	362	534	578	763	829	628	685
Hrs fished	851	380	3,848	2,579	4,693	3,115	9,392	6,074
/trip	10	10	10	10	11	11	10	10
Trips less than 8 hrs								
Vessels	4	3	19	18	23	20	46	41
Trips	14	6	77	63	57	29	148	98
/vessel	4	2	4	4	2	1	3	2
Catch (bu)	2,327	379	34,809	25,327	25,764	18,561	62,900	44,267
/trip	166	63	452	402	452	640	425	452
Hrs fished	73	19	443	332	289	157	805	508
/trip	5	3	6	5	5	5	5	5

From 1/1-2/25 24 hrs/week were allowed = 2 trips/week X 8 weeks = 16 trips.
From 2/26-5/22 12 hrs/week were allowed = 1 trip/week X 12 weeks = 12 trips.

Source: unpub. prelim. NMFS logbook data.

Table 24. Distribution of Mid-Atlantic Surf Clam Only Trips by Day, 1984

	Share of Total Trips
Sunday	19%
Monday	24
Tuesday	24
Wednesday	21
Thursday	12
Total (4,721 trips)	100%

Source: unpub. prelim. NMFS logbook data.

Table 25. Mid-Atlantic Allowable Surf Clam Fishing Time (hours/week)
17 November 1977 - 30 June 1984

Date	Hrs/wk	Number of Weeks	Number of Hours
11/17/77	48	6	288
1/1/78	96	4	384
1/30/78	48	6	288
3/10/78	Close	3	-
4/1/78	48	5	240
5/7/78	24	21	504
10/1/78	36	4	144
10/30/78	24	8	192
12/21/78	Close	1	-
1/1/79	24	9	216
2/27/79	36	5	180
4/1/79	24	27	648
10/15/79	36	11	396
1/1/80	24	9	216
2/18/80	36	6	216
3/31/80	24	3	72
4/20/80	36	4	144
5/18/80	48	6	288
1/29/80	24	1	24
7/7/80	48	9	432
9/28/80	24	14 (80), 29 (81)	336 (80), 696 (81)
7/21/81	12	23	276
1/4/82	24	52 (82), 52 (83), 8 (84)	1,248 (82), 1,248 (83), 192 (84)
2/26/84	12	17	204
6/24	Close	2	-

Table 26. Mid-Atlantic Allowed Surf Clam Fishing Time by Year, 1978-1984

	Close	Hours/Week 12		24		36		48		96		Total		
	Wks	Wks	Hrs	Wks	Hrs	Wks	Hrs	Wks	Hrs	Wks	Hrs	Wks	Hrs	% Ch
1978	4	-	-	29	696	4	144	11	528	4	384		1,752	
			-		40%		8%		30%		22%		100%	
1979	-	-	-	36	864	16	576	-	-	-	-		1,440	-18%
			-		60%		40%		-		-		100%	
1980	-	-	-	27	648	10	360	17	720	-	-		1,728	20
			-		38%		21%		42%		-		100%	
1981	-	23	276	29	696	-	-	-	-	-	-		972	-44
			28%		72%		-		-		-		100%	
1982	-	-	-	52	1,248	-	-	-	-	-	-		1,248	28
			-		100%		-		-		-		100%	
1983	-	-	-	52	1,248	-	-	-	-	-	-		1,248	-
			-		100%		-		-		-		100%	
1984#	2	17	204	8	192	-	-	-	-	-	-		396	
			52%		48%		-		-		-		100%	
TOTAL														
Weeks	6	40		233		30		26		4		339		
	2%	12%		69%		9%		8%		1%		100%		
Hours			480		5,592		1,080		1,248		384		8,784	
			5%		64%		12%		14%		4%		100%	

% Ch = % change in value from previous year.
# through 7 July 1984.

Table 27. Surf Clam Ex-Vessel Value (millions of $) and Distribution (%) by State

	NE		NY		NJ		DE		MD		VA		Total#	
	Val	%	Val	%	Val	%	Val	%	Val	%	Val	%	Val	%
1950	*	1	*	43	*	54	-	-	*	1	-	-	1	100
1951	*	1	*	36	1	52	-	-	*	12	-	-	1	100
1952	*	*	*	31	1	57	-	-	*	12	-	-	1	100
1953	-	-	*	30	1	56	-	-	*	15	-	-	1	100
1954	*	2	*	29	1	58	-	-	*	12	-	-	1	100
1955	*	*	*	19	1	71	-	-	*	10	-	-	1	100
1956	*	2	*	17	1	72	*	-	*	10	-	-	2	100
1957	*	*	*	10	2	83	*	*	*	6	-	-	2	100
1958	*	-	*	4	1	84	*	6	*	6	-	-	2	100
1959	*	*	*	3	2	84	*	9	*	4	-	-	2	100
1960	*	-	*	5	2	90	*	3	*	2	-	-	2	100
1961	*	*	*	4	2	96	-	-	*	*	-	-	2	100
1962	*	*	*	4	2	95	*	1	*	*	-	-	2	100
1963	-	-	*	3	3	96	-	-	*	*	-	-	3	100
1964	*	*	*	4	3	96	-	-	*	*	-	-	3	100
1965	*	-	*	4	3	95	-	-	*	1	-	-	3	100
1966	*	*	*	4	4	96	-	-	*	*	-	-	4	100
1967	*	*	*	4	4	93	-	-	*	2	-	-	4	100
1968	*	*	*	7	3	80	-	-	1	13	*	*	4	100
1969	*	*	*	7	4	72	*	6	1	15	*	*	6	100
1970	*	1	*	6	5	61	1	12	1	19	*	1	8	100
1971	*	*	*	6	4	56	1	15	1	14	1	8	7	100
1972	*	1	*	4	3	35	1	14	1	15	3	32	8	100
1973	*	*	*	4	3	28	1	8	1	12	5	48	10	100
1974	*	*	1	6	3	24	1	6	1	8	7	56	12	100
1975	*	*	1	6	5	38	*	3	1	8	6	45	13	100
1976	*	*	1	5	11	46	-	-	4	16	8	32	23	100
1977	*	2	1	4	12	44	-	-	5	18	9	33	27	100
1978	*	1	1	4	8	36	-	-	5	24	7	35	21	100
1979	1	3	1	3	6	32	-	-	5	23	7	37	20	100
1980	*	2	1	4	5	25	-	-	6	30	8	39	19	100
1981	*	1	1	3	10	41	-	-	6	26	7	29	23	100
1982	2	7	1	3	12	45	-	-	5	21	6	24	26	100
1983	2	8	1	4	10	40	-	-	3	12	8	32	25	100

Includes any unallocated value. - = zero. * = less than $500,000 or .5%.
Rows may not add to Total because of rounding.
Source: USDC, 1984 and unpub. prelim. NMFS data.

Table 28. FCZ and Total Surf Clam Ex-Vessel Value (millions of $)

	FCZ					Total			
	Current $		Deflated $**		% of	Current $		Deflated $**	
	Value	Change	Value	Change	Total	Value	Change	Value	Change
1974	10		6		83	12		8	
1975	7	-30%	4	-33%	54	13	8%	7	-13%
1976	21	300%	12	300%	91	23	77%	13	86%
1977	24	14%	12	*	89	27	17%	14	8%
1978	18	-25%	9	-25%	86	21	-22%	10	-29%
1979	17	-6%	7	-22%	85	20	-5%	8	-20%
1980	18	6%	7	*	95	19	-5%	7	-13%
1981	20	11%	7	*	87	23	21%	8	14%
1982	21	5%	7	*	81	26	13%	8	*
1983	21	*	7	*	84	25	19%	8	*

* = less than .5%.
** = Using Producer Prices, All Commodities (Series 330), 1967 = 100.
Source: USDC, 1984 and unpub. prelim. NMFS data.

Table 29. Surf Clam Price Per Pound, 1950-1982

	Total		FCZ	
	Current	Deflated*	Current	Deflated*
1950	$.10	$.12	$ -	$ -
1951	.10	.11	-	-
1952	.11	.13	-	-
1953	.11	.13	-	-
1954	.12	.14	-	-
1955	.11	.13	-	-
1956	.11	.12	-	-
1957	.12	.13	-	-
1958	.11	.11	-	-
1959	.08	.09	-	-
1960	.07	.07	-	-
1961	.06	.07	-	-
1962	.07	.07	-	-
1963	.07	.07	-	-
1964	.07	.07	-	-
1965	.07	.08	-	-
1966	.09	.09	-	-
1967	.10	.10	-	-
1968	.10	.10	-	-
1969	.12	.11	-	-
1970	.11	.10	-	-
1971	.13	.11	-	-
1972	.12	.10	-	-
1973	.12	.09	-	-
1974	.13	.08	.13	.08
1975	.14	.08	.15	.09
1976	.47	.26	.50	.27
1977	.52	.27	.55	.28
1978	.53	.25	.58	.28
1979	.56	.24	.58	.25
1980	.51	.19	.52	.19
1981	.51	.17	.55	.19
1982	.52	.17	.57	.19
1983	.45	.15	.47	.16

- = zero. * = Using Producer Prices, All Commodities (Series 330), 1967 = 100.
Source: USDC, 1984 and unpub. prelim. NMFS data.

Table 30. Mid-Atlantic FCZ Surf Clam Vessel Average Deflated Gross Revenue, 1979 - 1983 (bu in thousands)

	Class	(1) Vessels	(2) Bu	(3) $/lb	(4) $/bu	(5) Ave. Gross Revenue
1979	1	26	100	$ .25	$4.25	$ 16,000
	2	56	374	.25	4.25	28,000
	3	71	1,177	.25	4.25	70,000
	Total	161	1,650	.25	4.25	44,000
1980	1	14	80	.19	3.23	18,000
	2	49	495	.19	3.23	33,000
	3	65	1,346	.19	3.23	67,000
	Total	128	1,921	.19	3.23	48,000
1981	1	15	65	.19	3.23	14,000
	2	43	469	.19	3.23	35,000
	3	64	1,437	.19	3.23	73,000
	Total	122	1,971	.19	3.23	52,000
1982	1	14	93	.19	3.23	21,000
	2	42	469	.19	3.23	36,000
	3	58	1,441	.19	3.23	80,000
	Total	114	2,003	.19	3.23	57,000
1983	1	13	112	.16	2.72	23,000
	2	43	666	.16	2.72	42,000
	3	57	1,546	.16	2.72	74,000
	Total	113	2,324	.16	2.72	56,000

(1) and (2) from Table 16.
(3) = FCZ price per lb deflated for inflation from Table 32.
(4) = (3) X 17 lbs per bu.
(5) = (2) X (4) divided by (1).

Table 31. Ocean Quahog Ex-Vessel Value (millions of $), by Water Area

	Territorial Sea					FCZ					Total			
	Current		Deflated		% of	Current		Deflated		% of	Current		Deflated	
	Value	Ch.	Value	Ch.	Total	Value	Ch.	Value	Ch.	Total	Value	Ch.	Value	Ch.
1967	*		*		100	-		-		-	*		*	
1968	*	*	*	*	100	-	-	-	-	-	*	*	*	*
1969	*	*	*	*	100	-	-	-	-	-	*	*	*	*
1970	*	*	*	*	100	-	-	-	-	-	*	*	*	*
1971	*	*	*	*	100	-	-	-	-	-	*	*	*	*
1972	*	*	*	*	100	-	-	-	-	-	*	*	*	*
1973	*	*	*	*	100	-	-	-	-	-	*	*	*	*
1974	*	*	*	*	100	-	-	-	-	-	*	*	*	*
1975	*	*	*	*	100	-	-	-	-	-	*	*	*	*
1976	*	*	*	*	23	1	-	1	-	77	2	552	1	524
1977	1	88	*	*	13	5	500	3	300	83	6	300	3	300
1978	1	*	*	*	11	6	20	3	*	86	7	17	3	*
1979	1	*	*	*	9	9	50	4	33	90	10	43	4	33
1980	1	*	*	*	10	9	*	3	-25	90	10	*	4	*
1981	*	-83	*	*	2	10	11	3	*	98	10	*	3	-25
1982	*	*	*	*	2	10	*	4	33	98	11	10	4	33
1983	1	88	*	*	5	10	*	4	*	95	11	*	4	*

Ch. = % change in value from previous year.
- = zero.
* = less than $500,000 or .5%.
Deflated using Producer Prices, All Commodities, 1967 = 100 (USDC, Bureau of Economic Analysis, Business Conditions Digest, Series 330).
Source: USDC, 1984 and unpub. prelim. NMFS data.

Table 32. Ocean Quahog Average Price per Pound, by Water Area ($ per pound, Deflated: 1967 = 100)

	Territorial Sea		FCZ		Total	
	Current	Deflated	Current	Deflated	Current	Deflated
1967	$ .13	$.13	$ -	$ -	$ .13	$.13
1968	.13	.13	-	-	.13	.13
1969	.15	.15	-	-	.15	.15
1970	.17	.16	-	-	.17	.16
1971	.17	.15	-	-	.17	.15
1972	.17	.14	-	-	.17	.14
1973	.17	.13	-	-	.17	.13
1974	.17	.11	-	-	.17	.11
1975	.19	.11	-	-	.19	.11
1976	.25	.14	.30	.16	.29	.16
1977	.28	.15	.31	.16	.30	.16
1978	.29	.14	.29	.14	.29	.14
1979	.31	.13	.29	.12	.29	.13
1980	.31	.11	.30	.11	.30	.11
1981	.19	.06	.28	.10	.28	.10
1982	.38	.13	.31	.10	.31	.10
1983	.36	.12	.30	.10	.31	.10

- = zero.
Deflated using Producer Prices, All Commodities, 1967 = 100 (USDC, Bureau of Economic Analysis, Business Conditions Digest, Series 330).
Source: calculated from data in Tables 16 and 34.

Table 33. Supply Indicators

	1965	1974	1983
VESSELS			
Total Number	68	98	113
% Class 3	3	17	50
Effort Full	Full	Part	
Hours/week	96	96	24
WHOLESALE FUEL PRICE INDEX (deflated)	1.02	1.43	2.29
Fuel Price/Ex-Vessel Surf Clam Price	13.9	16.3	15.2

Table 34. Demand Indicators

	1965	1974	1983
CONSUMER			
Population (millions)	192	211	232
Per Capita Disposable Income (d$)	2,625	3,195	3,375
Per Capita Eating & Drinking Establishment Sales (d$)	115	134	173
% Eating & Drinking Estab. Sales/Disposable Income	4.5	4.2	5.1
Per Capita Consumption of Commercial Fish & Shellfish (lbs of edible meat)	10.8	12.1	12.9
Unemployment Rate (%)	4.5	5.6	9.6
Prime Interest Rate (%)	5.1	11.3	10.8
Consumer Price Index	.97	1.48	2.97
COMPETING PRODUCTS			
Index of Retail Soup Prices (deflated)	.61	.58	.48
Processed Clam Chowder & Juice (d$/lb)	.20	.24	.20
Soup Price/Clam Chowder & Juice	3.1	2.4	2.4
Processed Canned Shrimp (d$/lb)	1.39	1.28	2.00
Processed Canned Clams Whole & Minced (d$/lb)	.81	.86	.62
Canned Shrimp Price/Canned Clam Price	1.72	1.49	3.23
Processed Breaded Shrimp (d$/lb)	.83	1.05	1.24*
Processed Breaded Strips (d$/lb)	N/A	.70	.70*
Breaded Shrimp Price/Breaded Strips Price	N/A	1.49	1.78*
Sea Scallops (d$/lb)	.68	1.03	1.84
Sea Scallop Price/Surf Clam Ex-vessel Price	9.4	11.7	12.1
Gulf Shrimp (d$/lb)	.37	.50	.71
Gulf Shrimp Price/Surf Clam Ex-vessel Price	5.1	5.7	4.7
Finfish Index	100#	230	465
Surf Clam Index	100#	137	445
Finfish Index/Surf Clam Index	1	1.7	1
Hard Clam Price (d$/lb)	.69	.90	1.00
Hard Clam Price/Surf Clam Ex-vessel Price	9.6	10.2	6.6

d$ = deflated $ (1967 = 100). * = 1982 estimate. # = 1967.

Table 35. Supply and Demand Indicators

	1965	1974	1983
SURF CLAM EX-VESSEL PRICE (d$/lb)	.08	.08	.15
TOTAL SURF CLAM REVENUE (d$ in millions)	3.5	7.7	8.4
TOTAL OCEAN QUAHOG REVENUE (d$ in millions)	N/A	N/A	3.5
TOTAL CLAM SUPPLY (lbs in millions)			
Beginning Frozen Inventories	N/A	2	5
Surf Clam Landings	38	96	56
Ocean Quahog Landings	-	1	35
Hard Clam Landings	15	15	14
Soft Clam Landings	11	10	8
Imports	2	5	11
Total	66	129	129
Lbs per capita	.34	.61	.56

d$ = deflated $ (1967 = 100).

Table 36. Cetaceans and Turtles Found in Survey Area

Scientific name	Common name	Est. Minimum Number in Study Area	Endangered	Threatened
LARGE WHALES				
Balaenoptera physalus	fin whale	1,102	X	
Megaptera novaeangliae	humpback whale	684	X	
Balaenoptera acutorostrata	minke whale	162		
Physeter catodon	sperm whale	300	X	
Eubalaena glacialis	right whale	29	X	
Balaenoptera borealis	sei whale	109	X	
Orcinus orca	killer whale	unk		
SMALL WHALES				
Tursiops truncatus	bottlenose dolphin	6,254		
Globicephala spp.	pilot whales	11,448		
Lagenorhynchus acutus	Atl. white-sided dolphin	24,287		
Phocoena phocoena	harbor porpoise	2,946		
Grampus griseus	grampus (Risso's) dolphin	10,220		
Delphinus delphis	saddleback dolphin	17,606		
Stenella spp.	spotted dolphin	22,376		
Stenella coeruleoalba	striped dolphin	unk		
Lagenorhynchus albirostris	white-beaked dolphin	unk		
Ziphius cavirostris	Cuvier's beaked dolphin	unk		
Stenella longirostris	spinner dolphin	unk		
Steno bredanensis	rough-toothed dolphin	unk		
Delphinapteras leucas	beluga	unk		
Mesoplodon spp.	beaked whales	unk		
TURTLES				
Caretta caretta	logggerhead turtle	4,017		X
Dermochelys coriacea	leatherback turtle	636	X	
Lepidochelys kempi	Kemp's ridley turtle	unk	X	
Chelonia mydas	green turtle	unk		X

Source: University of Rhode Island, 1981.

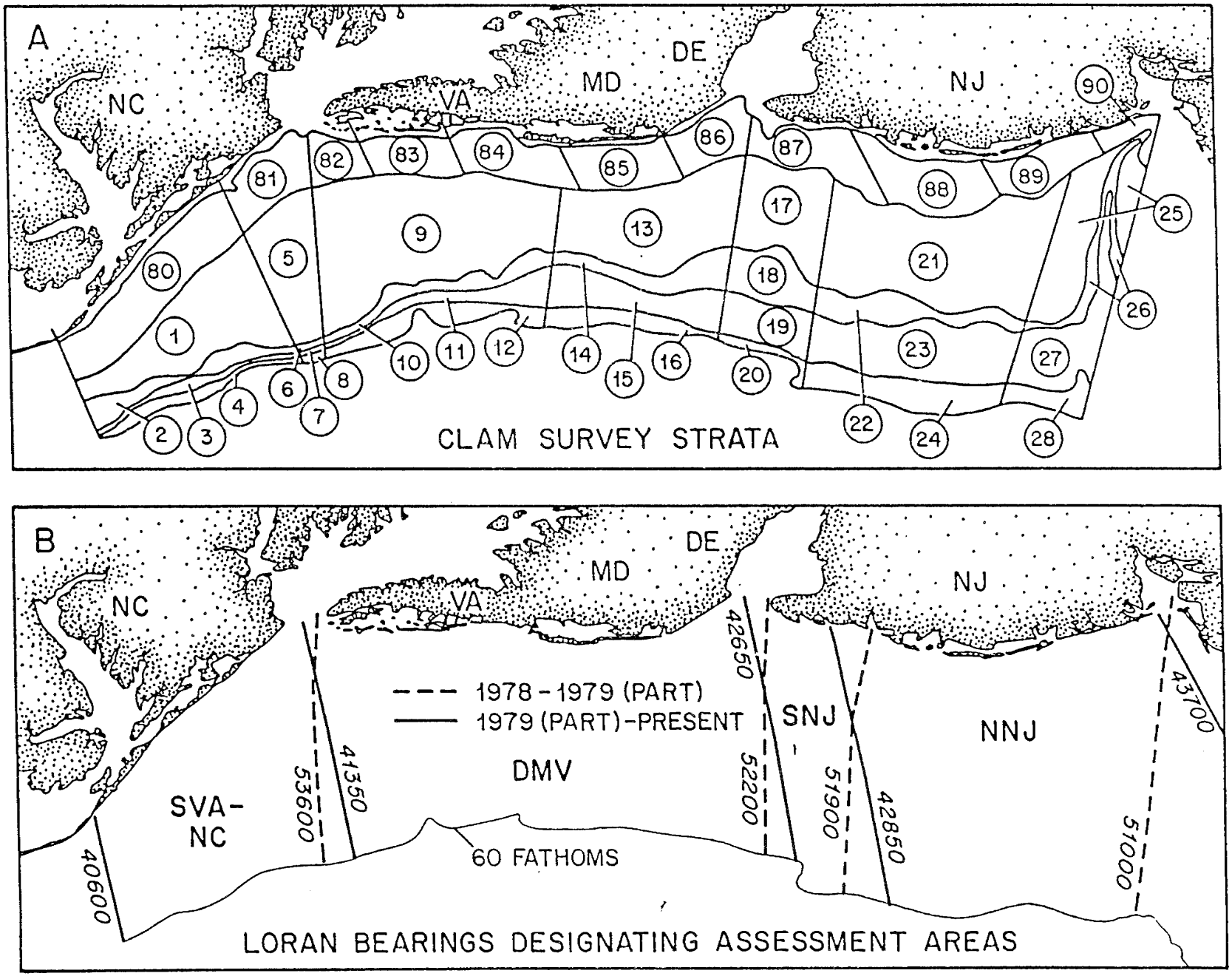

Figure 1. Offshore surf clam survey strata (A) in the Middle Atlantic Bight, New Jersey-North Carolina; and LORAN bearings designating four surf clam assessment area (B). (Source: Murawski and Serchuk, 1982)

