Northeast Invertebrate Fisheries

Unit 4

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INTRODUCTION

Offshore fisheries for crustaceans and mollusks are among the most valuable in the region. U.S. commercial landings of American lobster (32,100 metric tons (t)) and sea scallops (6,000 t) in 1997 ranked first and second in overall ex-vessel value with $223 million and $87 million, respectively. Additionally, landings of surfclams, ocean quahogs, squids, and northern shrimp contributed another $100 million in revenue. The combined value of these fisheries exceeds that for all Northeast offshore finfish fisheries combined.

Four separate fishery management plans regulate the harvest of these invertebrate species. Two of these are the Mid-Atlantic Fishery Management Council's Surfclam and Ocean Quahog Fishery Management Plan and the New England Fishery Management Council's Sea Scallop Fishery Management Plan. The northern shrimp and American lobster fisheries are regulated by the Atlantic States Marine Fisheries Commission under the Atlantic Coastal Fisheries Cooperative Management Act.

SPECIES AND STATUS

American Lobster

Comprehensive stock assessments of the American lobster resource, last completed in 1996 (Northeast Fisheries Science Center, 1996a,b), indicated that recent fishing mortality rates on the Gulf of Maine portion of the resource were nearly double the overfishing level. For the resource fished inshore from Cape Cod through Long Island Sound, fishing mortality was substantially greater and nearly three times higher than the overfishing level. Throughout the range, the fishery has become increasingly dependent on newly recruited animals (in some areas more than 90% of the lobsters landed are newly recruited to the fishery), with a great majority of all lobsters landed not yet sexually mature. Fishing mortality rates for both inshore and offshore populations greatly exceed the rates that would provide maximum yields. Recent average landings of lobsters have been 32,300 t (Table 4-1), with landings in 1997 also at that level (Figure 4-1).

Sea Scallop

Sea scallops are harvested on the continental shelf from the Virginia Capes to the "Hague Line," which separates the U.S. and Canadian portions of Georges Bank, and in the Gulf of Maine. Canadian landings on Georges Bank represent a significant part of the total (Figure 4-2), i.e. 30% (3,100 t) of the recent average yield (Table 4-1). Sea scallops are harvested primarily using epibenthic dredges in the Gulf of Maine, Georges Bank, and the Mid-Atlantic Bight. A small but rapidly growing proportion of the landings is taken with otter trawls in the Mid-Atlantic Bight.

Management of the sea scallop fishery by the New England Fishery Management Council changed markedly in 1994 as maximum meat count regulations (numbers of scallop meats per pound) were eliminated. In their place, controls on the number of days at sea, reduced crew size, and increased dredge mesh-ring sizes were instituted. Also, the harvesting of sea scallops within three areas in the Georges Bank and Nantucket Shoals region, closed to protect depressed groundfish stocks, has been prohibited since December 1994.

A comprehensive assessment completed in the fall of 1996 (Northeast Fisheries Science Center,

Table 4-1
Productivity in metric tons and status of Northeast invertebrate fisheries resources.

Species	Recent average yield (RAY)[1]	Current potential yield (CPY)	Long-term potential yield (LTPY)	Fishery utilization level	Stock level relative to LTPY
American lobster	32,300	20,000	Unknown	Over	Above
Surfclams[2,3,4]	27,700	19,800	22,000	Under	Near
Ocean quahogs[2]	21,200	18,100	25,000	Full	Near
Longfin squid	15,600	21,000	26,000	Full	Near
Shortfin squid	14,900	19,000	24,000	Full	Near
Sea scallops[2,5]	10,200	3,700	13,300	Over	Below
Northern shrimp	7,600	5,000	5,000	Unknown[6]	Unknown
Red crab	1,000	2,700	2,700	Unknown	Unknown
Total	130,500	109,300	138,000		
U.S. Subtotal	127,200	108,100	133,900		

[1]1995–97 average (including foreign landings).
[2]Data for bivalve species are in shucked meat weights.
[3]RAY includes landings from both inshore (state) and offshore (U.S. EEZ) areas.
[4]CPY and LTPY refers only to EEZ.
[5]For sea scallops, U.S. portion of RAY is 7,100 t (70% of total).
[6]High fishing mortality. No overfishing definition currently in place.

