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Ocean Quahog

by

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Distribution, Biology and Management

The ocean quahog, *Arctica islandica*, is a bivalve mollusk distributed in temperate and boreal waters on both sides of the North Atlantic Ocean. In the northeast Atlantic, quahogs occur from Newfoundland to Cape Hatteras. Ocean quahogs in US waters are managed as a single stock (Figure 35.1) although trends in abundance, recruitment and mortality regionally.

Ocean quahogs are found at depths from 8 to 400 m. Ocean quahogs further north occur closer to shore. The US stock resource is almost entirely within the Exclusive Economic Zone (EEZ, 3-200 mi from shore), outside of state waters and at depths between 20 and 80 m. The notable exception is fishable concentrations in state waters off the coast of Maine. Ocean quahogs are rarely found where bottom water temperatures exceed 16° C. They burrow in a variety of substrates and are often associated with fine sand.

Ocean quahogs are among the longest lived, slowest growing marine organisms in the world. Ocean quahogs off Southern New England, in the Mid-Atlantic Bight and on Georges Bank can live to at least 200 years. Ocean quahogs in the EEZ resource are relatively large and old, with most individuals 70-110 mm (2.8-4.3 in) shell length. Growth is slow after about age 20, which is also about the age at which many individuals become vulnerable to fishing. Growth is faster on Georges Bank and off Maine although ocean quahogs in Maine waters are seldom larger than 70 mm (2.8 in).

Size and age at sexual maturity are variable and poorly known. Based on studies in Icelandic waters, 10%, 50% and 90% of female ocean quahogs were sexually mature at 40, 64 and 88 mm (1.5, 2.5 and 3.5 in) shell length or approximately 2, 19 and 61 years of age. Spawning occurs over a protracted interval from summer through autumn. Free-floating larvae may drift far from their spawning location because they develop slowly and are planktonic for more than 30 days before settling. Major recruitment events appear to be separated by periods of decades.

Based on their growth, longevity and recruitment patterns, ocean quahogs are relatively unproductive and able to support only low levels of fishing (removals of a few percent per year). The current resource, which is still at a relatively high biomass level, consists of individuals that accumulated over many decades.

The Fishery

The ocean quahog fishery was among the first US fisheries managed using an individual transferable quota (ITQ) system. ITQ management was established in 1990 by the Mid-Atlantic Fishery Management Council under Amendment 8 to the Surf Clam-Ocean Quahog Fishery Management Plan (FMP). Management of the ocean quahog resource off Maine was addressed in Amendment 10, which was approved in 1999. Amendment 13, the most recent amendment, was approved in 2002. It implemented various measures to facilitate efficient management, including multi-year quotas and provisions for use of automatic vessel monitoring systems (VMS) aboard fishing vessels.

The principal gear used in the fishery is hydraulic clam dredges, which use jets of water to dislodge ocean quahogs from sediments. A smaller “dry” dredge (without hydraulic jets) is used in Maine waters. Recreational and foreign fishing do not occur in the EEZ.

Ocean quahogs were first harvested commercially during World War II off Rhode Island. Total landings never exceeded 2,000 mt of shucked meats until 1976. Annual ocean quahog landings increased from about 23,000 mt during 1979-1983 to about 20,000 mt of meats during 1987-1993. Landings declined from 1994 to 2000, increased during 2001-2003, but declined in 2005 to about 13,000 mt meats, which was the lowest level since 1980. Landings from Maine waters are minor (< 2% of EEZ landings) (Table 35.1, Figure 35.2).

Large ocean quahogs from the EEZ have relatively small, dark and tough meats which prevent their use as clam strips or in higher valued products. Landings from the EEZ are used in processed clam products such as soups, chowder and sauces. Landings of smaller ocean quahogs from Maine waters are marketed as “mahogany clams” sold on the half-shell market or for steaming.

Fishing effort for ocean quahogs in the US EEZ increased from 21,000 to 46,000 hours fished during 1980-1991, decreased to 33,000 hours during 1996, varied without trend until 2004, and then declined to 22,000 hours during 2005, which was the lowest level since 1982. Number of trips per year declined from 3,400 to 1,215 during 1991-2005. The number of active permits during each year declined from 92 in 1991 to 47 in 2005. Declines were due to industry consolidation, market factors and use of larger and more efficient vessels.

