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HARD-CLAM FISHERY OF THE ATLANTIC COAST

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(Prepared at the request of the Atlantic States Marine Fisheries Commission)

INTRODUCTION

This report supplements biological studies being conducted by the U. S. Fish and Wildlife Service's Clam Investigations, and deals with the present status and past trends of the fishery for the hard clam or quahaug (*Venus mercenaria*),¹ the types of gear employed, and the particular problems facing the industry in each of the Atlantic coastal states.

The information on which the study is based was obtained from personal interviews during 1949, 1950, and 1951 with clam fishermen, dealers, and state conservation personnel in all of the Atlantic Coast states; and from the Service's catch statistics. The results of these surveys have been used in planning and establishing the clam research program authorized by Congress in 1948.

Members of state conservation agencies, universities, and research groups contributed information used in this report. Dealers and fishermen have been thoroughly cooperative in describing the industry and its problems. The first part of this report is a consideration of the general aspects of the fishery, including data pertaining to volume and value of production, location of the fishing grounds, and a description of the types of gear employed. The second part includes state summaries, and deals more in detail with the production and problems of the individual states. Catches statistics have been taken from the U. S. Fish and Wildlife Service's Administrative Reports or Statistical Digests.

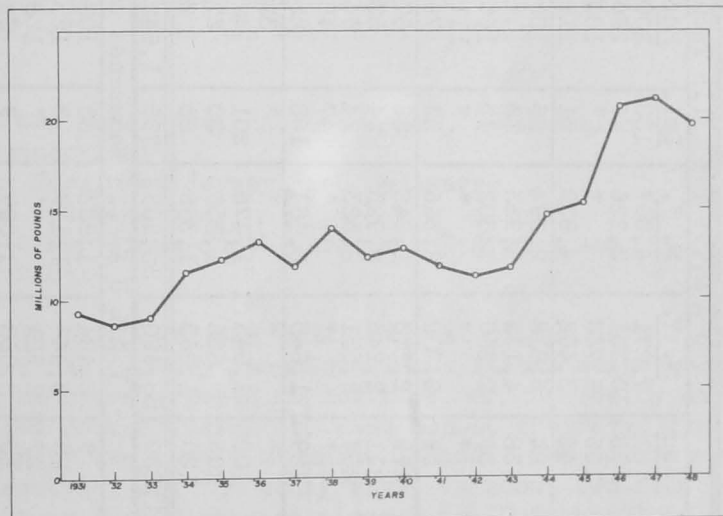


FIG. 1 - TOTAL CATCH OF HARD CLAMS FOR ATLANTIC COAST STATES, 1931-48. WHEN STATISTICAL SURVEYS WERE INCOMPLETE, THE ANNUAL TOTALS WERE CALCULATED FROM AN AVERAGE OF PRECEDING AND SUCCEEDING YEARS.

GENERAL ASPECTS OF THE FISHERY

CATCH AND VALUE: Although Atlantic Coast catch statistics for hard clams from 1931 to 1948 show a steady upward trend in production to a level above previous peak years (table 1 and figure 1), the total annual production and value are small

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¹/THIS DOES NOT INCLUDE THE OCEAN QUAHAUG (*ARCTICA ISLANDICA*).

Table 1 - Production (Meats) and Value of the Atlantic Coast Hard-Clam Fishery, 1931-48

Year	Q U A N T I T Y (In Thousands of Pounds)													
	Maine	Mass.	R. I.	Conn.	N. Y.	N. J.	Del.	Md.	Va.	N. C.	S. C.	Ga.	Fla.	Total
1948	289	1,495	3,512	21	7,271	4,007	158	200	1,567	*	*	*	*	18,520**
1947	96	1,967	3,139	58	10,331	3,226	9	250	879	*	*	*	*	19,955**
1946	168	2,277	3,035	106	8,740	*	*	183	979	*	*	*	*	15,488**
1945	489	2,296	1,911	42	3,402	4,838	31	119	1,010	502	1	-	691	15,332
1944	186	1,810	1,522	24	6,818	2,094	26	180	834	*	*	*	*	13,494**
1943	79	1,560	1,305	38	4,133	1,933	33	*	*	*	*	*	*	9,081**
1942	152	1,844	2,004	39	2,250	1,802	13	160	1,672	*	*	*	*	9,936**
1941	*	*	*	*	*	*	*	111	1,563	*	*	*	*	1,674**
1940	5	2,411	1,978	59	2,808	2,366	33	79	1,764	530	3	-	708	12,744
1939	-	2,509	2,015	179	2,223	1,842	36	67	2,025	629	-	-	813	12,338
1938	55	2,299	2,164	211	2,243	2,925	24	53	2,810	358	-	-	747	13,989
1937	13	1,311	2,281	204	2,531	2,523	24	64	1,631	430	8	-	748	11,768
1936	*	*	*	*	*	*	47	48	2,625	840	20	-	634	4,214**
1935	2	1,266	2,360	429	1,645	3,464	108	25	1,644	*	*	*	*	10,943**
1934	*	*	*	*	*	*	*	32	2,609	338	47	-	535	3,561**
1933	12	1,769	1,158	102	1,945	1,476	201	42	1,169	*	*	*	*	7,874**
1932	135	1,806	1,312	206	885	1,356	30	27	1,434	261	5	1	1,121	8,629
1931	198	2,928	1,565	120	1,265	1,356	25	2	742	332	-	1	794	9,328
Total ..	1,879	29,548	31,261	1,838	58,490	35,208	798	1,642	27,007	4,220	84	2	6,791	198,768**
Year	V A L U E (In Thousands of Dollars)													
	Maine	Mass.	R. I.	Conn.	N. Y.	N. J.	Del.	Md.	Va.	N. C.	S. C.	Ga.	Fla.	Total
1948	60	478	1,114	9	2,424	1,603	63	100	783	*	*	*	*	6,634**
1947	28	591	827	25	3,444	1,119	3	125	439	*	*	*	*	6,601**
1946	30	666	737	27	2,921	*	*	128	667	*	*	*	*	5,176**
1945	92	675	524	15	2,068	1,629	9	62	525	151	-	-	173	5,923
1944	42	470	347	8	3,341	679	8	90	378	*	*	*	*	5,363**
1943	14	435	274	13	2,468	628	9	*	*	*	*	*	*	3,841**
1942	22	348	410	9	730	558	3	49	554	*	*	*	*	2,683**
1941	*	*	*	*	*	*	*	25	339	*	*	*	*	364**
1940	-	336	237	10	479	340	4	17	352	45	-	-	67	1,887
1939	-	352	236	22	341	269	5	13	338	50	-	-	79	1,705
1938	4	263	183	44	393	376	3	10	375	28	-	-	72	1,751
1937	1	110	288	43	442	431	3	12	271	34	-	-	49	1,684
1936	*	*	-	*	*	*	7	5	407	75	2	-	41	537**
1935	-	143	219	89	281	500	13	3	371	*	*	*	*	1,619**
1934	*	*	*	*	*	*	*	3	364	34	6	-	26	433**
1933	1	215	137	21	276	224	32	4	264	*	*	*	*	1,174**
1932	14	198	163	48	147	201	7	5	348	17	1	-	43	1,192
1931	18	391	252	38	407	326	5	1	253	31	-	1	36	1,759
Total ..	326	5,671	5,948	421	20,162	8,883	174	652	7,028	465	9	1	586	50,326
*NO STATISTICAL SURVEY														**INCOMPLETE

when compared with other shellfish resources of the Atlantic States. In value per pound of shucked meats, however, hard clams outrank all others except lobsters. A summary of the production and value of the shellfish resources based on Fish and Wildlife Service catch statistics for 1945 (the most recent year for which complete data are available) is presented in table 2.

Species	Quantity	Value	Avg. Price
	1,000 Lbs.	\$1,000	per Pound
Blue crab (in shell)	60,258	4,293	7
Shrimp (heads on)	55,947	4,227	8
Oyster (meats)	52,920	19,383	37
Lobsters (Northern, in shell)	22,727	9,460	42
Hard clam (meats)	15,332	5,923	39
Soft clam (meats)	8,875	1,954	22
Scallop (meats)	6,619	2,399	36

LOCATION OF THE FISHERY:
Hard clams occur in nearly every sheltered bay, cove, or inlet along the entire Atlantic Coast, but the fishery is centered largely in the southern

New England and Middle Atlantic States. New York leads in production, followed in descending order by New Jersey, Rhode Island, and Massachusetts. On the basis of a five-year average (1944-48), these four states produced 85 percent of the hard clams caught on the entire coast (figure 2). Virginia, Florida, and North Carolina are the ranking southern states and account for an additional 13 percent.

The locations of the commercially-fished areas along the Atlantic Coast are shown in figures 3, 6, 8, and 10. The coast has been divided into the four sections as follows:

New England - Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut.

Middle Atlantic - New York, New Jersey, and Delaware.

Chesapeake - Maryland and Virginia

South Atlantic - North Carolina, South Carolina, Georgia, and Florida.

TYPES OF GEAR AND PRODUCTION METHODS: The usual habitat of the hard clam is in relatively shallow water, and the fishery therefore lends itself quite well to hand-operated gear. Where the beds are exposed at low tide, or covered by only very shallow water, short-handled hoes or rakes are used almost entirely. Typically a New England gear, hoes are rarely used south of Rhode Island. The design varies somewhat from one locality to another, but the usual style is about two feet in length and is provided with four or five flattened tines 8 to 10 inches long as shown in figure 5. Forks and picks replace hoes in the southern states. These are basically the same in design, but have somewhat longer handles, and picks usually have only two or three closely spaced short tines.

In deeper water, long-handled rakes and tongs are employed. Rakes are used in all of the coastal states, and vary in pattern from one area to another, depending on the depth of water, type of bottom, and preferences of the local fishermen. Bull rakes, typically used in New England, are provided with detachable heads, 3 to 4 feet in width, fitted with closely-spaced curved teeth which form a horizontal basket. Spacing of the teeth varies according to the minimum legal size in the different states (figure 7).

