# Chapter 4.
# Shellfish, Finfish and Wildlife


**Chapter Summary**

Pleasant Bay's shellfish, finfish and wildlife resources are notable for their ecological significance, and are also important assets to the community. Nature viewing, shellfishing, and finfishing are among the most popular and highly valued Bay activities. The sustainability of these resources has been identified by area residents as a priority for the resource management plan.

Of the forty-five species of shellfish in the Bay, quahogs, scallops and soft shell clams are, historically, the most popular for commercial and recreational fishing. All three species have experienced marked declines in harvests over the past decade. The precise causes of decline, whether natural, human-induced, or both, are not known. In their place, alternative shellfish species, such as razor clams, eels and horseshoe crabs, are being fished more actively. However, there are gaps in the regulations of these alternative species, and much is still unknown about the impacts that sustained fishing ,or the use of various fishing techniques, could have on them.

The Bay's thirty-six finfish species are also a highly valued and ecologically significant resource. Pleasant Bay is well known as one of the most popular sport fishing areas in the state. Flounder, eel, and lobster are among the Bay's commercial fisheries. Several offshore commercial species -- American eel, winter flounder, white hake, pollock, and menhaden -- rely on the Bay's warm waters and extensive marsh areas to provide nursery areas. Numerous conditions influence the productivity of the Bay's finfish species. Significant trends include the virtual disappearance of winter flounder, and the resurgence of bass and blue fish stocks. Also, there are two active alewife fish runs, and four historic, but inactive, runs.

Pleasant Bay is also renowned for its terrestrial and avian wildlife. There are nine state-listed rare plant and animal species that occur in the Pleasant Bay area. Animals found in the Pleasant Bay area include four species listed as threatened or endangered, and 248 species of birds, including many migratory species. The Bay's varied topography and vegetation – including stands of pitch pine, scrub oak, and cedar -- provide a number of significant, and increasingly rare, habitats. Several of the Bay's inter-tidal flats and woodland habitats are threatened by encroaching land uses, or impacts from noise and pollution. There is also concern that use of tidal flats for aquaculture may diminish the effectiveness of those areas as feeding grounds for migratory birds or other marine species.


## 4.1 Shellfish Resources

Although Pleasant Bay is home to some forty-five species of shellfish, three species -- quahogs, scallops, and soft shell clams -- have historically dominated commercial and recreational shellfishing here. However, twenty-year harvest data

collected by Orleans, Chatham, and Harwich show a sustained decline in harvests for all three species. The annual average harvest for the three species combined was 22,275 bushels between 1975 and 1985, ten times greater than the annual average harvest between 1985 and 1995. In the absence of extensive field measurements of shellfish densities, reported harvest data provides a reasonable indication of productivity trends. All three experienced exceptional harvest years from 1975 through 1985, followed by precipitous declines from 1985 through 1995. In response to declines in the three species, alternative species such as razor clams have emerged as commercially viable species. However, harvests of alternative species are not yet at a level that would compensate -- in volume or economic value -- for the drop in harvests for quahogs, scallops, and soft shell clams.

PLEASANT BAY SHELLFISH HARVESTS 1975-1995 (Bushels)

| | 1975-1985 | % Total '75-'85 | 1986-1995 | % Total '86-'95 |
|---|---|---|---|---|
| Quahogs | 59,564 | 24 | 8,002 | 35.2 |
| Scallops | 169,224 | 69 | 6,915 | 30.4 |
| Clams | 16,243 | 7 | 7,832 | 34.4 |
| TOTAL | 245,031 | 100 | 22,749 | 100 |
| Total Annual Average | 22,275 | | 2,275 | |

Source: Offices of Orleans Shellfish Constable, Chatham Shellfish Warden, Harwich Natural Resources Officer.

Harvest data, together with input from local shellfish officials and fishermen, suggest that the productivity of the Bay's primary shellfisheries is in decline. Numerous reasons are offered to account for harvest declines, including the dynamics of natural productivity cycles, an increase in shellfish predators, and sustained over-fishing of some species. Further study will be needed to pinpoint the causes for the declines, and the strategies for addressing those causes. This chapter will explore trends in the productivity and habitat of the Bay's predominant shellfish species. Other issues concerning shellfish sustainability, and management of shellfish resources are discussed in Chapter 10.

