THE ATLANTIC COAST SURF CLAM FISHERY 1965-69

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This is a summary of the very active Atlantic coast surf clam (Spisula solidissima) fishery for 1965-69. Landings each year during the 5-year period were progressively larger and set new catch records. This one species has supplied more than half the clam meats in the United States. Landings averaged 44.7 million pounds annually and peaked at 49.9 million pounds in 1969.

During the 5-year period, the most significant events were increased effort, decline in surf clam stocks off Point Pleasant, New Jersey, one of the principal ports for landings, and movement of vessels to more southern ports. Effort was directed to clam stocks off Delmarva (Delaware, Maryland, Virginia) Peninsula. These stocks were important in sustaining a high annual production of clam meats. It is predicted that landings from these stocks will increase in the near future.

Surf clams (Spisula solidissima) supplied better than half the meats for clam products in the United States during 1960-69. Landings increased in the second half of the decade (Fig. 1). The importance of the fishery was recognized by the Bureau of Commercial Fisheries early in the 1960s. Research was initiated on the biology and population dynamics of the clam in 1963 (Merrill and Webster, 1964). As part of the research program, vessel captains in the surf clam fleet were interviewed frequently to obtain information on fishing location, effort, and catch. Data from these interviews have resulted in five annual reports on the fishery (Groutage and Barker, 1967a and b; Yancey, 1968 and 1970; Barker and Ropes, 1971). The reports give a detailed account of the fishery for 1965-69. The following summarizes the data for the same 5-year period.

THE RESOURCE & THE FISHERY

Surf clams are commercially abundant from Montauk Point, Long Island, New York, to Cape Charles, Virginia. Although they have been found from the surf zone to 420 feet, survey results indicate that they were taken most often at an average depth of 93 feet. Clams at stations deeper than 140 feet were less numerous and smaller (Merrill and Ropes, 1969; Ropes and Merrill, 1969; Ropes, 1971). In 1970, the fishery extended from Long Island to off the mouth of Chesapeake Bay.

VESSELS, GEAR, & PRODUCTIVITY

Most vessels in the surf clam fleet are from other fisheries. More than half were built before 1950, and a few are almost 100 years old (Table 1).

Table 1 - Surf clam fleet age composition

Year built	Percent
1875-1899	6
1900-1924	13
1925-1949	40
1950-1969	41

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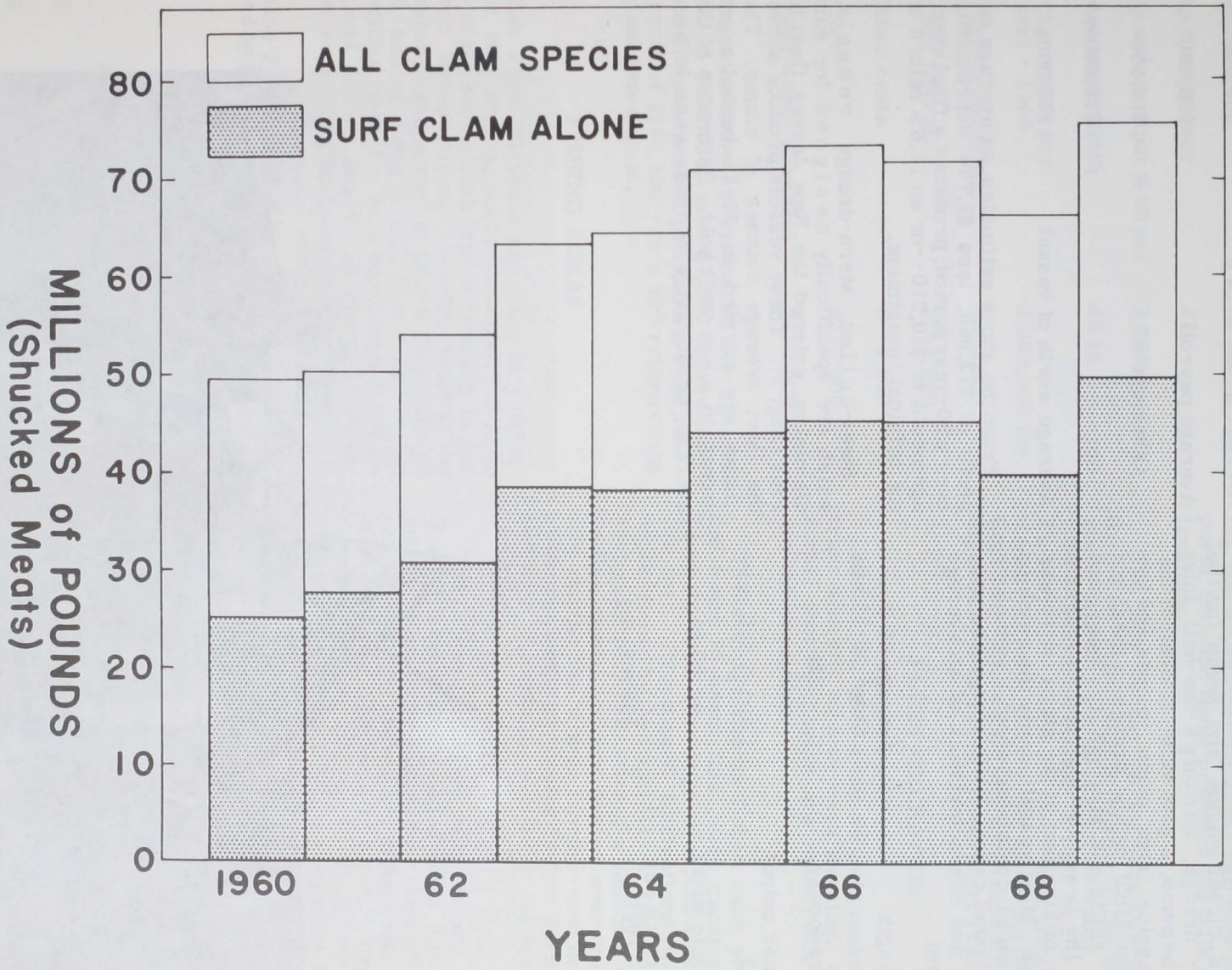