Long sectional wooden handles or stales are fitted to the rake heads, the length depending on the depth fished, and the strength and skill of the fishermen. Occasional reports were obtained of stales over 50 feet long, although 36 feet is usually the maximum length. In fishing, the rake is shoved out and away from the

anchored boat, and then worked through the bottom in a series of short tugs to a vertical position, from which it is hauled up. The long curved teeth force a

roll of bottom soil ahead of them as the rake is pulled, and the clams are held, while the soil is washed through. Generally, the use of rakes is restricted to softer bottom than that which can be fished with tongs.

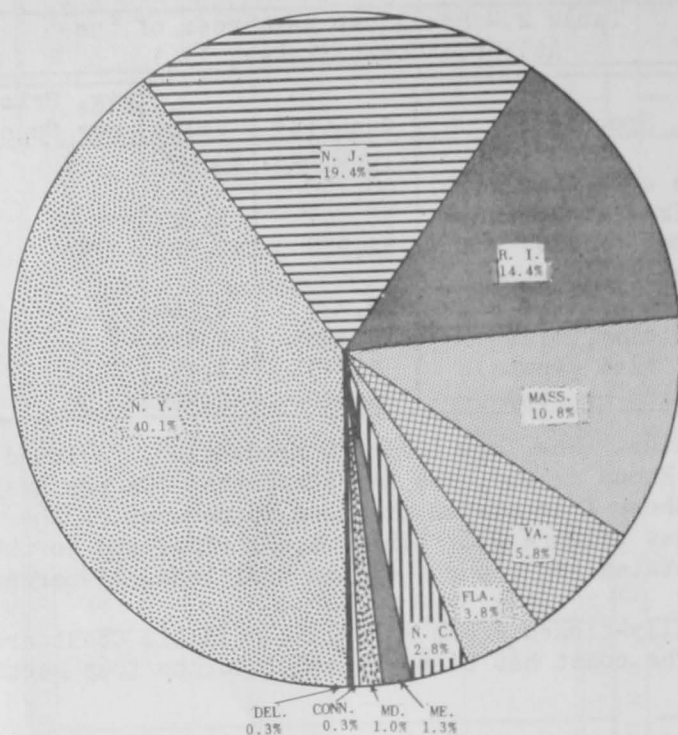


FIG. 2 - AVERAGE HARD-CLAM PRODUCTION BY STATES, 1944-48, EXPRESSED IN PERCENT.

Basket rakes, on which the ends are closed by wire mesh are used in some localities, particularly where clams are abundant. They are very popular in Massachusetts for the recovery of planted clams from privately-leased grounds.

Tongs (figure 9) are extensively used in all states except Florida, and accounted for over 60 percent of all the hard clams caught in the coastal states during the period from 1944 to 1948. Basically, tongs are a basket formed by two opposing sets of teeth, which are

opened and closed by means of long scissor-like handles. The operating principle of tongs restricts their use to more shallow water than that which can be fished with rakes. Tong shafts over 28 feet in length are rarely used and in most cases do not exceed 18 to 20 feet.

Dredges are more varied in their design than any other type of clam gear. Different types are used in the power-boat fishery of Massachusetts and Rhode Island, as shown in figure 4, than in the sail fishery of New Jersey. The modified crab and oyster dredges used in lower Chesapeake Bay are of a still different pattern. Conservation laws in the different states regulate the size, weight, spacing and length of teeth and other features in the design of dredges.

The five-year (1944-48) average annual production and value by gear and by state are shown in table 3 and figure 11.

State	TONGS		RAKES		DREDGES		BY HAND		HOES		CRABS		TOTAL	
	Quantity 1,000 Lbs.	Value \$1,000	Quantity 1,000 Lbs.	Value \$1,000	Quantity 1,000 Lbs.	Value \$1,000	Quantity 1,000 Lbs.	Value \$1,000	Quantity 1,000 Lbs.	Value \$1,000	Quantity 1,000 Lbs.	Value \$1,000	Quantity 1,000 Lbs.	Value \$1,000
Maine	-	-	-	-	-	-	-	-	246	50	-	-	246	50
Mass.	279	81	1,149	353	473	124	-	-	67	18	-	-	1,968	576
R. I.	1,405	396	366	105	853	210	-	-	-	-	-	-	2,624	711
Conn.	26	9	24	8	-	-	-	-	-	-	-	-	50	17
N. Y.	7,312	2,840	-	-	-	-	-	-	-	-	-	-	7,312	2,840
N. J.	1,158	405	1,104	397	147	55	424	149	-	-	-	-	2,833	1,006
Del.	5	2	20	8	20	7	-	-	-	-	-	-	45	17
Md.	76	42	84	47	2	1	25	13	-	-	-	-	187	103
Va.	503	266	341	181	53	29	157	83	-	-	-	-	1,054	569
N. C.	-	-	96	29	-	-	4	1	-	-	-	-	100	30
S. C.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ga.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fla.	-	-	1	-	103	26	-	-	9	-	6	-	138	34
Total	10,764	4,041	3,185	1,128	1,651	452	610	246	322	70	25	6	16,557	5,943
Per-centage of Total	65.0	68.0	19.2	19.0	10.0	7.6	3.7	4.1	2.0	1.2	0.1	0.1	100.0	100.0

GENERAL REGULATORY MEASURES: It would be impractical to attempt a detailed discussion of conservation laws dealing with the hard clam in this report. The

Table 4 - Summary of General State or Local Regulations Governing the Hard-Clam Fishery of Atlantic Coast States

State	Minimum Size	Gear	Season
Maine	2" longest diameter	Regulated by each county or town.	Regulated by each county or town.
Massachusetts	2" longest diameter	Regulated by each town.	Regulated by each town.
Rhode Island	Nothing that will pass through a $1\frac{1}{2}$ " ring.	Power dredges limited to Sakonnet River. No limit on hand gear.	Power dredges from Dec.1 to Mar.31. No season on hand gear.
Connecticut	Nothing that will pass through a $1\frac{1}{2}$ " ring	No power gear on public grounds.	None
New York	1" thickness	No power gear on public grounds.	None
New Jersey	$1\frac{1}{2}$ " in length	No power-operated vessel.	None
Delaware	None	No dredge more than 5 ft. 2 in. wide or with rings less than 2" in diameter.	None
Maryland	None	May be taken by rakes, tongs, patent tongs, dredges, or hand scrapes, as defined, and by no other means.	None
Virginia	None	Regulated in specific counties and sections.	None
North Carolina	$1\frac{1}{2}$ " from hinge to mouth	Only with clam dredges, hand rakes, or by hand.	None
South Carolina	None	No dredging in less than 12' at low water.	Closed May 1 to Oct. 1.
Georgia	None	None	None
Florida	2" from hinge across widest part	None	None

general regulations regarding size limits, gear limits, and closed seasons now in effect are summarized in table 4. These vary considerably from one state to another, and even within a single state, where individual townships have jurisdiction over the clam-producing areas within their boundaries. It should be understood that this table is simply a summary to aid the reader in understanding the meaning of sub-legal clams and to present some idea of the conservation measures being employed. It should not be used as a reference for state regulations.

TRADE CATEGORIES: Considerable variation in marketing procedures and size categories is encountered in different areas along the Atlantic Coast. A few general rules, however, apply to all areas.

The smallest legal-size hard clams--termed "necks," "little necks," or "steamer necks"--command the highest price in all areas. These small clams are used principally in restaurants, where they are served freshly opened on the half shell, or steamed and served with drawn butter.

The term "cherrystone" originated in the Chesapeake area in the vicinity of Cherrystone Creek, and refers to a clam slightly larger than the "little neck" classification common in New England. This size, too, is popular in most areas when served raw or steamed.

Clams larger than the cherrystone size are nearly always used in the preparation of chowders or in canned whole or minced clams, and are classed as "mediums" and "chowders." These larger sizes command a considerably lower price.

The manner in which clams are bought from the fishermen varies also from one area to another. Throughout New England and part of the Middle Atlantic area, clams are sold by weight or by bushel measure, although the weight of a bushel varies slightly from one state to another. This variation is due to the fact that the yield in shucked meats of clams from upper New England is greater than from lower New England and the Middle Atlantic. In the Chesapeake and southern states the small, medium, and large clams are separated and sold according to the number per bushel.

MAINE

LOCATION OF THE FISHERY: Although small quantities are harvested for home consumption elsewhere along the coast, commercial fishing for hard clams is limited to a small area in upper Casco Bay, bounded on the east and west by the Harraseeket and New Meadows Rivers, respectively. Maquoit Bay leads in production, and smaller amounts are taken from Quahaug Bay and sections of the New Meadows River.