### 4.1.1 Quahogs (Mercenaria mercenaria)

#### 4.1.1.1 Trends in Resource Location and Productivity

The status and trend of the Bay's quahog resource is based on historic information as well as current records and observations of shellfish officials and shellfishermen gathered for the resource management plan. The comparison of historic and current data suggests that quahogs, once the most abundant and productive shellfish resource in Pleasant Bay, are now in an apparent decline.

A study conducted by the Massachusetts Division of Marine Fisheries (DMF) thirty years ago provided information on the location and productivity of quahogs in the Bay. Based on square foot samples taken at various locations in the Bay, the study concluded that Pleasant Bay at the time was probably the most productive quahog area in

Barnstable County. [31] The status of the quahog resource at that time followed a fifty year trend of "long term gradual increase with only intermittent and brief declines."[32] Notwithstanding the overall trend, the study's samples and review of historic data suggested that quahog productivity had been cyclical At the turn of the century, quahogs were an abundant and active commercial fishery. By the late 1920's, increased demand for the resource prompted the towns to initiate propagation efforts. A decline in natural sets was observed between 1940 and 1956. From the late 1950s through the time of the study, abundant natural sets and sound regulation were credited with sustaining a robust fishery.[33]

Most of the quahog fishery at the time of the DMF study was located on 640 acres of bottom in Little Pleasant Bay, and the west side of Big Pleasant Bay[34] This was consistent with earlier records that located most of that productive quahog area in Orleans, with some productive acreage in Harwich, and in Ryder's Cove and Crow's Pond in Chatham.

The present location and density of quahog beds in the Bay suggests a much smaller and less productive resource. Today, quahogs are actively harvested on 473 acres in the Bay. Densities within the beds are also noticeably lower than reported in earlier studies. In 1964, a square foot sample taken in Orleans, for example, estimated more than 68,000 bushels on a twenty-seven acre area, not accounting for juveniles and mortality. By comparison, recent square foot densities taken in Harwich and densities estimated in Orleans and Chatham indicated signficantly less shellfish in most areas.

Recent local harvest data also suggests that quahogs are no longer the most productive shellfish resource in the Bay, and that productivity measured by harvests is on a long-term decline. Quahogs accounted for nearly twenty-five per cent of all shellfish harvested in the Bay between 1975 and 1985. The average annual yield during that period was 5,415 bushels. Comparatively, the total yield from 1986 to 1995 was only 8,002 bushels, or 800 bushels per year.

### 4.1.1.2 Habitat Conditions

The predominant quahog habitat described in the DMF study was sandy mud covered with silt accumulation. Habitat conditions reported for the resource management plan are predominantly a mixture of sand-shell and mud. The DMF study also found that the most productive quahog areas were in deeper water, with habitat depths ranging from one to sixteen feet. The growing season for quahogs is five months, from May through

[31] Fiske,et al, *A Study of the Marine Resources of Pleasant Bay*. Massachusetts Department of Natural Resources, Division of Marine Fisheries. May, 1967.
[32] Fiske,et al, *A Study of the Marine Resources of Pleasant Bay*. Massachusetts Department of Natural Resources, Division of Marine Fisheries. May, 1967.
[33] Fiske,et al, *A Study of the Marine Resources of Pleasant Bay*. Massachusetts Department of Natural Resources, Division of Marine Fisheries. May, 1967.
[34] Fiske,et al, *A Study of the Marine Resources of Pleasant Bay*. Massachusetts Department of Natural Resources, Division of Marine Fisheries. May, 1967.

September, with spawning occurring in June and July when water temperatures are slightly higher. [35]

### 4.1.2 Scallops (Argopecten irradians irradians)

#### 4.1.2.1 Trends in Resource Location and Productivity

Historically, scallops have had a sporadic and elusive existence in Pleasant Bay. However, recent local harvest data indicates that scallops, by far, accounted for the largest percentage of recorded landings of any shellfish species in Pleasant Bay. Scallops accounted for two-thirds of all shellfish harvested in Pleasant Bay from 1975 to 1985. A closer look at scallop harvest data reveals tremendous variations in the size of harvests from year to year. From 1975 to 1979, total harvests were mostly well under 1,000 bushels, except for 1977 when the harvest totaled 12,000 bushels. A more sustained spike in harvests occurred from 1980 to 1983 when the average annual yield was over 30,000 bushels, and as high as 72,000 bushels in 1983. Fewer than 1,000 bushels per year were harvested in eight of the eleven years between 1984 and 1995.