Fig. 1 - The quantities of surf clams and all species of clams landed in the United States, 1960-69.

Vessel modifications to fish for surf clams include a diesel engine and pump for the hydraulic dredge, through-the-hull inlet pipes to the pump, a gate valve to control the water passing from pump to hose and hydraulic manifold on the dredge, a mast and boom of sufficient strength to lower and retrieve the heavy dredge, and an A-frame stanchion or king post at the stern for towing the dredge. Most vessels carry the catch on deck in sacks containing about 1 bushel, or in 30-32 bushel cages. Estimates of the productivity and characteristics of an average vessel are:

Vessel length	Average 68 ft.; range 40-135 ft.
Pump horsepower	226
Pump water output @ 90 psi	1,800-3,600 gpm
Dredge knife width	40-60 in.
Average catch per vessel - 1969	508,000 lbs.
Average gross @ 12 ¢	$60,960
Average payroll	$34,000
Other costs	$14,000
Net	$12,960
Average worth of vessel	$55,000

From the above estimates, an average net profit of $12,960, less $2,750 depreciation over a 20-year period, produces a final average profit of $10,210--or an 18.6% return on the original investment.

Steel-hulled, stern-dredge vessels, which are specifically designed for surf clamming, entered the New Jersey fleet in 1969 (Fig. 2). These vessels produce above the fleet average catches of clams. The clams are carried in 30-32 bushel cages stored in a wet-well hold. Estimates of the average productivity of these vessels are:

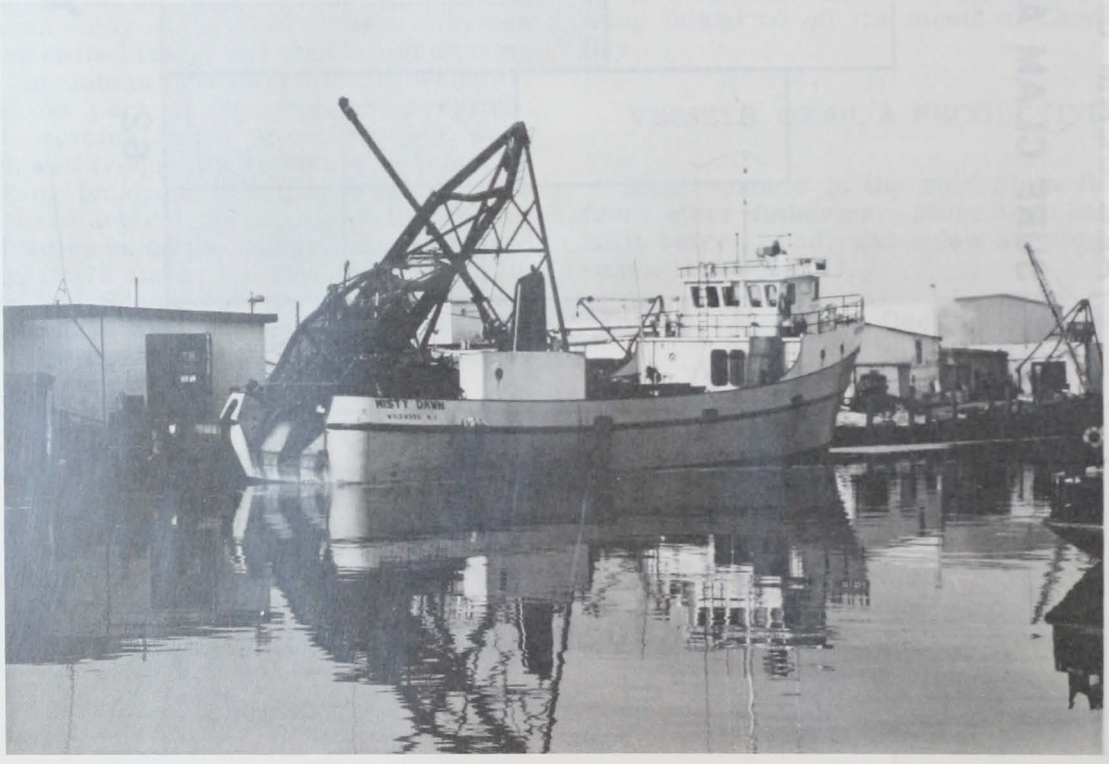

Fig. 2 - A steel-hulled, stern-rigged surf clam vessel.

Vessel length	75-80 ft.
Pump horsepower	370
Pump water output @ 90 psi	3,600 gpm
Dredge knife width	60 in.
Average catch per vessel - 1969	3,000,000 lbs.
Average gross @ 10¢	$300,000
Average payroll	$114,000
Other costs	$ 14,000
Net	$232,000
Average worth of vessel	$150,000

From the above estimates, an average net profit of $172,000, less $7,500 depreciation over a 20-year period, produces a final average profit of $164,500--or a 90% return on the original investment.

FISHING AREAS

The Point Pleasant and Cape May-Wildwood, New Jersey, ports accounted for 78 to 96% of the surf clams landed annually in the United States during 1965-69; most of the remainder was landed at Ocean City, Maryland, and on Long Island, New York. Small quantities used for bait were landed at New England ports. Interviews with vessel captains were most frequent and complete during the 5-year period at the two New Jersey ports because these provided the bulk of the landings.

Table 2 - Estimates of the size of areas fished by New Jersey surf clam fleet, 1965-69

	Square Nautical Miles of Fishing Area	
	Off Point Pleasant	Off Cape May-Wildwood
1965	220	140
1966	330	30
1967	510	470
1968	640	780
1969	780	1,100

The New Jersey fishing areas were near the ports. Significant increases in the size of areas fished have occurred annually since 1965. The area fished in 1969 by the Point Pleasant fleet was more than three times that fished in 1965; during the same period, the Cape May-Wildwood fleet increased its fishing area by a factor of almost eight (Table 2).

FLEET OPERATION

Nearly all surf clam vessels make day-trips and are in port each evening. Occasional overnight trips are made, but these are the exception.

The average depths fished each year by the Point Pleasant fleet were consistent at 73 to 76 feet; the range of depths was 40 to 120 feet. Pronounced fluctuations in the depths fished by the Cape May-Wildwood fleet each year were indicative of a seasonal effort to fish shoal, inshore depths averaging 40 feet during the winter months--and deeper, offshore depths averaging 70 feet during the summer. A depth range of 18 to 120 feet was recorded.

The annual average daily effort by the Point Pleasant fleet varied from 8.8 to 9.8 hours, or no more than 1 hour during the 5-year period; the averages for the Cape May-Wildwood fleet varied from 6.0 to 7.9 hours, or almost 2 hours (Fig. 3). Thus, the Point Pleasant fleet consistently fished more hours per day than the Cape May-Wildwood fleet. Increases in the average daily effort have been greatest in the second half of the 5-year period. There were records of trips as short as 1 hour fishing time, due usually to equipment failure, and as long as 22 hours.

