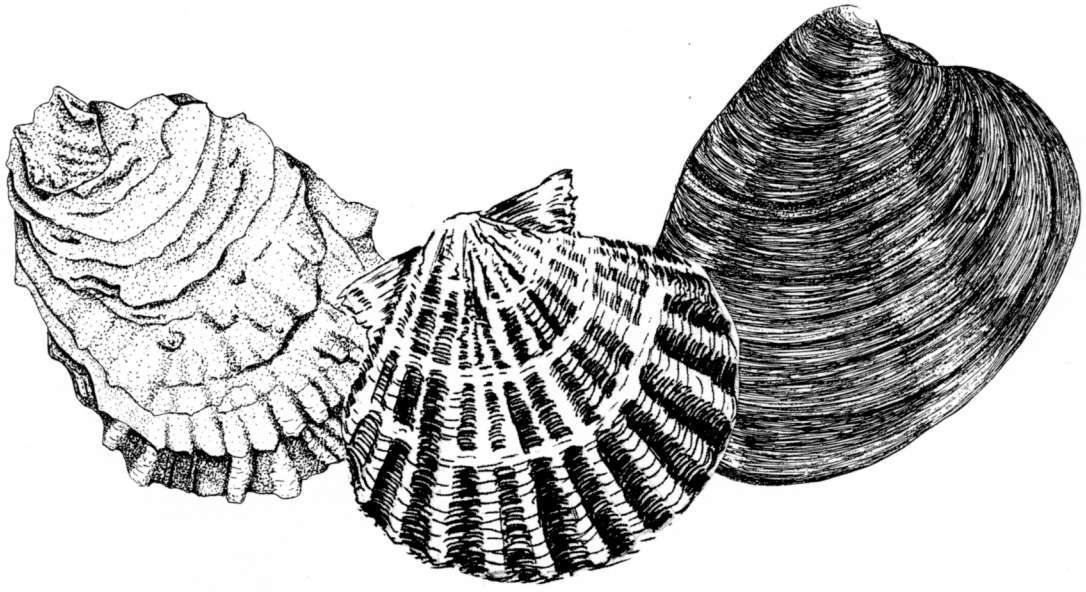
SHELLFISH ADVISORY BOARD

TOWN OF WELLFLEET

SHELLFISH MANAGEMENT PLAN

2007



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Preface and Acknowledgements

In preparing the 2007 Shellfish Management Plan for the Town of Wellfleet, the Shellfish Advisory Board drew heavily from the historical information described in the 1998 Shellfish Management Plan. We thank William Walton, Ph.D. for the statistics, insights and management ideas, summarized in the 2002 draft shellfish management plan.

Shellfish Constable Andrew Koch was an invaluable addition to all the discussions, debates and compromises that have resulted in the current plan. We also thank John Rhiel of the Natural Resources Advisory Board for attending some of our meetings and providing background for issues described in the 2006 Harbor Management Plan, some of which are identical or overlap with concerns voiced by shellfishermen and aquaculturists.

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Introduction

A. Community Description:

The Town of Wellfleet is located approximately seventy-five miles out into the Atlantic Ocean on the outer end of Cape Cod. Wellfleet is bounded on the east by the Atlantic Ocean and the west by Cape Cod Bay Wellfleet has a total upland area of approximately 13,100 acres (20.47 square miles). 61% of the land area of Wellfleet is in the Cape Cod National Seashore. During summer, the population swells from 3,500 year-round residents to an estimated 17,000 persons.

As a narrow strip of peninsula between the Atlantic Ocean and Cape Cod Bay with 44 miles of shoreline, Wellfleet's coastal resources, and in particular it shellfish, are its defining characteristic. From a planning and management point of view, these resources can be divided into three areas: the ocean-side beaches and bluffs on the east, the bay-side beaches on the northwest, and the harbor extending from the Herring River south to Eastham The first two areas are part of the Cape Cod National Seashore and are therefore under the management and control of the National Park Service. It is within the third area, Wellfleet Harbor, that the Town is most directly invested and where shellfish are most abundant.

Wellfleet Harbor is a shallow embayment (3.5' mean depth at mean low water) covering 6,094 acres 'at high water with a tidal amplitude of ten feet. The harbor lies open to southerly winds but is protected on the east and north by the curving arm of the Lower Cape and on the west by a bastion of islands of glacial till linked by tombolos and ending in a long sandy spit, Jeremy Point.

B. Shellfishing Area:

Wellfleet has a wild fishery that consists of harvest of bivalves by picking or scratching in intertidal areas in which they have grown. The public commercial fishery has access to almost all areas around Wellfleet Harbor, totaling approximately 2,500 acres. The only areas from which commercial fishermen are excluded are areas closed due to questionable water quality (i.e., Hatches Creek, Duck Creek above Uncle Tim's Bridge, and the upper portion of Herring River) and the recreation-only area near Indian Neck. Additionally, lower Herring River; Chipman's Cove and Duck Creek close seasonally according to State regulations about water quality. The deeper harbor is under constant pressure from commercial draggers.