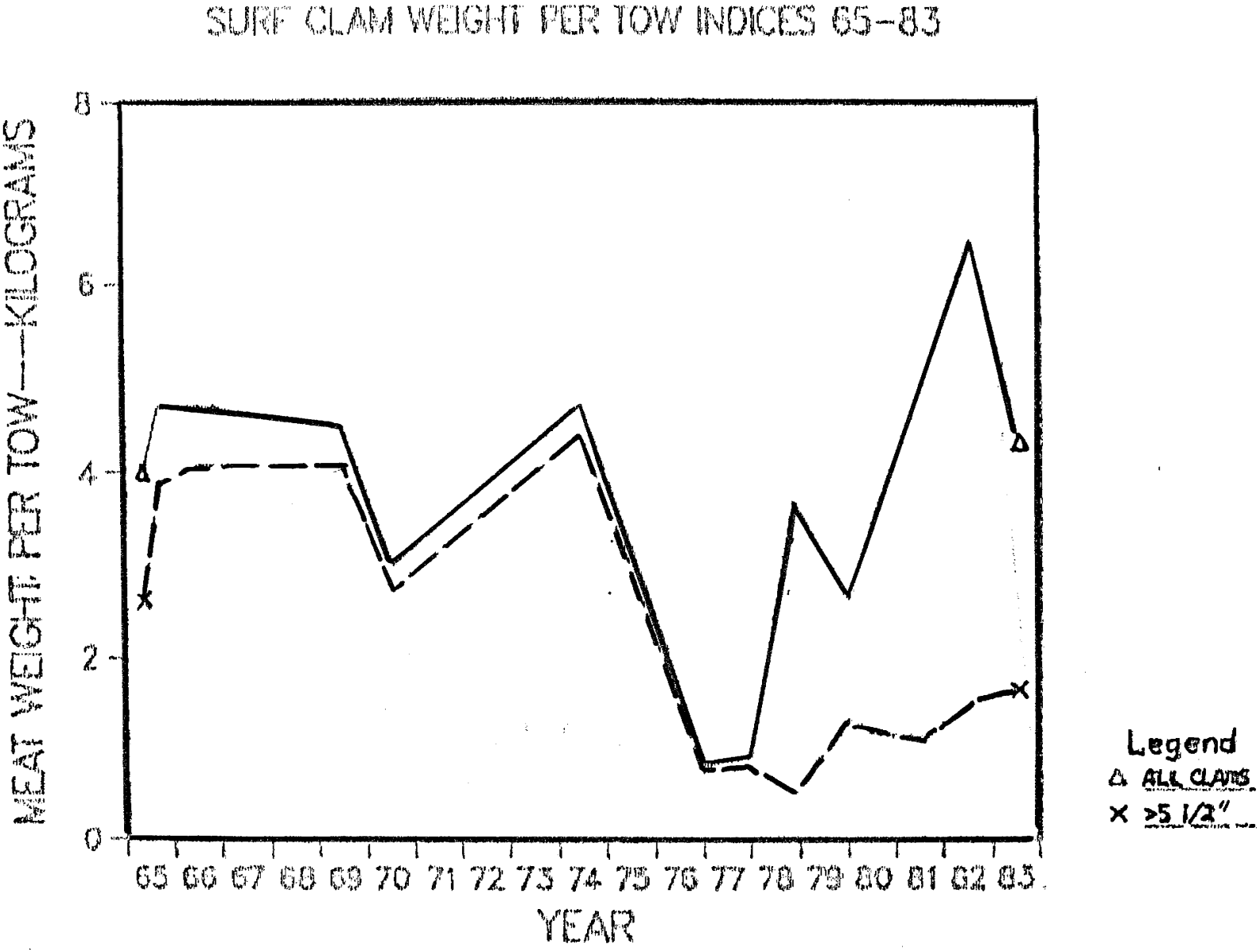

Figure 2. Surf clam biomass indices, 1965-1983
(Source: Murawski, 1984, pers. comm.)

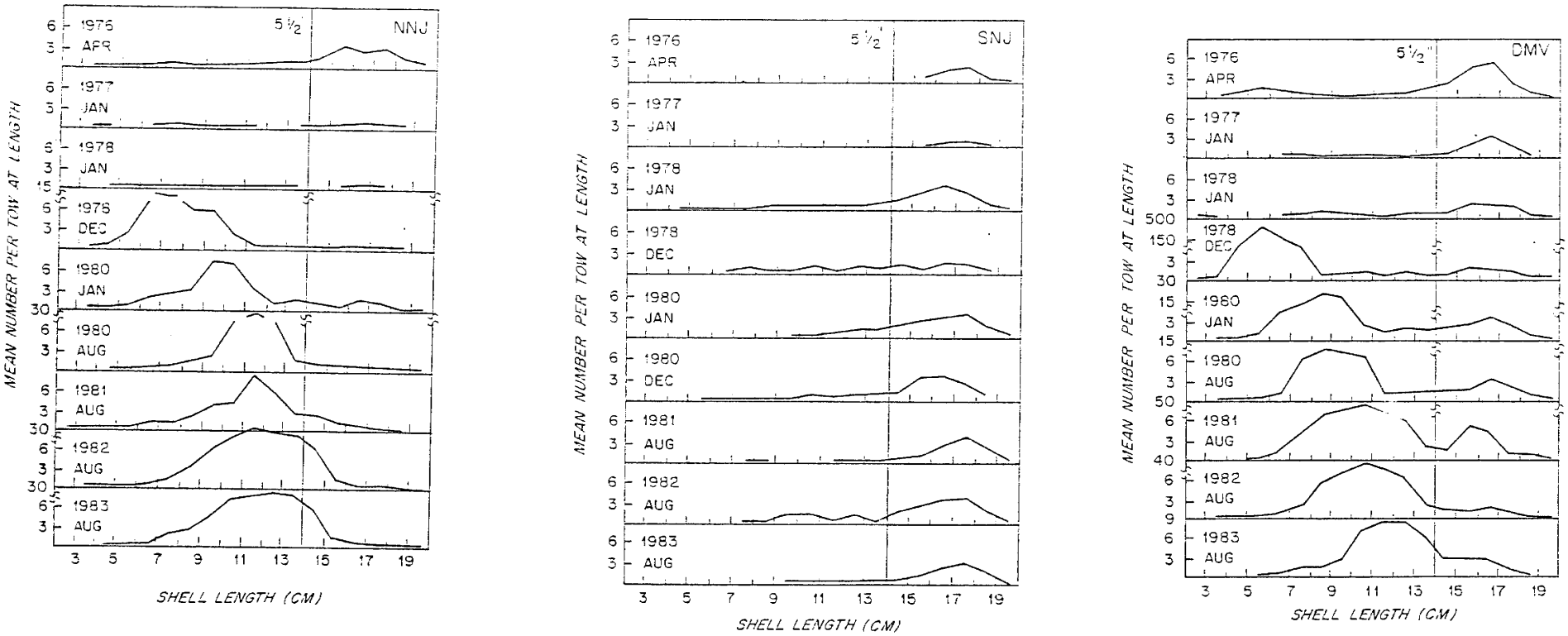

Figure 3. Stratified mean number of surf clams per standardized tow, at each 1 cm length group in NMFS shellfish surveys off Northern New Jersey, Southern New Jersey, and Delmarva, 1976 through 1983. (Source: Murawski and Serchuk, 1984)

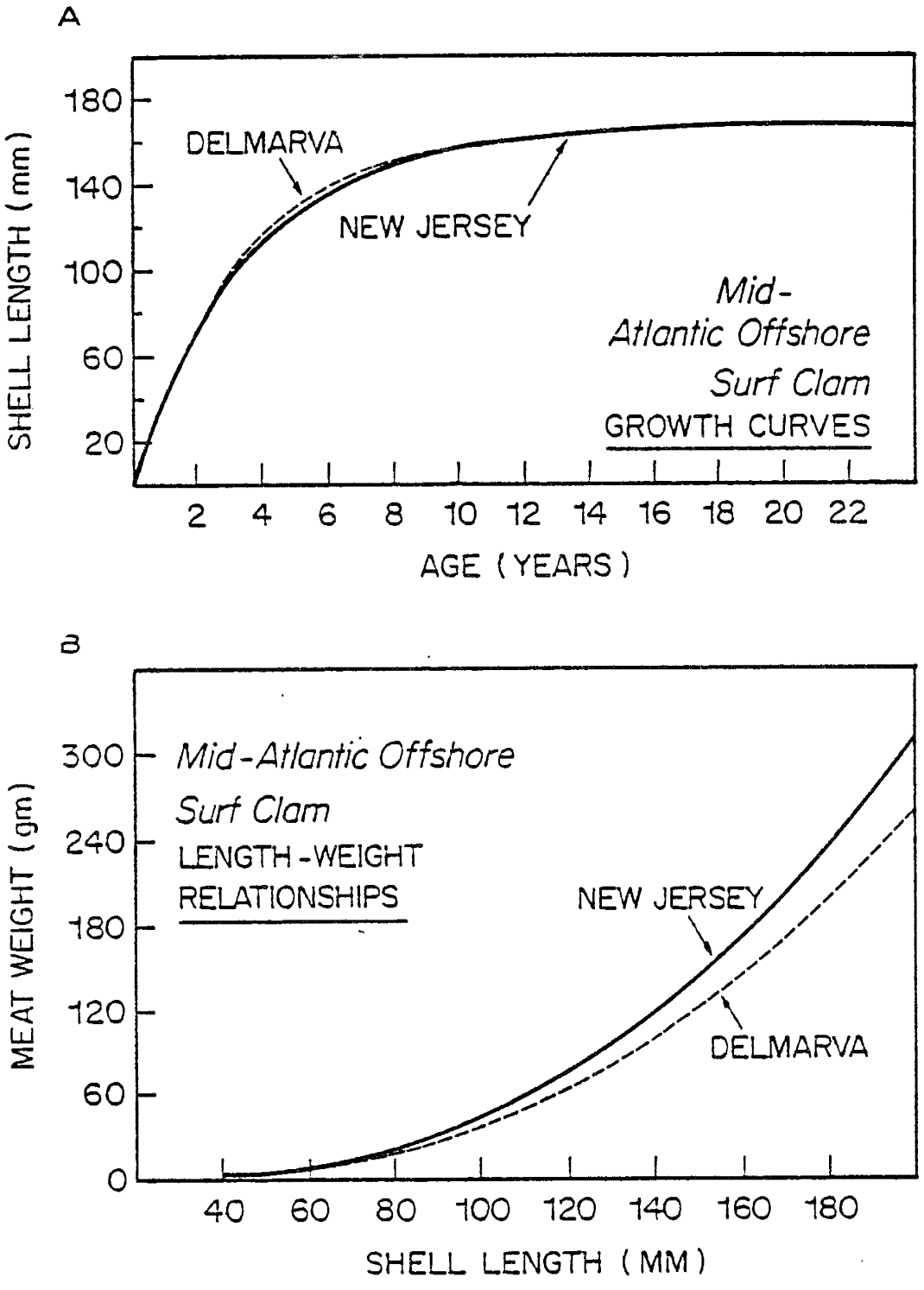

Figure 4. Growth curves (A) and length-weight relationships (B) for surf clams from offshore New Jersey and Delmarva derived from research vessel survey data. (Source: Murawski and Serchuk, 1981)

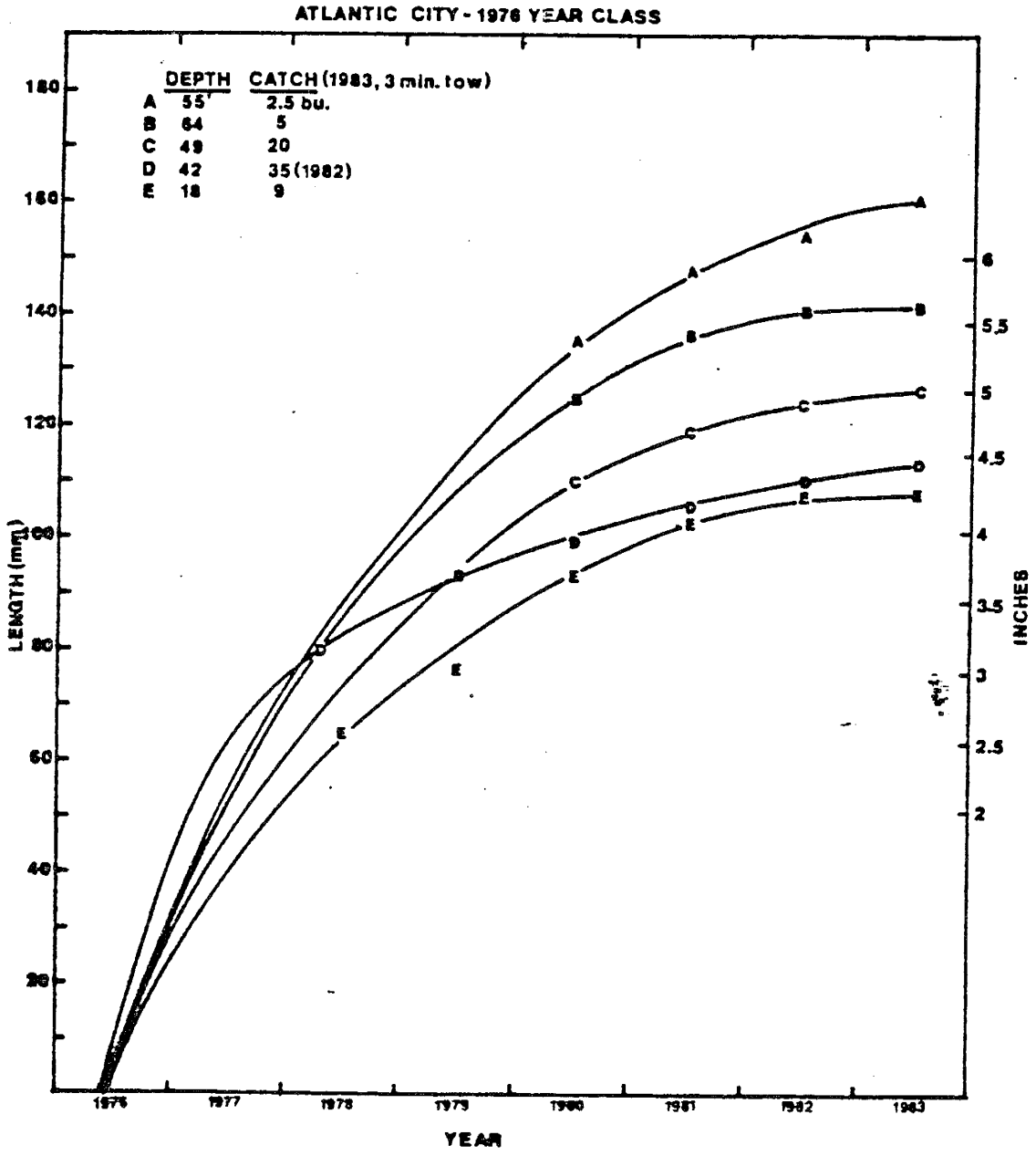

Figure 5. Growth curves for various densities of surf clams from the 1976 year class in the Atlantic City closed area (Source: Haskin, 1984, pers. comm.)

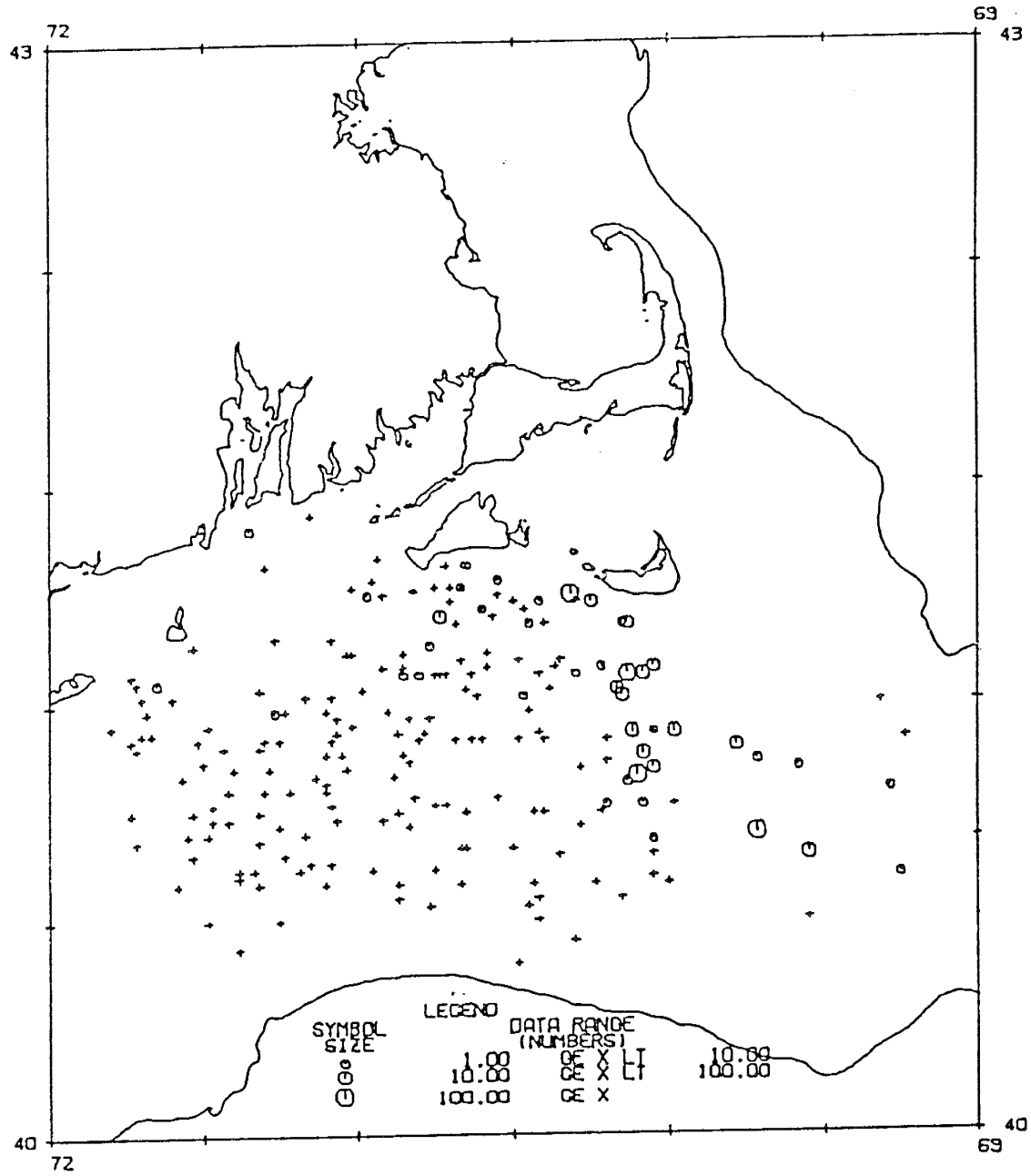

Figure 6. Surf clam catches (numbers) in the Southern New England Region, 1969-1982. Data are presented for 219 survey stations occupied during all cruises. Stations resulting in zero catch of surf clams are indicated by a cross; positive catches are indicated by a circle, the diameter if which is proportional to the number caught. (Source: Murawski and Serchuk, 1983a)

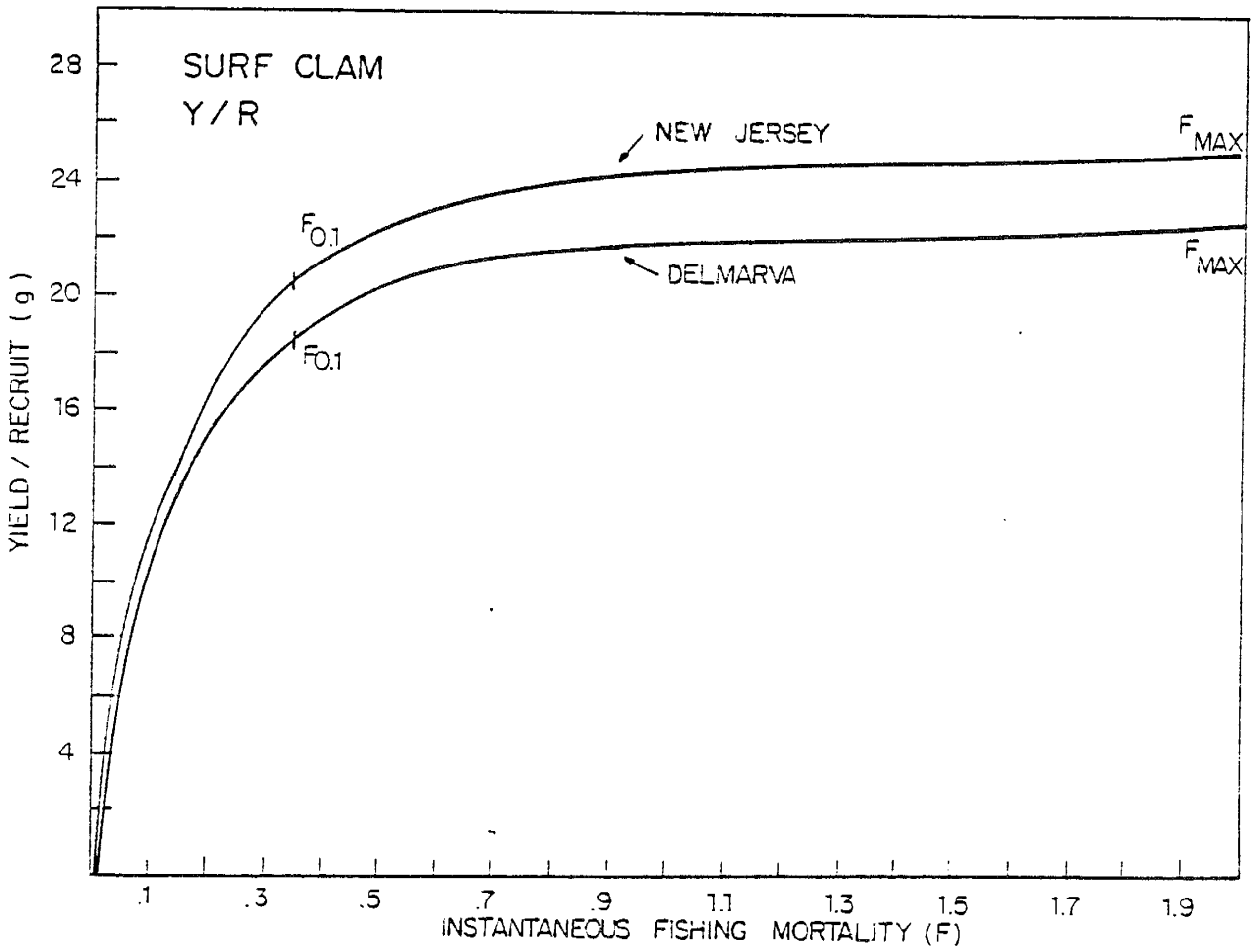

Figure 7. Yield per recruit curves for surf clams from offshore New Jersey and Delmarva. (Source: Serchuk and Murawski, 1980)