Catch Per Hour

High annual average-catch-per-hour values of 678 and 593 pounds were recorded for the Point Pleasant fleet in 1965 and 1966, but thereafter the values declined to between 391 and 425 pounds (Fig. 3). Even higher catch-per-hour values (about 900 lbs.) were recorded for the Cape May-Wildwood than Point Pleasant fleet during 1965 and 1966. A decline followed in 1967 and 1968 (578 and 476 lbs.) but not to the low values observed for

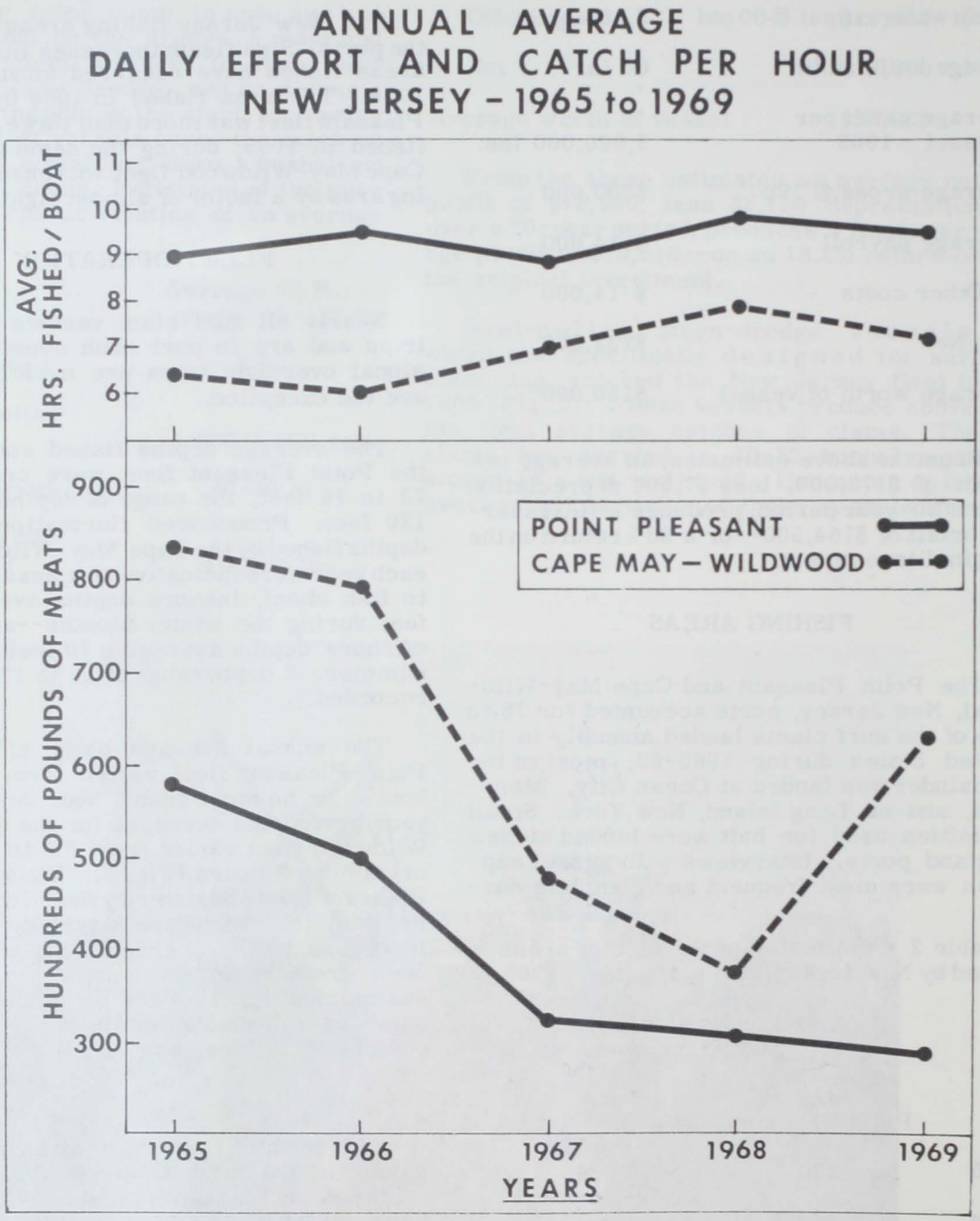

Fig. 3 - The annual average daily effort and catch per hour of surf clams for vessels fishing from Point Pleasant and Cape May-Wildwood, New Jersey, ports in 1965-69.

the Point Pleasant fleet. In 1969, the Cape May-Wildwood fleet catch-per-hour value increased to 731 pounds.