GEAR AND METHODS: With the exception of entries for "dredges" in 1940 and 1942, "hoes" are the only gear listed in Fish and Wildlife Service records for the period 1931-48. Nearly all digging is in the intertidal zone, on beds exposed at

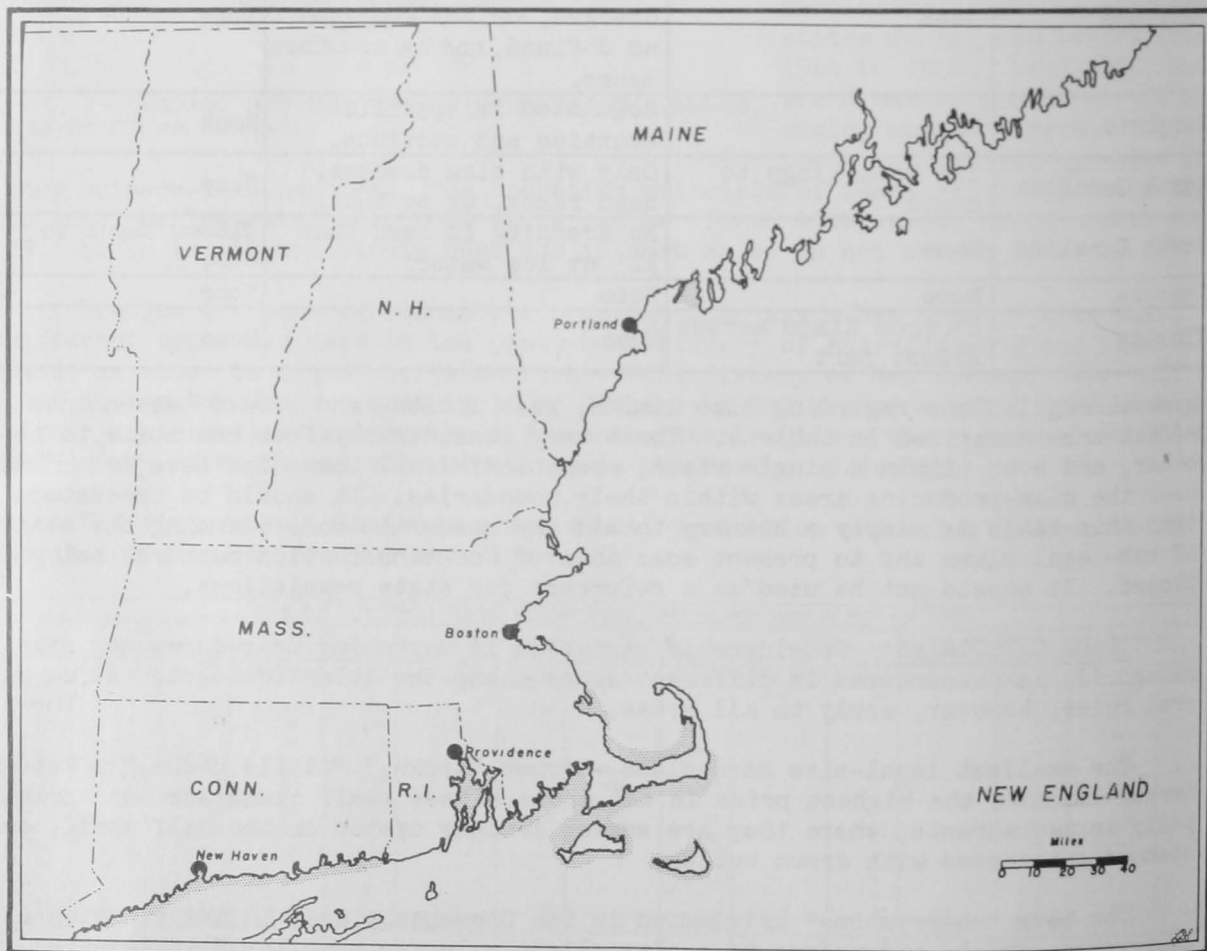


FIG. 3 - LOCATION OF HARD-CLAM FISHERY IN THE NEW ENGLAND STATES SHOWN BY STIPPLED AREAS.

low tide. Records of the Maine Department of Sea and Shore Fisheries show only four men fishing with tongs during 1950 in Maquoit Bay. A law passed in 1946 prohibits dredging from the flats or waters of Maquoit Bay.

GENERAL CONDITIONS OF THE FISHERY AND PROBLEMS: Sharp fluctuations in the annual catch have apparently occurred during the period from 1931-50, although catch records before 1942 are unreliable. According to the Maine Department of Sea and Shore Fisheries, an all-time peak was reached in 1949 and 1950, when the catch was nearly twice that of any previous year. This peak is based on a fishery for clams of one- or two-year classes.

The outlet for little necks and cherrystones is principally in the market areas of Boston, New York, and Philadelphia, and large chowders are sold to canneries in the southern New England and Middle Atlantic States.

Maine hard clams are considered particularly desirable for cannery use by some New England dealers, because the yield of shucked meats is greater than from clams in other areas.

During 1950, the Maine Department of Sea and Shore Fisheries undertook experimental transplantings of young quahaugs which had become established in such heavy concentrations that stunting and excessive mortality were occurring. Local fishermen volunteered assistance, and funds were made available by local buyers and dealers. In eighteen days, 3,012 bushels were moved to nearby commercially-depleted areas. Studies are being conducted by the State of Maine to determine if productive flats can be developed in other parts of the State.

Considering the relatively small area in which fishing is profitable, and the high level of production during the past three years, it appears that the hard-clam resources of Maine are being exploited to nearly their fullest extent. Unless successful techniques of restocking or farming are developed it is doubtful whether the fishery can expand much beyond its present production.

MASSACHUSETTS

LOCATION OF THE FISHERY: The southern shore of Cape Cod, Buzzards Bay, and the waters surrounding Nantucket, Martha's Vineyard, and the Elizabeth Islands support nearly the entire hard-clam fishery of Massachusetts. Wellfleet Harbor, near the northeast tip of the Cape, Barnstable Harbor, and Plymouth Bay also contribute to a lesser extent.

GEAR AND METHODS: Rakes are the most numerous and most productive gear in Massachusetts, followed in descending order by dredges, tongs, and hoes. Bull rakes, basket rakes, and tongs are used from small boats in shallow bays and coves along the entire Cape, on the shores of Buzzards Bay, Nantucket, Martha's Vineyard, and the Elizabeth Islands.

Dredges are restricted by law to deeper offshore waters, while hoes are used only on intertidal flats which are exposed at low tide. The Fall River or Nantucket dredge is typically a New England gear, and is rarely found in the Middle or South Atlantic States. The average dredge weighs about 450 pounds. The width of the blade, which varies from slightly less than two feet to about four feet, is usually expressed in terms of the number of teeth. Small dredges carry as few as 9 teeth, while large ones may have up to 24. The length and angle of teeth, as well as the amount of ballast attached to the dredge frame, depend largely on the nature of the bottom. The bag of the dredge is composed of iron rings and connecting links, the diameter and length of which are determined by local minimum-size limits and by the nature of the bottom.

GENERAL CONDITIONS OF THE FISHERY AND PROBLEMS: Individual townships assume the responsibility for their shellfish resources. The issuance of licenses and

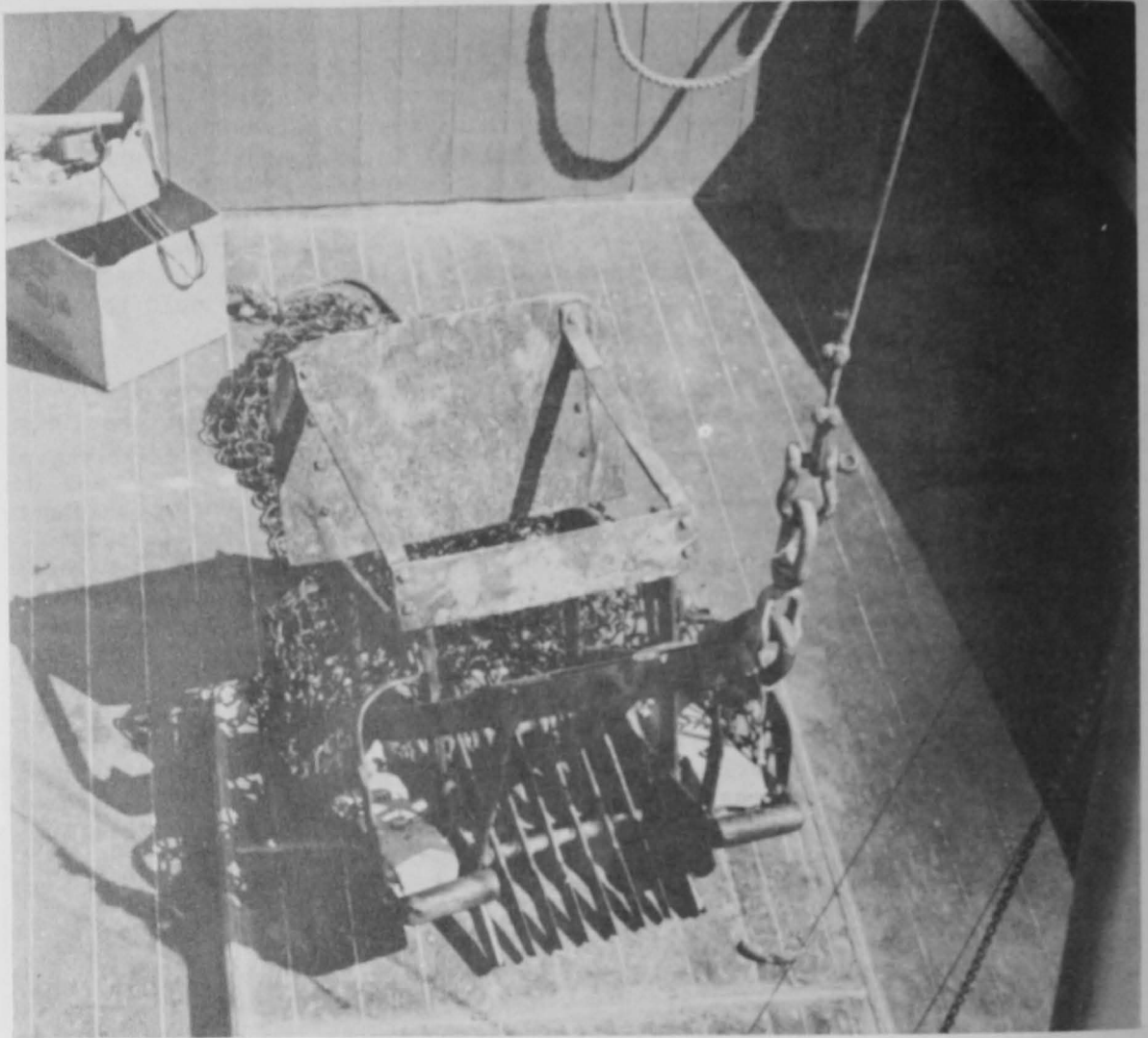


FIG. 4 - "FALL RIVER" DREDGES OPERATED BY POWER BOATS ARE USED PRINCIPALLY IN MASSACHUSETTS AND RHODE ISLAND AND ON LEASED GROUNDS IN NEW YORK.

grants for holding grounds, establishment of closed areas or seasons, and regulations of the daily catch limit for hand or power fishing are all under the control of the town selectmen or board of aldermen. State health officials work with the towns in prohibiting fishing in contaminated waters, and State conservation personnel assist in transplanting and re-seeding projects.