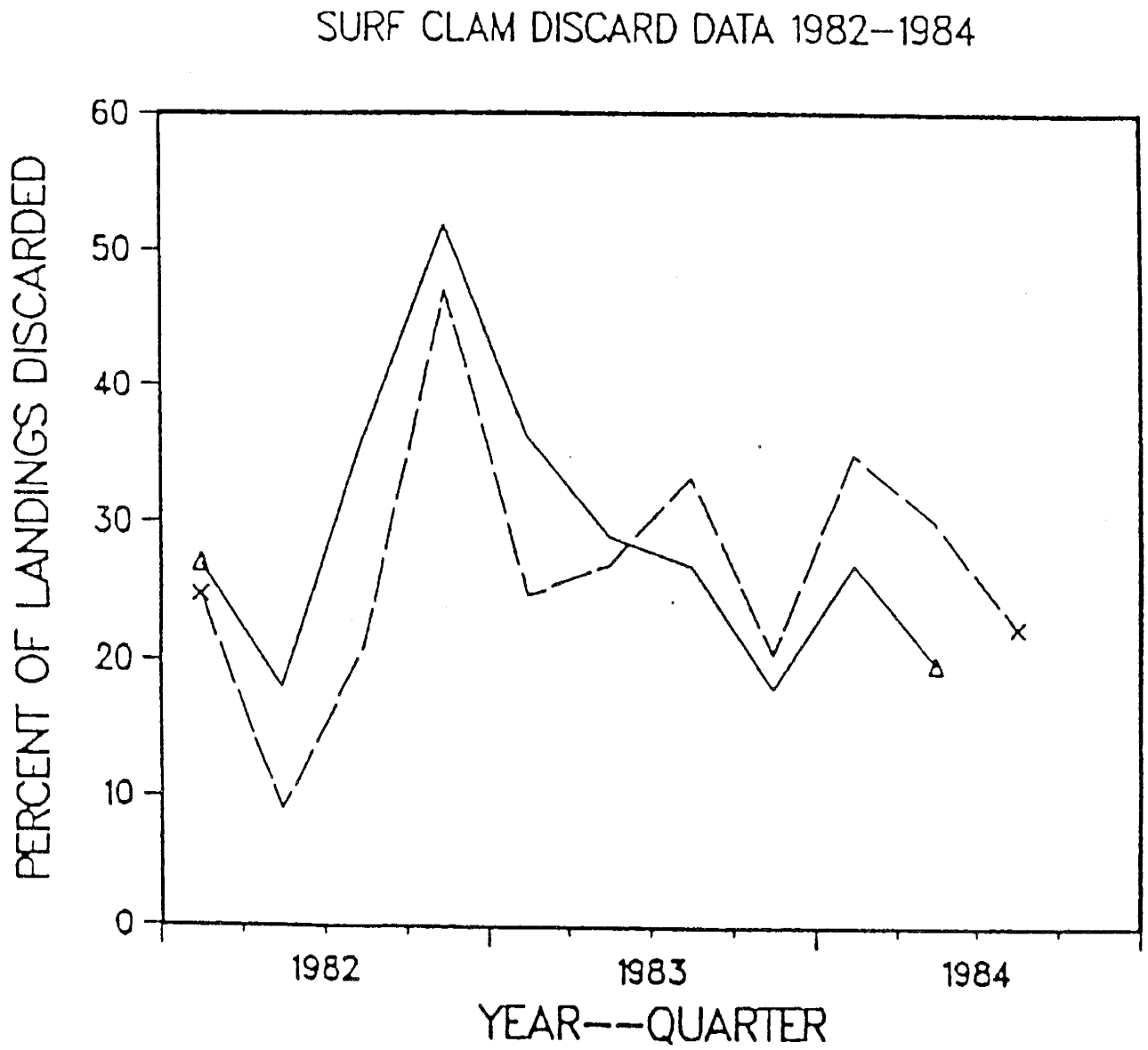

Figure 8. Average discard rates (as a percentage of landings) of small clams, the FCZ surf clam fisheries off New Jersey (solid line), and the Delmarva Peninsula (dashed line), 1982-1984. Data are given on a quarterly basis. (Source: Murawski, 1984)

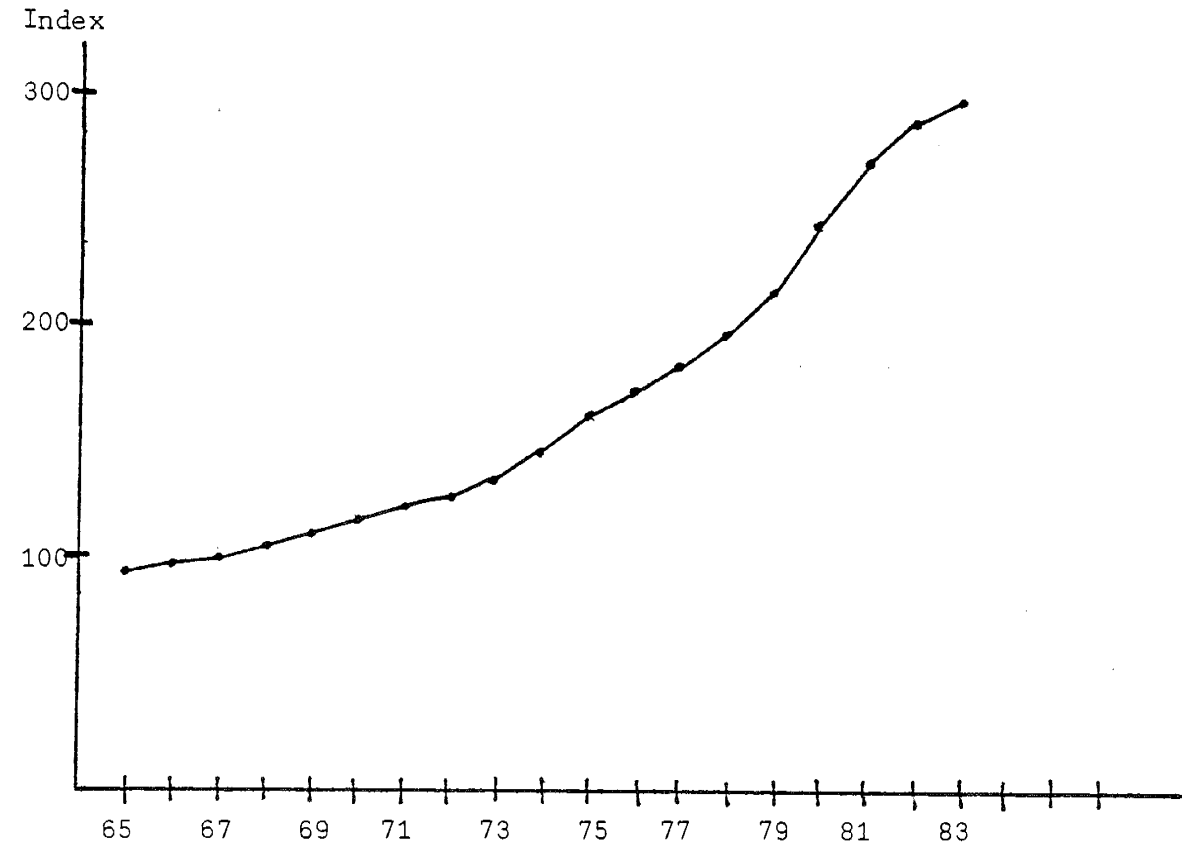

Figure 9. Consumer Price Index, 1965-83 (1967 = 100) (Source: U.S. Dept. of Commerce Survey of Current Business)

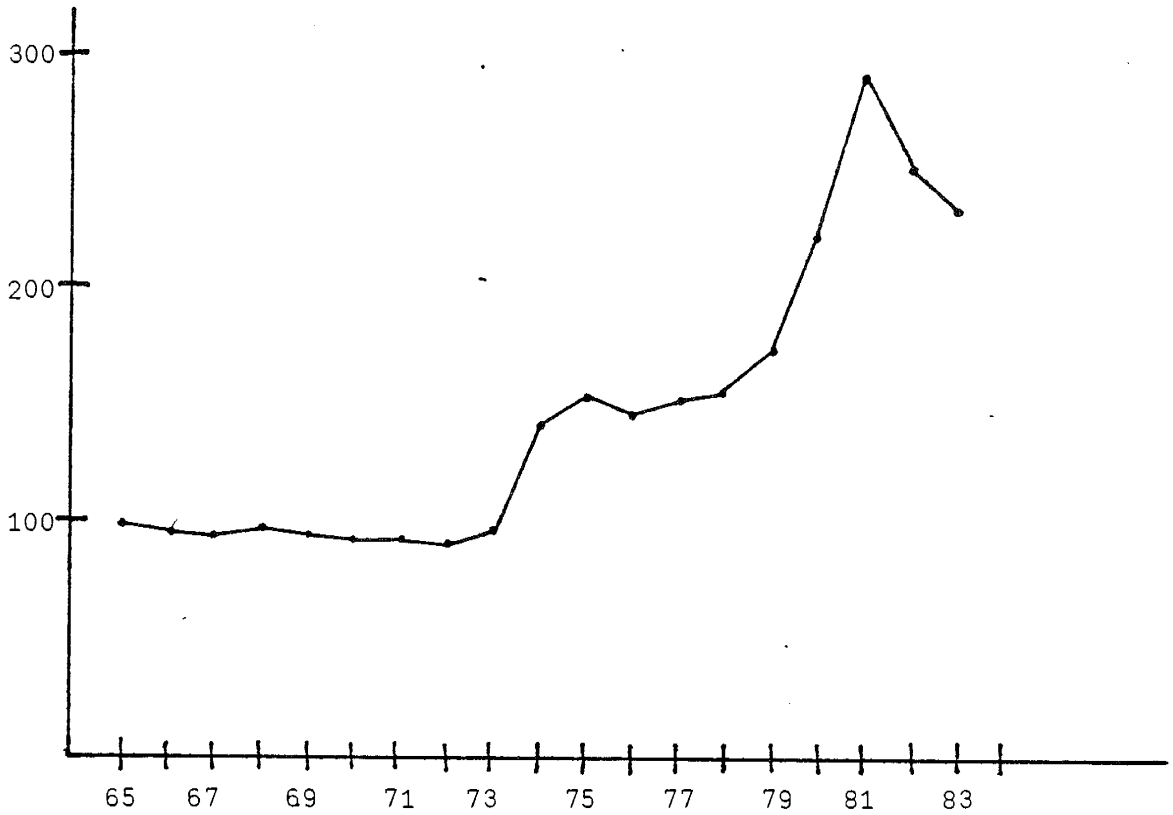

Figure 10. Wholesale Price Index Crude Oil, 1965-83 (deflated by Consumer Price Index) (Source: U.S. Dept. of Commerce Survey of Current Business)

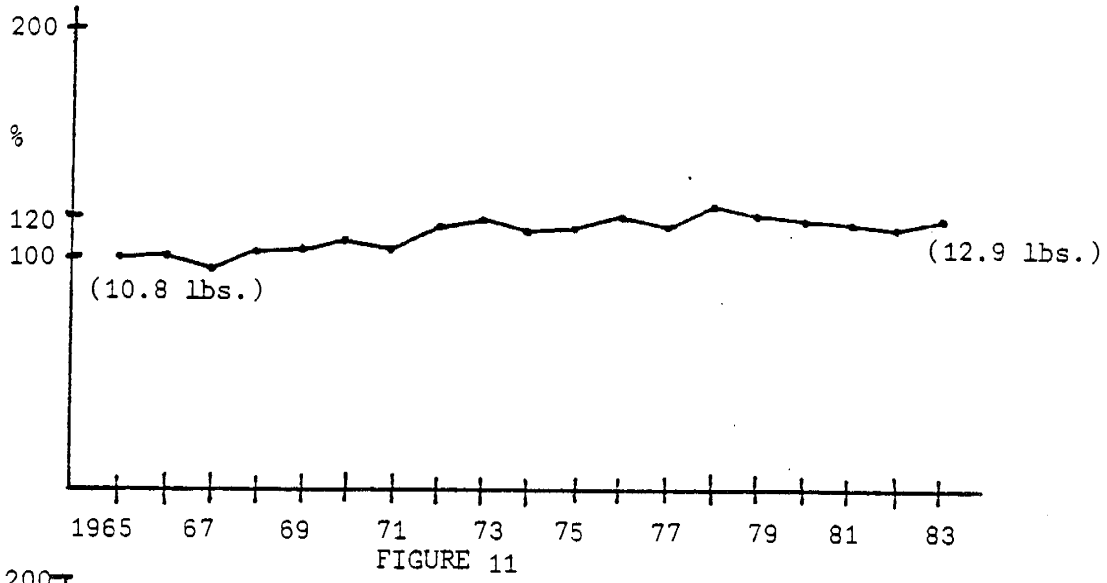

FIGURE 11

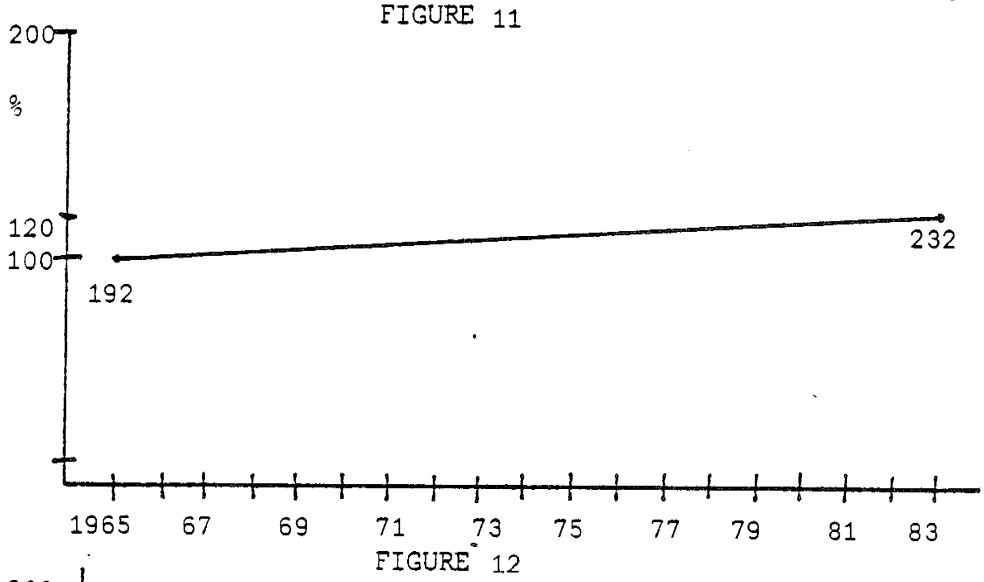

FIGURE 12

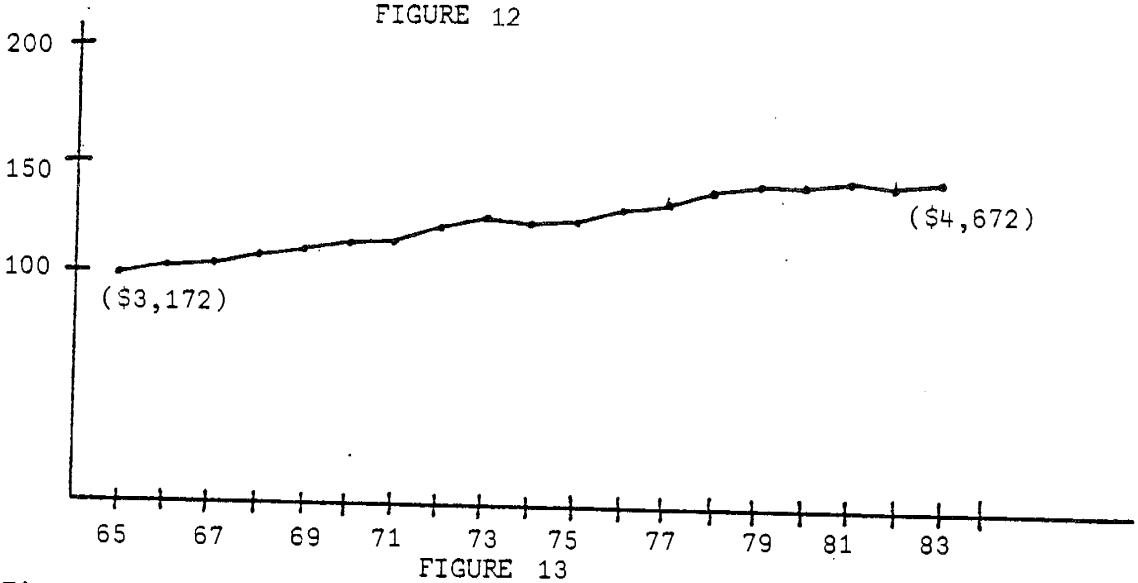

FIGURE 13

Figure 11. Per Capita Consumption of Commercial Fish and Shellfish, 1965-83 (Relative to 1965 per capita consumption, lbs/person) (Source: USDC, 1984)

Figure 12. Civilian Resident Population, 1965-83 (Relative to 1965 Population, Millions) (Source: USDC, 1984)

Figure 13. Per Capita Disposable Income, 1965-83 (Relative to 1965 Per Capita Disposable Income, 1972 Dollars) (Source: U.S. Dept. of Commerce, Survey of Current Business)

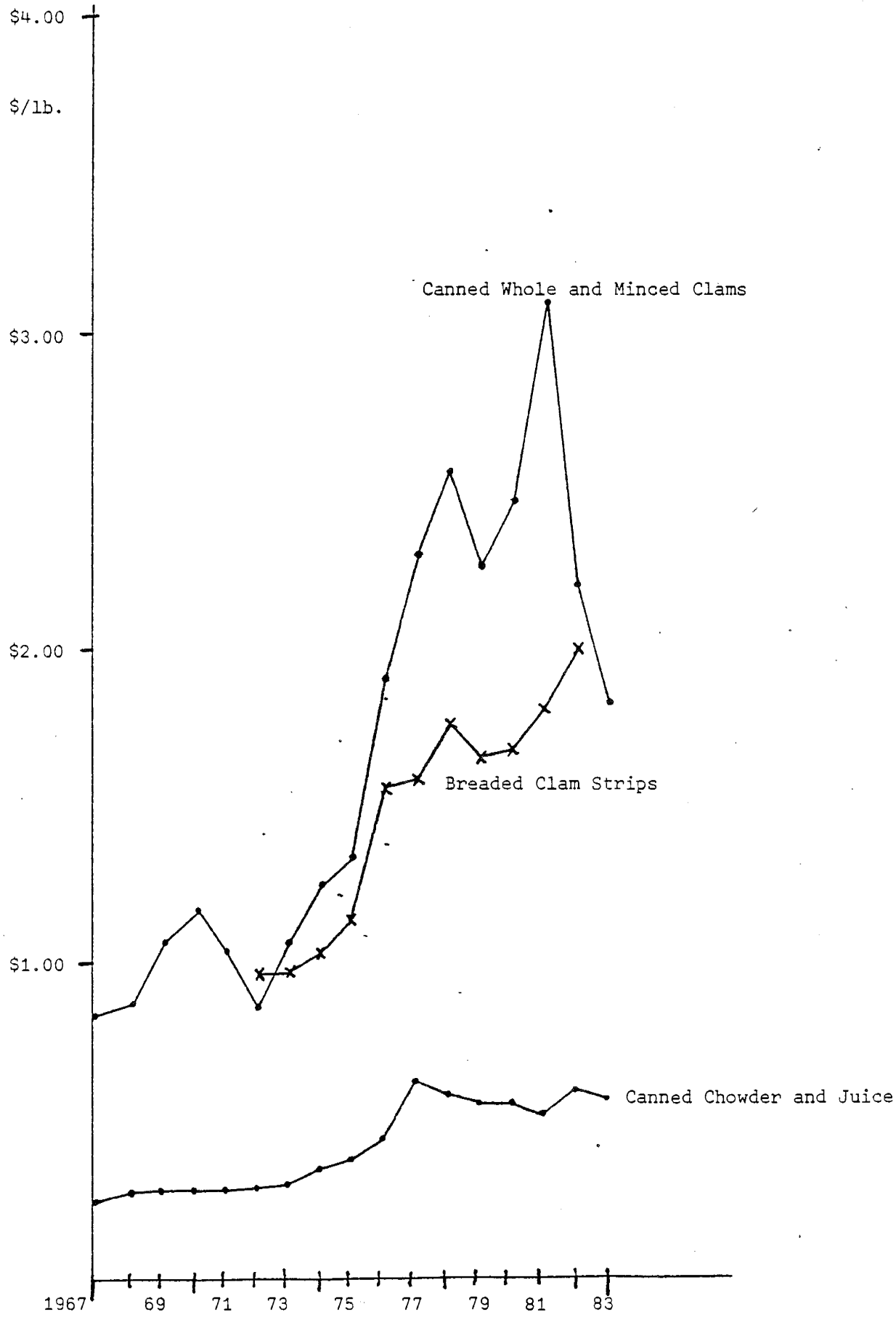

Figure 14. Processor Prices of Canned Chowder and Juice, Breaded Clam Strips, and Canned Whole and Minced Clams. (Source: USDC, 1984)