A substantial ocean quahog resource exists on Georges Bank in the EEZ, but this area has been closed to harvesting of ocean quahogs since 1990 due to the risk of paralytic shellfish poison (PSP).

Research Vessel Surveys and Commercial LPUE Indices

NEFSC clam surveys during 1982-2005 indicate that ocean quahog biomass (meat weights) has declined by about 75% off Delmarva and 50% off New Jersey where the traditional southern fishing grounds are located. In contrast, survey indices indicate relatively high and stable biomass off Long Island, in Southern New England and on Georges Bank.

Trends in LPUE (landings per unit of fishing effort, mt meats per hour fished) at the regional level are similar to trends in research survey trends. LPUE during 2005 was relatively low off Delmarva and New Jersey and nearshore where the fishery had operated for many years.

Assessment Results

Total ocean quahog biomass has been gradually decreasing since the late 1970s (Figure 35.3). Biomass during 2005 (3.05 million mt meat weight) was 78% of that during 1978 (3.91 million mt meat weight). Estimated stock biomass in the exploitable portion of the stock (less Georges Bank where fishing is not allowed) in 2005 (1.78 million mt meat weight) was 67% of that during 1978 (2.64 million mt).

Fishing mortality (Figure 35.3) on ocean quahogs has been low ($F=0.008$ and $F=0.010$ per year) and stable since 1985. In contrast, losses due to natural mortality are about 2% per year.

Biological Reference Points

The biomass target for ocean quahogs is specified in the FMP as one-half of the virgin (unfished) biomass for the whole stock (Table 35.2). Virgin biomass is assumed to be the same as the biomass in 1978 (3.91 million mt meats). On this basis, the biomass target is 1.95 million mt meats. The biomass threshold is one half of the target value or 977 thousand mt meats.

The fishing mortality target for the exploitable stock (less Georges Bank) is defined as $F_{0.1}=0.028$ (2.8%) per year. The fishing mortality threshold as $F_{25\%}=0.052$ (5.2%) per year.

On the basis of current reference points (Table 35.2), ocean quahogs were not overfished in 2005 because the estimated biomass for the entire stock (3.05 million mt) exceeded the target of 1.95 million mt. Overfishing did not occur because the estimated fishing mortality $F=0.0075$ (0.75% per year) during 2005 for the exploited region (excluding Georges Bank) was less than the fishing mortality target of 0.028 (2.8%) per year.

Summary

Ocean quahog biomass remains relatively high and fishing mortality rates are relatively low. The stock is not overfished and overfishing is not occurring.

Table 35. 1. Quotas, landings data and estimates of biomass and fishing mortality for ocean quahogs in US waters (thousand metric tons).

Category	1986-95 Average	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Quota	24.9	20.2	19.6	18.1	20.4	20.4	20.4	20.4	20.4	22.7	24.2
Landings	21.3	20.1	19.6	17.9	17.4	14.7	17.1	17.9	18.8	17.6	13.6
Biomass	3,470	3,435	3,401	3,367	3,335	3,303	3,272	3,243	3,214	3,186	3,159
Fishing Mortality	0.01	0.01	0.01	0.009	0.009	0.008	0.009	0.01	0.01	0.01	0.008

Table 35.2. Yield and SSB per recruit, and MSY based reference points for ocean quahogs.

MSY-based Reference Points

- Biomass threshold = 977,000 mt meats
- Biomass target = 1,950,000 mt meats
- Fishing mortality threshold $F_{25\%}$ = 0.052
- Fishing mortality target¹ $F_{0.1}$ = 0.028

¹ For the exploited region only (i.e. entire stock area less Georges Bank)