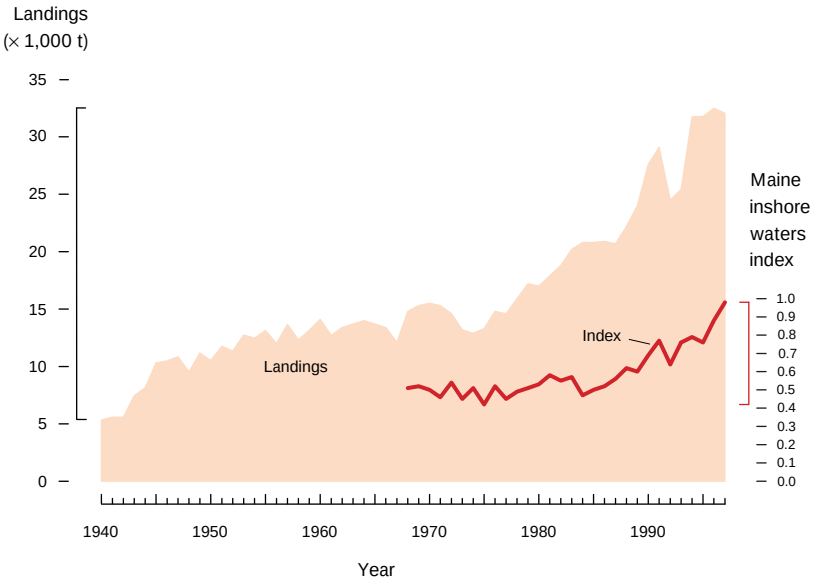

Figure 4-1
Landings of American lobster in the northeastern United States, 1940–97, in metric tons (t). The index shows the average number of legal-sized lobsters caught per trap averaged over a 24-hour period in Maine inshore waters.

1997a,b) indicated that sea scallops were overfished both on Georges Bank and in the Mid-Atlantic Bight and were at a low overall level of abundance. Reductions in days at sea and crew size and an increase in mesh-ring size have shown limited effectiveness in preventing the resources from being overfished. In contrast, the sea scallop biomass within the closed groundfish areas tripled during the first 20 months of closure. Sea scallop populations are characterized by wide variability in year-class strength and little relationship among dominant cohorts between the Mid-Atlantic Bight and Georges Bank. Several strong year classes resulted in record high U.S. landings in 1990–91 of about 17,000 t (Figure 4-2), but landings dropped abruptly in 1993 to only 7,400 t, remaining at about that level during 1994–96. Sea scallop landings declined further to about 6,000 t in 1997, reflecting much poorer recruitment in recent years. Fisheries in all areas depend almost entirely on the growth of new recruits into the exploitable size range. In the Mid-Atlantic Bight, current landings are dependent on poor 1996 and 1997 year classes. Additional areas in the Mid-Atlantic Bight were closed in April 1998 under the authority of the Secretary of Commerce. Given the rapid growth, low natural mortality rates, and early age at entry into the fishery by this species, considerable yield is currently being foregone because of growth overfishing.

Atlantic Surfclams and Ocean Quahogs

These shellfish are harvested with hydraulic dredges in the U.S. Exclusive Economic Zone (EEZ). The majority of surfclams are taken off New Jersey, while the majority of landings of ocean quahogs now come from Southern New England and Long Island waters. Small quantities of ocean quahogs are also taken off the coast of Maine and sold at a higher price to the raw seafood restaurant trade (halfshell market). Fisheries for both of

these species have been closed on Georges Bank since late 1989 due to the risk of paralytic shellfish poisoning. They are managed under the Surfclam and Ocean Quahog Fishery Management Plan of the Mid-Atlantic Fisheries Management Council. The primary management tool is a system of individual transferable quotas allocated on the basis of historical participation in the fisheries.