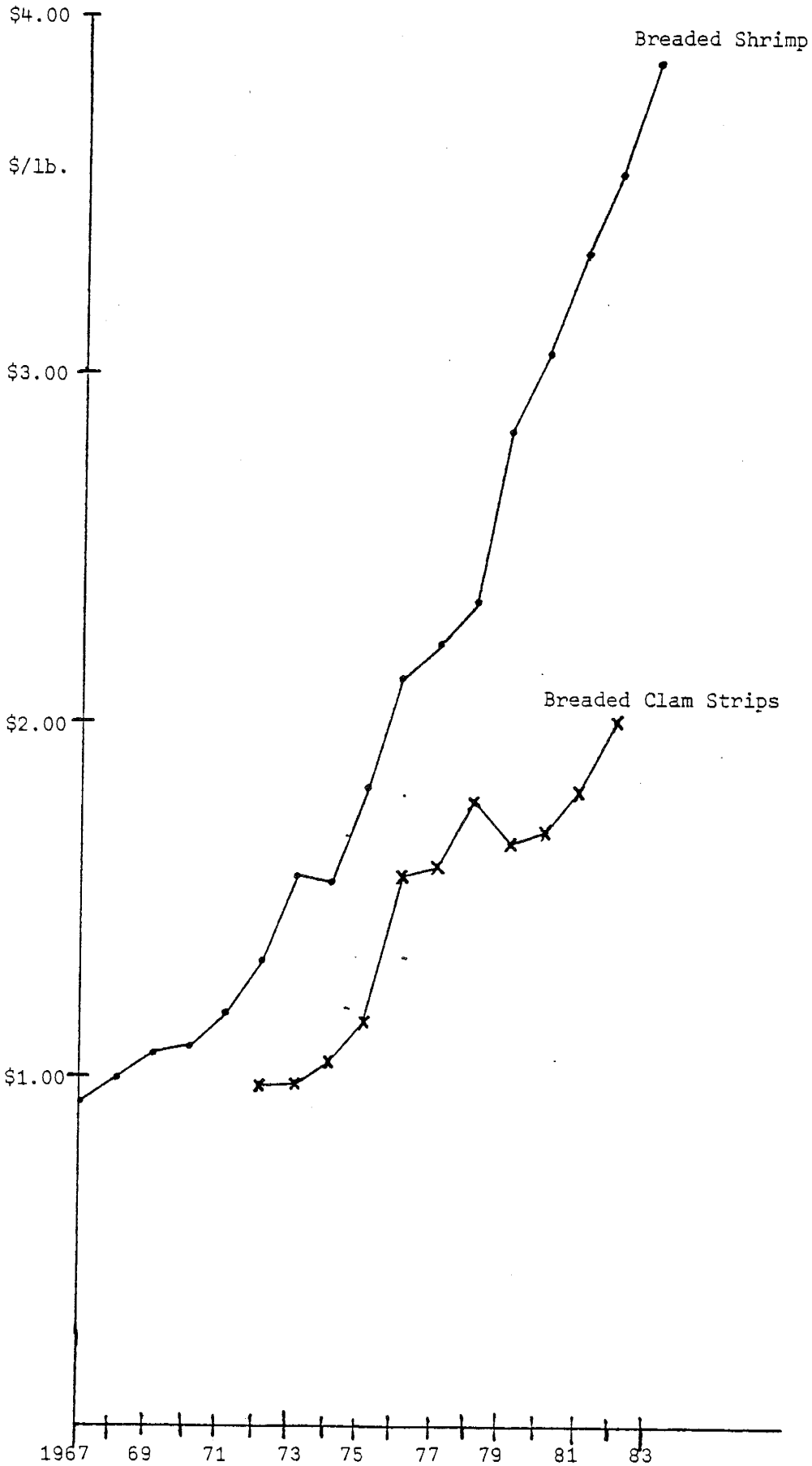

Figure 15. Processor Prices of Breaded Shrimp and Breaded Clam Strips 1967-83. (Source: USDC, 1984)

Figure 16. Current Prices of Canned Shrimp, Canned Whole and Minced Clams, Index of Canned and Semi-Prepared Soups, and Clam Chowder and Juice, 1965-83. (Sources: USDC, 1984; US Bureau of Labor Statistics, Detailed Characteristics of the Consumer Price Index)

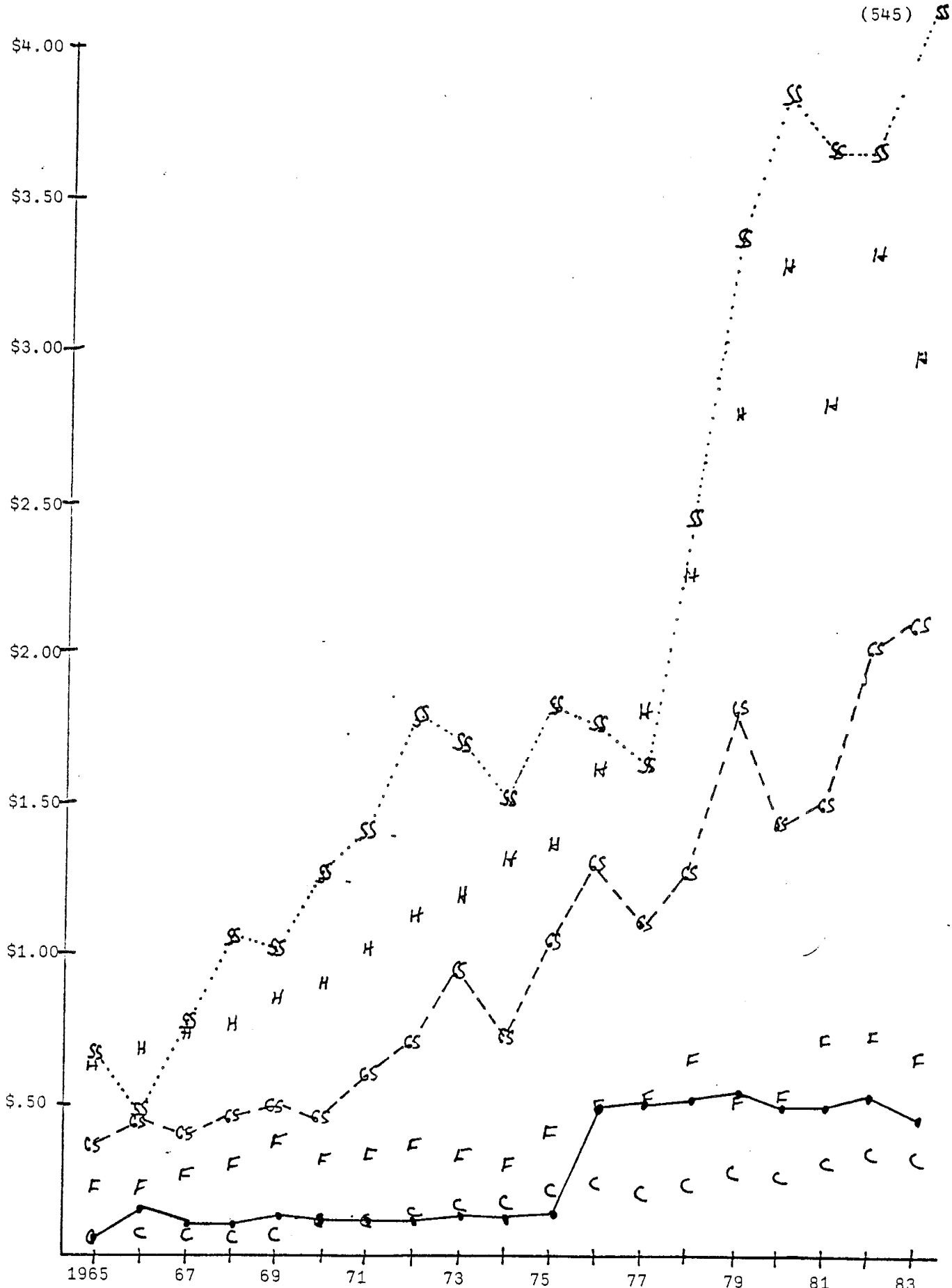

Figure 17. Ex-vessel prices of Sea Scallops (SS), Hard Clams (H), Gulf Shrimp (GS), Fluke (F), Cod (c), and Surf Clams (●——●) (Source: USDC, 1984)

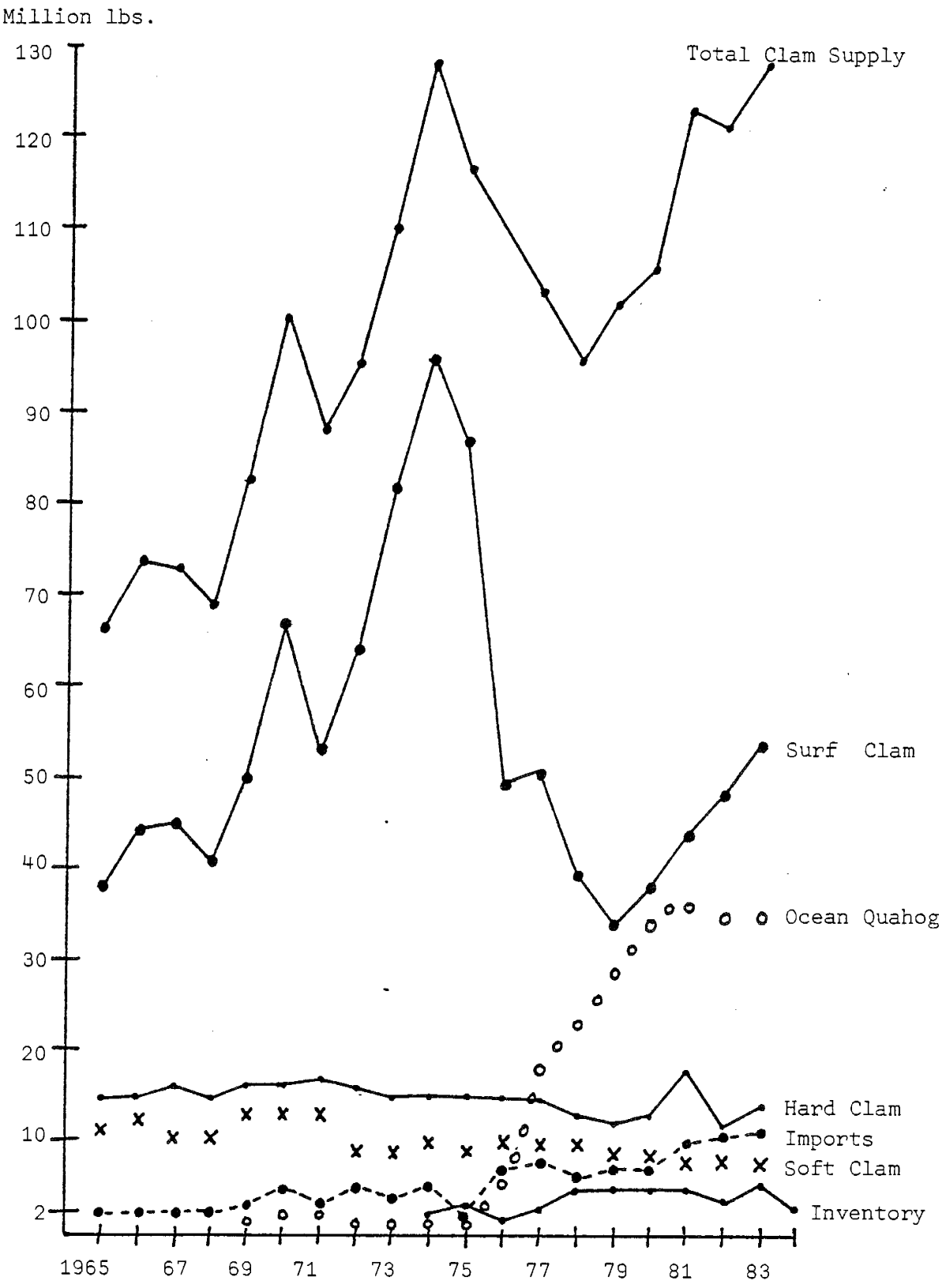

Figure 18. Total Clam Supply, 1965-83 (Source: USDC, 1984)

ENVIRONMENTAL ASSESSMENT ON AMENDMENT #5 TO THE SURF CLAM AND OCEAN QUAHOG FISHERY MANAGEMENT PLAN (FMP)

I. INTRODUCTION

The Fishery Management Plan for the Surf Clam and Ocean Quahog Fisheries (FMP) was prepared by the Mid-Atlantic Fishery Management Council (Council) and approved by the National Oceanic and Atmospheric Administration (NOAA) in November 1977 for the period through September 1979. Amendment #1 extended it through 31 December 1979. Amendment #2 extended it through the end of calendar year 1981. Amendment #3, approved 13 November 1981, extended the FMP indefinitely. Amendment #4, currently in the Secretarial review process, will increase the Optimum Yield (OY) in the New England Area and review the New England Area management regime to minimize the chances of closures.

II. PURPOSE OF AND NEED FOR ACTION

The FMP currently states: "No person shall harvest or possess surf clams smaller than 5.5" in length". Amendment #5 (Amendment) changes that provision to read:

> There is a surf clam minimum size limit. After consultation with the Council and opportunity for public comment, the Regional Director shall adjust, by increments no less than 0.25", the surf clam minimum size limit to a value less than 5.5" as necessary, so that discards on average do not exceed 30% of the trip catch. In no event shall the size limit be less than 4.75". When data indicate the clams have grown sufficiently, the limit would be increased, ultimately reaching the 5.5" limit. There is a tolerance of 240 undersized clams per cage but no more than 50 clams per cage under 4.75". If any cage is in violation of the size limit, the entire load is in violation. In adjusting the size limit the Regional Director shall consider current stock assessments, catch reports, and other relevant information concerning the size distribution of the surf clam resource. No person shall harvest or possess surf clams smaller than the minimum size limit.

The Amendment adds the requirement that all surf clam cages must be tagged before leaving the vessel and that tags may not be removed until cages are emptied at the processing plant.

Also, the Amendment adds the provision that all surf clams landed on an authorized FCZ fishing day are assumed to have been caught in the FCZ and are subject to the Federal size limit.

The management unit is maintained as all surf clams (Spisula solidissima) and all ocean quahogs (Arctica islandica) in the Atlantic FCZ.

The objectives of the FMP are maintained by the Amendment, and are as follows:

1. Rebuild the surf clam populations to allow eventual harvest approaching the 50 million pound level, which is the estimate of maximum sustainable yield over the range of the resource, based on the average yearly catch from 1960 to 1976.

2. Minimize economic dislocation to the extent possible consistent with objective 1 and encourage efficiency in the fishery.

3. Prevent the harvest of ocean quahogs from exceeding maximum sustainable yield and direct the fishery toward achieving Optimum Yield.

4. Provide the greatest degrees of freedom and flexibility to all harvesters of these resources consistent with the attainment of the other objectives of this Plan.

5. Optimize yield per recruit.

6. Increase understanding of the conditions of the stocks and fishery.

Failure to amend the FMP would not address the problem of discards associated with the surf clam size limit.

III. ALTERNATIVES

The alternative to the proposed Amendment is take no action at this time. This would mean that the surf clam minimum size limit would remain at 5.5". This would not address the problem of discards associated with the surf clam size limit.

The August 1983 NMFS surf clam survey found that about half (51%) the resource (numbers) in the Mid-Atlantic is less than 4.75" (Table 8) with 46% of the resource less than 4.75" outside the closed areas. Twenty-nine percent of the total resource fell between 4.75" and 5.5" while 31% of the resource in the open areas were within this 0.75" length interval. Thus, 23% of the resource in the opened areas and 19% of the total resource was greater than 5.5". By summer of 1984 another 0.25" of growth is projected so the total number of clams greater than 5.5" should be roughly 30%. Commercial catch sampling and processor sampling by NMFS indicates that 1% of the catch landed during the fall of 1983 was below 4.75" with 30% of the catch sampling and 36% of the processor sampling between 4.75" and 5.5" (Table 8).

There have been a significant number of violations of the size limit: 19 in 1981, 38 in 1982, 50 in 1983, and 26 thus far in 1984. The discard rate has been decreasing (Figure 8), while CPUE has been increasing (Tables 13-15). This information suggests that fishermen are keeping the smaller clams. If the fishermen were to fish so as to meet the current size limit, discards could return to the 50% level of late 1982 (Figure 8), a significant negative impact given the estimated 50-60% mortality of discarded clams.

NEFC data for 1984 (January through early August) show that 65% of Mid-Atlantic surf clam landings were 5.5" or more, whereas 21% were between 5.25-5.5", 10% were between 5-5.25", and 4% were less than 5" (Murawski, 1984). Murawski (1984) noted "If, however, the minimum size limit was enforced absolutely, discarding rates would markedly increase since substantial quantities of sub-legal clams are now landed rather than culled overboard at sea. Such a response by the fishery to more rigorous enforcement of the size limit regulations occurred during the fourth quarter of 1982 when discard rates approached 50% of the landings."

IV. ENVIRONMENTAL IMPACTS

The environmental impacts of the management regime instituted in the original FMP were described in the Environmental Impact Statement accompanying the FMP, and in the Supplemental Environmental Impact Statements or Environmental Assessments accompanying the Amendments.

This Amendment would solve the current size limit problem in a manner consistent with the FMP's objectives. It would retain the current 5.5" minimum size limit as a target, but is a compromise between the size limit objective and the desire to reduce the waste of discards. Essentially, the size limit would stay at 5.5" unless the clam size distribution suggested that excessive discards would result from that limit. The size is then reduced as necessary to keep the discard level around 30% while still maintaining the number of clams an agent must count to get a violation small (no less than 50 and no more than 240). The converse of this is keeping a fixed size limit but changing the tolerance, which can lead to an unacceptably large number of clams needed to get a violation. When data indicate the clams have grown sufficiently, the limit would be increased, ultimately reaching the 5.5" limit.

Specifying the number of clams needed for a violation means the tolerance percentage floats from about 10% (240 clams at 5.5") to about 1% (50 clams at 4.75").

This Amendment provides that the size limit may not be adjusted smaller than 4.75", which equals maximum YPR. The YPR for the 5.5" size limit is approximately 10% less than that at 4.75". Therefore, providing for a decrease in the size limit to the maximum YPR value results in an increase in yield of up to about 10%.

If the Amendment resulted in a significant decrease in the size limit (i.e., close to 4.75"), negative economic impacts could occur by a decrease in the supply of strip clams, a decrease in clam prices because of increases in the supply of small clams, and transfers of effort from the ocean quahog to the surf clam fishery. The size limit was set at 5.5" to not only protect the resource but also to optimize the use of the clams since 5.5" is about the smallest size clam that has been used for strips (the highest valued clam product). To the extent that the smaller processors and the independent vessels that work with them are more dependent on larger surf clams than are the larger, vertically integrated processors that also use smaller surf clams and ocean quahogs, significant decreases in the size limit with concomitant decreases in the supply of larger clams could negatively impact the smaller firms relative to the larger firms. However, all processors can process both large and small clams with the sizes processed dependent on the processors' markets, so the distributional impacts of this measure should not be significant.

While the mortality of discarded clams has not been determined conclusively, it is generally agreed that it is around 50-60% (Haskin, 1975). Adjusting the size limit to minimize discards will provide insurance against overfishing since discarded clams that die are not counted against the quota even though they are a part of fishing mortality.

The smaller the size limit, the greater the portion of the resource that will be legally harvestable, so the quota will be taken more quickly, resulting in decreases in allowed fishing time and increasing closures. August 1983 data for the whole Mid-Atlantic show that lowering the size limit to 4.75" would increase the legally harvestable clams by 29%. However, given the large number of small clams currently being landed (Murawski, 1984), which are reflected in high catch rates, reduced fishing hours, adjustments to lower the size limit may not result in dramatic short run increases in catch rates.

At all levels of possible size authorized by this Amendment the resource will have had several spawning opportunities. At 4.75" clams will have spawned two or three times, while at 5.5" there will have been four to five spawns (Table 11).

In summary, the 5.5" minimum size limit has positive impacts (MAFMC, 1981). However, the current size distribution of the resource suggests that rigorous enforcement of that limit would lead to unacceptably large discard rates (Murawski, 1984). If half of the catch would be discarded (Murawski, 1984) and half of those discarded would die (Haskin, 1975), and assuming the entire 2.35 million bu 1984 quota were landed under those circumstances, about 1.18 million bu would be wasted, clearly an unacceptable impact. As discussed above, if the limit were reduced to the minimum level, there would be negative economic impacts. Examining the situation in 1984 provides insight into impacts between the 4.75" and 5.5" extremes. Discard rates in 1984 have been around 30% with about 35% of the landings smaller than the current 5.5" limit (Murawski, 1984). If the Amendment were implemented and the limit adjusted to 5.25" and the discard and fishing patterns did not change, 14% of the landings would be less than the 5.25" limit (Murawski, 1984). While it is impossible to estimate these impacts on a vessel or trip basis, it is reasonable to expect that the number of violations should decrease. It is also reasonable to expect that the discard rate should decrease since some portion of the clams currently discarded are likely between 5.25" and 5.5". Clearly, if a larger proportion of the catch is landed, the catch rate will increase, leading to more frequent or longer closures, but the Council has determined that the waste associated with discarding represents a greater cost than that associated with accelerated catch rates.

