

Assessment of Ocean Quahog (Arctica islandica)

Resources in the Northwest Atlantic

September 1977

by

Fredric M. Serchuk

Laboratory Reference #77-22
National Marine Fisheries Service
Northeast Fisheries Center
Woods Hole, Massachusetts 02543
September 14, 1977

1977 Ocean Quahog Assessment

Commercial exploitation of the ocean quahog, Arctica islandica, began during World War II in response to the USA war food production program. Landings increased from 664 thousand pounds (meat weight) in 1944 to 1510 thousand pounds in 1946, then declined to a low of 45 thousand pounds in 1967 (Table 1). The decrease in landings was associated with the development of the surf clam and other clam resources, and with various problems involved with storing, processing, and marketing of ocean quahog meats. During the 1970's, dwindling supplies of surf and bay clams prompted industrial interest in harvesting and marketing of ocean quahogs (Rathjen, 1977). Landings increased markedly, averaging 1450 thousand pounds annually during 1970-75. A sharp increase to 5717 thousand pounds in 1976 was due to the development of the New Jersey fishery. The traditional Rhode Island ocean quahog fishery has remained virtually stable since 1970, averaging 1300 thousand pounds of meat annually.

Commercial catch/effort or size frequency data for commercial landings is virtually unavailable. Similarly, knowledge of the growth rate, longevity, mortality, and reproductive potential of the species is limited (Merrill, Chamberlin, and Ropes, 1969). Exploratory and research clam surveys conducted by the National Marine Fisheries Service since 1963 provided data on the distribution and abundance of ocean quahogs from Massachusetts Bay south to North Carolina (Parker, 1966, 1967; Parker and Fahlen, 1968; Parker and McRae, 1970; BCF, 1970a, 1970b; NMFS, 1971a, 1971b, 1971c; NMFS, 1974, 1976, 1977; Ropes, 1976a, 1976b, 1976c, 1976d), although most of the effort assessed the resource in the Middle Atlantic Bight.

Results of the 1976 shellfish assessment cruise (NMFS, 1976) indicated a biomass (standing crop) of ocean quahogs of 5.4 billion pounds (meats) from Long Island south to Virginia (Table 2). Population abundance was estimated by the area swept method (Baranov 1918) and the data were stratified by quahog

density, depth range, and geographical region. Abundance declined southward of Long Island, but some concentrations of quahogs were generally found in all areas between the 20 to 30 fm (37-55 m) depth contours. This geographical trend in abundance was further corroborated in the results of the 1977 shellfish assessment survey. Biomass estimates for populations of quahogs in Southern New England waters are currently being derived.

An annual sustainable yield (Y_{\max}) of commercially harvestable (≥ 3.5 inches) ocean quahogs south of Long Island was estimated using Gulland's equation (Gulland 1971) for virgin stock exploitation:

$$Y_{\max} = 0.5 MB_0$$

where M = instantaneous natural mortality (0.1 estimated for ocean quahogs)

B_0 = virgin biomass of commercial size quahogs
(2.16 billion pounds - see Table 2)

Thus, $Y_{\max} = (0.5) (0.1) (2.16) = 108$ million pounds. This estimate would be identical to that derived by using the ratio between virgin biomass and maximum sustained yield of 10:1 postulated for slow growing, longlived, offshore species by Caddy et al., (1974). The estimate should be interpreted with caution, however, due to the preliminary nature of the biomass estimate and the uncertainty of the natural mortality estimate used in the yield determination. Reports of substantial quantities (25%) of very old (100 years old) ocean quahogs (Dr. Ida Thompson, Princeton University, pers. comm; Anonymous, 1977; Stanley 1977) imply that natural mortality may be much lower than 10% annually. If the instantaneous rate of natural mortality is 0.014 (which it would be based on 25% of the population surviving to 100 years old), then Y_{\max} would equal 15 million pounds.

From underwater observations, ocean quahog dredging mortalities are substantial (>80% of the uncaught clams) (Medcof and Caddy, 1971). This mortality source should be considered in any management measures adopted for the

fishery.