Surfclam landings increased steadily during the 1960's and early 1970's, peaking in 1974. Subsequently, a succession of poor year classes, combined with a large die-off of the surfclam resource off the New Jersey coast in 1976, led to a very low stock biomass and reduced landings. Since 1977, a fishery management plan has regulated total annual surfclam landings from the 200-mile Federal zone (where most landings are derived) and has addressed the earlier significant overcapitalization in the fishery. Large year classes spawned in 1976 and 1977 off New Jersey and the Delmarva Peninsula supported the fishery throughout the 1980's. Evidence from the most recent assessment (Northeast Fisheries Science Center, 1998a,b) suggests consistent but modest levels of recruitment. New incoming year classes have supported the fishery in the 1990's. Based on surfclam biomass production off New Jersey, where most harvesting takes place, there are adequate resources to support the fishery at the current harvest level in the near future. Recent annual landings from state and Federal waters averaged 27,700 t (Table 4-1).

Ocean quahog landings increased rapidly as the surfclam resource declined in the mid 1970's, and a market substitute for processed clam products developed. Ocean quahogs inhabit relatively deep waters of the Mid-Atlantic continental shelf and Georges Bank. In the Gulf of Maine, they are found relatively near the shore in these cooler waters. Ocean quahogs are one of the longest living (>100 years) and slowest growing marine bivalves in the world. Current annual landings (recent average yield is 21,200 t, Table 4-1) can be sustained for the next 54–76 years in existing fishable areas (Northeast Fisheries Science Center, 1998c,d). Over the past two decades, ocean quahog fisheries have moved progressively northward from the Mid-Atlantic Bight to Southern New England. Large resources still exist off Southern New England and on Georges Bank, but portions of these areas cannot be easily fished with existing technology due to depth or bottom type.

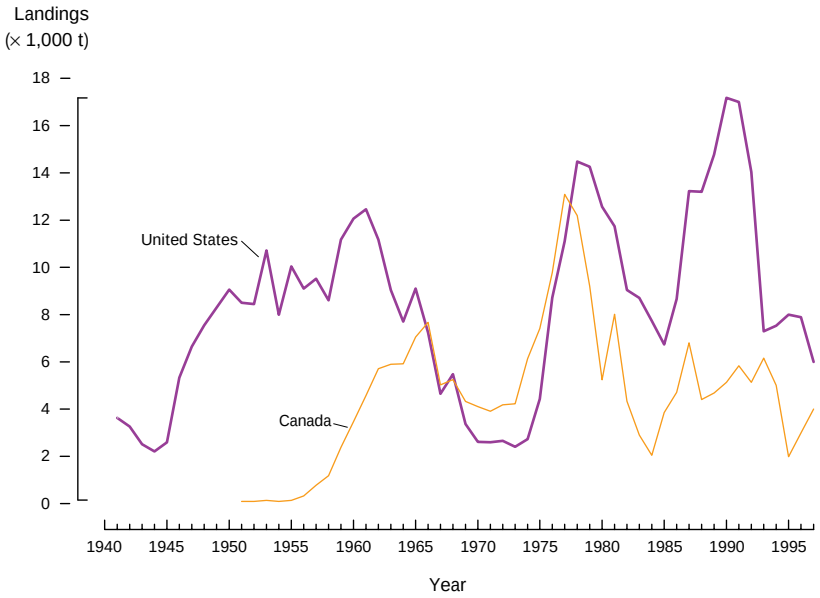

Figure 4-2
Atlantic sea scallop landings by the United States and Canada, 1940–97.

Northern Shrimp

Gulf of Maine northern shrimp are at the southern extent of their geographical range, and abundance is generally associated with low water temperatures. Northern shrimp are harvested using small-mesh trawls and inshore traps. The fishery began as an inshore winter fishery, but expanded during the 1960's to a year-round offshore fishery until the stock collapsed in the 1970's, following peak landings of 12,800 t in 1969, which prompted a closure of the fishery. A restricted seasonal fishery resumed in the 1980's. Landings have increased substantially since 1994, peaked at 9,500 t in 1996, declined to 6,400 t in 1997, and averaged 7,600 t during 1995–97 (Table 4-1). In response to concerns that the stock cannot sustain recent increases in fishing effort, which were associated with restrictions on the groundfish trawl fishery, a new analytical assessment was completed in 1997 (Northeast Fisheries Science Center, 1997c,d) which indicated that the stock is currently at a low level of biomass and the fishing mortality rate exceeds sustainable levels.