The requirement that surf clam cages be tagged will have a negative impact to the extent that fishermen may need to purchase and are required to use the tags.

The Regional Director has the responsibility for the tagging system. As of this date the specifics of the system have not been determined. Information available to the Council indicates that NMFS is considering a system that would involve supplying the fishermen with prenunbered tags, either at no cost or at a charge of $.10 per tag.

If the tags are sold, the cost to the fishermen is negligible. The maximum quotas are 2.9 million bu for the Mid-Atlantic Area and 200,000 bu (following approval of Amendment #4) for the New England Area, for a total of 3.1 million bu. At 32 bu/cage, if the total quota was set at the

maximum level and the entire quota were caught, 96,875 cages would be landed, would require a tag expenditure of $9,687.50 at $.10 per tag.

If the tags are issued free, there would be no cost to the fishermen but a cost to the government. The $.10 per tag sale cost was intended to pay for the government's cost to buy the tags and also recover the government's cost of distributing the tags, so in this case the government would pay the estimated maximum $9,687.50 rather than the fishermen.

The cost of installing tags is considered negligible.

The positive impact will be to facilitate enforcement of the size limit provision. The size limit is a possession regulation, so fishermen and processors are responsible for assuring that clams meet the minimum size limit. Without tagging substantial enforcement effort is needed to assure an evidence trail from the vessel to the processing plant so that all parties to a violation can be cited. Tagging cages will mean that enforcement officers can inspect cages at the processing plants, while being able to enforce the size limit on both vessel operators, processors, and anyone in the transportation chain between the vessels and plants, which is more cost effective than inspecting vessels at the docks and inspecting the processing plants. This is merely a result of the small number of processors relative to the number of vessels and landing ports along with the tags providing the evidence trail. NMFS estimates landings can be monitored at between $28 per vessel for eight inspections per day to $227 per vessel for one inspection per day, whereas their officers can inspect two dealers or processors a day, for a cost per inspection of $114. There are about twelve surf clam processors whereas about 80 vessels (Table 21) are active in the Mid-Atlantic Area in any month (the number of active vessels in the New England Area is unknown because of incomplete logbook reporting). Because of the effort limitations in the Mid-Atlantic Area the number of vessels actually landing surf clams on any given day would be less than 80, but even if the number of vessels landing on a given day equals the number of plants, there are advantages to plant inspections relative to vessel inspections. Primary enforcement at the plant level will optimize the use of the very small number of available enforcement officers simply because they can spend their time enforcing the regulations rather than traveling from dock to dock and waiting for the vessels to land, that is, the locations of the plants is known whereas the vessels land and random times and at ports along essentially the entire coast.

While this measure will make enforcement more efficient and thus perhaps less expensive, the primary benefit will be to increase the likelihood that the FMP can be enforced, and thus that OY can be attained (i.e., achieved but not exceeded).

The provision that surf clams landed on an authorized FCZ fishing day are assumed to have been caught in the FCZ should have no negative impacts, either environmental or economic. However, it should have a very positive impact from an enforcement standpoint. While several States have size limits, some do not and none of the existing State minimum size limits are the same as the limit that will result from this Amendment. It is necessary to assure that surf clams caught in the FCZ meet the minimum size limit. It is not reasonable to expect that the minimum size limit will be enforced adequately at sea. However, enforcement on land, in the absence of identical size limits for the FCZ and State waters, means that fishermen can claim that undersized clams were caught in State waters, effectively nullifying the FCZ minimum size limit. All of the States are encouraged to adopt size limits similar to the size limit included in this Amendment. However, the provision that surf clams landed on an authorized FCZ fishing day were caught in the FCZ is necessary to eliminate this loophole. It must be recognized that this provision will only be effective in the Mid-Atlantic Area since vessels operating in the New England Area do not have authorized FCZ fishing days. However, given that most of the surf clams are landed in the Mid-Atlantic Area (based on the Optimum Yields for the two Areas), this should not present a major problem relative to size limit enforcement.

The net effect of this Amendment is that the size limit may be adjusted so that it will be easier for fishermen to land clams that meet the limit with minimal discarding while it will also be easier to obtain convictions of those who violate the limit.

The benefits of the Amendment are:

1. Being able to adjust the size limit to reduce discards decreases resource waste associated with discard mortality. While the mortality of discarded clams has not been determined conclusively, it is generally agreed that it is around 50-60% (Haskin, 1975). At times the discard rate has been 50% of the catch (Figure 8). While the reported discard rate (Figure 8) has been decreasing, that is considered to be a result of fishermen landing the small clams rather than discarding them as evidenced by the increase in size limit violations (19 in 1981, 38 in 1982, 50 in 1983, and 26 through mid-June 1984) and by catch sampling data (Murawski, 1984). The size distribution of the resource (Figure 3) clearly indicates a substantial portion of the resource under 5.5".

2. It will be easier to enforce the surf clam minimum size limit relative to vessels, transportation facilities, and processing plants.

3. It will eliminate the loophole of fishermen being able to claim they caught undersized clams in State waters.

4. At all levels of possible size authorized by this Amendment the resource will have had several spawning opportunities. At 4.75" clams will have spawned two or three times, while at 5.5" there will have been four to five spawns (Table 11).

The adverse impacts include:

1. If there were a significant decrease in the size limit, there could be a decrease in the supply of clams at the traditional size for strips, a decrease in clam prices because of increases in the supply of small clams, transfers of effort from the ocean quahog to the surf clam fishery, a greater portion of the resource that will be legally harvestable (increasing the rate at which the quota will be taken), and the greater the need for timely remedial action to assure the quota is not exceeded in light of increased catch rates.

2. The cost of purchasing and installing cage tags.

Given the significant waste associated with discarding and the problems associated with enforcing the size limit, it is the Council's conclusion that the benefits of the Amendment, both short and long term, outweigh the adverse impacts. Additionally, given the current size distribution of the resource, major decreases to the size limit in the short run are extremely unlikely (a reduction to 5.25" will likely solve the current problem), so significant distributional impacts between large and small operators are unlikely. The reduced mortality resulting from reduced discards should provide benefits over time that outweigh any short term negative impacts. The positive impacts of the enforcement provisions (cage tagging and the FCZ catch presumption) clearly outweigh any negative impacts.

It is expected that the governmental costs of implementing the Amendment will be similar to those experienced in enforcing the current FMP. Council and NMFS administrative costs would increase slightly because of the need to periodically evaluate whether size limit adjustments were necessary and to make those changes. NMFS enforcement costs should decrease to the extent that the size limit more nearly approximates what the fishermen are catching, so that while the enforcement effort should not decrease, the number of violations and the time needed to process them should decrease. More importantly, tagging should facilitate enforcement at the processing plant level which, as discussed above, should optimize the use of the very small number of available enforcement officers simply because they can spend their time enforcing the regulations rather than traveling from dock to dock and waiting for the vessels to land. The tagging requirement and FCZ catch presumption should improve enforcement effectiveness, if not reduce enforcement costs.

Effect on Endangered Species and on the Coastal Zone

Neither the Amendment or the alternative would constitute an action that "may affect" endangered or threatened species or their habitat within the meaning of the regulations implementing Section 7 of the Endangered Species Act of 1973. Thus, consultation procedures

under Section 7 will not be necessary on the Amendment.

Also, the Amendment will be conducted in a manner consistent, to the maximum extent practicable, with the Coastal Zone management Programs within the meaning of Section 307(c)(1) of the Coastal Zone Management Act of 1972 and its implementing regulations. A determination that this action is consistent with the approved State coastal zone management programs has been prepared by the Council and submitted for review to each of the State coastal zone management agencies.

Effects on Flood Plains or Wetlands

The Amendment or its alternative will not adversely affect flood plains or wetlands, and trails and rivers listed or eligible for listing on the National Trails and Nationwide Inventory of Rivers.

List of Agencies and Persons Consulted in Formulating the Proposed Action

The Council consulted with NMFS, the Fish and Wildlife Service, the Department of State, and the States of New York, New Jersey, Pennsylvania, Delaware, Maryland, and Virginia through their membership on the Council. In addition to the States that are members of the Council, Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut were consulted through the Coastal Zone Management Program consistency process. A list of the organizations and persons receiving copies of the Amendment, including the EA, RIR, and proposed regulations during the review process is included as Exhibit A to this EA.

Findings of No Significant Environmental Impact

For the reasons discussed above, it is hereby determined that neither approval and implementation of the proposed action nor the alternative would affect significantly the quality of the human environment, and that the preparation of an environmental impact statement on the Amendment is not required by Section 102(2)(c) of the National Environmental Policy Act nor its implementing regulations.

_____ _____

Assistant Administrator for Fisheries, NOAA Date

James Ackert
The Gorton Group
327 Main St.
Gloucester MA 01930

Richard B. Allen
31 Bliss Rd.
Wakefield RI 02879

Bryan Andrew
341 South St.
Somerset MA 02726

Alessandro Bacconcelli
Apt. 31
1980 Commonwealth Ave.
Brighton MA 02135

P. L. Beckman
5 Paul Ave.
Peace Dale RI 02883

Steven M. Bowie
6 Pine St.
Kingston MA 02364

William Brey
NMFS, NOAA
P.O. Box 338
Oxford MD 21654

Nick Calabria
P.O. Box 285
Jamesport NY 11947

Floyd Carrington
25 Sunset Ave
East Quogue NY 11942

Scott Clarke
#8 the Landing
West Lake Dr.
Montauk NY 11954

Burton Coffey
Seafood America
P.O. Box 656
Camden ME 04843

AK Dept. of Fish & Game
George Utermohle
Subport Bldg.
Juneau AK 99801

Amerifish Longline Co., Inc.
P.O. Box 8368
Salem MA 01971

Tony B. Astbury
Snow Cove Rd.
Sedgwick ME 04676

Dr. Gilbert Bane
Dir. of Marine Sci.
U. of NC
Wilmington NC 28406

Capt. Bill Bell
6 Northgate Ct.
Willingboro NJ 08046

Allen Branch
R.F.D. 1
Box 212
Midway GA 31320

Burgess Management Assoc.
Suite 3314
1133 Ave. of the Americas
New York NY 10036

Cape Henry Fish Co.
3319 Shore Dr.
Va. Beach VA 23451

Robert Chandler
NFI
1101 Conn. Ave.
Washington DC 20036

Philip G. Coates
Div. of Marine Fisheries
100 Cambridge St.
Boston MA 02202

Barry O. Collier
Seiners Assoc.
1111 N.W. 45th St.
Seattle WA 98107

Albert D. Sturtevant,Es.
Chapman, Duff and Paul
1825 Eye St., NW
Washington DC 20006

J.Gregory Anderson
1377 Bridge Street
South Yarmouth MA 02664

C. E. Atkinson
8000 Crest Dr., NE
Seattle WA 98115

George F. Baust
319 Stratton Ct.
Tareyton Estates
Langhorne PA 19047

Charles B. Belt
Marine Resources Comm.
233 Broadway
New York NY 10007

William J. Brennan
9 Main St.
Wickford RI 02852

Bill Burton
Baltimore Sunpapers
501 N. Calvert St.
Baltimore MD 21203

CARIBBEAN FISH. MGT. CO.
P.O. Box 1001
Hato Rey PR 00919

G. M. Chursin
1609 Decatur St., NW
Washington DC 20011

David Codiga
Cong. Info. Serv.
4520 East West Hwy.
Bethesda MD 20814

Commander (Aoi)
USCG, Atlantic Area
Governors Island
New York NY 10004

Clement E. Daley
42 Water St.
P.O. Box 307
Fairhaven MA 02719

Wayne M. Deep
F/V Strider
R.F.D. #1
Norwich CT 06360

Director
SWFC/NMFS
P.O. Box 271
LaJolla CA 92038

DSSA
P.O. Box 21
Townsend DE 19734

Susan Follock
Nat'l Fisherman
21 Elm Street
Camden. ME 04843

Embassy of Poland
Edmund Zawadzki, Econ. Co
2640 16th St. NW
Washington DC 20009

EPA Region 1
Inter-Gov't. Liaison
Rm 2203 JFK Bldg
Boston MA 02203

EPA Region 4
345 Courtland St. NE
Atlanta GA 30308

Charles A. Follett, Jr.
P.O. Box 730
Narragansett RI 02882

James Fullilove
National Fisherman
21 Elm St.
Camden ME 04843

John Cronan
Div. Fish Wildlife
Wash Co Govt Cntr
Wakefield RI 02879

Jessica Damen
Cntr. for Env. Ed.
624 9th St., NW
Washington DC 20001

Dept. of Fish. & Oceans
P.O. Box 5667
St. John's, Nfld.
Canada A1C 5X1

Richard Dobbs
12 Main St.
Henry Clay DE 19807

Frank Duffy
85 Jedwood Road
Valley Stream, NY 11581

Embassy
German Federal Rep.
4645 Res. Rd., NW
Washington DC 20007

Embassy of Spain
Commercial Office
2558 Mass. Ave. NW
Washington DC 20008

EPA Region 2
Rm. 400
26 Federal Plaza
New York NY 10278

August Felando
Amer. Tuna Boat Assoc.
1 Tuna Lane
San Diego CA 92101

Nancy Follini
Briarpatch Ent., Inc.
R.D. #1, Box 26
Stonington CT 06378

Charles W. Garnache
193 Hills Bch. Rd.
Biddleford ME 04005

Peter F. Crowell
P.O. Box 362
Scituate MA 02066

Gary Davis
722 Grad Village
Kingston RI

Dir., Env. Project
Office of the Secret
Dept. of Interior
Washington DC 20240

Ronald G. Dodson
Nat'l. Audubon Soc.
282 Delaware Ave.
Delmar NY 12054

Jack Dunnigan
9 Crescent Dr.
Georgetown MA 01833

Embassy of Korea
Sang Chul Song
2320 Mass. Ave NW
Washington DC 2

Env. Pl. Div. (HQ AF
526 Title Bldg.
30 Pryor St., S.W.
Atlanta GA 30303

EPA Region 3
EIS Rev. (3IR62)
6th & Walnut Sts.
Philadelphia PA 1

William L. Finn
34 Manor House Ct.
Holyoke MA 01040

James Frank
P.O. Box 553
Rockport ME 04856

George Gaskill
100 Alberta Ave.
Trenton NJ 08619

EXHIBIT A

EA 7

Ray Gerson
Fisheries Dev. Corp.
17 Battery Place
New York NY 10004

Douglas B. Gordon
National Food Proc. Assn.
1133 20th St., NW
Washington DC 20036

GULF FISH. MGT. CO.
5401 W. Kennedy Blvd.
Tampa FL 33607

Jay Hastings
1111 3rd Ave. Bldg.
Suite 3305
Seattle WA 98101

Roger Hillhouse
1222 80th St. South
St. Petersburg FL 33707

J. R. Huard
23 Luce St.
Lowell MA 01852

M. Hunter
240 Sparks St. (8th Flr)
Ottawa, Ontario
K1A 0EL

Anthony L. Iarocci
41 Isabelle Dr.
Narragansett RI 02882

Joseph Karch
9 East 8th Street
Barnegat Light NJ 08006

Alfred Kuhnle
117-26 228th Street
Cambria Heights NY 11411

Thomas J. Leonard
Cape May County
Library
Cape May Cthse NJ 08210

Charles O. Gibson
P.O. Box 340
Boca Grande FL 33921

Clifton W. Greene, Jr.
42 Dorothys Way
S. Dennis MA 02660

Robert C. Haley
46 Grayfield Ave.
W. Roxbury MA 02132

F. Philip Heiner
1468 Enfield St.
Enfield CT 06082

Gary V. Hodge
Tri-County Co. for S. MD
P.O. Box 301
Waldorf MD 20601

Mr. Huber
Army Corps.of Eng.-Econ.Br.
803 Front Street
Norfolk VA 23510

Roger W. Hutchinson
Fisheries Dev. Div.
NMFS
Washington DC 20235

Ronald T. Jeffers
Hanson's Ridge Rd.
Springvale ME 04083

Kennebunk Enrichment
Learning Program
Gen. Delivery
W. Kennebunk ME 04094

Robert A. Lacasse
P.O. Box 145
Rollinsford NH 03869

James Levy
5 Sweet Meadow Court
Narragansett RI 02882

Howard Glickberg
2127 Broadway
New York NY 10023

Phil Guglielmo
198 Woodbury Rd.
Hunt NY 11743

T. A. Ham
507 Bay Blvd.
Lavallette NJ 08735

John Herrman
P.O. Box 471
Salisbury MD 21801

Terry Hopkins
26 Plymouth St.
Portland ME 04103

Raymond C. Hubley, Jr.
Hatch. & Fish. Res. Div.
US Fish & Wildlife
Washington DC 20240

Walter T. Hynes, Jr.
IPB00A
75 Essex Ave.
Gloucester MA 01930

Joint Trawlers (NA) Ltd.
P.O. Box 1209
63 Main St.
Gloucester MA 01930

C. J. Kolenda
7 Riverview Ext
Portland CT 06480

Sandra J. Lamer
NMFS, SE Region
9450 Koger Blvd.
St. Petersburg FL 33702

Capt. P. Lit
8 Warren St.
Rumson NJ 07760

Louisiana State Univ.
Sea Grant Legal Program
52 Law Center
Baton Rouge LA 70803

Douglas Marshall NEFMC
Suntaug Office Park
5 Broadway (Rt. 1)
Saugus MA 01906

Kevin L. McPhelim
P.O. Box 169
Falmouth MA 02541

Mark Middleton
Seafare Trading Co.
East Marion NY 11939

Gerhardt Muller
Port Authority of NY/NJ
1 World Trade Ctr. Rm 54E
New York NY 10048

NAFO
P.O. 638
Dartmouth, N.S.
Canada B2Y 3Y9

NMFS Fish. Mgt. Div.
300 S. Ferry St.
Room 2016
Terminal Island CA 90731

Ocean & Coastal Law Cntr
Law School
Univ. of Oregon
Eugene OR 97403

Old Dominion Lobster Co.
c/o Carl Meixner
903 S. Main Street
Chincoteague VA 23336

Capt. Mario Pagano
138 E. Shore Road
Narragansett RI 02882

Walter T. Pereyra
ProFish Int'l
1530 Westlake Ave.N.,Su.700
Seattle WA 98109

Charles H. Lyles
GSMFC
P.O. Box 726
Ocean Springs MS 39564

Charles A. Matley
Northgate West
Apartment F-1
Middletown RI 02840

Capt. Mark Merdinyan
Marine Ed. Assoc.
80 Love Lane
N. Kingston RI 02852

Nick Mirkovich
P.O. Box 168
Aransas Pass TX 78336

R. Munson
Box 358
Newport NJ 08345

New Haven Fish Co., Inc.
27 Howard Ave.
New Haven CT 06519

Nutmeg Fisheries
P.O. Box 117
Lubec ME 04652

Officer-in-Charge
US Coast Guard Station
Ocean City MD 21842

Oregon State Univ.
Library - Serials
Corvallis OR 97331

Anthony Pallazola
16 Washington St.
Gloucester MA 01930

D. A. MacLean
P.O. Box 2223
Halifax, N.S.
B3J 3C4

William C. Maxwell
P.O. Box 151
Peconic NY 11958

Mid-Atlantic Fishery
Development Foundation
Su. 600, 2200 Somervil
Annapolis MD 21401

Mote Marine Laboratory
Davis Library
1600 City Isd. Pk.
Sarasota FL 335

N. PACIFIC FISH. MGT.
P. O. Box 31360T
Anchorage AK 99510

Anthony V. Nizetich
Gov't. & Ind. Relation
Star-Kist Foods, Inc.
Terminal Island CA 907

Tim O'Connor
Life Raft Sales & Serv.
70 Kemble St.
Boston MA 02119

Michiru Okuma
First Secretary (Ag.)
2520 Mass. Ave. NW
Washington DC 20008

PACIFIC FISH MGT. CO.
526 S.W. Mill St.
Portland OR 97201

Capt. Salvatore Panto
RFD 1, Box 153H
Greenwich St.
Montauk NY 11954

W. Michael Pitcher
Hampton Chronicle-News
P.O. Box 1071
Westhampton Beach NY 1

EA 8

Pt. Judith Fishermen's
Coop Assn., Inc.
Galilee Rd.
Pt. Judith RI 02882

Rudolph A. Rosen
Nat'l Wildlife Fed.
1412 16th St., NW
Washington DC 20036

Joseph J. Santapaola
23 Highland St.
Gloucester MA 01930

Richard Shaul
Cont. Shelf Assoc.
P.O. Box 3609
Tequesta FL 33458

Christopher Simpson
Daily Press, Inc.
P.O. Box 746
Newport News VA 23607

Walter Small
10 Bluff Rd. West
Gales Ferry CT 06335

Dianne Stephan
Rt. 1, Box 591
Nebo NC 28761

Capt. Steve Strattman
72 N. Lakeshore Dr.
Manahawkin NJ 08050

Sal Testaverde
11 Lakeridge Drive
Georgetown MA 01833

Stewart Tweed
Cape May Co. Ext. Serv.
Dennisville Rd., Rt. 657
Cape May Cthse. NJ 08210