Nearly all of the dealers and town shellfish warden reported evidence of depletion. In nearly every instance, failure of setting combined with overfishing were believed the cause. This apparent depletion is noticeable, particularly in the scarcity of "necks," the highest-priced, and consequently most heavily fished size. Statistical records for the period from 1931-48 show periodic fluctuations in the catch, which may indicate alternate periods of successful and unsuccessful spawning. The reported decline may be, therefore, only a temporary condition, caused (as suggested by the men interviewed) by heavy cropping of recent year classes without recruitment. Nearly all of the clam-producing areas in the State are said to be good natural seeding areas, but none is characterized by successful sets every year.

With the exception of one or two areas in which pollution has reduced the size of the grounds, and thereby increased the fishing pressure on other areas, fishermen and dealers believe that the stocks of clams can still support the same number of men.

Marketing is no problem in Massachusetts. Demand reportedly exceeds supply, particularly for little necks, and some dealers have found it necessary to buy from Rhode Island to fill their orders. Canneries and restaurants provide a good outlet for chowder clams, and summer residents supplement the already heavy demand for the smaller little necks and cherrystones.

Records of the catch for each town are compiled annually, and the daily limits are adjusted when necessary to prevent overexploitation. Transplanting projects are considered very important in maintaining the productivity of the clam beds.

Fluctuations in the total catch for the State have been of about the same amplitude over a period of years. The peaks of 1931, 1938-39, and 1945-46 were surprisingly similar, and the low years of 1935-37, 1943, and 1948 were also nearly equal.

It appears that the fishery in its present condition is limited in potential production, and is being exploited to about its fullest extent.

RHODE ISLAND

LOCATION OF THE FISHERY: Hard clams are restricted to the upper two-thirds of Narragansett Bay, and are rarely found in commercial abundance beyond a depth of 25 feet. The most productive beds occur in the more shallow inshore areas.

GEAR AND METHODS: Bull rakes and tongs, similar to those employed in Massachusetts, are the most productive gears in Rhode Island.

Dredging is restricted to the lower half of the Sakonnet River, and is permitted only from December 1 to March 31. The Fall River dredge, already described for Massachusetts, is generally used, but in the last few years it has been supplanted in some areas by a hydraulic-jet dredge. This gear employs high-pressure streams of water directed into the bottom just in front of the dredge blade, and greatly increases the efficiency of dredging in firm, sandy bottom.

GENERAL CONDITION OF THE FISHERY AND PROBLEMS: No serious problems of depletion or marketing were reported by any of the persons interviewed in Rhode Island. Consistently favorable comments were obtained with respect to the present supply, the success and frequency of setting in the past several years, and the number of fishermen who find clam fishing profitable.

The present intensity of the fishery by hand methods and the possible expansion of power dredging have raised the question of the effect of increased fishing pressure on the clam population. This basic problem faces the conservation department of every state having a hard-clam fishery. Each must know how many clams can be harvested each year without causing depletion. Greenwich Bay, which supports 30 to 50 tongers and rakers, was chosen recently by the Fish and Wildlife Service for productivity studies to determine the number of bushels of clams which can safely be removed each year. Records of commercial production are balanced against information concerning growth rate, setting, predators, and natural mortality. A clam census is taken once each year to determine what the fishery is doing to the population level. The results of these studies should help the states to determine whether their fishery is too intensive or if it can safely be expanded.

Considerable concern was expressed by all dealers interviewed regarding the capture and out-of-state shipment of sub-legal clams. This business has expanded greatly during the last several years, and dealers believe that severe depletion of the clam resources of the State will result unless this practice is curtailed.

Several men interviewed (all of whom are dredge operators or who depend on the dredge fishery for their supplies of clams) mentioned another problem. Legal

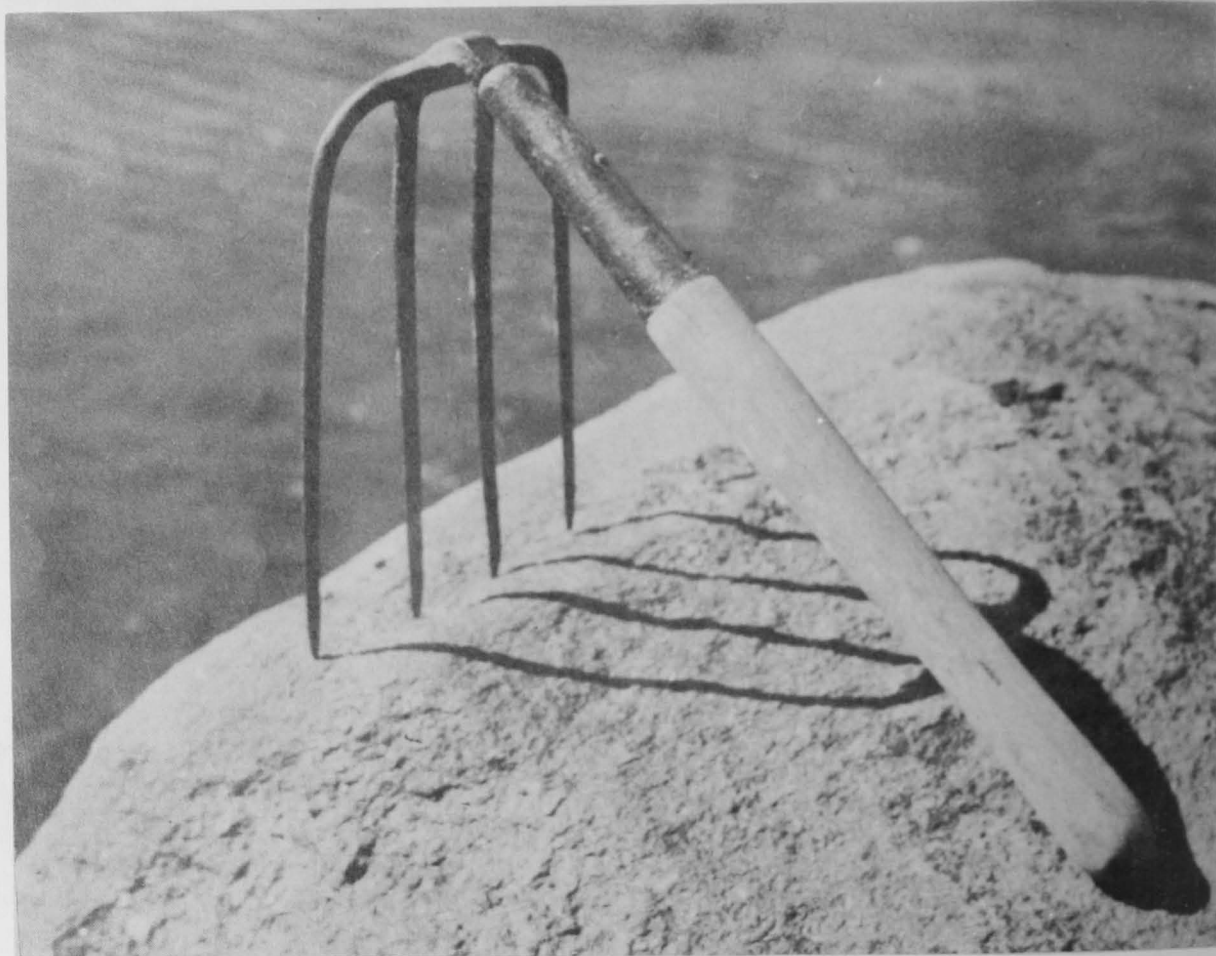


FIG. 5 - THE CLAM HOE IS USED PRINCIPALLY IN NEW ENGLAND.

dredging in Rhode Island is restricted to a comparatively small area. This area has been open to dredging since 1927, and has been depleted until at present it supports only 5 boats instead of the former fleet of nearly 40. Even when equipped with "jet dredges," which can harvest clams from beds which are too hard to be fished with the regular dredges, the fishermen report that it is almost impossible for a boat to fish profitably in the dredging area. They believe firmly that unless additional grounds are opened to them, it is doubtful whether the dredge fishery can survive another season.

Pollution is a problem in some areas of Narragansett Bay, according to dealers but is not serious enough to prevent the Rhode Island clam fishery from reaching high levels of production. Fishermen report no evidence that predators are a serious threat to any of the Rhode Island clam beds. Unless setting is unsuccessful for several years, or over-intensive fishing for sub-legal sizes is permitted, there is apparently little danger of depletion.

CONNECTICUT

The coast line of Connecticut, slightly over one hundred miles long, has practically no sheltered water. There are no barrier beaches to break the force of ocean waves, and practically no bays or coves typical of the productive areas in Massachusetts, Rhode Island, New York, and New Jersey.

The waters of Fairfield County are sheltered to a limited extent by Long Island, and together with the few small coves and inlets near New London and Mystic produce nearly the entire catch of hard clams in the state.

Tongs are the most numerous and most productive gear, and rakes rank second in catch. Power dredges are illegal on natural beds, but probably account for a considerable part of the catch of clams taken from privately-leased shellfish grounds.

Hard-clam fishing is of minor importance in Connecticut. The diggers do not depend on clams for their entire annual income, and work at this only when other fishing is unprofitable. Dealers stated there is no apparent depletion and report that hard clams never have been very abundant in this State.

Unpolluted waters are limited, and are occupied largely by privately-leased oyster grounds. These grounds yield small quantities of hard clams, but not enough to support a fishery. During World War II, one fisherman located a small bed near Milford, leased the ground, and dredged it until it became unprofitable, at which time he dropped his lease.