The Point Pleasant fleet consistently caught clams of a larger average shell length each year than the Cape May-Wildwood fleet. The mean annual lengths recorded for clams landed at the former port were 149 to 155 mm. (5.9-6.1 in.); those for the latter port were 130 to 149 mm. (5.1-5.9 in.) (Fig. 4). The largest and smallest clams were taken by the Cape May-Wildwood fleet only in 1968. The largest clam was taken in 1969 by a Point Pleasant vessel. It was 203 mm. (8.0 in.) long. A larger specimen 210 mm. (8.3 in.) long has been reported (Ropes, Chamberlin, and Merrill, 1969).

The Point Pleasant fleet landed 33.5 and 32.4 million pounds of surf clam meats in 1965-66 (Fig. 4). These landings constituted the bulk of the New Jersey catch for those years and were followed by a nearly 10 million pound decline in 1967. In 1968 and 1969, landings 4 to 8 million pounds lower than those recorded for Cape May-Wildwood were observed. The decline in annual landings from 33.5 to 14.0 million pounds at Point Pleasant during the 5-year period was a decrease of 60%, but the number of vessels using the port declined only 30%. Vessels landing surf clams at Cape May-Wildwood contributed to the bulk of the New Jersey catch in 1968-69. A $2\frac{1}{2}$-fold increase in landings from 8.8 to 22.0 million pounds at Cape May-Wildwood during the 5-year period--and 5-fold increase in the number of vessels--helped maintain New Jersey landings that were higher than those for any other state in the Middle Atlantic Bight.

Long Island & Ocean City

Annual landings of surf clams at Long Island and Ocean City ports have increased during the 5-year period (Fig. 5). Although the landings on Long Island have been less than 4 million pounds each year, they have increased almost $2\frac{1}{2}$-fold during the 5-year period--from 1.5 to 3.7 million pounds--and with about a $1\frac{1}{2}$-fold increase in number of vessels. Landings increased most dramatically at Ocean City. Less than 1 million pounds of meats were recorded for 1965 and 1966; only one vessel fished from the port, and most of its catch was used for bait. Since 1966, landings at Ocean City have increase 7-fold, and the numbers of vessels 13-fold.

TRENDS AND PREDICTIONS

Long Island Fishery

A small fleet fishes on nearshore beds of clams off the western half of the Long Island oceanside coast. Although surf clams were found along the whole coast of Long Island during a survey of the Middle Atlantic Bight, the area was rated next to lowest in abundance of the four surveyed (Ropes, 1971). The clams also inhabited the shoalest depths. Beds off the eastern half of Long Island are not fished because the vessels have difficulties navigating channels to nearby ports. These factors, then, limit the Long Island fishery. An expansion of effort may result in overfishing the available stocks.

Point Pleasant Fishery

After record high landings in 1965 and 1966 at the Point Pleasant port (Fig. 4), the fleet size was reduced because the catch rate declined in 1966 and continued to decline thereafter (Fig. 3). The reduction in effort on the beds off Point Pleasant was recommended to the Sea Clam Packers Committee, Oyster Institute of North America, at a June 1967 meeting by the Bureau of Commercial Fisheries surf clam program staff. The recommendation was made because the results of research surveys and interview data indicated that the available stocks had been reduced and that more effort would merely distribute the catch among more vessels. Vessels moved to the Cape May-Wildwood and Ocean City ports in 1967 and continued to do so thereafter. The vessels at Point Pleasant have maintained a fairly steady average catch rate since 1966 of about 400 pounds of meats per hour.