W. PACIFIC FISH. MGT. CO.
1164 Bishop St.
Room 1405
Honolulu HI 96813

Jeff Reichle
Lund's Fisheries
Ocean Drive
Cape May NJ 08204

S. ATLANTIC FISH. MGT. CO
Southpark Bldg. #1
Southpark Circle
Charleston SC 29407

Sea Grant Legal Program
52 Law Center, LSU
Baton Rouge LA 70803

Dale Shively
Dept. of Oceanography
Old Dominion Univ.
Norfolk VA 23508

Vincent Slikas
87-34 95 St.
Woodhaven NY 11421

David S. Smarowski
69 Quail's Crossing
Marion MA 02738

Harry C. Stephens
78 Bennington Pky.
Franklin Park NJ 08823

Michael W. Street
Div. of Marine Fisheries
P.O. Box 769
Morehead City NC 28557

Steven Todd
7 Settlers St.
Portsmouth RI 02871

US Coast Guard
G-W/12
2100 2nd St., SW
Washington DC 20593

Steve Waitnoight
101 Oakford Circle
Wayne PA 19087

Dr. R. J. Reimold
Coastal Res. Div.
1200 Glynn Ave.
Brunswick GA 3152

Tom Santaguida
1587 W. Princeton Ave.
Bricktown NJ 0872

Sea Harvest, Inc.
Mr. Daniel Cohen
P.O. Box 555
Cape May NJ 08204

Dale E. Shoemaker
145 Winter Street
Bridgewater MA 02324

Lucy Sloan
Suite 516
2424 PA Ave., NW
Washington DC 20037

Michael Solo
110 Spring St.
Pt. Jefferson NY 11777

Stinson Canning Co.
Atlantic Ave.
Rockland ME 04881

F. H. Swearingen
3 Washington
Lavallette NJ 08735

Everett Tolley
Progressive Services, In
P.O. Box 10076
Baltimore MD 21204

USDI, BLM
26 Federal Plaza
Rm 32-120 Federal
New York NY 10278

James F. Walker
16 Clinton Ave.
Swansea MA 02777

Don Wallace
Inst. for Inf.Studies
2704 Brown Street
Philadelphia PA 19130

Jim Warner
Star Rte. 1
Wolfeboro NH 03894

Paul Wehrlin
Internat'l Multi Foods
72 N. Water St.
New Bedford MA 02740

Steven Wickleder
P.O. Box 882
Montauk NY 11954

Stephen H. Zingale
6 Sunnyvale Rd.
Port Washington NY 11050

James L. Wallace
Inter Science Res. Assoc.
158-42 84th St.
Howard Beach NY 11414

Douglas D. Weaving
470 Marlborough Rd.
Brooklyn NY 11226

Richard Weisberg
509 Nassau Ave.
Freeport NY 11520

Anne D. Williams
710 W. Vermont Ave.
Urbana IL 61801

George C. Walueff
P.O. Box 415
Lewes DE 19958

Stephen Weber
215 W. 22nd St.
Ship Bottom NJ 08008

Dr. W. A. Wentz
Nat'l. Wildlife Fed.
1412 16th St., NW
Washington DC 200

David W. Windley
138 Court Street
Brooklyn Heights NY 11

Leonard Alfonso
P.O. Box 295
North Dartmouth MA 02747

Asbury Park Press
John Geiser, Out.Writer
Press Plaza
Asbury Park, NJ 07712

Atlantic Vessels, Inc.
P.O. Box 178
Norfolk VA 23501

Frederick Blount
P.O. Box 54
383 Water St.
Warren RI 02885

John Carlson
4408 Park Blvd.
Wildwood NJ 08260

R. D. Dempsey
c/o Snow Foods
Box 994
Cape May NJ 08204

Arnold I. Epstein
Snow Food Prod. Div.
180 E. Broad St.
Columbus OH 43215

GHG Corp.
2601 New Jersey Ave.
Wildwood NJ 08260

Ken Hand
7312 Pacific Ave.
Wildwood NJ 08260

Kris Isaksen
107 Hughes Ave.
Cape May NJ 08204

Morris Johnson, Jr.
MA Shellfish Officers Ass'n.
176 Winslow Gray Rd.
West Yarmouth MA 02673

Kenneth Allen
448 N. Connecticut Ave.
Atlantic City NJ 08401

John H. Atkinson
P.O. Box 5475
212 Washington Ave.
Towson MD 21204

Robert P. Avery
W.P.A. & Son, Inc.
109 New Jersey Ave.
Absecon NJ 08201

Roger Bookmyer
Old Salt Seafood
P.O. Box 439
Easton MD 21601

George S. Carmine
117 Darden Dr.
Poquoson VA 23362

East Coast
Trawling & Dock Co.
Box 205
Leesburg NJ 08327

Robert J. Farmer
1507 Sunset Ave.
Wanamasea NJ 08742

Eugene B. Goldenberg
Delaware Seafood, Inc.
39-41 Seafood Market
Philadelphia PA 19148

Harry O. Higbee
119 E. Rambler Rd.
Wildwood Crest NJ 08260

Isles of York, Inc.
RFD 1
Box 291A
Ocean City MD 21842

Thomas M. Karwacki
Progresso Quality Foods
500 Elmer Rd.
Vineland NJ 08360

Gerald Anderson
243 W. Juniper Ave.
Wildwood NJ 08260

Atlantic Offshore Fish &
Lobster Assoc.
1 Washington St.
Newport RI 02840

Thomas J. Becica, Sr.
1626 Star Ave.
Villas NJ 08251

William C. Brunell
545 Breakwater Rd.
Cape May NJ 08204

Communications Office
College of Wm. & Mary
VIMS
Gloucester Pt. VA 23062

Ellen W. Corp.
Eastern Shore Seafood Pr
P.O. Box 38
Mappsville VA 23407

Richard Gaskill, Jr.
Box 940
Exmore VA 23350

Grasonville Fisheries
P.O. Box 27
Ridgeley MD 21660

Jeffrey L. Howe
Cultured Clam Corp.
P.O. Box AC
Dennis MA 02638

George J. Jarvis
Harbor Shellfish, Inc.
RFD Rt. 2
Slocum RI 02877

Kim Bay Co., Inc.
P.O. Box 51
Ocean City MD 21842

Charles Lambros
Tom's Ipswich Clam Co., Inc.
5 Wildes Ct.
Ipswich MA 01938

Morton C. Lieborman
Atlantic Fish Market, Inc.
3533 S. Lawrence St.
Philadelphia PA 19148

Richard Loring
Cultured Clam Corp.
P.O. Box AC
Dennis MA 02638

Howard Matthews
616 Seashore Road
Cape May NJ 08204

John R. Miles
J.H. Miles & Co., Inc.
Box 178
Norfolk VA 23501

Sig Osmundsen
Sig's Dock, Inc.
704 W. Montgomery Ave.
Wildwood NJ 08260

Ronald Pearson
8401 Atlantic Ave.
Wildwood Crest NJ 08260

Alfred Rammell
R.D. 6
Hammonton NJ 08087

Richard Ryder
33 Teal Rd.
Rio Grande NJ 08242

Stanley Smith
Box 119
Ocean City MD 21842

Peter A. LaMonica
Cape May Canners, Inc.
P.O. Box 158, Indian Trl
Cape May NJ 08204

Lil' Robin, Inc.
Box 119
North Harbor Rd.
Ocean City MD 21842

Mabel Kim, Inc.
5 Cresse St.
Rio Grande NJ 08242

Donald McClellan
Althea Corp.
84 Long Point Dr.
Bricktown NJ 08723

Crest Millin, Jr.
P.O. Box 241
Ocean City MD 21842

Robert H. Nicholson
Doxee Food Corp.
P.O. Box 288
Lewes DE 19958

Ottens Harbor Clam, Inc.
Burk Ave. & Tacony Rd.
Wildwood NJ 08260

Frank Quigley
108 Broadway
Villas NJ 08251

Roy Scott
Dept. of Nat'l Res.
Bldg C2, 580 Taylor Ave.
Annapolis MD 21401

Peter Soffron, Jr.
Soffron Bros. Clam Co.
Brown Square
Ipswich MA 01938

Capt. Ted Lang
P.O. Box 710
Crisfield MD 21817

Joseph E. Lore
Main St.
Newport NJ 08345

Maryland Watermen's Ass
48 Maryland Ave.
Annapolis MD 21401

Donald McDaniels
1052 Shunpike Rd.
Cape May NJ 08204

Arthur R. Myers
C & D Seafood Co.
P.O. Box 48
Mappsville VA 23407

Gary Osmundsen
940 Myrtle Ave.
Cape May NJ 08204

Jack Patterson
P.O. Box 332
3 E. 8th St.
Barnegat Light NJ 08006

Samuel M. Quillen
Nanticoke Seafood Co.,
W. Harbor Rd.
Nanticoke MD 21840

RI Seafood Council
51 Tower Hill Rd.
Wakefield RI 02879

Nils Sletten
Box 375
Cheriton VA 23316

Teresa & Dawn Fish &
Clam Co.
Rt. 4, Box 53
Berlin MD 21811

Valerie E., Inc.
103 Teal Rd.
Rio Grande NJ 08242

Anthony W. Watson
Piney Island
Bishopville MD 21813

W. A. Ballard Corp.
Eastern Shore Seafood Prod.
P.O. Box 38
Hoppsville VA 23407

Ed Watson
28 E. Atlantic Ave.
Villas NJ 08251

A. Wayne Watson
Golf Course Rd.
Ocean City MD 21842

William P. Riggin
& Son, Inc.
13 S. Temperance St.
Port Norris NJ 08349

Dr. Emory Anderson
NEFC/NMFS
Woods Hole MA 02543

Edgar Bowman
NMFS/NEFC
Woods Hole MA 02543

Dr. Harold Haskin
Shellfish Research Laboratory
P.O. Box 587
Port Norris, NJ 08349

Carol Kilbride F/NER72
NMFS
State Fish Pier
Gloucester MA 01930

Dr. Lee Anderson
Col. of Marine Studies
U. of Del.
Newark DE 19711

Paul Hamer
Nacote Creek Res. Sta.
Star Route
Absecon NJ 08201

Dr. Mark Holliday F/SR1
Resource Statistics Div.
NMFS, NOAA
Washington DC 20235

Douglas Marshall NEFMC
Suntaug Office Park
5 Broadway (Rt. 1)
Saugus MA 01906

Dr. Herbert Austin
VIMS
Gloucester Pt. VA 2306_

Dr. William J. Hargis
VIMS
Gloucester Pt. VA 23062

Dr. Edward D. Houde
Project Director
Biographical Oceanographer
National Science Foundation
Washington, DC 20550

Dr. Bonnie J. McCay
Dept. of Human Ecology
Cook College, PO Box 23
New Brunswick NJ 08903

Stuart J. Wilk
NOAA/NMFS/NEFC
Sandy Hook Lab.
Highlands NJ 07732

Dr. Richard Agnello
Economics Dept.
University of DE
Newark DE 19711

Mr. Richard P. Surdi F/M11
NOAA/NMFS
U.S. Dept. of Commerce
Washington, DC 20235

Ralph W. Abele
Penna. Fish Comm.
P. O. Box 1673
Harrisburg PA 17120

V. Adm. Paul A. Yost, Jr.
Commander (A)
3rd Coast Guard Dist.
Governors Island NY 10004

Frank Grice
NMFS
State Fish Pier
Gloucester MA 01930

David H. Hart
P.O. Box 553
Cape May NJ 08204

Carol Kilbride F/NER72
NMFS
State Fish Pier
Gloucester MA 01930

Pam Lunsford
Dept. of Natural Res.
Natural Res. Bldg.
Annapolis MD 21401

Robert L. Martin
Lock Drawer 179
Bellefonte PA 16823

Edward R. Miller
Penna. Fish Comm.
Robinson Lane
Bellefonte PA 16823

Raymond T. Richardson
300 Main St.
Port Monmouth NJ 07758

Atlantic States Marine
Fisheries Commission
1717 Mass. Ave.
Washington DC 20036

Gordon Colvin
Dept. of Env. Cons.
SUNY Bldg. #40
Stony Brook NY 11794

Bruce Freeman
1619 Marigold Ave.
Manasquan NJ 08736

Bruce Halgren
Nacote Creek Res. Lab.
Star Route
Absecon NJ 08201

Alfred J. Hurlock, Jr.
Bay View Park
Andrews Street
Bethany Beach, DE 19930

George Krantz
Tawes State Office Bldg.
580 Taylor Ave.
Annapolis MD 21401

Cmdr. Ronald L. Blake, USCG
Commander (Aol)
Atlantic Area
Governors Island NY 10004

John Mason
Dept. of Env. Cons.
SUNY Bldg. #40
Stony Brook NY 11794

William Pruitt
Marine Res. Comm.
P.O. Box 756
Newport News VA 23607

Patrick Carroll
94 Henderson Road
Fairfield CT 06430

Edgar Bowman
NMFS/NEFC
Woods Hole MA 02543

Russell A. Cookingham
Dept. of Env. Protect.
CN400
Trenton NJ 08625

Charles M. Frisbie
Tidewater Adm., Tawes Bld
580 Taylor Ave.
Annapolis MD 21401

Dr. William J. Hargis
VIMS
Gloucester Pt. VA 23062

Harry M. Keene
Route 4, Box 286
Easton MD 21601

Dr. Robert Lippson
Habitat Protection Br.
NMFS Oxford Lab.
Oxford MD 21654

Joel MacDonald
NMFS
14 Elm St.
Gloucester MA 01930

James McHugh
28 Research Drive
P.O. Box 7033
Hampton VA 23666

Barry T. Parker
3 Greentree Centre,Suite 401
Route 73 & Greentree Road
Marlton, NJ 08053

Regional Director
Northeast Region, NMFS
14 Elm St.
Gloucester MA 01930

Ricks E. Savage
Route 2, Box 212

Ronal Smith
89 Kings Highway
P.O. Box 1401
Dover DE 19901

Jack Travelstead
Marine Res. Comm.
P.O. Box 756
Newport News VA 23607

Warren Hader
P.O. Box 508
Montauk, NY 11954

Charley J. Stearns
US Fish & Wildlife Serv.
One Gateway Center,Suit.700
Newton Corner MA 02158

William Wagner
89 Kings Highway
P.O. Box 1401
Dover DE 19901

Joseph MacMillan
60 Atlantic Avenue
W. Sayville, NY 11796

Barbara D. Stevenson
128 Second Street
Newport, RI 02840

Daniel A. Feifsnyder OES/OF
Office of Fisheries Affairs
Room 5806, Dept of State
Washington DC 20520

Alan D. Guimond
President, Stonington Seafoo
One Echo Farm Drive
Bristol, RI 02809

William P. Aikens
R. D. 2
Box 271
Lewes DE 19958

Tom Becker
Tampa II Fishing Corp.
3121 Avenue P
Brooklyn NY 11234

Michael Bickler
PA Fish Commission
P.O. Box 1673
Harrisburg PA 17120

David Bramhall
106 Chicago Blvd.
Sea Girt NJ 08750

R. Peter Connell
601 Bangs Ave.
Asbury Park NJ 07112

Anthony DeMaula, Jr.
Soundview Ave.
Mattituck NY 11952

Danny DiDanielle
P.O. Box 787
Montauk NY 11954

Dr. William DuPaul
Dept. of Advisory Services
VIMS
Gloucester Pt. VA 23062

Arthur Fass
Maritime Trading Co.
P.O. Box 5271
Newport News VA 23605

Alan Fields
c/o Merritt Seafood
W. Ocean City MD 21842

Capt. Richard Gallmore
P.O. Box 128
Barnegat Light NJ 08006

Capt. Fred Ardolino
2345 Knapp St.
Brooklyn NY 11229

Capt. Nelson R. Beideman
10th St. & Bay Ave.
Barnegat Light NJ 08006

Capt. Howard Bogan
7 Kings Path
Brielle NJ 08730

Larry Cantwell
Village of E. Hampton
159 Pantigo Rd.
East Hampton NY 11937

Jerry Connolly
Box 238A
Golf Course Rd.
Ocean City MD 21842

Bruce DeYoung
NY Sea Grant
39 Sound Ave.
Riverhead NY 11901

Robert Dorman
R. D. 2
Box 258
Lewes DE 19958

Gordon Eastlake
P.O. Box 197
Wachapreague VA 23480

William M. Feinberg
Feinberg, Oee, & Feinberg
554 Broadway
Bayonne NJ 07002

Gef E. Flimlin, Jr.
Ocean Co. Ext. Serv.
Rt. 527 Agr. Cntr.
Toms River NJ 08753

William Gifford
Sea-Pak
P.O. Box 536
Brigantine NJ 08203

Peter Barrett
Fisherman Magazine
339 Herbertsville Rd.
Bricktown NJ 08723

Scott Bennett
Box AX
Amagansett NY 11930

Joe Bogan
742 Revere Drive
Bricktown NJ 08723

Max Cohen
489 Locust Lane
Cape May Courthouse NJ

Neil Delanoy
90 Cedar Point Dr.
West Islip NY 11795

Barry Dickel
Bahia Marina, Inc.
2107 Herring Way
Ocean City MD 21842

Vernon Drewer, Jr.
Saxis VA 23427

James M. Falk
College of Marine Studie
U. of Del.
Lewes DE 19958

Fred Feller
2440 Camino Real South
Virginia Beach VA 23456

Fred Fox
Sea Watch Int'l., Ltd.
P. O. Box 263
Milford DE 19963

Nancy K. Goell
P.O. Box 1493
East Hampton NY 11937

Capt. Warren Hader
P.O. Box 508
Montauk NY 11954

Herbert Hudson
623 Seashore Road
Cape May NJ 08204

Harold B. Kennerly, Jr.
1115 Woodland Rd.
Salisbury MD 21801

David Krusa
386A Fairview Ave.
Montauk NY 11954

Wally Laudeman
Cold Spring Fish
& Supply Co.
Cape May NJ 08204

Capt. Albert Lindroth
182 Miller Ave
Freeport NY 11520

Wm. C. Lunsford, Jr.
1913 Knollton Rd.
Timonium MD 21093

John Mazurie
121 - 50th St.
Sea Isle City NJ 08243

Frank McGinnes
Virginia Seafoods, Inc.
P.O. Box 207
Irvington VA 22480

David Greenly
R.D. 1
Box 1738
Frederica DE 19946

Lance Hallock
P.O. Box 2248
Montauk NY 11954

William Jabine, II
Dept. of Nat. Res. (C-4)
Tawes State Office Bldg.
Annapolis MD 21401

Eirik Kirkeberg
Yacony Rd.
Wildwood NJ 08260

James T. Lamble
6 Ripley Lane
South Belmar NJ 07719

Donald Leonard
P.O. Box 173
Chincoteague VA 23336

Dr. Roger R. Locandro
Adm. Bldg., P.O. Box 231
Cook Col., Rutgers
New Brunswick NJ 08903

Ed Maliszewski
214 Ernston Rd.
Parlin NJ 08859

James Martin
Rt. 4, Box 734
Hayes VA 23072

Tony Mazzaccaro
Marine Adv. Program
U. of Maryland
College Park MD 20742

Dr. J. L. McHugh
Marine Sci. Res. Cntr.
SUNY
Stony Brook NY 11794

Dr. Churchill B. Grimes
National Marine Fisheries
Southeast Fisheries Center
3500 Delwood Beach Road
Panama City, FL 32407

Allen W. Haynie
Zapata-Haynie Corp.
P.O. Box 175
Reedville VA 22539

Joseph P. Julian
Julian's Bait shop
P.O. Box 302
Atl. Highlands NJ 07716

Sigmund Kislowski
1827 Lakeview Ave.
Neptune NJ 07753

Nestor Lane
345 South Blvd.
Spring Lake NJ 07762

Bob Lick
504 King Ave.
Collingswood NJ 08108

Douglas Marshall NEFMC
Suntaug Office Park
5 Broadway (Rt. 1)
Saugus MA 01906

William Masin
Flamingo Rd.
Montauk NY 11954

Harry McGarrigle, Jr.
2401 W. Brigantine Ave.
Brigantine NJ 08203

Thomas McVey
813 Seashore Rd.
Cape May NJ 08204

Ted Miller
206 Merion Rd.
Dover DE 19901

John Olsen
R.D. 2
Box 304
Flemington NJ 08822

Allan Paschall
2137 E. Admiral Drive
Virginia Beach VA 23451

Barbara Porter
Box 356
Bethany Beach DE 19930

Richie Rade
P.O. Box 852
Montauk NY 11954

Victor M. Rivas
#2 Windmill Rd.
Oakdale NY 11769

Robert Rubelmann
Rt. 3
Box 308
Cambridge MD 21613

John Sadowski
712 S. Franklin St.
Wilmington DE 19805

L. K. Shackelford, Jr.
P.O. Box 38
Gloucester Pt. VA 23062

John Stensland
Fisherman's Supply
Pt. Pleasant NJ 08742

Donald W. Strattman
DVM
3732 Lynnfield Drive
Virginia Beach VA 23452

Dr. William A. Muller
37 West 10th Ave.
Deer Park NY 11729

Charles Parker
Davis & Lynch Fish Co.
Ocean City MD 21842

William Pell
Pell's Fish Market
Box 341
Greenport NY 11944

Louis Puskas, Jr.
P.O. Box 191
Barnegat Light NJ 08006

Allan Ristori
2 Vermont Court
Lake Hiawatha NJ 07034

Louis A. Rodia, Jr.
Box 365
Cape May Cthse NJ 08210

Bernie Rubin
Chincoteague Seafood
P.O. Box 21
Chincoteague VA 23336

Joseph Sciabarra
31 Ross Lane
Sinai NY 11766

Norman J. Sickles, Jr.
179 Brookside Dr.
Belford NJ 07718

Gale Steves
Woman's Day
1515 Broadway
New York NY 10036

John F. Summers, Jr.
12 Highland Ave.
Rumson NJ 07760

John Murray, Jr.
P.O. Box 387
Brielle NJ 08730

F. Michael Parkowski
116 W. Water St.
Dover DE 19901

Julian Penello
2928 Replica Lane
Portsmouth VA 23703

Walt Quimby
R.R. #1
Box 156
Goldsboro MD 21636

Theodore Ritchie
24 Wilmington Ave.
Rehoboth Beach DE 19971

Claude Rogers, Jr.
Dept. of Cons. & Eco. D
25th St. & Pacific Ave.
Virginia Beach VA 23451

Fred Rushin
1584 Lake Christopher Dr
Virginia Beach VA 23464

Howard Seymour
P.O. Box 801
Lewes DE 19958

Melvyn Siegel
American Swordfish Asso
7908 Bayshore Dr.
Margate NJ 08402

Richard Stotz
East St. &
Massachusetts Ave.
Cape May NJ 08204

Carl Swenson
1201 Ocean Ave.
Apt. 78
Sea Bright NJ 07760

Anthony S. Taormina
108 Glenwood Lane
Pt. Jefferson NY 11777

William Tully
39 Canoe Place Rd.
Hampton Bays NY 11946

Capt. Theodore Weeks
11th St. & Bay Ave.
Barnegat Light NJ 08006

Chester V. Townsend
Sandy Landing
Daysboro DE 19939

David Wallace
22 Catherell Ct.
Salisbury MD 21801

Frederick Traber, Jr.
300 E. Myrtle Rd.
Wildwood Crest NJ 0826

James Wallace
VA Marine Prod. Comm.
P.O. Box 1248
Newport News VA 23601

APPENDIX II. REGULATORY IMPACT REVIEW

I. INTRODUCTION

A. Purpose

The purpose of this document is to present an analysis of the proposed regulations for Amendment #5 (Amendment) to the Surf Clam and Ocean Quahog Fishery Management Plan (FMP). This document has been prepared in compliance with the procedures of the National Marine Fisheries Service (NMFS) to implement Executive Order (E.O.) 12291. The document also contains an analysis of the impacts of the Plan relative to the Regulatory Flexibility Act and the Paperwork Reduction Act of 1980.