In addition to seasonal variations in productivity, municipal harvest data points out the geographic concentrations of most large scallop harvests. In 1980 Chatham reported more than 24,000 bushels in its Pleasant Bay waters, compared to 4,500 bushels in Orleans and only fifty bushels in Harwich. In 1982, Orleans reported 4,200 bushels, Harwich none, and Chatham 39,000 bushels. The following year, Orleans reported 44,000 bushels, Harwich 250 and Chatham 28,000 bushels.

Migration of scallop beds limits the ability to precisely locate the resource. The DMF study found scallops to be located primarily in Big Pleasant Bay, and to a lesser extent north of Sipson's Island and Little Pleasant Bay. Sampling also revealed the presence of scallops in Crow's Pond, Paw Wah Pond, and near Strong Island. Current surveys indicate there are 3,165 acres of scallop habitat in Pleasant Bay. All of Little Pleasant Bay extending along Crooked Channel to the east of Strong Island, most of Big Pleasant Bay, and areas in Crow's Pond, Ryder's Cove and Bassing Harbor have been identified as scallop habitat areas. These are areas where significant densities of scallops have been known to exist in the last five to ten years. Location of habitat, rather than location of scallop beds, was determined to be more relevant to on-going resource management because of the tremendous variability of location and density of beds from year to year.

#### 4.1.2.2 Habitat Conditions

[35] Fiske,et al, *A Study of the Marine Resources of Pleasant Bay*. Massachusetts Department of Natural Resources, Division of Marine Fisheries. May, 1967.

Historically, the productivity of scallops has largely been tied to the presence of eelgrass. An eelgrass blight in 1931 was coincident with the disappearance of scallops from the Bay. [36] Ironically, the DMF study reported that the rapid spread of eelgrass hampered sampling and was a problem for scallop harvesters. As discussed in Chapter 3, more emphasis is being placed on the value of the Bay's eelgrass resources today.

### 4.1.3 Soft Shell Clams (Mya arenaria)

#### 4.1.3.1 Trends in Resource Location and Productivity

In comparison with quahogs and scallops, the volume of soft shell clams harvested from the Bay has declined in recent years, but constitutes a growing share of overall harvests. More than 16,000 bushels of soft shell clams were harvested from the Bay between 1975 and 1985, accounting for seven per cent of all shellfish harvested during that period. Between 1986 and 1995 less than half that volume was harvested, but it accounted for more than one-third of the total shellfish harvested. The longest sustained spike in soft shell clam harvests during this period occurred from 1980 to 1985 when annual harvests ranged from 1,103 bushels in 1985 to 4,153 bushels in 1981.

Historically, soft shell clams have been found in more protected areas of the Bay. The DMF study located soft shell clams in the upper reaches of the estuary. Sample densities in these locations were twelve and one-half per square foot, with roughly half of those being large enough to harvest. Local shellfish officials and shellfishermen have identified 561 acres of soft shell clam beds in the Bay currently, including the north shore of Big Pleasant Bay, and the inner shore of the North Beach across from Sipson Island. Estimated densities in these areas ranged from four or fewer per square foot, to between five to nine per square foot.

#### 4.1.3.2 Habitat Conditions

Samples taken for the DMF study found that most soft shell clams were located in sandy mud and mixtures of sand and gravel. Similarly, habitat conditions reported for the resource management plan are primarily sand-shell, sand-silt, or a mixture of the two. The DMF study suggested that a lack of stable mud flats in the Bay accounts for the low productivity of this resource.

### 4.1.4 Oysters (Crassostrea virginica)

While never a major fishery in the Bay, oysters have appeared over the century due to propagation efforts and, to a lesser extent, natural setting. Oysters have historically been found in the Namequoit River (also known as Arey's River), Paw Wah Pond, Round Cove, a small patch on the west shore of Big Bay, and Crows Pond. Currently oysters are found in only seven acres of the Bay.