The Point Pleasant beds have been of major importance to the industry since 1950. Predictions of how soon fishing may be increased on the beds cannot be exact. But less effort in the area means that less bottom is being disturbed by hydraulic dredges, and this may enhance clam survival. The natural reproduction of a residual population throughout the area may repopulate the seabed with young clams. Surf clams spawned twice each year during 3 of 4 years that detailed observations were made (Ropes, 1968). Thus, larvae are probably produced each year. The fate of the larvae and set of young clams in the natural environment are unknown, but recruits to the fishery stocks were estimated

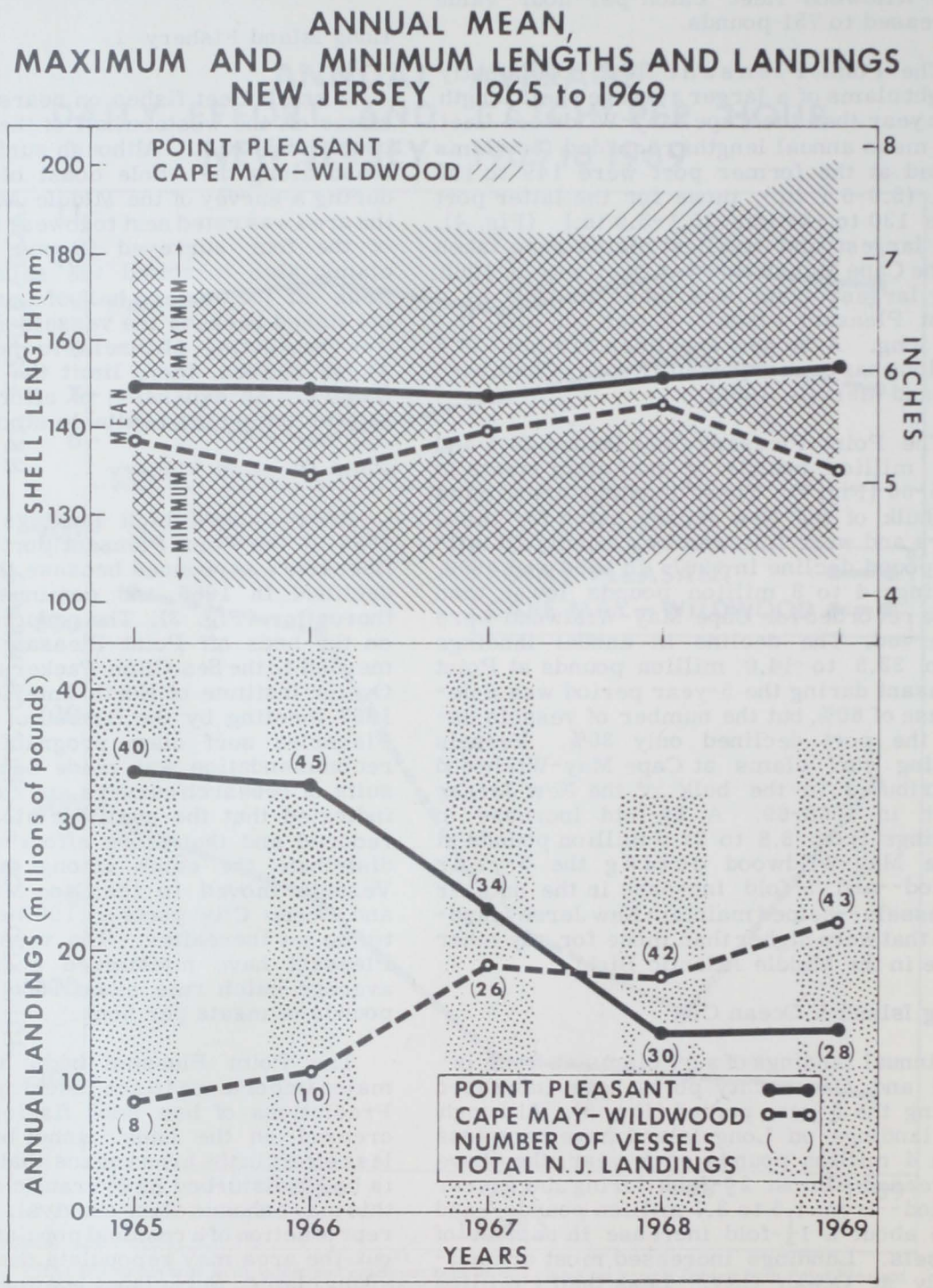

Fig. 4 - The annual maximum mean and minimum shell lengths of surf clams, millions of pounds of meats landed, and number of vessels fishing for the Point Pleasant and Cape May-Wildwood, New Jersey, ports in 1965-69.

to be 5 to 6 years old (Ropes, Chamberlin, and Merrill, 1969). A 1970 set would be expected to reach minimum commercial size by about 1975. An additional 5 years of growth would probably produce clams of the shell lengths being harvested now.