Commercial oyster growers make no effort to cultivate clams on their grounds, but do market those taken in their oyster-dredging operations.

Nearby cities provide a ready outlet for Connecticut clams, and marketing is never a problem. Dealers requiring large quantities for restaurant or hotel contracts often find it necessary to buy from New York or Rhode Island, particularly during the summer when tourist trade increases the demand. Even the many roadside stands which open during the summer are dependent almost entirely on out-of-state clams to supply their needs.

Highly efficient and practical methods of seeding, transplanting, and harvesting oysters have been developed by Connecticut oyster growers, and it is possible that clam farming may also be attempted if practical techniques are developed. Some of the dealers who were interviewed expressed interest in clam farming, but felt that a sufficiently rich source of seed was not available. None of them could recall having seen a heavy set of clams in Connecticut waters.

NEW YORK

LOCATION OF THE FISHERY: The hard-clam fishery of New York is concentrated principally on the southern shore of Long Island in the sheltered bays, protected by the barrier of beaches extending from the mainland nearly to the eastern tip of the island.

There is considerable production on the northern shore of Long Island, but the clam-producing areas are limited to a few relatively small bays and harbors, some of which are polluted.

Three areas of productivity may be delimited on Long Island. These are, in descending rank, as follows:

1. Great South Bay--in which the western portion is more productive than the eastern portion.
2. Port Jefferson to Cold Spring Harbor on the northern shore.
3. Greenport to Peconic Bay.

GEAR AND METHODS: The following types of gear are employed and have been arranged in descending order of their production.

1. Tongs are employed on hard bottoms to a depth of about 20 feet.
2. Bull rakes and scratch rakes are used in New York. The former have already been described in the section dealing with gear and methods. Scratch rakes are shorthanded, used by fishermen who wade in shallow areas and tread for clams with bare feet or search for siphon holes in shallow water or on exposed beds.
3. Dredges are essentially the same as those described for New England, and may be used legally only on privately-leased grounds.

GENERAL CONDITIONS OF THE FISHERY AND PROBLEMS: The fishery is in excellent condition at present, production is high, and with the exception of Great South Bay duck-farm pollution, few problems were reported by the dealers and fishermen interviewed.

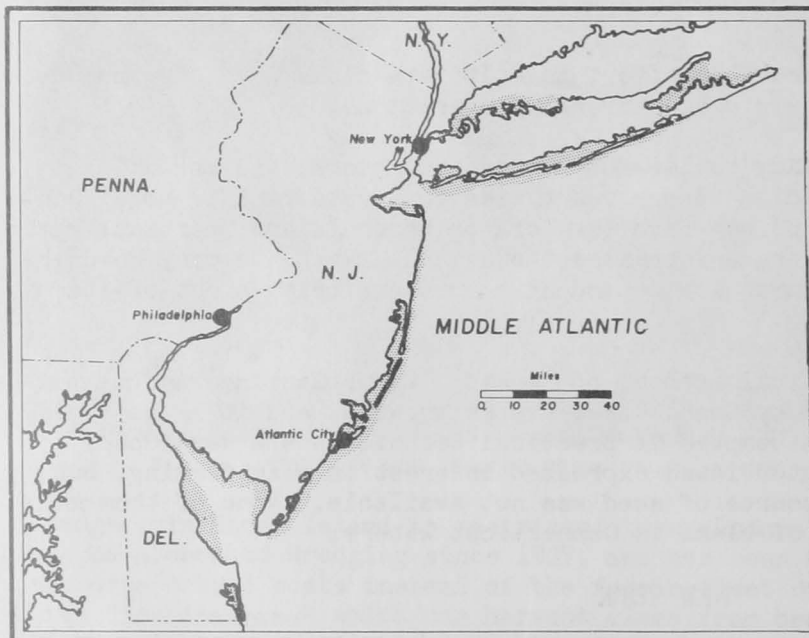


FIG. 6 - LOCATION OF HARD-CLAM FISHERY IN MIDDLE ATLANTIC STATES SHOWN BY STIPPLED AREAS.

Until about fifteen years ago Shinnecock and Great South Bays were the most consistent clam-producing areas, but in more recent years clams have been found in nearly every bay or cove on both north and south shores.

The opening of the intra-coastal waterway around 1930-31 with channels to harbors for the coastal towns (Babylon, Bay Shore, Lindenhurst, etc.) was followed by greatly increased clam production. It is the general opinion of local dealers

and watermen that increased salinity tripled the clam-producing area of Great South Bay. Eel grass began to disappear about 1931, and also is believed to have increased the clam-producing bottom by permitting good circulation of previously choked shallow flats.

Fishermen report sets are not regular, but frequent enough to maintain a good, constant supply of clams. The most recent heavy set appearing in the fishery occurred in 1941. This set was good along both north and south shores, with the result that the north shores are at present more productive than ever.

Dealers in the eastern part of Long Island (Orient Harbor, Peconic Bay, Shinnecock Bay, and Moriches Bay) reported depletion of clam stocks and believed overfishing and failure of setting to be the principal causes. This apparent depletion is probably not as serious as the dealers reported. Two influences are present which can produce a reduction in yield without actual depletion. First, fewer men are employed in the fishery, resulting in lower production. The second influence is the inability of the individual dealer to compete as effectively as in the past for the limited supply of clams. The consistently higher prices which have prevailed for the past several years and the proximity of the New York market have lured many more small buyers into the business. These small buyers can operate with low overhead, and can therefore pay a slightly higher price than the established companies.

Further west on Long Island, dealers reported the fishery to be in excellent condition. They did not recognize any depletion, and although some of them believed that there are fewer fishermen in the business, they felt this is due to lack of recruitment rather than a shortage of clams.

Dealers believe pollution is more serious than depletion in New York. State health authorities have closed a number of productive areas on Long Island because of sewage pollution. Some of these are closed all year; others are closed only during the summer months when the influx of tourists increases the sewage problem. The State conducts extensive transplanting projects to reclaim clams from areas closed because of pollution. The reclamation is mandatory and consists of supervised removal, sale, and replanting of the clams in approved waters. Usually the clams are sold at about one-half the current market price, but are abundant enough to make the work profitable to the fishermen.

Another type of pollution is becoming increasingly serious in southern Long Island, and in time may have very damaging effects. A number of duck farms on the shore of Moriches Bay discharge large quantities of duck excreta into the water. This material is said to increase the phosphate content of the water and when prevailing easterly winds during the summer carry this water into eastern Great South Bay, blooms of a *Chlorella*-like organism frequently occur. Unpublished results of studies conducted by biologists working for shellfish companies have reported that the organism becomes sufficiently abundant to clog the gills of clams and inhibit feeding, resulting in "poorness" and a reduced yield in shucking. This problem has not seriously affected the Great South Bay fishery, although canneries, buying for the greatest possible yield in shucked meats, will occasionally buy elsewhere when these clams are in poor condition. The restaurant and raw-bar trade for the smaller, higher-priced clams is unaffected. A complete biological and hydrographical survey of this problem was undertaken in 1949 through cooperative efforts of the State of New York, the Woods Hole Oceanographic Institution, and dealers in the affected area. Preliminary reports on this study are being prepared, and are expected to be released in the near future.

Marketing was not reported as a serious problem by any of the dealers interviewed on Long Island. The proximity of the New York market makes it the best outlet, and most Long Island clams are shipped there, where they may be sold and reshipped. Some, however, are shipped directly to western New York State, Connecticut, and to more distant markets in Maryland, Pennsylvania, and Ohio.

Tabular and graphic data already presented have shown New York ranks first in hard clam production, and it appears that the State's clam resources are in no immediate danger of overexploitation.

NEW JERSEY

LOCATION OF THE FISHERY: Hard clams are caught along almost the entire coast from Sandy Hook Bay to Cape May. Barrier beaches and islands shelter nearly all of the shore line, and clams occur abundantly in the harbors and bays behind these barriers.

According to some of the dealers interviewed, New Jersey's most productive clam grounds extend from the southern part of Barnegat Bay to Cape May, and Fish and Wildlife Service records of the catch by counties for the period 1931-47 support this idea. The best areas are Little Egg Harbor and Great Bay.

GEAR AND METHODS: With the exception of local modifications of dredges and rakes, the gear employed is similar to that used in New York, and is listed below in descending order of production:

1. Tongs.
2. Rakes include bull rakes; jig rakes, which are simply bull



FIG. 7 - BULL RAKES ARE EQUIPPED WITH SECTIONAL STALES OR HANDLES FOR FISHING IN WATER 20 TO 25 FEET DEEP.

rakes with sectional handles composed of 5-foot lengths of steel pipe; and short-handled rakes used in shallow areas.

3. Dredges of two types are used. One similar to that described for the Massachusetts fishery may legally be employed only on private grounds. The other, a gang-rig, consisting of three or four short-handled bull rakes fastened to towing lines, is operated from sail boats in public waters.

GENERAL CONDITION OF THE FISHERY AND PROBLEMS: Fish and Wildlife Service catch records for New Jersey indicate no depletion in the State's hard-clam resources. In fact, 1948 was considerably above the average annual production for all years since 1931. Dealers, however, reported a decrease in the supply of clams, especially those of smaller size, and little evidence of a successful recent set. All of the men interviewed who believed depletion has occurred, felt that overfishing and failure of setting were the principal causes.

Some of the fishermen were more optimistic about the condition of the industry, and felt that if small clams are somewhat more scarce than in recent years, it is a temporary problem which has occurred periodically in the past. Successful sets are said to occur only occasionally, but support the fishery for several years. Temporary scarcity of small sizes may occur between the periods of successful setting, but this condition is not believed to be indicative of a permanent decline in the fishery.