[36] Fiske,et al, *A Study of the Marine Resources of Pleasant Bay*. Massachusetts Department of Natural Resources, Division of Marine Fisheries. May, 1967.

### 4.1.5 Other Significant Shellfisheries

The DMF study reported forty-five species of shellfish in Pleasant Bay, including the four species noted above. While much less is know about most of the other species, some of them do represent active commercial shellfisheries.

Lobsters migrate into the Bay during the Spring, and are generally harvested commercially from the Bay during the months of May through September. A large number of recreational lobster pots are also placed in the Bay during the peak harvest season.

Other species have emerged as being commercially viable fisheries although, as of this report, the species are unregulated and little data exists. Razor clams are an increasingly sought after species by commercial shellfishermen. An estimated 424 acres of razor clam beds have been identified in the Bay. The technique of salting flats to attract the clams to the surface has been raised as a practice that requires further study to determine whether any undesirable environmental impacts result.

Long considered a nuisance, horseshoe crabs are now widely perceived to be a commercially and ecologically important species. For centuries, horseshoe crabs have been considered a threat to shellfish populations. Although the DMF removed horseshoe crabs from the list of shellfish predators in state regulations, shellfishing regulations in Chatham allow the destruction of horseshoe crabs as a means of predator control.

The sandflats east and south of Sampson's, Hog, and Sipson's Islands to the tip of Strong Island, have been cited as a habitat area for horseshoe crabs.[37] Horseshoe crabs are collected in the Bay and used for commercial purposes. Currently there are no regulations in Massachusetts to control the taking of horseshoe crabs for any purpose. There is some concern that some forms of commercial harvesting may pose threats to the species. [38]

## 4.2 Finfish

Like shellfish, finfish are an important ecological, recreational and commercial resource in Pleasant Bay. Thirty-two percent of survey respondents said they use the Bay for fishing, and sixty-nine said that fishing is an important activity in the Bay. Twenty-nine percent of those who said they use the Bay for commercial purposes use it for fishing. It has been estimated that seventy-five percent of all motor boats using the Bay have at least one fishing implement on board.

The health of finfish stocks is also an important concern to eighty-five percent of survey respondents. Bass and bluefish, perhaps the most popular recreational and

[37] Memorandum to Pleasant Bay Steering Committee from Jay Harrington and Joann Burns
[38] Louise Russell. *Ancient Mariner, The Mysterious Horseshoe Crab.* The Cape Naturalist. Cape Cod Museum of Natural History. 1997.

commercial species in the Bay, have experienced a resurgence. Flounder, once a heavily fished species, has all but disappeared from the Bay. Concerns have been raised that sustained fishing of juveniles could threaten the viability of other species in the Bay. The most recent comprehensive inventory of Pleasant Bay's finfish populations is more than thirty years old. Because the area is comparable to Pleasant Bay, a study of finfish in Nauset Marsh conducted in 1985 and 1986 provides some more recent information. However, the need for an updated survey on the status of Pleasant Bay's finfish populations is clear.

### 4.2.1 Species Diversity

The waters of Pleasant Bay support a wide variety of finfish species. Similar to Nauset Marsh, most of the species are migratory and visit the area only part of the year. The DMF study reported thirty six species of finfish taken from seven sampling stations within the Bay and immediately off-shore. The most abundant species caught was the Atlantic silverside found in all but one sampling station. Mummichog, striped killifish, four-spined and three-spined stickleback were also found in abundance at in-shore sampling locations. Offshore, winter and yellowtail flounder, Atlantic cod, and winter and little skate were reported. Juvenile forms of white hake, small tautog, scup, and winter flounder underscored the importance of the Bay as a nursery for many species of finfish. Other species not included on the table, while less abundant, are important for their predator-prey relationships within the Bay.