Cape May-Wildwood Fishery

The low effort and production of the Cape May-Wildwood fleet in 1965-66 increased markedly thereafter because vessels were transferred from the Point Pleasant port, and vessels were added to the fishery (Figs. 3, 4). This action increased the landings in 1968-69 to quantities greater than those for Point Pleasant. High hourly catch rates in 1965-66 by the Cape May-Wildwood fleet decreased significantly in 1967-68 (Fig. 3). In the first 2 years, the fleet concentrated on dense beds of small clams nearshore; in the latter 2 years, effort was directed more to offshore beds of large clams. The industry prefers the larger offshore clams because of their greater meat yield (Barker and Merrill, 1967), but the small inshore clams are usually fished when weather prevents offshore operations. A lower catch rate of clams offshore caused the fishermen to range over a greater area in an attempt to locate the best concentrations (Table 2). An analysis of small (less than 140 mm. long) and larger (more than 139 mm. long) clams during 1967-69 distinguishes between the catch from inshore and offshore beds (Table 3). In 1969, two new stern dredge vessels of unique design entered the fishery. Their effort increased the catch-per-hour average and total landings at Cape May-Wildwood, but they concentrated on inshore beds of small clams and accounted for almost half the landings from this source.

Table 3 - Landings from inshore and offshore surf clam stocks by Cape May-Wildwood fleet, 1967-69

	Million of Pounds and (Percent) Landed		
	Inshore stocks	Offshore stocks	Total
1967	12.9 (69)	5.8 (31)	18.7
1968	6.3 (35)	11.7 (65)	18.0
1969	14.0 (64)	8.0 (36)	22.0

In the future, landings at Cape May-Wildwood will increase slightly above those for 1969. Some of the fleet has explored the beds off Delaware, and the more available stocks in beds nearer to port are being fished.

Ocean City Fishery

Ocean City has been used for landings of surf clams since 1952, but the quantities never exceeded 2.5 million pounds until after 1967; the 64,000 pounds landed in 1966 were nearly the lowest amount recorded (Fig. 5). Vessels were transferred to the port from more northern ones in New Jersey after 1966, and landings increased dramatically to 7.1 million pounds in 1969. The increase in landings was expected. Survey results located new beds of surf clams off the Delmarva Peninsula coast that contained nearly the same quantities as those off New Jersey (Merrill and Ropes, 1969; Ropes and Merrill, 1969; Ropes, 1971). These results were reported to the fishermen (Ropes, 1970) and at meetings attended by industry representatives. Even greater landings are expected at this port in the next few years, although dock facilities limit the entry of vessels.

GENERAL COMMENTS

Average annual landings of 44.7 million pounds of surf clam meats during the second half of 1960-69 were significantly greater than the 32.0-million-pound annual average for the first half; landings of 49.6 million pounds in 1969 were the highest ever reported (Fig. 1). New vessels entered the fishery during 1965-69 and increased size of surf clam fleet by 69%. However, this additional effort produced only 40% more clams, based on the above averages. The greater expenditure of effort and lower production of clams were caused by a decline in catch rate on beds off Point Pleasant, the generally lower catch rate on offshore beds, and the lower yield of small clams from nearshore beds. A movement of vessels to Cape May-Wildwood and Ocean City ports has focused effort on beds of clams off Delmarva Peninsula that, heretofore, had not been fished. An increase in effort on these beds is expected to produce future landings greater than those for 1969. Some vessels are expected to use ports south of Ocean City in the near future.