Ocean quahog mortalities associated with the anoxic bottom water in the Middle Atlantic Bight during summer, 1976, were very low compared with surf clam losses (Ropes and Chang, 1977). For example, biomass loss in Long Island waters was negligible and only 0.8% of the New Jersey ocean quahog resource experienced mortalities. The entire Middle Atlantic Bight ocean quahog stock was diminished by only 0.3%.

Literature Cited

Anonymous.

1977. Century old clams may flavor your chowder. URI Comm. Fish. Newsletter.
March/April, 1977. 7p.

Baranov, T. I.

1918. On the question of the biological basis of fisheries. USSR Bureau of Fisheries Bulletin. 1(1): 81-128 (Translated from Russian by U.K. Min. of Agr. and Fish.).

BCF.

1970a. Ocean quahog survey. Cruise report, Delaware II Cruise 70-1,
January 26-February 5, 1970; February 11-18, 1970. March 11, 1970. 7p.

BCF.

1970b. Ocean quahog survey. Cruise report, Delaware II Cruise 70-5,
July 17-23, 1970; July 30-August 7, 1970. August 20, 1970. 6p.

Caddy, J. F., R. A. Chandler, and D. G. Wilder.

1974. Biology and commercial potential of several underexploited molluscs and crustaceans on the Atlantic coast of Canada. A paper presented to the Federal-Provincial fisheries committee on Utilization of Atlantic Resources. Montreal, 5-7 February 1974. 111p.

Gulland, J. A.

1971. The fish resources of the ocean. Fishing News (Books) Ltd., London. 255p.

Medcof, J. C., and J. F. Caddy.

1971. Underwater observations on performance of clam dredges of three types. ICES C. M. 1971/B:10, Gear and Behavior Committee. 7p. (not to be cited without prior reference to author).

Merrill, A. S., J. L. Chamberlin, and J. W. Ropes.

1969. Ocean quahog fishery, p. 125-129. IN F. E. Firth (ed.). The Encyclopedia of Marine Resources. Van Nostrand and Reinhold Publ. Corp., New York.

NMFS.

1971a. Ocean quahog survey. Charter Cruise Report. Fishing Trawler Jo-Ann,
April 18-May 16, 1971. 4p.

NMFS.

1971b. Ocean quahog survey. Cruise Report. Delaware II Cruise 71-1,
June 1-July 23, 1971. August 16, 1971. 10p.

NMFS.

1971c. Ocean quahog survey. Research Vessel Cruise Report. R/V Rorqual,
August 16-30, 1971. 5p.

NMFS.

1974. Shellfish assessment survey. Cruise Report. Delaware II, June 13-28,
1974; August 5-10, 1974. 9p.

- NMFS.
1976. Shellfish assessment survey. Cruise Report. Delaware II, April 6-
May 13, 1976. 27p.
- NMFS.
1977. Shellfish assessment survey. Cruise Report. Delaware II, January 26-
March 17, 1977. 23p.
- Parker, P. S.
1966. Ocean clam survey off U.S. middle Atlantic coast - 1963. Commer.
Fish. Rev. 28(3): 1-9.
- Parker, P. S.
1967. Clam survey Ocean City, Maryland, to Cape Charles, Virginia. Commer.
Fish. Rev. 29(5): 56-64.
- Parker, P. S. and L. A. Fahlen.
1968. Clam survey off Virginia (Cape Charles to False Cape). Commer. Fish.
Rev. 39(1): 25-34.
- Parker, P. S. and E. D. McRae, Jr.
1970. The ocean quahog, Arctica islandica, resource of the northwestern
Atlantic. Fish. Ind. Res. 6(4): 185-195.
- Rathjen, W. F.
1977. Fisheries development in New England - a perspective. Mar. Fish. Rev.
39(2): 1-6.
- Ropes, J. W.
1976a. Trip Report. Commercial Vessel Valerie E., August 6-8, 1976. 11p.
- Ropes, J. W.
1976b. Trip Report. Commercial Vessel Gail Snow and Cora May Snow.
September 9-14, 1976. 14p.
- Ropes, J. W.
1976c. Trip Report. Commercial Vessel Cora May Snow. September 15-25, 1976.
13p.
- Ropes, J. W.
1976d. Trip Report. Commercial Vessel Cora May Snow. October 7-8, 1976.
11p.
- Ropes, J. W. and S. Chang.
1977. Impact on offshore sea clam populations (surf clam and ocean quahog)
associated with anoxic bottom water in the Middle Atlantic Bight during summer,
1976, p. 263-240. IN Oxygen depletion and associated environmental disturbances
in the Middle Atlantic Bight in 1976. A report on a series of interagency
workshops held in November and December, 1976. Technical Series Report No. 3,
Northeast Fisheries Center, NMFS, Sandy Hook, New Jersey, February 1977.
- Stanley, L.
1977. Centenarian quahogs indicate slow growth rate of species. National
Fishermen, June 1977. p. 36A.