The FMP was prepared by the Mid-Atlantic Fishery Management Council (Council) and approved by the National Oceanic and Atmospheric Administration (NOAA) in November 1977 for the period through September 1979. Amendment #1 extended it through 31 December 1979. Amendment #2 extended it through the end of calendar year 1981. Amendment #3, approved 13 November 1981, extended the FMP indefinitely. Amendment #4, currently in the Secretarial review process, will increase the Optimum Yield (OY) in the New England Area and review the New England Area management regime to minimize the chances of closures.

The management unit is maintained as all surf clams (Spisula solidissima) and all ocean quahogs (Arctica islandica) in the Atlantic FCZ.

B. Description of User Groups

The fishery is described in Sections VIII and IX of the Amendment.

C. Problem Addressed by the Amendment

The FMP currently contains a 5.5" minimum surf clam size limit in the Mid-Atlantic Area. Amendment #4, when implemented, will extend the size limit to the New England Area. The regulations implementing the FMP set a tolerance on the size limit in that 10% of the cages on board a vessel (at least 1 cage) may be reserved from inspection and no more than 240 clams in the remaining cages may be under 5.5", the effect being a combined tolerance of about 19%.

When the size limit provision was developed it was understood that it was necessary to tradeoff against conflicting goals. The 5.5" size was considered optimum in terms of the value of the product although maximum yield per recruit (YPR) is 4.75". Clams in any bed generally are mixed in size, so that even the most competent fishermen will catch smaller clams. Therefore, a tolerance was considered necessary to minimize discarding. Discarding was considered wasteful since a considerable portion (perhaps 50-60%) of the discarded clams probably die (Haskin, 1975).

The current distribution of the stock has led to discard rates of up to 50% (Figure 8) to meet the 5.5" size limit with the current tolerance. This level is considered unacceptable.

It was the Council's intent when the size limit provision was developed that the tolerance in the regulations could be changed over time as the size distribution of the stock changed in order to minimize discarding. However, the FMP did not include the parameters within which the tolerance adjustment could be made since the concept of framework management measures was not fully developed when the size limit was added to the FMP. Current interpretations of the characteristics of a framework measure conclude that the FMP does not provide an adequate basis for tolerance adjustments of a magnitude adequate to solve at least the current discarding problem.

Enforcement is also a consideration in terms of how much work is necessary to determine if a violation has occurred. Large tolerances mean that a large number of clams must be measured or that subsampling must occur. Subsampling is not as straight forward when developing cases as an overall measure, since a conviction depends not only on whether the clams were undersized but also

on whether the subsampling was done appropriately.

In summary, the problem is to revise the size limit provision to reduce the waste of discarding to the greatest extent possible.

D. Management Objectives

The objectives of the FMP are:

1. Rebuild the surf clam populations to allow eventual harvest approaching the 50 million pound level, which is the estimate of maximum sustainable yield over the range of the resource, based on the average yearly catch from 1960 to 1976.

2. Minimize economic dislocation to the extent possible consistent with objective 1 and encourage efficiency in the fishery.

3. Prevent the harvest of ocean quahogs from exceeding maximum sustainable yield and direct the fishery toward achieving Optimum Yield.

4. Provide the greatest degrees of freedom and flexibility to all harvesters of these resources consistent with the attainment of the other objectives of this Plan.

5. Optimize yield per recruit.

6. Increase understanding of the conditions of the stocks and fishery.

E. Provisions of the Amendment

The FMP currently states: "No person shall harvest or possess surf clams smaller than 5.5" in length".

Amendment #5 (Amendment) changes that provision to read:

> There is a surf clam minimum size limit. After consultation with the Council and opportunity for public comment, the Regional Director shall adjust, by increments no less than 0.25", the surf clam minimum size limit to a value less than 5.5" as necessary, so that discards on average do not exceed 30% of the trip catch. In no event shall the size limit be less than 4.75". When data indicate the clams have grown sufficiently, the limit would be increased, ultimately reaching the 5.5" limit. There is a tolerance of 240 undersized clams per cage but no more than 50 clams per cage under 4.75". If any cage is in violation of the size limit, the entire load is in violation. In adjusting the size limit the Regional Director shall consider current stock assessments, catch reports, and other relevant information concerning the size distribution of the surf clam resource. No person shall harvest or possess surf clams smaller than the minimum size limit.

The Amendment adds the requirement that all surf clam cages must be tagged before leaving the vessel and that tags may not be removed until cages are emptied at the processing plant.

Also, the Amendment adds the provision that all surf clams landed on an authorized FCZ fishing day are assumed to have been caught in the FCZ and are subject to the Federal size limit.

F. Alternative to the Amendment

The alternative to the proposed Amendment is to take no action at this time. This would mean that the surf clam minimum size limit would remain at 5.5". This would not address the problem of discards associated with the surf clam size limit.

The August 1983 NMFS surf clam survey found that about half (51%) the resource (numbers) in the Mid-Atlantic is less than 4.75" (Table 8) with 46% of the resource less than 4.75" outside the closed

areas. Twenty-nine percent of the total resource fell between 4.75" and 5.5" while 31% of the resource in the open areas were within this 0.75" length interval. Thus, 23% of the resource in the opened areas and 19% of the total resource was greater than 5.5". By summer of 1984 another 0.25" of growth is projected so the total number of clams greater than 5.5" should be roughly 30%. Commercial catch sampling and processor sampling by NMFS indicates that 1% of the catch landed during the fall of 1983 was below 4.75" with 30% of the catch sampling and 36% of the processor sampling between 4.75" and 5.5" (Table 8).

There have been a significant number of violations of the size limit: 19 in 1981, 38 in 1982, 50 in 1983, and 26 thus far in 1984. The discard rate has been decreasing (Figure 8), while CPUE has been increasing (Tables 13-15). This information suggests that fishermen are keeping the smaller clams. If the fishermen were to fish so as to meet the current size limit, discards could return to the 50% level of late 1982 (Figure 8), a significant negative impact given the estimated 50-60% mortality of discarded clams.

NEFC data for 1984 (January through early August) show that 65% of Mid-Atlantic surf clam landings were 5.5" or more, whereas 21% were between 5.25-5.5", 10% were between 5-5.25", and 4% were less than 5" (Murawski, 1984). Murawski (1984) noted "If, however, the minimum size limit was enforced absolutely, discarding rates would markedly increase since substantial quantities of sub-legal clams are now landed rather than culled overboard at sea. Such a response by the fishery to more rigorous enforcement of the size limit regulations occurred during the fourth quarter of 1982 when discard rates approached 50% of the landings."

II. REGULATORY IMPACT ANALYSIS

This Amendment would solve the current size limit problem in a manner consistent with the FMP's objectives. It would retain the current 5.5" minimum size limit as a target, but is a compromise between the size limit objective and the desire to reduce the waste of discards. Essentially, the size limit would stay at 5.5" unless the clam size distribution suggested that excessive discards would result from that limit. The size is then reduced as necessary to keep the discard level around 30% while still maintaining the number of clams an agent must count to get a violation small (no less than 50 and no more than 240). The converse of this is keeping a fixed size limit but changing the tolerance, which can lead to an unacceptably large number of clams needed to get a violation. When data indicate the clams have grown sufficiently, the limit would be increased, ultimately reaching the 5.5" limit.

Specifying the number of clams needed for a violation means the tolerance percentage floats from about 10% (240 clams at 5.5") to about 1% (50 clams at 4.75").

This Amendment provides that the size limit may not be adjusted smaller than 4.75", which equals maximum YPR. The YPR for the 5.5" size limit is approximately 10% less than that at 4.75". Therefore, providing for a decrease in the size limit to the maximum YPR value results in an increase in yield of up to about 10%.

The economic impacts of the 5.5" minimum size limit were discussed in the Regulatory Impact Review for Amendment #3 to the FMP. If the Amendment resulted in a significant decrease in the size limit (i.e., close to 4.75"), negative economic impacts could occur by a decrease in the supply of strip clams, a decrease in clam prices because of increases in the supply of small clams, and transfers of effort from the ocean quahog to the surf clam fishery. The size limit was set at 5.5" to not only protect the resource but also to optimize the use of the clams since 5.5" is about the smallest size clam that has been used for strips (the highest valued clam product). To the extent that the smaller processors and the independent vessels that work with them are more dependent on larger surf clams than are the larger, vertically integrated processors that also use smaller surf clams and ocean quahogs, significant decreases in the size limit with concomitant decreases in the supply of larger clams could negatively impact the smaller firms relative to the larger firms. However, all processors can process both large and small clams with the sizes processed dependent on the processors' markets, so the distributional impacts of this measure should not be significant.

While the mortality of discarded clams has not been determined conclusively, it is generally agreed

that it is around 50-60% (Haskin, 1975). The 50-60% estimate may, in fact, be considered a minimum since it was based on fishing in a research mode whereas in commercial fishing the sorting and discarding operations would likely result in more shells being broken which would mean than more clams would die. Adjusting the size limit to minimize discards will provide insurance against overfishing since discarded clams that die are not counted against the quota even though they are a part of fishing mortality.

The smaller the size limit, the greater the portion of the resource that will be legally harvestable, so the quota will be taken more quickly, resulting in decreases in allowed fishing time and increasing closures. August 1983 data for the whole Mid-Atlantic show that lowering the size limit to 4.75" would increase the legally harvestable clams by 29%. However, given the large number of small clams currently being landed (Murawski, 1984), which are reflected in high catch rates, reduced fishing hours, adjustments to lower the size limit may not result in dramatic short run increases in catch rates.

At all levels of possible size authorized by this Amendment the resource will have had several spawning opportunities. At 4.75" clams will have spawned two or three times, while at 5.5" there will have been four to five spawns (Table 11).

In summary, the 5.5" minimum size limit has positive impacts (MAFMC, 1981). However, the current size distribution of the resource suggests that rigorous enforcement of that limit would lead to unacceptably large discard rates (Murawski, 1984). If half of the catch would be discarded (Murawski, 1984) and half of those discarded would die (Haskin, 1975), and assuming the entire 2.35 million bu 1984 quota were landed under those circumstances, about 1.18 million bu would be wasted, clearly an unacceptable impact. As discussed above, if the limit were reduced to the minimum level, there would be negative economic impacts. Examining the situation in 1984 provides insight into impacts between the 4.75" and 5.5" extremes. Discard rates in 1984 have been around 30% with about 35% of the landings smaller than the current 5.5" limit (Murawski, 1984). If the Amendment were implemented and the limit adjusted to 5.25" and the discard and fishing patterns did not change, 14% of the landings would be less than the 5.25" limit (Murawski, 1984). While it is impossible to estimate these impacts on a vessel or trip basis, it is reasonable to expect that the number of violations should decrease. It is also reasonable to expect that the discard rate should decrease since some portion of the clams currently discarded are likely between 5.25" and 5.5". Clearly, if a larger proportion of the catch is landed, the catch rate will increase, leading to more frequent or longer closures, but the Council has determined that the waste associated with discarding represents a greater cost than that associated with accelerated catch rates.

The requirement that surf clam cages be tagged will have a negative impact to the extent that fishermen may need to purchase and are required to use the tags.

The Regional Director has the responsibility for the tagging system. As of this date the specifics of the system have not been determined. Information available to the Council indicates that NMFS is considering a system that would involve supplying the fishermen with prenunbered tags, either at no cost or at a charge of $.10 per tag.

If the tags are sold, the cost to the fishermen is negligible. The maximum quotas are 2.9 million bu for the Mid-Atlantic Area and 200,000 bu (following approval of Amendment #4) for the New England Area, for a total of 3.1 million bu. At 32 bu/cage, if the total quota was set at the maximum level and the entire quota were caught, 96,875 cages would be landed, would require a tag expenditure of $9,687.50 at $.10 per tag.

If the tags are issued free, there would be no cost to the fishermen but a cost to the government. The $.10 per tag sale cost was intended to pay for the government's cost to buy the tags and also recover the government's cost of distributing the tags, so in this case the government would pay the estimated maximum $9,687.50 rather than the fishermen.

The cost of installing tags is considered negligible.

The positive impact will be to facilitate enforcement of the size limit provision. The size limit is a

possession regulation, so fishermen and processors are responsible for assuring that clams meet the minimum size limit. Without tagging substantial enforcement effort is needed to assure an evidence trail from the vessel to the processing plant so that all parties to a violation can be cited. Tagging cages will mean that enforcement officers can inspect cages at the processing plants, while being able to enforce the size limit on both vessel operators, processors, and anyone in the transportation chain between the vessels and plants, which is more cost effective than inspecting vessels at the docks and inspecting the processing plants. This is merely a result of the small number of processors relative to the number of vessels and landing ports along with the tags providing the evidence trail. NMFS estimates landings can be monitored at between $28 per vessel for eight inspections per day to $227 per vessel for one inspection per day, whereas their officers can inspect two dealers or processors a day, for a cost per inspection of $114. There are about twelve surf clam processors whereas about 80 vessels (Table 21) are active in the Mid-Atlantic Area in any month (the number of active vessels in the New England Area is unknown because of incomplete logbook reporting). Because of the effort limitations in the Mid-Atlantic Area the number of vessels actually landing surf clams on any given day would be less than 80, but even if the number of vessels landing on a given day equals the number of plants, there are advantages to plant inspections relative to vessel inspections. Primary enforcement at the plant level will optimize the use of the very small number of available enforcement officers simply because they can spend their time enforcing the regulations rather than traveling from dock to dock and waiting for the vessels to land, that is, the locations of the plants is known whereas the vessels land and random times and at ports along essentially the entire coast.

While this measure will make enforcement more efficient and thus perhaps less expensive, the primary benefit will be to increase the likelihood that the FMP can be enforced, and thus that OY can be attained (i.e., acheived but not exceeded).

The provision that surf clams landed on an authorized FCZ fishing day are assumed to have been caught in the FCZ should have no negative impacts, either environmental or economic. However, it should have a very positive impact from an enforcement standpoint. While several States have size limits, some do not and none of the existing State minimum size limits are the same as the limit that will result from this Amendment. It is necessary to assure that surf clams caught in the FCZ meet the minimum size limit. It is not reasonable to expect that the minimum size limit will be enforced adequately at sea. However, enforcement on land, in the absence of identical size limits for the FCZ and State waters, means that fishermen can claim that undersized clams were caught in State waters, effectively nullifying the FCZ minimum size limit. All of the States are encouraged to adopt size limits similar to the size limit included in this Amendment. However, the provision that surf clams landed on an authorized FCZ fishing day were caught in the FCZ is necessary to eliminate this loophole. It must be recognized that this provision will only be effective in the Mid-Atlantic Area since vessels operating in the New England Area do not have authorized FCZ fishing days. However, given that most of the surf clams are landed in the Mid-Atlantic Area (based on the Optimum Yields for the two Areas), this should not present a major problem relative to size limit enforcement.

The net effect of this Amendment is that the size limit may be adjusted so that it will be easier for fishermen to land clams that meet the limit with minimal discarding while it will also be easier to obtain convictions of those who violate the limit.

The benefits of the Amendment are:

1. Being able to adjust the size limit to reduce discards decreases resource waste associated with discard mortality. While the mortality of discarded clams has not been determined conclusively, it is generally agreed that it is around 50-60% (Haskin, 1975). At times the discard rate has been 50% of the catch (Figure 8). While the reported discard rate (Figure 8) has been decreasing, that is considered to be a result of fishermen landing the small clams rather than discarding them as evidenced by the increase in size limit violations (19 in 1981, 38 in 1982, 50 in 1983, and 26 through mid-June 1984). The size distribution of the resource (Figure 3) clearly indicates a substantial portion of the resource under 5.5".

2. It will be easier to enforce the surf clam minimum size limit relative to vessels,

transportation facilities, and processing plants.

3. It will eliminate the loophole of fishermen being able to claim they caught undersized clams in State waters.

4. At all levels of possible size authorized by this Amendment the resource will have had several spawning opportunities. At 4.75" clams will have spawned two or three times, while at 5.5" there will have been four to five spawns (Table 11).

The adverse impacts include:

1. If there were a significant decrease in the size limit, there could be a decrease in the supply of clams at the traditional size for strips, a decrease in clam prices because of increases in the supply of small clams, transfers of effort from the ocean quahog to the surf clam fishery, a greater portion of the resource that will be legally harvestable (increasing the rate at which the quota will be taken), and the greater the need for timely remedial action to assure the quota is not exceeded in light of increased catch rates. However, given the large number of size limit violations and the current discard rate, it is assumed that fishermen are currently landing significant numbers of smaller clams, so an adjustment of the size limit under this Amendment should not impact these factors significantly. In other words, if the size limit adjustment Amendment is implemented, the most significant short run impact will be to legalize what many fishermen are currently doing, thus creating minimal economic impacts.

2. The cost of purchasing and installing cage tags.

Given the significant waste associated with discarding and the problems associated with enforcing the size limit, it is the Council's conclusion that the benefits of the Amendment, both short and long term, outweigh the adverse impacts. Additionally, given the current size distribution of the resource, major decreases to the size limit in the short run are extremely unlikely (a reduction to 5.25" will likely solve the current problem), so significant distributional impacts between large and small operators are unlikely. The reduced mortality resulting from reduced discards should provide benefits over time that outweigh any short term negative impacts. The positive impacts of the enforcement provisions (cage tagging and the FCZ catch presumption) clearly outweigh any negative impacts.

It is expected that the governmental costs of implementing the Amendment will be similar to those experienced in enforcing the current FMP. Council and NMFS administrative costs would increase slightly because of the need to periodically evaluate whether size limit adjustments were necessary and to make those changes. NMFS enforcement costs should decrease to the extent that the size limit more nearly approximates what the fishermen are catching, so that while the enforcement effort should not decrease, the number of violations and the time needed to process them should decrease. The tagging requirement and FCZ catch presumption should improve enforcement effectiveness, if not reduce enforcement costs.

IV. Discussion of the Benefits and Costs of the Amendment

E.O. 12291 requires that a benefit-cost analysis of all proposed regulations be performed.

A. Costs

The economic impacts of the 5.5" minimum size limit were discussed in the Regulatory Impact Review for Amendment #3 to the FMP. If the Amendment resulted in a significant decrease in the size limit (i.e., close to 4.75"), negative economic impacts could occur by a decrease in the supply of strip clams, a decrease in clam prices because of increases in the supply of small clams, and transfers of effort from the ocean quahog to the surf clam fishery. The size limit was set at 5.5" to not only protect the resource but also to optimize the use of the clams since 5.5" is about the smallest size clam that has be used for strips (the highest valued clam product). To the extent that the smaller processors and the independent vessels that work with them are more dependent on

larger surf clams than are the larger, vertically integrated processors that also use smaller surf clams and ocean quahogs, significant decreases in the size limit with concomitant decreases in the supply of larger clams could negatively impact the smaller firms relative to the larger firms.

The requirement that surf clam cages be tagged will have a negative impact to the extent that fishermen will need to purchase and use the tags. However, the cost of purchasing and installing tags is considered negligible. The positive impact will be to facilitate enforcement of the size limit provision.

B. Benefits

This Amendment provides that the size limit may not be adjusted smaller than 4.75", which equals maximum YPR. The YPR for the 5.5" size limit is approximately 10% less than that at 4.75". Therefore, providing for a decrease in the size limit to the maximum YPR value results in an increase in yield of up to about 10%.

The benefit of being able to adjust the size limit to reduce discards is a decrease in resource waste associated with discard mortality. While the mortality of discarded clams has not been determined precisely, it is generally agreed that it is around 50-60% (Haskin, 1975). At times the discard rate has been 50% of the catch (Figure 8). While the reported discard rate (Figure 8) has been decreasing, that is considered to be a result of fishermen landing the small clams (Murawski, 1984) rather than discarding them as evidenced by the increase in size limit violations (19 in 1981, 38 in 1982, 50 in 1983, and 26 through mid-June 1984). The size distribution of the resource (Figure 3) clearly indicates a substantial portion of the resource under 5.5".