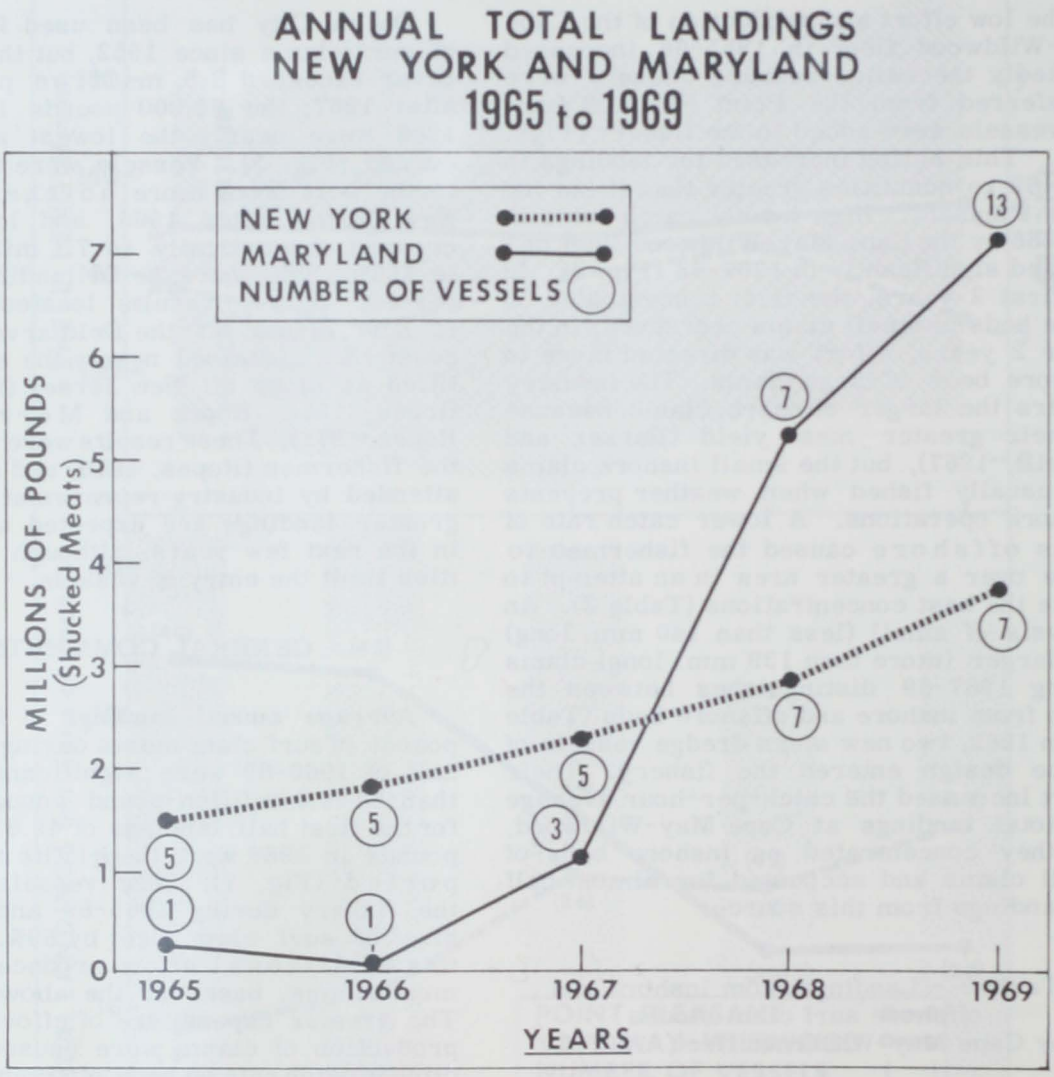

Fig. 5 - The annual total landings of surf clams and number of vessels at New York and Maryland ports in 1965-69.

Technological Advances

Several technological advances have been made or are in progress to harvest and process surf clams. The stern dredge vessels designed specifically for surf clamming are more efficient than traditional vessels. Vessels able to catch and shuck clams at sea are being developed. These will fish 24 hours a day, hold the meats under refrigeration, and remain at sea for several days rather than operate on a day-trip schedule. Machines now in use have been patented to open the clams (Snow, 1971). These replace hand labor at shore-based plants, and modifications may sometime adapt these for use at sea. Research on microwave ovens to open the clams is in progress. Surf clam meats are manually cleaned of the gonad, digestive gland, and stomach before further processing of the edible muscle tissues. A "mollusk flesh processor" has been patented to replace hand labor (Marvin and Henderson, 1969). These advances are a characteristic of the dynamic fishery.

Ocean Quahogs

Ocean quahogs, Arctica islandica, are frequently taken in bottom samples off the east coast of the United States (Merrill and Ropes, 1969). They have occurred in abundance during surveys for surf clams off Long Island, New York, and New Jersey (Ropes, 1971). Relatively small quantities of this clam have been utilized since 1945. The potential of the ocean quahog resource has not been realized because of technological problems in processing the clam and greater availability of surf clams in the past two decades.

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