Table 1. Annual landings and value of ocean quahogs by State (in thousands of pounds of meat and thousands of dollars), 1944-1976.

	RI		MA		CT		NJ		TOTAL	
	#	\$	#	\$	#	\$	#	\$	#	\$
1944	664	60	-	-	-	-	-	-	664	60
1945	1312	109	-	-	-	-	-	-	1312	109
1946	1510	126	-	-	-	-	-	-	1510	126
1947	311	20	-	-	-	-	-	-	311	20
1948	238	15	-	-	-	-	-	-	238	15
1949	63	5	-	-	-	-	-	-	63	5
1950	221	18	-	-	-	-	-	-	221	18
1951	205	15	-	-	-	-	-	-	205	15
1952	484 ^a	43	-	-	-	-	-	-	484	43
1953	276 ^b	25	-	-	-	-	-	-	276	25
1954	183 ^b	15	197	20	-	-	-	-	380	35
1955	157 ^b	18	287	29	-	-	-	-	444	47
1956	187	19	199	23	-	-	-	-	386	42
1957	127	13	262	35	-	-	-	-	389	48
1958	109	11	154	25	-	-	-	-	263	36
1959	95	10	-	-	-	-	-	-	95	10
1960	186	19	-	-	-	-	-	-	186	19
1961	124	12	-	-	-	-	-	-	124	12
1962	67	7	-	-	-	-	-	-	67	7
1963	104	10	-	-	-	-	-	-	104	10
1964	113	11	-	-	-	-	-	-	113	11
1965	93	11	-	-	-	-	-	-	93	11
1966	91	11	-	-	-	-	-	-	91	11
1967	45	6	-	-	-	-	-	-	45	6
1968	205	27	20	2	-	-	-	-	225	29
1969	472	69	82	17	85	13	-	-	639	99
1970	1435	251	4	2	308	52	-	-	1747	305
1971	1495	253	5	2	532	90	-	-	2032	345
1972	1392	233	<1	<1	8	2	-	-	1401	235
1973	1456	250	<1	<1	-	-	-	-	1457	250
1974	804	139	-	-	-	-	-	-	804	139
1975	1255	239	-	-	-	-	-	-	1255	239
1976	1618	406	-	-	-	-	4099	1237	5717	1643

^aIncludes small quantities of sea mussels.

^bIncludes both ocean quahogs and surf clams.

SOURCE: Fishery Statistics of the United States, 1944-1973; Rhode Island Landings, 1974-1976; Massachusetts Landings, 1974-1976; New Jersey Landings, 1974-1976.

Table 2. Biomass (millions of pounds, meats) of ocean quahogs, Arctica islandica, from Long Island south to Virginia - 1976.

Inches	2	2.5	3	3.5	4	Total Biomass (in millions of pounds)
<u>Long Island</u>						
Percent available	98.67	82.62	59.09	34.55	9.22	
Biomass available	3271.3	2739.2	1959.1	1145.5	305.7	3315.4
<u>New Jersey</u>						
Percent available	99.26	97.94	86.90	52.77	18.83	
Biomass available	1791.8	1768.0	1568.7	952.6	339.9	1805.2
<u>Delmarva</u>						
Percent available	99.83	98.7	86.87	56.65	24.42	
Biomass available	283.4	280.2	246.6	160.8	69.3	283.9
<u>Virginia</u>						
INSIGNIFICANT RESOURCES						
<u>All Areas</u>						
Percent available	98.96	87.14	67.01	39.94	11.88	
Biomass available	5363.2	4722.6	3631.7	2164.6	643.9	5419.6