For further information

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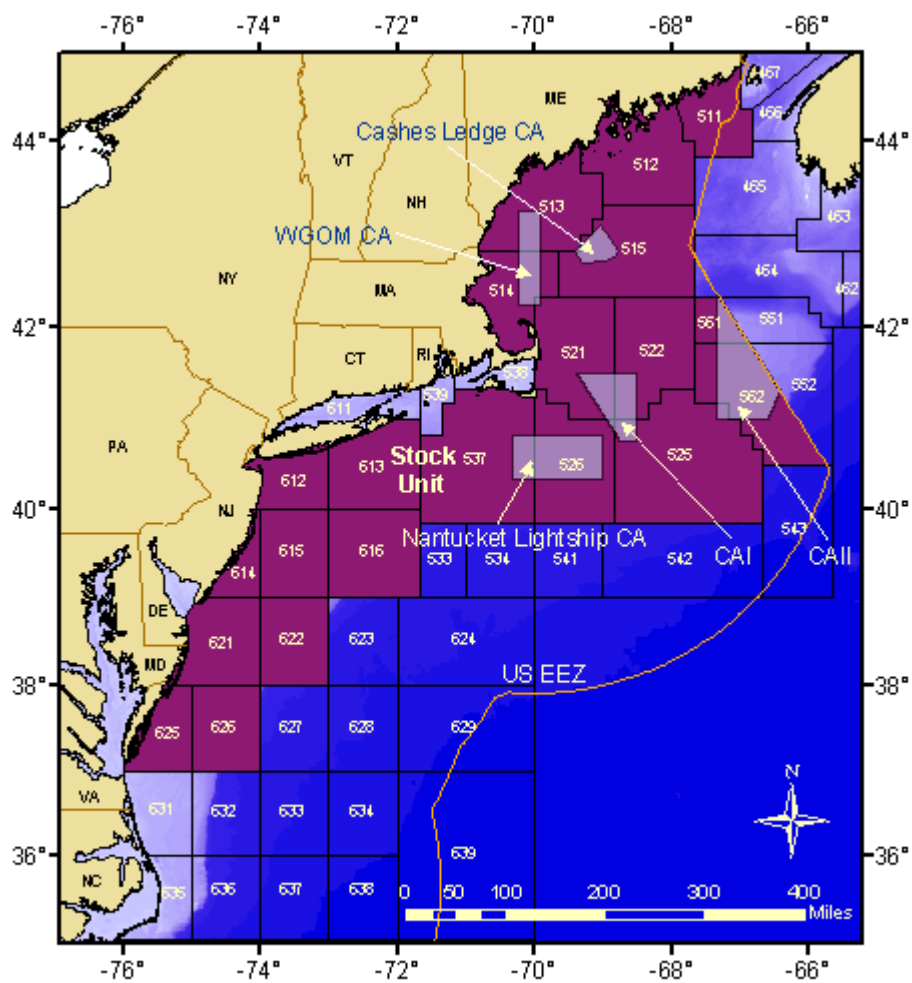


Figure 35.1. Statistical areas used to define the US ocean quahog management unit.