Longfin Inshore Squid

Longfin inshore squid form commercially significant aggregations that sustain otter trawl and trap fisheries from Georges Bank to Cape Hatteras, N.C. Recent research shows that longfin squid generally live for less than 1 year, grow rapidly, and spawn year-round. The original fishery began in the 1800's as a bait fishery, and a valuable market for human consumption developed in the 1960's. Annual landings fluctuate widely because squid generations have little overlap from year to year, and seasonal dynamics are sensitive to environmental factors. Fishing patterns reflect the seasonal distribution of the stock—offshore from October to March, then inshore from April to September. In recent years, most landings were taken in the offshore fishery. The most recent stock assessment of longfin squid (Northeast Fisheries Science Center, 1996c,d) indicated that the stock was fully exploited and at an above-average biomass level. Recent average landings were 15,600 t (Table 4-1), with 16,200 t landed in 1997 which generated $26 million in ex-vessel revenue.

Northern Shortfin Squid

Northern shortfin squid are fished commercially from Cape Hatteras, N.C., to Newfoundland, Can., and are considered a single stock throughout that range. This species exhibits rapid growth, has a lifespan of about 1 year, and undergoes long-distance migrations. Both its distribution and annual abundance are strongly influenced by oceanographic factors. The domestic fishery generally occurs during summer and autumn in offshore waters south of New Jersey and is conducted by otter trawl vessels, the larger of which freeze the whole squid at sea, while the smaller vessels deliver fresh squid. A robust distant-water fishery existed during the 1970's and 1980's, with the bulk of the landings occurring off Canada. Peak international landings of nearly 180,000 t were taken in 1979, 90% of which were from Canadian waters. This fishery subsequently collapsed in the early 1980's, and annual landings during 1983–96 averaged only about 3,300 t, but demonstrated a significant increase to 15,400 t in 1997. U.S. landings increased steadily from 1988 to a record high of 18,350 t in 1994, but they have dropped somewhat to a recent average yield of 14,900 t (Table 4-1). This decline has been due primarily to a weak export market. The stock was classified as fully utilized and at a medium level of biomass when it was last assessed (Northeast Fisheries Science Center, 1996c,d).

ISSUES AND PROGRESS

Individual Transferable Quota

An individual transferable quota system for the surfclam and ocean quahog fisheries was implemented in 1990 (Amendment 8 to the fishery management plan). This system eliminated the need for complex restrictions on the amount of effort and time each vessel could fish, which had been characteristic of the management system under the Mid-Atlantic Fishery Management Council since 1977. As a consequence of the individual transferable quota, the number of vessels in the surfclam fleet has decreased substantially, with a reduction from about 160 to fewer than 100 vessels in the first year alone. Further consolidation of fishing effort, as well as construction of new and more efficient vessels to reduce overhead, is expected in the future. Fewer than 60 vessels are now used to fish for both surfclams and ocean quahogs.

Scientific Advice and Adequacy of Assessments

Considerable progress has been made in the past several years in assessing the status of many of the exploited invertebrate stocks of the Northeast region. In 1996, an independent panel of internationally recognized scientists, convened by the Atlantic States Marine Fisheries Commission and the National Marine Fisheries Service (NMFS), reviewed and endorsed the scientific basis for the existing overfishing definition for lobsters and the validity of current assessment methods. This panel offered a number of recommendations for improvements (Atlantic States Marine Fisheries Commission, 1996). A major benchmark assessment of American lobsters followed later in 1996 (Northeast Fisheries Science Center, 1996a) and

employed length-based cohort analysis, life-history-stage-based population estimation models, and an improved egg-production-per-recruit model as the basis for management advice. In 1997, a major breakthrough was made in the ability to provide reliable swept-area estimates of surfclam and ocean quahog populations from research vessel dredge surveys as a result of successful NMFS-academia-industry field experiments to estimate efficiency of the research dredge and improved capability to monitor dredge performance (Northeast Fisheries Science Center, 1998a). Also in 1997, a first-time analytical assessment of Gulf of Maine northern shrimp was conducted integrating catch and survey abundance indices into estimates of stock size and fishing mortality rates (Northeast Fisheries Science Center, 1997c).