COMMON NAMES OF FIN FISH SPECIES FOUND IN PLEASANT BAY

| | | | |
|---|---|---|---|
| little skate | big skate | alewife | blueback herring |
| Atlantic herring | Atlantic menhaden | American smelt | American eel |
| Atlantic needlefish | mummichog | striped killifish | sheepshead minnow |
| Atlantic tomcod | Atlantic cod | white hake | twospine stickleback |
| threespine stickleback | fourspine stickleback | northern pipefish | striped bass |
| bluefish | crevalle jack | scup | cunner |
| tautog | sea raven | grubby | longhorn sculpin |
| American sand lance | Atlantic silverside | yellowtail flounder | winter flounder |
| hog choker | oyster toadfish | | |

*Source: A Study of Marine Resource of Pleasant Bay, Massachusetts Division of Marine Fisheries, 1967*

By comparison, the Nauset Marsh inventory conducted twenty years later found nearly the same populations, although some of the southern fish found in Pleasant Bay were not found further north in Nauset Marsh. The Nauset Marsh study also included a distribution of species by habitat type. Fish tended to favor eelgrass and deep water areas over sand and mud substrates.

More recent anecdotal observations on the status of the Bay's finfisheries include the marked decline of the flounder population, and the apparent resurgence of striped bass and bluefish.

### 4.2.2 Seasonal Variations

Seasons, which effect water temperature and other habitat conditions, accounted for variations in finfish populations in both the Pleasant Bay and Nauset Marsh studies. According to the DMF study, of all of the fish collected in Pleasant Bay, more than eighty per cent were captured between April and November, and only fourteen species were taken between December and February. The seasonal variation in populations was echoed in the Nauset Marsh study, which indicated that the largest number of fish were caught in the summer and relatively few in the winter.

### 4.2.3 Nurseries and Spawning Areas

The warm brackish waters and extensive salt marshes of Pleasant Bay provide significant nursery and spawning areas for a number of commercial species, most notably winter flounder, alewife, and American eel.

Winter flounder, a popular commercial and recreational species, was found to be in relative abundance by the DMF study. That year winter flounder were found at all sampling locations, with the heavier concentrations in April. Spawning was found to occur in ponds and coves in the upper reaches of the Bay between February and mid-March, although they are known to spawn between December and May. Although flounder are believed to have all but disappeared from the Bay, the Nauset Marsh study found young flounder as well as adults in every sampling period. After hatching, young flounder stay in the immediate area where they spawn until late spring when they move into cooler and deeper waters. Size, time of year, and other factors relating to the migration of flounder from these estuaries to offshore waters are unknown.

Several important commercial offshore species, including cod, white hake, pollock, and menhaden, all use Nauset Marsh during the juvenile stage. Pleasant Bay is also used by these juveniles.

Alewife, an anadramous species, spawn in fresh water and return to salt water. Pleasant Bay has two active alewife fish runs, and there are historical accounts of others which may be suitable for restoration. Active fish runs are found between Kescayogansett (Lonnie's) Pond and Pilgrim Lake; and between Ryder's Cove and Lovers' Lake. The DMF report also noted an active fish run between Stillwater Pond and Ryder's Cove. Historic fish runs that are no longer active include (1) a stream connecting Sparrow Pond (now Crystal Lake) with Pleasant Bay; (2) the Chathamport Alewife Brook, connecting Smith's Pond and Ryder's Cove; (3) Muddy Creek connecting with Pleasant Bay; and (4) Frost Fish Cove and Ryder's Cove.

## 4.3 Wildlife

### 4.3.1 Significant Wildlife Habitats

The vast diversity of wildlife found in and around Pleasant Bay is one of the area's defining features. The estuarine environment provides numerous feeding grounds and nursery areas for resident and migratory species of fin fish, shellfish, birds and other mammals. The ecology of the region is all the more notable because Pleasant Bay is located at the extreme boundaries of distinct southern and northern zoogeographic zones. Some of the cold-climate species that migrate to Pleasant Bay for part of the year are at the southern-most point of their annual journey, while some southern species have traveled as far north as they will go. As noted above, some southern species of fin fish found in Pleasant Bay, are not found in Nauset Marsh to the north. Consequently, some migratory species may be exceptionally sensitive to changes in temperature or other environmental conditions in the area. [39]

### 4.3.2 Rare and Endangered Species

The many species of animals and plants which populate the area include some rare and endangered varieties. Currently within the Pleasant Bay study area there are four animal species listed as threatened or endangered by the Massachusetts Natural Heritage and Endangered Species Program: Short-eared Owl; Piping Plover, Diamondback Terrapin, and Waterwillow Stem Borer. Species listed as being of special concern include the eastern box turtle and four plants: Plymouth Gentian, Bushy Rockrose, Strignose Knotweed, and New England Blazing Star. These designations carry with them legal protections under the Massachusetts Endangered Species Act (M.G.L. ch. 131A) The Wetlands Protection Act and local wetlands protection by-laws and regulations also restrict activities that can have an adverse impact on species living in wetlands habitats.