Ocean Quahog Total Commercial Landings

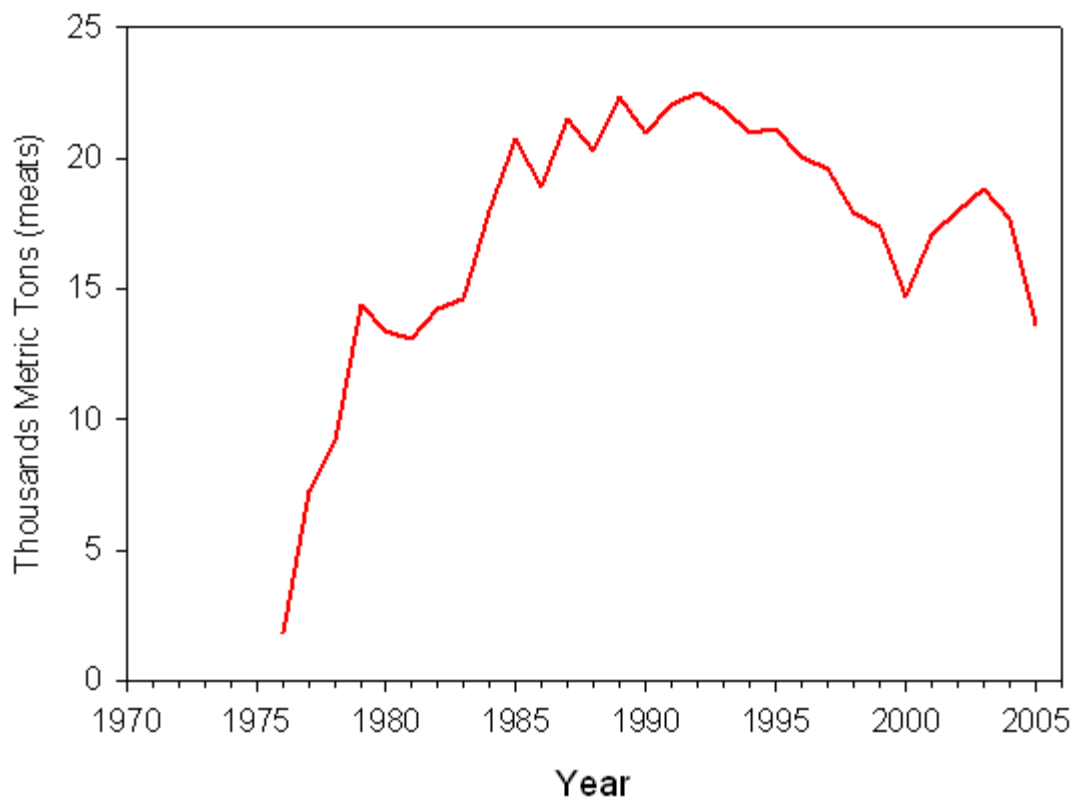


Figure 35.2. Total commercial landings of Ocean quahog, 1976-2005.

Ocean Quahog Biomass, Fishing Mortality, and Exploitation Rate

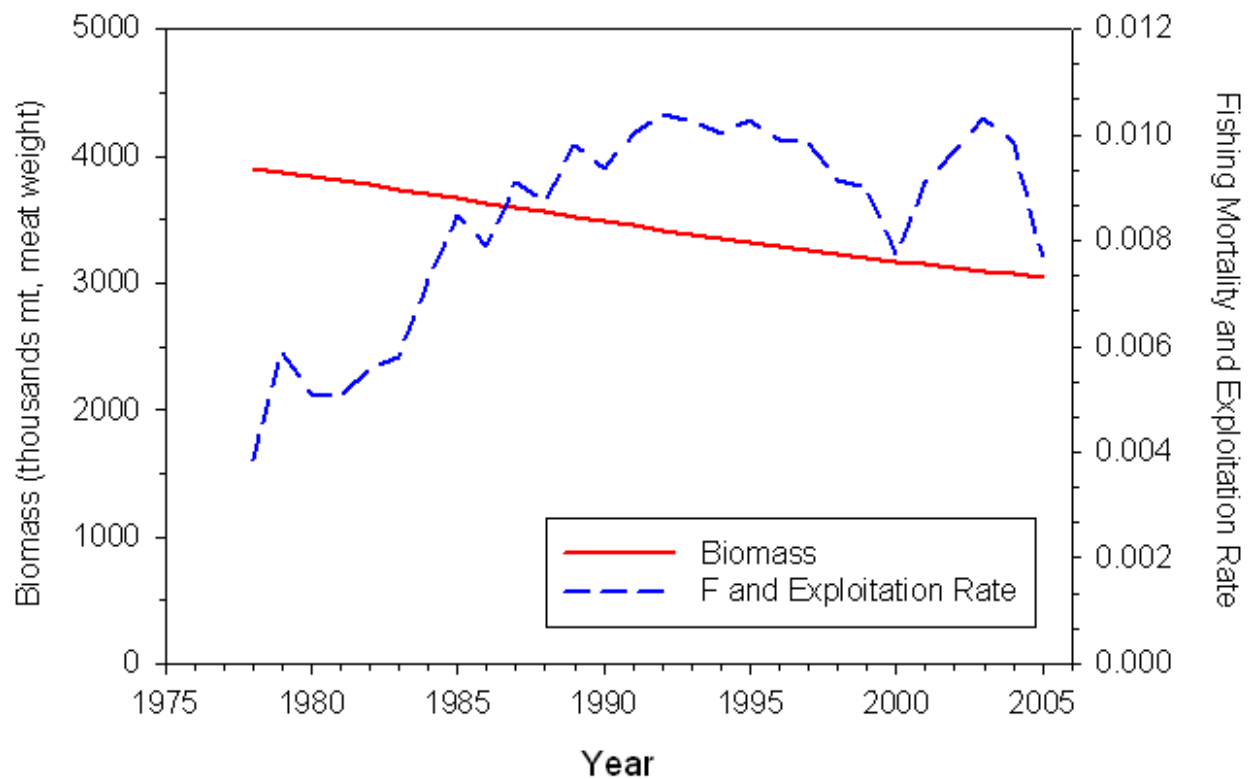


Figure 35.3. Biomass estimates for the entire ocean quahog stock. Fishing mortality and exploitation rates (landings/biomass) for the exploitable stock, which excludes Georges Bank, during 1978-2005.