Marketing presents only a minor problem in New Jersey. There is a constant demand for small clams to be served as "half-shells" or "steamers," particularly during the late summer when clambakes are most popular. The demand is so great for very small "steamers" in some localities that a considerable amount of undersized clams are taken, and in some areas this illegal fishing is considered a contributing factor in the apparent depletion. Canneries provide a lower-priced outlet for medium and large clams which are used in preparing chowder, minced, and canned clams.

The principal markets for New Jersey clams are in New York, Pennsylvania, and Ohio. Many dealers maintain leased beds on which they hold clams bought during periods of depressed prices on glutted summer markets. These men have found that bedded clams are subject to high mortality if held for more than one season unless planted more thinly than is desirable for easy recovery. Usually fishing is reduced during the winter, and demand exceeds the supply, so the bedded clams may be profitably sold later in the same year in which they were purchased.

Pollution is a problem in only a small portion of the clam-producing areas of New Jersey, and most of it occurs in the less productive northern part of the coast. With the exception of areas near Atlantic City and Wildwood which are closed during the summer when the population is greatly increased by vacationists, the shores of the most productive bays and harbors are so sparsely populated that sewage pollution is no problem.

Apart from the reports of dealers cited previously, there is little evidence of depletion of New Jersey clam resources. Production has been at a very high level for the past several years, and unless increased market demands intensify the fishing effort, it seems unlikely that depletion from overdigging will occur.

DELAWARE

The clam-fishing grounds of Delaware are very limited, and the production, when compared to New York and New Jersey, is so small as to be almost insignificant. The western shore of Delaware Bay in the vicinity of Little Creek supports a dredge fishery which accounts for the major part of the production, and the sheltered waters of Rehoboth Bay and Indian River Bay maintain a very small tong-fishing fishery.

Dredges are the only gear used in the Delaware Bay fishery, since the water is too rough for the small boats used by tong-and-rake fishermen. The dredges are simply modified oyster dredges equipped with teeth from 6 to 9 inches in length.

The clam-dredging fishery, which accounts for almost the entire catch in Delaware, developed as a sideline of the oyster business of Delaware Bay. Boats operated in the Little Creek area dredge small quantities of clams from privately-leased oyster beds, but their largest catches are taken from adjacent natural grounds. Ordinarily, clam fishing stops at the end of the oyster season because the price of clams is lowest during the summer, and they must be sold promptly to avoid loss by spoilage. Good market conditions in 1949 and 1950, however, have encouraged some of the dredgers to continue operations during the summer. No effort has been made to maintain holding beds, since dredging is typically a winter fishery, and mortality is high in winter plantings, according to dealers.

Almost all of the dredged clams are large enough to be used by canneries, since the $2\frac{1}{2}$ -inch rings used in the dredge pockets allow most small clams to escape.

Clam production in Delaware Bay has been increasing steadily for about three years. Dealers interviewed reported 1950 catches at an all-time high level, and believed the last similar peak of production occurred in about 1932.

The Indian River and Rehoboth Bay areas were described by local shellfish dealers as unproductive when compared with Chincoteague Bay, which lies a few miles south. Only about seven men in the vicinity of Oak Orchard dig clams commercially and the largest individual shipper in the area handles only about 2,500-5,000 clams per week. A State law limits a fisherman's daily catch in the Indian River to 1,000 clams, but the scarcity of clams makes it difficult to reach this limit.

There seems to be no problem of marketing the available supply, and no evidence of depletion. The supply is limited to a small area, and is simply not great enough to maintain a large fishery.

Pollution is not serious with respect to the Delaware clam fishery, since the limited areas in which fishing is profitable are free from pollution.

It appears that the fishery of Delaware is being exploited to nearly its fullest extent. Continuation of dredging through the summer may increase production, but if the clams are cyclic in abundance, the particular size groups in which the dredges are most effective will probably be diminished until another successful period of recruitment occurs.

MARYLAND

LOCATION OF THE FISHERY: Although Pocomoke Sound, located in the southeastern part of Chesapeake Bay yields small quantities of clams, nearly the entire catch comes from the protected bays on what is locally called the sea side of Maryland. Chincoteague, Sinepuxent, Assawoman, and Isle of Wight Bays form a continuous body

of water along the entire east coast. The whole area is very shallow, rarely exceeding 12 feet in depth at high water, and the bottom is largely composed of soft, sandy mud, with scattered areas of shell formed by natural oyster beds.

GEAR AND METHODS: With the exception of small quantities taken by dredges working on the lower Chesapeake oyster beds, tongs and rakes account for the entire catch of clams in Maryland waters. Rakes are used principally in the summer when fishermen can wade and tread clams, or locate them by "signing" at low tides when the bottom conditions are right. This method is used by skilled fishermen who can recognize the "sign," which may be a mound, depression, or any hole in the bottom indicating the position of the clam. Tongs, which produce about the same as rakes, are used in both summer and winter in deeper water, and are particularly effective on the natural oyster beds where clams are abundant.

GENERAL CONDITION OF THE FISHERY AND PROBLEMS: Catch records for the period from 1931-48 show a steady increase in production, with only occasional minor regressions. Although somewhat less than 1947, the catch for 1948 is still well above any other preceding year.

Depletion was considered a major problem only in the Chesapeake Bay clam fishery. Dealers in Crisfield reported that formerly productive beds in Pocomoke Sound have become so depleted during the last fifteen years that they now produce virtually no clams.

Members of the Maryland shellfish industry who were interviewed almost universally agreed that marketing is the major barrier confronting the Maryland clam fishery. The greater volume of production in New England offers serious competition to a year-round market. Nearly all Maryland dealers depend largely on "bedding"--clams bought at low prices during the summer and on the re-sale of the clams during the winter. In normally severe winters, the New England fishery is considerably restricted, and "bedding" is quite profitable. A number of dealers stated that they have bought and held clams from New York, New Jersey, Rhode Island, and North Carolina to augment their local supply. Mild winters during the last few years have made this practice risky, and several dealers reported that the poor winter market had forced them to reduce or abandon "bedding" operations.

The outlet for Maryland clams is almost entirely out-of-state. Regular markets are found in New York, Pennsylvania, Ohio, Florida, and even Texas. The peaks of

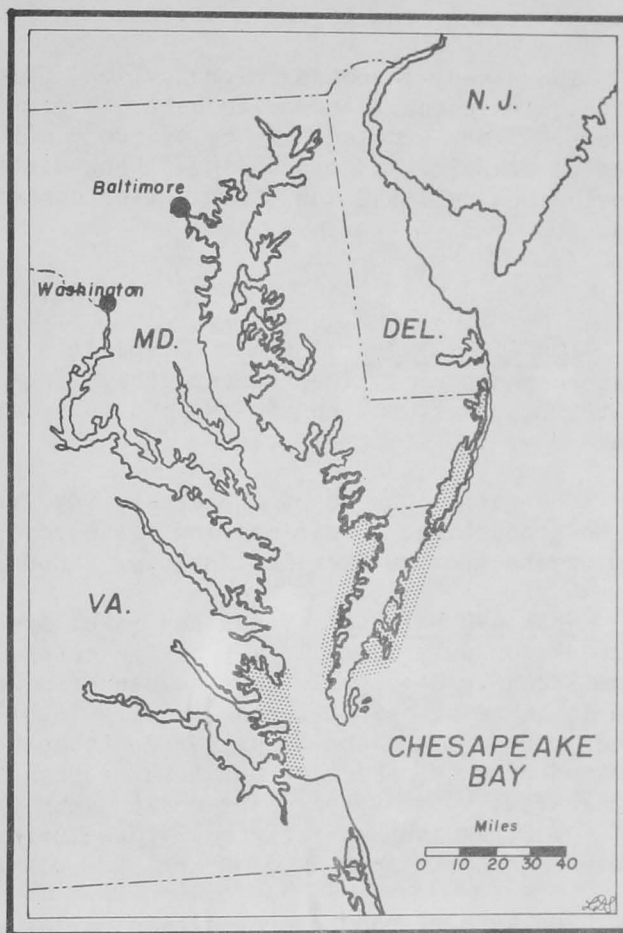


FIG. 8 - LOCATION OF HARD-CLAM FISHERY IN CHESAPEAKE BAY STATES--STIPPLED AREAS.

demand occur during late summer for small clams used in clambakes, and during the winter for large chowder clams.

Two firms within the State produce canned chowder, and very recently another company has begun freezing clams with satisfactory results.

Pollution presents no problem to the Maryland clam fishery since most of the clam-producing area of the Eastern shore is sparsely populated.

The steady increase in production, despite a reported reduction in fishing effort, indicates that the industry is growing even though marketing problems are severe. These problems may be overcome with the development of efficient techniques of freezing and processing. Long-distance shipment at minimum cost could provide new outlets, and offer better competition to the New England clam fisheries.

VIRGINIA

LOCATION OF THE FISHERY: Virginia's hard-clam fishery is centered along the eastern peninsula. The sheltered bays from Cape Charles to Chincoteague Bay are most productive, but considerable quantities are also taken from the lower Chesapeake Bay.

The western shore of Chesapeake Bay from Mobjack Bay to Cape Henry is also quite productive. Broad shallow flats cover much of the area, and small coves and creeks provide excellent holding grounds.

GEAR AND METHODS: Tongs and rakes are the most productive gears, and dredges account for only a small part of the catch. Hand tongs are most numerous, but in some areas in Chesapeake Bay the use of power-operated patent tongs is permitted, and in those areas, this gear is very important. Patent tongs are exactly the same in design as hand tongs, except that the shafts are shorter, and made of iron instead of wood, and that the head or basket is much larger. Wire ropes replace the shafts, but the tongs are worked into the bottom by the same scissor-like action. This gear was originally developed for use in oyster fishing, but has proved very efficient in catching hard clams.

The type of hand-operated gear varies with the season. In winter, tongs are used almost exclusively, while in the summer rakes are used very extensively by fishermen who take clams by treading and "signing."