C. Benefit - Cost Conclusion

Given the significant waste associated with discarding and the problems associated with enforcing the size limit, it is the Council's conclusion that the benefits of the Amendment, both short and long term, outweigh the adverse impacts. Additionally, given the current size distribution of the resource, major decreases to the size limit in the short run are extremely unlikely (a reduction to 5.25" will likely solve the current problem), so significant distributional impacts between large and small operators are unlikely. The reduced mortality resulting from reduced discards should provide benefits over time that outweigh any short term negative impacts. The positive impacts of the enforcement provisions (cage tagging and the FCZ catch presumption) clearly outweigh any negative impacts.

It is expected that the governmental costs of implementing the Amendment will be similar to those experienced in enforcing the current FMP. Council and NMFS administrative costs would increase slightly because of the need to periodically evaluate whether size limit adjustments were necessary and to make those changes. NMFS enforcement costs should decrease to the extent that the size limit more nearly approximates what the fishermen are catching, so that while the enforcement effort should not decrease, the number of violations and the time needed to process them should decrease. The tagging requirement and FCZ catch presumption should improve enforcement effectiveness, if not reduce enforcement costs.

D. Other E.O. 12291 Requirements

E.O. 12291 requires that the following three issues be considered:

1. Will the Plan have an annual effect on the economy of $100 million or more.

2. Will the Plan lead to an increase in the costs or prices for consumers, individual industries, Federal, State, or local government agencies or geographic regions.

3. Will the Plan have significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of US based enterprises to compete with foreign based enterprises in domestic or export markets.

The Amendment should not have an annual effect of $100 million or more since the total fishery had a value of only $25 million in 1983 and since 1950 has never exceeded $27 million.

The Amendment should not lead to an increase in the costs or prices for consumers, individual industries, Federal, State, or local government agencies or geographic regions. It is expected that the governmental costs of implementing the Amendment will be similar to those experienced in enforcing the current FMP. Council and NMFS administrative costs would increase slightly because of the need to periodically evaluate whether size limit adjustments were necessary and to make those changes. NMFS enforcement costs should decrease to the extent that the size limit more nearly approximates what the fishermen are catching, so that while the enforcement effort should not decrease, the number of violations and the time needed to process them should decrease. The tagging requirement and FCZ catch presumption should improve enforcement effectiveness, if not reduce enforcement costs. Industry costs should decrease by minimizing the need to discard small clams and by minimizing violation problems associated with catching and not discarding small clams and these cost decreases should be greater than the cost of buying and using cage tags. Since industry costs should be reduced, there is no reason to believe that consumer prices should increase.

The Amendment should not have significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of US based enterprises to compete with foreign based enterprises in domestic or export markets. It should have no impact on competition, employment, investment, innovation, or foreign competition. It should have a positive impact on productivity because of decreased sorting to reduce the number of sublegal clams landed.

V. Impacts of the Plan relative to the Regulatory Flexibility Act and the Paperwork Reduction Act of 1980.

The Regulatory Flexibility Act requires the examination of the impacts on small businesses, small organizations, and small jurisdictions. The impacts of the Amendment do not favor large businesses over small businesses. Both large and small businesses are impacted by the current size limit problem and will be benefitted by the solution contained in the proposed Amendment.

The economic impacts of the 5.5" minimum size limit were discussed in the Regulatory Impact Review for Amendment #3 to the FMP. If the Amendment resulted in a significant decrease in the size limit (i.e., close to 4.75"), negative economic impacts could occur by a decrease in the supply of strip clams, a decrease in clam prices because of increases in the supply of small clams, and transfers of effort from the ocean quahog to the surf clam fishery. The size limit was set at 5.5" to not only protect the resource but also to optimize the use of the clams since 5.5" is about the smallest size clam that has be used for strips (the highest valued clam product). To the extent that the smaller processors and the independent vessels that work with them are more dependent on larger surf clams than are the larger, vertically integrated processors that also use smaller surf clams and ocean quahogs, significant decreases in the size limit with concomitant decreases in the supply of larger clams could negatively impact the smaller firms relative to the larger firms.

The Paperwork Reduction Act concerns the collection of information. The intent of the Act is to minimize the Federal paperwork burden for individuals, small business, State and local governments, and other persons as well as to maximize the usefulness of information collected by the Federal government. This Amendment does not change the FMP's permitting and reporting requirements and, therefore, has no impact relative to the Paperwork Reduction Act.

APPENDIX III. SUMMARY OF PUBLIC HEARINGS AND WRITTEN COMMENTS

27 August 1984 Salisbury, MD Public Hearing

The hearing began at approximately 7:15 pm with Council member Ricks Savage as moderator. Staff members present were John C. Bryson and Mary Ann Zdana. NMFS was represented by William Brey (Oxford Lab). Public attendees were David Wallace (United Shellfishermen's Assoc.), Adrian Wayne Watson (Watson's Surf Clam Dock, F/V Sea Quest, F/V Mel Antone, F/V Lady Kim), Eirik Kirkeberg (Eirik's Dock), Ann Hart (Eirik's Dock), Clay Jester (American Original Corp.), Dennis Russell (Delmarva Coastal Clam), Donald Leonard (D.J. Leonard & Sons, Sea Transporters, Inc.), Christian Madsen (F/V Leprechaun), Bernie Rubin (Chincoteague Seafood Co., Inc.), Toby Rubin (Chincoteague Seafood Co., Inc.), Sam Quillin (Nanticoke Seafood Co.), Joseph Lett (F/V Amy Lynn, Lett's Clam Inc.), and Verne Conaway (Sea Watch International).

Mr. Bryson explained the provisions of Amendment #5.

Mr. Clay Jester, representing American Original Corporation, read a statement into the record (Attachment A).

Mr. David H. Wallace, representing the United Shellfishermen's Association, read a statement recommending that surf clam vessels be limited to one trip per day. A vote was taken to indicate how many in attendance agreed with the one trip per day provision and 3 voted in favor, 4 voted against, with the rest of the attendees not voting.

Five attendees (Mr. Madsen, Mr. Leonard, Ms. Hart, Mr. Kirkeberg, and Mr. Conaway) indicated that they supported the preferred alternative, without making any additional comments.

Six attendees indicated that they supported the preferred alternative but with the following additional comments:

> Mr. Watson: I support a 5.25" minimum size limit. I feel that we have been wasting some of our resource by discarding clams of this size. By discarding this size clam, many will not live. Some are broken or cracked when they are returned to the ocean bottom. In my opinion, this is wasteful conservation. I also support one trip per working day.
>
> Mr. Jester: Additional comments will be submitted regarding trip limits within 12 hour period by August 30, 1984.
>
> Mr. Bernie Rubin and Ms. Toby Rubin: Tags should be uniform and numbered in such a manner so they can not be duplicated or forged. I support this Amendment wholeheartedly.
>
> Mr. Lett: I support the position taken all except tags. I do not support the addition to this of one trip per day.
>
> Mr. Wallace: 1) support the tagging system with 5 part tags as stated by U.S.A.; 2) with varying size each vessel should be limited to one trip per 12 hour day; 3) support a 5.25" size limit when Amendment goes into effect.

Mr. Quillin supported taking no action at this time but gave no additional comments.

Mr. Russell supported taking no action at this time with the following comment: I do not support the tagging system proposed. I do not support the proposal for the boat not being allowed to leave dock on other than a fishing day. There are enough regulations without invoking a new set.

The hearing adjourned at approximately 8:20 p.m.

27 August 1984 Wakefield, RI Public Hearing

The hearing began at approximately 7:10 pm with Council member Mike Keene as moderator. Staff members present were Dave Keifer and Carol Stevenson. Others present were Alan Guimond, Robert Smith, Doug Marshall, and Sharon Lake (New England Council), Dave Borden (RI Div. of Fish and Wildlife), Francis Manchester (Manchester Seafoods Inc. and Point Trap Co.), Inc., George Richardson (Blount Seafood Corp.), Daniel Cohen (Sea Harvest, Inc.), John Kelleher (F/V Chesapeake Inc.), and Robert Kelleher (F/V Chesapeake, Inc.).

Mr. Keifer explained the provisions of Amendment #5.

Mr. Borden commented that he felt the provision in the Amendment that the Regional Director may adjust the size limit, after consultation with the Council, would present a problem for the states in that it would be difficult for them to adopt complimentary regulations.

Mr. Cohen read a statement on behalf of the United Shellfishermen's Association. The Association supports Amendment # 5 with a few additional provisions. They would like to have a 1 trip per 12 hour period be added to the Amendment. This trip would only allow one offloading during that 12 hour period. They also recommend that a 5 part tag be used to be issued by the government so that the vessel, unloading dock, truck, shucking plant, and processor could all have copies of the same tag. The Association feels that any given vessel should not be allowed to fish in both the Mid-Atlantic and the New England areas at the same time.

Mr. Borden raised a question how the provision that "all surf clams landed on an authorized FCZ fishing day are assumed to have been caught in the FCZ and are subject to the Federal size limit" would apply to the New England Area since the regime in the New England Area currently does not incorporate authorized days.

Daniel Cohen, John Kelleher, and Robert Kelleher supported the position of the United Shellfishermen's Association. George Richardson supported the preferred alternative in Amendment # 5. Francis Manchester supported no position until the wording was clarified in reference to the authorized FCZ fishing day for the New England area.

The hearing adjourned at approximately 7:45 pm.

28 August 1984 Cape May Court House, NJ Public Hearing

The hearing began at approximately 7:05 pm with Council member David Hart as moderator. Staff members present were David Keifer and Carol Stevenson. NMFS was represented by Bruce Nicholls. Others present included Bruce Halgren (NJ Div. of Fish, Game, and Shellfisheries), Steward Tweed (NJ Marine Advisory Service), William Avery (W.P.A. & Sons, Inc.), Thomas Karwacki (Progresso Foods), David Wallace (United Shellfishermen's Association), Fred Ware (Clamco Corp.), Stan Osmundsen (Capt. Sig's Seafood, Inc.), Robert Avery (W.P.A. & Sons, Inc.), Phin Marr (Garden State Seafood), Rick Traber (Seabound Inc.), Capt. Elmer Widerstrom (F/V Myrtle Virginia), Warner Muller (F/V Lady Cheryl), Chris Letts (Letts Clam, Inc.), Joseph Letts (Letts Clam, Inc.), Gerry Frye (F/V First Lady), Donald McDaniels (New Sea Rover, Inc.), Katharine Marvin (American Original Corp.), Don Shoffler, and William Watson (Press & Sunday Press).

Mr. Keifer explained the provisions of Amendment #5.

Mr. Shoffler asked where the Council had gotten the figures of the discards averaging 50%. He stated there were no fishermen he knew of that were throwing back half of their catch and asked for a hand show of how many fishermen in the room were doing that, which received no response.

Mr. Marr stated he was concerned about the price dropping on clam meats and asked if the

quota could be brought up to compensate for it.

Mr. Frye asked when final action would be taken on the Amendment and how long it would take to be in effect. Mr. Nicholls replied that it could be implemented as soon as 30-45 days.

Mr. Wallace from the United Shellfishermen's Association read a statement which supported Amendment # 5 with a few additional provisions. The Association proposed a 1 trip per 12 hour period with only one offloading during that period. They also suggested that a 5 part tag be used for the tagging requirement so that the vessel, unloading dock, truck, shucking plant, and processors could all have copies of the same tag. The Association strongly supports that the states should attempt to adopt similar tagging requirements.

Mr. Keifer asked if the fishermen would please show their hands for and against the proposal to allow 1 trip per 12 hour period. Five were for and 11 were against.

Mr. Karwacki asked how the size limit would ever go back up. Mr. Keifer replied that the decision to move the minimum size up or down was based on current stock assessments, catch reports and other relevant information concerning the size distribution of the surf clam resource.

Several fishermen felt that the NMFS surveys were inadequate and that they were using obsolete dredging equipment to do their surveys and were, therefore, not getting a true picture of what is on the bottom of the ocean. Mr. Nicholls commented that they used a 60" dredge that would pick up everything on the bottom. He stated that the equipment was hardly obsolete or inadequate and had been upgraded for precision.

Mr. Avery stated that he didn't think the size limit should be lowered because they were facing closures in the fishery now and the closures would only get longer if they were allowed to land more clams because the quota would only be caught up that much faster. He also stated that 1 trip a day would be unfair to the smaller independent boats because they can't catch clams at the same rate as the large boats and therefore it would be hard for them to make it on just one load a day.

Mr. Halgren commented that he felt it would be difficult for NMFS to adjust a regional discard distribution in order that the discards do not exceed 30% of the trip catch. He also felt that it would be difficult to monitor the discard rates because a randon sample on size distribution such as NMFS does would not be adequate.

In summary, there were 11 present who supported the preferred alternative. Three of those 11 also supported the proposal by the United Shellfishermen's Association which would add 1 trip per 12 hour period with only one offload during that period and the 5 part tag requirement. Stan Osmundson and Rick Traber both stated that the size should not be lowered below 5.25". William Avery, Robert Avery, and Phin Marr all supported taking no action at this time. William and Robert Avery commented that a per boat quota was the only fair answer and that it was working in NJ inshore licenses. Tom Karwacki commented that they were opposed to the processor being held responsible for undersized clams.

The hearing adjourned at approximately 8:10 p.m.

No written comments were received on the Amendment.

SURF CLAM AND OCEAN QUAHOG FISHERY MANAGEMENT PLAN
PROPOSED AMENDMENT NO. 5

COMMENTS OF THE AMERICAN ORIGINAL CORPORATION

The American Original Corporation endorses Plan Amendment No. 5 which would allow the Regional Director to make adjustments to the size limit as indicated to reduce the amounts of discards. With respect to such proposal, flexibility should also be maintained to allow for ¼" increases as well as decreases in the size limit. The American Original Corporation also endorses the adoption of an effective cage tagging system as well as the provision that surf clams landed on an authorized FCZ fishing day be assumed to be clams caught in the FCZ. Both these measures, if properly implemented and enforced, could be effective in curtailing the flagrant violation of federal regulations resulting from the inshore--offshore jurisdictional gambit utilized in New Jersey.

The question for consideration regarding this matter is not whether a size limit adjustment should be made but rather why the change has not been made sooner. Approximately 18 months prior to this date it was readily apparent that the existing surf clam beds in the Mid-Atlantic Region were not sufficient to allow commercial harvesting in compliance with the 5½" size limit so that the annual quota of legal sized surf clams could be taken. During such period adjustments were made in the field by enforcement personnel to reflect such fact through discretionary increases in tolerance levels. The amount of enforcement discretion exercised varied from port to port depending upon the time period involved, the beds from

which surf clams were taken and subjective factors related to the individual enforcement agent involved. At certain times when the enforcement effort regarding the size limit became stricter excess culling on deck took place to the extent that approximately 50% of the catch was thrown overboard. Even with such efforts it was not possible to strictly comply with the 5½" size limit. In some instances enforcement personnel resorted to a catch criteria of a specific number of cages to determine whether or not to issue a violation citation. In effect, the catch of surf clams of virtually identical size could pass inspection if the number of cages were under the agent determined limit whereas the same catch if over the cage limit would result in a violation. In either case it was not possible to strictly comply with the 5½" size limit.

For the past year these problems have been presented on numerous occasions in repetative fashion to the National Marine Fishery Service, the Surf Clam Committee of the Mid-Atlantic Council and directly to the Mid-Atlantic Council. It is submitted that this problem could have been resolved approximately a year ago by the National Marine Fishery Service through a simple adjustment in the tolerance levels of the 5½" size limit. At such time the American Original Corporation provided data to the National Marine Fishery Service which showed that approximately one-half of the typical catch was at or above 5½" while the remainder was between 5" and 5½" with most approximately 5¼". It is important to emphasize that the Management Plan governing the surf clams established only the 5½" limit and the provisions of the regulation dealing with tolerances were imposed in the regulatory process on a discretionary basis by

the National Marine Fishery Service. It follows that the National Marine Fishery Service under the plan has always been in a position to make necessary adjustments to the tolerance levels. Unfortunately, the indecisiveness and inflexibility of the regulatory system has allowed this dilemma with an obvious solution to persist to this point. .

Within the context of the foregoing it must be emphasized that the biological size limit of the surf clam is approximately 4.75 inches. In such regard, the extent of enforcement effort exercised regarding the 5½" size limit during the time the change was being actively promoted and considered takes on the punitive aspect of enforcement for enforcement sake. In the framework of overall enforcement problems with the Management Plan, specifically with respect to fishing conducted in closed areas and wrong day fishing as a result of the inshore--offshore jurisdictional gambit, the emphasis placed on strict enforcement of the size limit at a time when the stocks did not allow for legal size limit fishing seems hardly justified.

In summary, the suggested size limit adjustment mechanism and other related enforcement measures are a long time coming and should be effectively implemented as soon as possible.

§652.7 through §652.10 are redesignated as §652.8 through §652.11 and a new §652.7 is added to read as follows:

§652.7 Cage identification.

(a) Tagging. All surf clam cages shall be tagged before leaving the vessel and tags shall not be removed until cages are emptied at the processing plant.

(b) Required information. Information to be shown on the tags shall be determined by the Regional Director, in consultation with the Council, but will include at least the information needed to establish a chain of evidence adequate for enforcement of the surf clam minimum size limit from the vessel through the transportation system to the processor, inclusive.

(c) Specifications. The Regional Director shall determine the minimum specifications of the tags, which as a minimum shall assure that markings are not erased prior to the cages being emptied at the processing plant.

§652.22(f) is amended to read as follows:

(f) Presumption.

(1) The presence of surf clams or ocean quahogs aboard any vessel engaged in the surf clam or ocean quahog fishery, or the presence of any part of a vessel's gear in the water more than 12 hours after a closure occurs under this section, will be prima facie evidence that such surf clams or ocean quahogs were taken in violation of these regulations.

(2) All surf clams landed on an authorized FCZ fishing day are assumed to have been caught in the FCZ and are subject to the Federal size limit.

§652.25 is amended to read as follows:

§652.25 Size restriction.

(a) Minimum length. A minimum size limit for surf clams of 5-1/2 inches in length is imposed on the fishery with the following exceptions:

(1) Adjustments. The Regional Director shall adjust the size limit, after consultation with the Council and opportunity for public comment, to a value less than 5-1/2 inches. Adjustments to the size limit will be made to reduce the amount of discards of surf clams so that they do not exceed 30 percent, on average, of trip catches. In no event shall the size limit be less than 4-3/4 inches. The increment of adjustment may not be less than 1/4 inch. The Regional Director will monitor current stock assessments, catch reports, and other relevant information concerning the size distribution of the surf clam resource to determine if any adjustment in the size limit is necessary. The Secretary will publish notice of any adjustments in the FEDERAL REGISTER.

(2) Tolerance. (i) When the minimum size limit is greater than 4-3/4 inches, as many as 240 surf clams in any full cage inspected by an authorized officer may be less than the legal minimum size, but no more than 50 clams in any full cage may be less 4-3/4 inches.

(ii) When the minimum size limit is 4-3/4 inches, no more than 50 clams in any full cage may be less than 4-3/4 inches.

(iii) If any inspected cage is found to be in violation of paragraphs (2)(i) -(ii), all cages in possession will be deemed in violation of the size limit.

(b) Measurement. Length is measured at the longest dimension of the surf clam.

APPENDIX V. ABBREVIATIONS AND DEFINITIONS OF TERMS

Act (MFCMA) - the Magnuson Fishery Conservation and Management Act of 1976, as amended, 16 USC 1801 et seq.

bushel (bu) - a standard unit of measure presumed to hold 1.88 cubic feet of surf clams or ocean quahogs in the shell (1 bu. of offshore surf clams = 17 lbs. of meats) (1 bu. of ocean quahogs = 10 lbs. of meats).

cage - a standard unit of measure presumed to hold 32 bu. of surf clams or ocean quahogs in the shell. The outside dimensions of a standard cage generally are 3' wide, 4' long, and 5' high.

CFR - Code of Federal Regulations.

Council (MAFMC) - the Mid-Atlantic Fishery Management Council.

CPUE - catch per unit of effort.

Fishery Conservation Zone (FCZ) - the zone contiguous to the territorial sea of the US, the inner boundary of which is a line coterminous with the seaward boundary of each of the coastal States and the outer boundary of which is a line drawn in such a manner that each point on it is 200 nautical miles from the baseline from which the territorial sea is measured.

GRT - gross registered ton.

Mid-Atlantic Area - that portion of the FCZ south of the line that begins at 41°18'16.249" north latitude and 71°54'28.477" west longitude and proceeds S 37°22'32.75" E to the point of intersection with the outward boundary of the FCZ.

MSY - maximum sustainable yield. The largest average catch of yield that can continuously be taken from a stock under existing environmental conditions.

NEFC - the Northeast Fisheries Center of the NMFS.

New England Area - that portion of the FCZ north of the line that begins at 41°18'16.249" north latitude and 71°54'28.477" west longitude and proceeds S 37°22'32.75" E to the point of intersection with the outward boundary of the FCZ.

NMFS - the National Marine Fisheries Service of NOAA.

natural mortality - deaths from all causes except fishing, including predation, senility, epidemics, pollution, etc.

NMFS - the National Marine Fisheries Service of the National Oceanic and Atmospheric Administration (NOAA).

OY - Optimum Yield.

Regional Director (RD) - the Regional Director, Northeast Region, NMFS.

stock assessment - the NMFS yearly biological assessment of the status of the resources. This document provides the official estimates of stock size, spawning stock size, fishing mortalities, recruitment, and other parameters used in this Plan. The data from these assessments shall constitute the "best scientific information currently available" as required by the Act.

Territorial Sea - marine waters from the shoreline to 3 miles seaward.

USDC - US Department of Commerce.

year-class - the fish spawned or hatched in a given year.

yield per recruit (YPR) - the expected yield in weight from a single recruit.