Management Controls

Fishing mortality on sea scallops is well above the level defined as constituting overfishing. In 1994, the New England Fishery Management Council implemented Amendment 4 to the fishery management plan which was aimed at reducing fishing mortality on sea scallops. Measures included provisions to reduce fishing effort through days-at-sea reductions and a moratorium on new vessel entrants, while removing the meat count requirement. Meat count regulations did not control the overall rate of fishing mortality, but redirected mortality onto older scallops. To reduce fishing mortality rates on smaller scallops, the minimum ring diameter in the chain bag at the end of the scallop dredges was increased to 3-1/2 inches (87.5 mm). This was intended to compensate for the removal of the meat count requirement by reducing fishing mortality on small scallops. Given the current overfished status of the sea scallop resource, the New England Fishery Management Council is currently considering additional management measures for reducing fishing mortality, protecting undersized scallops in the Mid-Atlantic region by means of closed areas, and possibly allowing limited scalloping in the three groundfish closure areas in the Georges Bank-Nantucket Shoals region.

To comply with the overfishing definition, the fishing mortality rate of the lobster fishery needs to be reduced significantly. Recent increases in landings stem from increased effort and apparent increases in abundance most likely due to favorable environmental conditions for the survival of pre-recruits. The lobster fishery is almost exclusively supported by animals recently molted, most of which are not sexually mature. At present, American lobster populations are regulated primarily by a minimum carapace length set at 3-1/4 inches (81.3 mm). Amendment 3 to the American Lobster Fishery Management Plan, approved in December 1997, incorporates effort reduction and area management and contains regulations on minimum and maximum landing sizes, prohibition of berried and v-notched[1] female lobsters, limits on gauge size, trap sizes and numbers, limits on nontrap fishermen landings, and requirements for biodegradable mesh panels and escape vents in traps. U.S. management effort continues to be complicated by the international trade in live lobsters from Canada.

The Atlantic States Marine Fisheries Commission regulates the northern shrimp fishery in the Gulf of Maine. Regulations control the duration of the harvesting season (December to May) and gear specifications. However, the fishery has open access, and an overfishing threshold is not defined by the current fishery management plan despite concerns that the stock is overfished.

The Mid-Atlantic Fishery Management Council develops management measures for squids under provisions of the Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan. Management targets for both species of squid were recently reevaluated according to new research results on life history parameters. Research continues to improve our understanding of squid growth, maturity, and reproductive dynamics to better assess appropriate levels of sustainable fishing. The United States, which joined the Northwest Atlantic Fisheries Organization at the end of 1995, is actively promoting efforts to implement more realistic management goals for this species. Real-time management of both squid species is desirable to avoid

[1]V-notching is a mark inscribed on the carapaces of berried females so that they will be recognized as female and released, even when not carrying eggs.

recruitment overfishing during periods of poor recruitment and to maximize landings during periods of good recruitment.

Surfclams and ocean quahogs have been managed since 1977 and by individual transferable quotas since 1990 (Amendment 8 to the fishery management plan). In 1996, Amendment 9 changed overfishing definitions for both species from a maximum sustainable yield basis to a maximum spawning potential basis. Amendment 10, currently under consideration, will specify management regulations for an ocean quahog fishery off the coast of Maine.

Bycatch and Multispecies Interactions

Bycatch and associated discard of groundfish in the Gulf of Maine trawl fishery for northern shrimp, which had earlier been considerable, has been reduced following the adoption of a fish-excluding device, the "Nordmore Grate," as a condition of participation in this fishery. Sea sampling efforts continue to monitor this fishery. Bycatch of goosefish and flounder in the sea scallop fishery continues to be a concern as a source of fishing mortality on these stocks as a whole, and particularly on very small fish. Scalloping, either by dredges or otter trawls, is prohibited in several large areas of Southern New England and Georges Bank which have been closed since December 1994 to assist in rebuilding depleted stocks of cod, haddock, and yellowtail flounder.

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