No dredges are licensed for clam fishing in Virginia, and the catches listed are taken incidentally in dredging for oysters and crabs. Clams are seldom dredged from privately-leased holding grounds, principally because these grounds are often in very shallow areas.

GENERAL CONDITION OF THE FISHERY AND PROBLEMS: Although the annual catch during the period from 1944-48 was not as high as in previous years since 1931, the lower production should not be interpreted as evidence of a serious decline or depletion. Only one of the many dealers interviewed believed that the stocks of clams were reduced. In all other instances, overproduction and marketing were considered the most serious problems.

The planting of clams on privately-leased grounds is one of the most important parts of the industry. It is very difficult for Virginia dealers to compete profitably with the great production from the New England and Middle Atlantic States. There is a steady year-round demand, but prices are depressed during the summer

When clams are plentiful and Virginia dealers consider winter trade most profitable. In severe winters when New England clam fishing is restricted, Virginia



FIG. 9 - TONGS ACCOUNT FOR OVER 60 PERCENT OF THE ANNUAL HARD-CLAM CATCH.

dealers can profitably sell clams bought during the previous summer and held on leased beds. Unusually mild winters during the past few years have made holding clams unprofitable. A number of men reported serious losses from holding clams for two years. The heavy losses from holding beds reported by some dealers may have been due to overcrowding, and the development of better farming techniques might be of great value during periods when depressed prices necessitate long holding periods.

Local markets consume some of the catch, but Pennsylvania, New York, and Ohio, and even Florida, provide the principal outlets. There is at present no large-scale effort being made to process clams, and practically all are sold in the shell. There is only a very limited local market for shucked clams, principally for restaurant and retail trade.

Pollution occurs only in a comparatively small area around Norfolk and is not a serious problem. State health laws permit the sale of clams from contaminated water, if they are transplanted to a pure area and held for one month.

Predation is usually not a serious problem, but occasionally skates invade the holding beds in the Chincoteague Bay area. One man reported the loss of 600 bushels of small clams in two nights during 1948, and said it was necessary to fence his holding beds to exclude these predators. Fortunately, skates do not come into the Bay every year, and the 1948 invasion was the first serious attack to occur in five years.

NORTH CAROLINA

Hard clams are found in nearly all of the sheltered coastal waters of North Carolina, but the commercial fishery is centered principally in Carteret and New Hanover counties. Statistics of the Service reveal that smaller quantities are also caught in Brunswick, Dare, Hyde, Onslow, and Pender counties.

Rakes, used by fishermen wading in shallow water or on beds exposed at low tide, account for almost the entire hard-clam catch. Tongs are used, but except in Carteret County, these are so few that their contribution to the catch is negligible. Dredging began about December 1949 in Carteret County and now accounts for almost the entire catch of this county.

The opinion of dealers and biologists interviewed in North Carolina was that the principal problem facing the hard-clam fishery is market development, although some concern was expressed over the effect of the new dredge fishery.

Clams are abundant, but the distance to markets makes transportation very costly. Most of the clam diggers work only part time, and turn to other fisheries whenever it appears more profitable.

It is possible for southern clam diggers to work during winter months when weather curtails the New England fishery, and North Carolina men find the winter season profitable. Maryland and Virginia have similar advantages of weather, however, with a further advantage of being closer to the northern markets.

"Bedding" of clams bought cheaply during the summer is a common practice, but is considered risky, particularly during the mild winters of the past several years. In "bedding," as in the fishery for native clams, Virginia and Maryland offers sharp competition.

Contracts with northern canneries for large chowder clams provide one good outlet, and the technique of freezing shucked meats and liquor separately had reduced transportation costs by increasing the pay load. Only a few dealers ship directly to northern markets. Most clams are sold in the shell through dealers in Virginia and Maryland.

Pollution and predation are of no importance to the North Carolina fishery. Fishermen and dealers believe the supply of clams greatly exceeds the demand at present. It seems improbable that the resource will be fully exploited unless the market is expanded to offer profitable full-time employment to fishermen or unless a more intensive dredge fishery develops.

SOUTH CAROLINA

Catch statistics indicate that the hard-clam fishery is concentrated in Horry and Georgetown Counties, but fishermen insist that Charleston and Beaufort Counties also have extensive clam beds. A sea-food producer of Beaufort reported that the hurricane of August 1940 exposed a three-quarter mile bed at Trenchard's Inlet "on which clams were so thick that there was not a hand's breadth between them."

Rakes account for most of the catch, a considerable part of which is dug on exposed flats at low tide. Although dredges used in the oyster fishery also catch a few clams, the catch is insignificantly small. Dredge production is limited further by a State law which prohibits dredging for clams in less than 12 feet of water.

Marketing is apparently the greatest problem in the hard-clam fishery of South Carolina. All of the dealers and conservationists interviewed agreed that hard clams offer an almost unexploited source of wealth, but the problem of finding a profitable outlet has retarded the development of the fishery. Only during

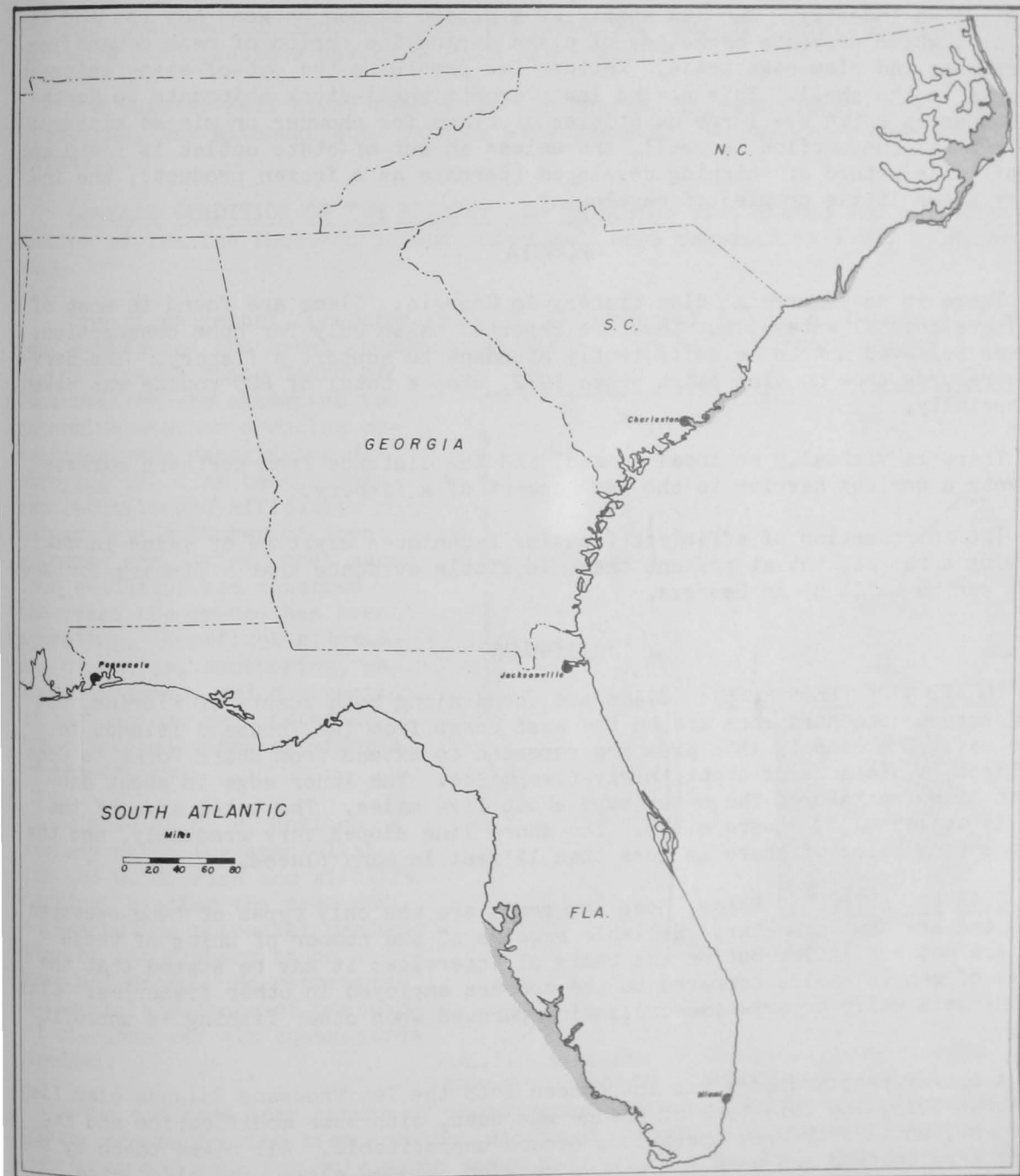


FIG. 10 - LOCATION OF HARD-CLAM FISHERY IN THE SOUTH ATLANTIC STATES SHOWN BY STIPPLED AREAS.

severe winters, when New England waters are inaccessible, can the Southern clams be dug and marketed at a price high enough to defray the expenses of packing and shipping to northern markets.

The oyster business is of much more importance, and extensive individually-leased areas are devoted to oyster farming. Holders of these leases are not greatly concerned with the development of a clam fishery, and at present there is little interest in clam farming. Clams occur on the leased oyster beds but are more abundant on public grounds.

South Carolina has 11 laws relative to clams some of which inhibit the development of an industry. One law specifies a closed season between May 1st and August 1st, which prevents marketing of clams during the period of peak demand from the raw-bar and clam-bake trade. Another law prohibits the out-of-state shipment of clams in the shell. This second law prevents shell-stock shipments to Northern canneries which use large quantities of clams for chowder or minced clam products. Local consumption is small, and unless an out-of-state outlet is found and a profitable method of shipping developed (perhaps as a frozen product), the industry shows little promise of developing.

GEORGIA

There is no commercial clam fishery in Georgia. Clams are found in most of the intra-coastal waters, but they are reported taken only for home consumption, and are believed not to be sufficiently abundant to support a fishery. The Service's records show no clam catch since 1932, when a total of 600 pounds was taken commercially.