The Bay area's varied topography and vegetation provide many increasingly rare habitats. Eelgrass beds, discussed above, are important nursery and feeding areas for scallops, three- and fourspined stickleback, flounder, and other species. The Bay's intertidal mud flats, sand flats, marshes, beaches, and open waters provide a home for numerous species of plants and animals, and are critical feeding areas for migratory shorebirds and waterfowl.[40] Small stands of pitch pine and scrub oak found on upland areas and islands of the Bay provide protected habitats for the Great Horned Owl, Hawk, Red Fox and, the Whip-poor-will. Some of these animals are the natural predators of rabbit, skunk, squirrel, mice, moles, and vole populations that are distributed throughout the study area. Atlantic white cedar stands found in swamp areas or bogs also provide a habitat for birds and small mammals. The islands of the Bay are particularly ideal habitats because they are relatively isolated with little human activity. Hog, Pochet

[39] Charles Roman, et al. *An Ecological Analysis of Nauset Marsh, Cape Cod National Seashore*. Rutgers: The State University of New Jersey. New Brunswick, New Jersey. June, 1989.
[40] Charles Roman, et al. *An Ecological Analysis of Nauset Marsh, Cape Cod National Seashore*. Rutgers: The State University of New Jersey. New Brunswick, New Jersey. June, 1989.

and Strong Islands , for example, are protected habitats for rare species such as the Osprey, Short-eared Owl, and Diamond Back Terrapin[41]

Several of the Bay's habitats that are important to resident and migratory birds are threatened by competing uses and activities. There is concern that use of inter-tidal flats for aquaculture, which covers the flats with mesh netting, may diminish the accessibility of those areas to some species of shore birds. This issue is being studied by the Massachusetts Audubon Society at the Wellfleet Sanctuary. Wooded and wetland habitats are increasingly threatened by encroaching residential uses. Encroachment can lead to a displacement of natural species to those more tolerant of human activity. Ten acres or more is needed for a habitat to sustain its wildlife diversity. [42] There is even a concern that increased noise levels on the Bay, from land use, boating and personal watercraft, could discourage certain species from using traditional habitat areas.

### 4.3.3 Shorebirds and Waterfowl

Bird watching is among the most popular ways residents use and enjoy Pleasant Bay. Because they rely on a variety of plants and animals as a source of food for survival, the habits and patterns of different species of birds can be an important indicator of the overall health of the Pleasant Bay eco-system.

There are roughly 248 species of birds that occur in the Pleasant Bay area. Most of the species are migratory and breed elsewhere. Migratory species that occur in small numbers but on a regular basis include the Red-throated loon, Great Egret, Little Blue Heron, Bald Eagle, and Mute Swan. More common migratory visitors include the Northern Oriole, Semi-palmated Sandpiper, Herring Gull, and Mallard.[43] As noted above, species that are rare, threatened, or of special concern include the short-eared owl and piping plover. A complete list of birds found in the Pleasant Bay area can be found in the appendix to the plan.

Migratory species rely on the abundant food sources provided by the Bay's marshes, tidal flats, and beaches and open waters. Because of their large numbers, migratory birds are a major consumer of plant and animal food sources in the Bay and can affect the overall distribution of vegetation and prey species in area [44]

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[41] *Pleasant Bay Area of Critical Environmental Concern Nomination Report.* August, 1986.
[42] Peg Brady, et al. *Buffer Zones: The Environment's Last Defense*. Gloucester, Massachusetts. 1989.
[43] *Pleasant Bay Area of Critical Environmental Concern Nomination Report.* August, 1986.
[44] Charles Roman, et al. *An Ecological Analysis of Nauset Marsh, Cape Cod National Seashore*. Rutgers: The State University of New Jersey. New Brunswick, New Jersey. June, 1989.