There is virtually no local demand, and the distance from northern markets presents a serious barrier to the development of a fishery.

The introduction of efficient freezing techniques might be of value in developing a market, but at present there is little evidence that a fishery for hard clams can be built up in Georgia.

FLORIDA

LOCATION OF THE FISHERY: Clams are found along both coasts of Florida, but the greatest concentrations are on the west coast from Ten Thousand Islands to Tampa Bay. The beds in this area are reported to extend from Shark Point to Coon Key Light, a distance of about thirty-five miles. The inner edge is about one-eighth mile from shore; the outer edge about five miles. The total area of the beds is at least 150 square miles. The shore line slopes very gradually, and the depth 4 to 5 miles offshore is less than 12 feet in many places.

GEAR AND METHODS: Rakes, hoes, and grabs are the only types of hand-operated gear, and are few in number. Reliable records of the number of units of these gear are not available, but on the basis of interviews it may be stated that the number of men is small, compared to the numbers employed in other fisheries. Clam digging is usually a part-time occupation pursued when other fishing is unprofitable.

A conveyor-belt dredge was introduced into the Ten Thousand Islands clam fishery about 1913, and this type of dredge was used, with some modification and improvement, until 1947 when operations became unprofitable. All clams taken by the dredge were shucked and used for canned chowder, minced clams, and clam juice.

The dredge was essentially a large wooden scow, about 30 by 80 feet, with a rectangular opening in the bottom through which the dredge belt operated. Clams

were washed from the bottom by high pressure jets of water, and brought to the surface by a conveyor belt. The earlier models of this dredge were self-propelled. An anchor was set and the dredge was allowed to drift or was towed to the end of the cable--a distance of about 1,000 feet. The dredge then hauled itself back to the anchor by means of a winch. The scoop of the dredge was about $3\frac{1}{2}$ feet in width, and a single set could therefore cover about 3,500 square feet. It was reported that the dredge operated 24 hours per day and could make about eight sets.

The most recent modification of this device is smaller in size, measuring 16 by 40 feet, and can operate in shallow water. It dredges a 24-inch swath, and may either be operated on an anchor cable, or towed by a power boat. Facilities are also provided for shucking and refrigeration, thereby minimizing the expense for shore installations needed to pack the clams.

The regular Fall River dredge used in the New England fishery has been tried in Florida, but although good catches were reported, it has never been used commercially.

GENERAL CONDITION OF THE FISHERY AND PROBLEMS: The status and potential production of the Ten Thousand Islands clam beds were reported in 1920, 1938, and 1943.

The first report, prepared by W. C. Schroeder of the U. S. Bureau of Fisheries, emphasized the great abundance of clams. The second report was by J.R. Kelly of the Florida State Board of Conservation who attempted to determine whether dredging operations were damaging or destroying the clam beds. This report contained affidavits obtained from a number of local watermen who claimed that serious depletion had occurred in the years the dredge has been operating. Overfishing, breaking of shells, smothering, removal of grass, and destruction of the habitat were cited as the principal damaging effects of the dredge.

In 1943, C. H. Chilton, a fishery marketing specialist for the U. S. Fish and Wildlife Service, visited the area and estimated the potential production of the fishery to be almost unlimited. He reported an estimated abundance of one bushel of clams per six square yards dredged.

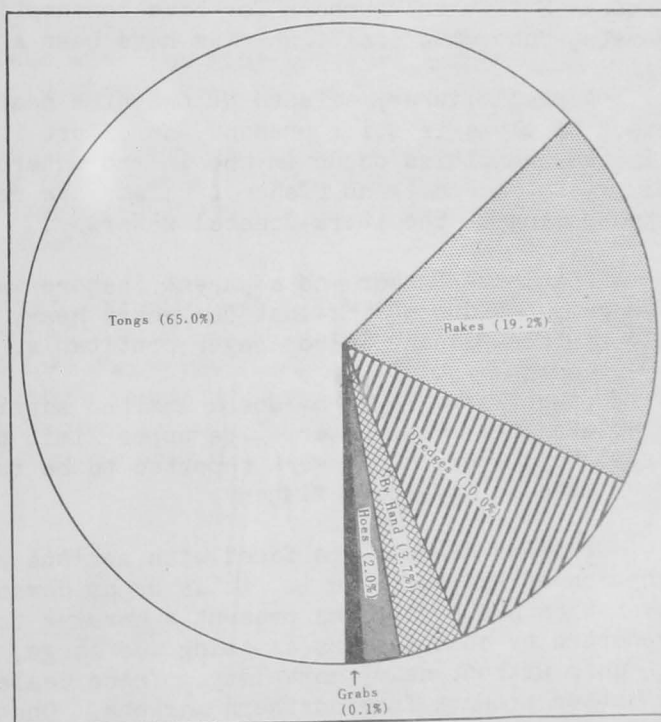


FIG. 11 - GEAR USED IN HARD-CLAM FISHERY MAINE TO FLORIDA SHOWN IN PERCENTAGE OF AVERAGE CATCH 1944-48.

The contradictory nature of these reports makes analysis of the available catch records for the area somewhat difficult. Service statistics are available by county and gear for only seven years between 1931 and 1947, but they do show a somewhat smaller catch for the Ten Thousand Islands area in 1947 than in any preceding year except 1934.

The men interviewed during the 1950 survey (upon which this report is largely based) felt that serious depletion had occurred, but that it was the result of an unusual natural mortality, and not the result of dredging.

One fisherman sampled the area with a Fall River dredge during 1948 and found clams sufficiently abundant to build another conveyor-belt dredge. In November 1949, he found that almost the entire population of clams had died. In eight days of dredging from Coon Key to Wood River, he found only eight live clams; the remainder of his catch consisted of empty shells. Areas untouched by previous dredging yielded only dead clams.

The annual catch of the dredge from 1943 to 1946 was 30,000, 50,000, 78,000, and 25,000 bushels. In the year 1947, clams were so scarce that operations were halted. It is very difficult to trace and evaluate the trends of the Ten Thousand Islands fishery. Although intensive dredging may have contributed to a reduction in the stocks of clams, the fishermen we interviewed believed that a destructive natural phenomenon also contributed to the depletion.

At present there is no fishery reported in the area, and unless natural restoration rebuilds the population to its former abundance, it is doubtful whether any further effort will be made to develop a clam industry in the Ten Thousand Islands.

Interviews with dealers and conservation research personnel indicated that only limited stocks of clams have ever been found outside of the Ten Thousand Islands. Sufficient numbers for home consumption occur in many areas along both coasts, but commercial fisheries have been attempted in only a few places.

A small fishery existed at one time near Matanzas Inlet, and although a small stock of clams is still present, no effort is made toward commercial harvesting. Limited quantities occur in the inland waters from Edgewater through the Indian River, but there is no fishery. Clams are reportedly less abundant than before the opening of the intra-coastal waterway.

Charlotte Harbor and adjacent inshore waters near Englewood supported a small fishery, but during the last few years heavy mortalities have so depleted the stocks that fishing is no longer profitable.

Lower Tampa Bay provides a limited supply for local use, and a few large clams are taken near Clearwater. The upper limit of clam production is in the area of Cedar Key, where clams were reported to be fairly plentiful, but no attempt has been made to develop a fishery.

Florida dealers are faced with serious problems of marketing. With the exception of Miami, there is little or no demand except in the tourist season, and even then northern clams present a barrier to local marketing. Florida clams were reported by some dealers as being too large, too full of sand, and too difficult to ship without heavy mortality. These dealers find a more dependable supply and a better product from northern markets. One dealer reported buying 2 to 3 tons per week from northern markets during the November-March tourist season.

At present there is practically no hard-clam fishery in Florida. Restoration of the Ten Thousand Islands stocks might offer an opportunity for the development of a market for shucked frozen clam meats to be used by northern canneries, or perhaps for locally-canned clam products. It is doubtful, however, whether the industry could ever be developed sufficiently to offer effective competition to the big northern clam resources.

CONCLUSIONS

The hard-clam fishery of the Atlantic Coast presents no picture of general depletion such as that observed in the soft-clam fishery. Stocks of hard clams in most areas are adequate and fishermen and dealers are often worried more about demand than supply. Local exceptions to this statement are found--the most notable being the disappearance of the hard clams in the Ten Thousand Islands area in Florida. This area, once described as the greatest bed of hard clams in the country, now supports no commercial fishery. The cause of the disappearance of hard clams in Florida is a worthy subject for biological research.

The intensive tong-and-rake fishery in Rhode Island, together with the possibility of using more efficient power dredges, causes concern over the ability of the clam population to withstand increased fishing pressure. The Service's investigations in this State are designed to determine the productivity of Greenwich Bay in terms of the number of quahuags which can safely be removed each year. These studies present a unique opportunity to observe a commercial fishery before it has been dangerously depleted.

Pollution is a serious problem only in Massachusetts, Rhode Island, and New York. Both Massachusetts and New York salvage their clams from polluted waters by transplanting them to clean beds for a specified time before marketing. Effective disposal systems would reduce sewage pollution, enlarge the fishing area, and increase clam production.

Marketing was reported to be an important problem by all states from Maryland to Florida. These states must compete with the Middle Atlantic and New England States, but are handicapped by their distance from the centers of population.

Severe winter weather restricts the northern diggers, but southern fishermen seldom face this problem and usually find winter fishing profitable. Mild winters during recent years have permitted digging most of the year in New England and have thereby reduced sales from the South.

Another factor reducing the market for southern clams is the latter's lower yield of meats per bushel as compared with northern clams. Catch statistics indicate that hard clams from the New York-Maine area average about 11.5 pounds of meats per bushel; New Jersey and Delaware about 9.0 pounds; whereas Maryland-Florida clams averaged only 7.5 pounds per bushel. It is apparent from these figures that southern clams must be obtainable at a lower price to compete with those from northern waters.