As early as the 1850s, Wellfleet has also supported aquaculture by licensing areas in the Harbor. These areas have generally been perceived as “non-productive” for natural shellfish but can be made productive through the practice of aquaculture. At the present time, there are approximately 210 acres granted under license by the town. This

represents about 5% of the town's intertidal acres. There are 73 growers who currently lease areas that are licensed for aquaculture. Up to three additional individuals may be added to the license. A significant increase in area under license is not expected. There are approximately 12 individuals who harvest oysters by dragging.

Wellfleet Oyster Shack; National Park Service Archives

In general, shellfish can be harvested from three areas:

Area 1: Commercial only; area north of a line from the seaward end of the Breakwater to the easternmost tip of Great Island. Duck Creek is only open from October 1 until April 30. Herring River is only open from March 15 until August 31.

Area 2: Non-commercial only: area off Indian Neck south of the Breakwater to the second groin. This area is open June 1 until September 30, Sundays and Wednesdays only. During the remainder of the year, this area is open every day.

Area 3: Commercial and Non-commercial: the rest of the Harbor with the exception of areas licensed for aquaculture. Chipman's Cove is only open from the last Sunday in October until April 30. These dates can be changed if necessary by vote of the Board of Selectmen.

Maps are displayed in Figure 1 and Figure 2 and at the Shellfish Department website: http://www.wellfleetshellfishdepartment.org/Maps.htm

Figure.1 **Commercial Shellfishing Area**

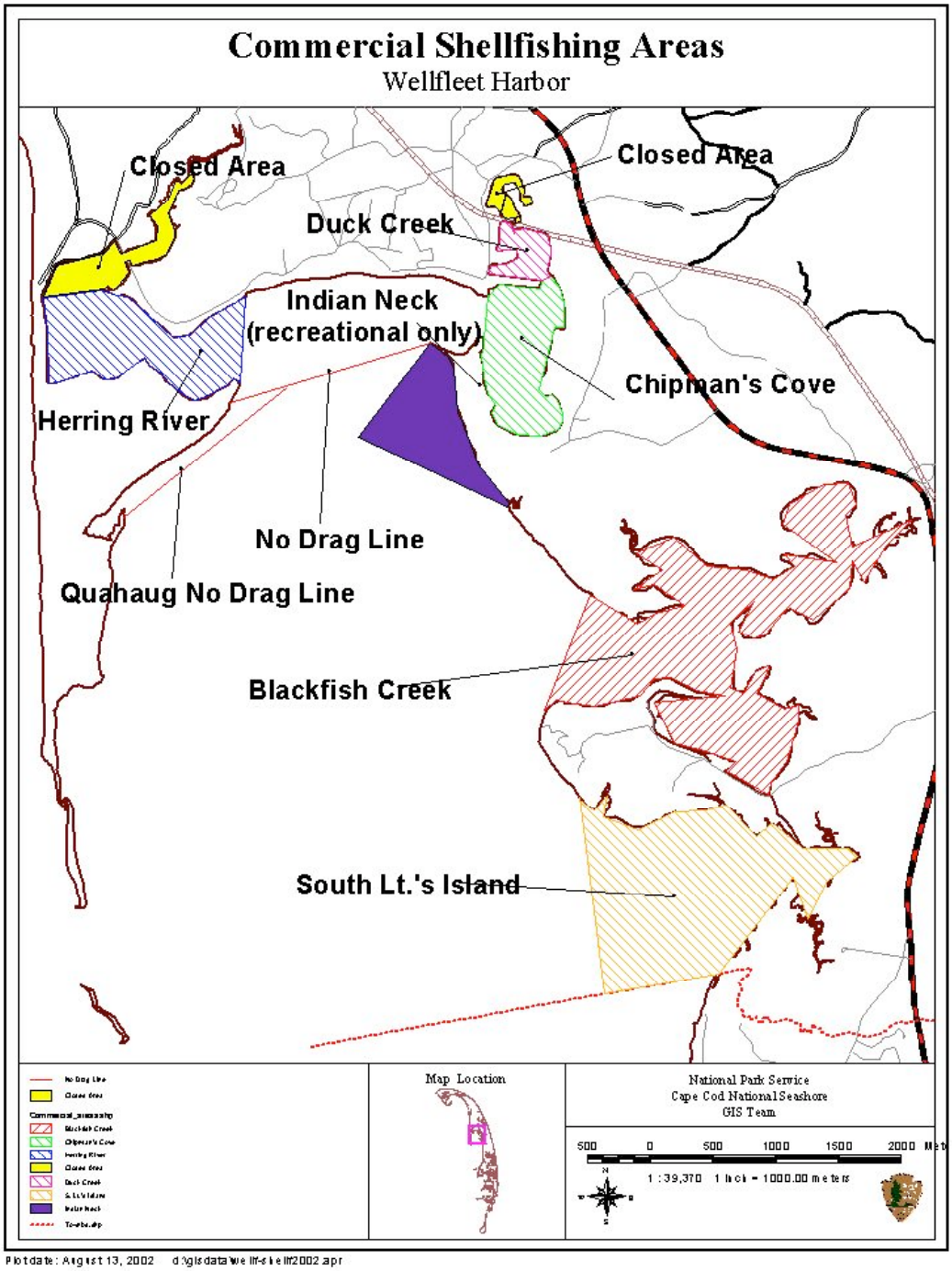
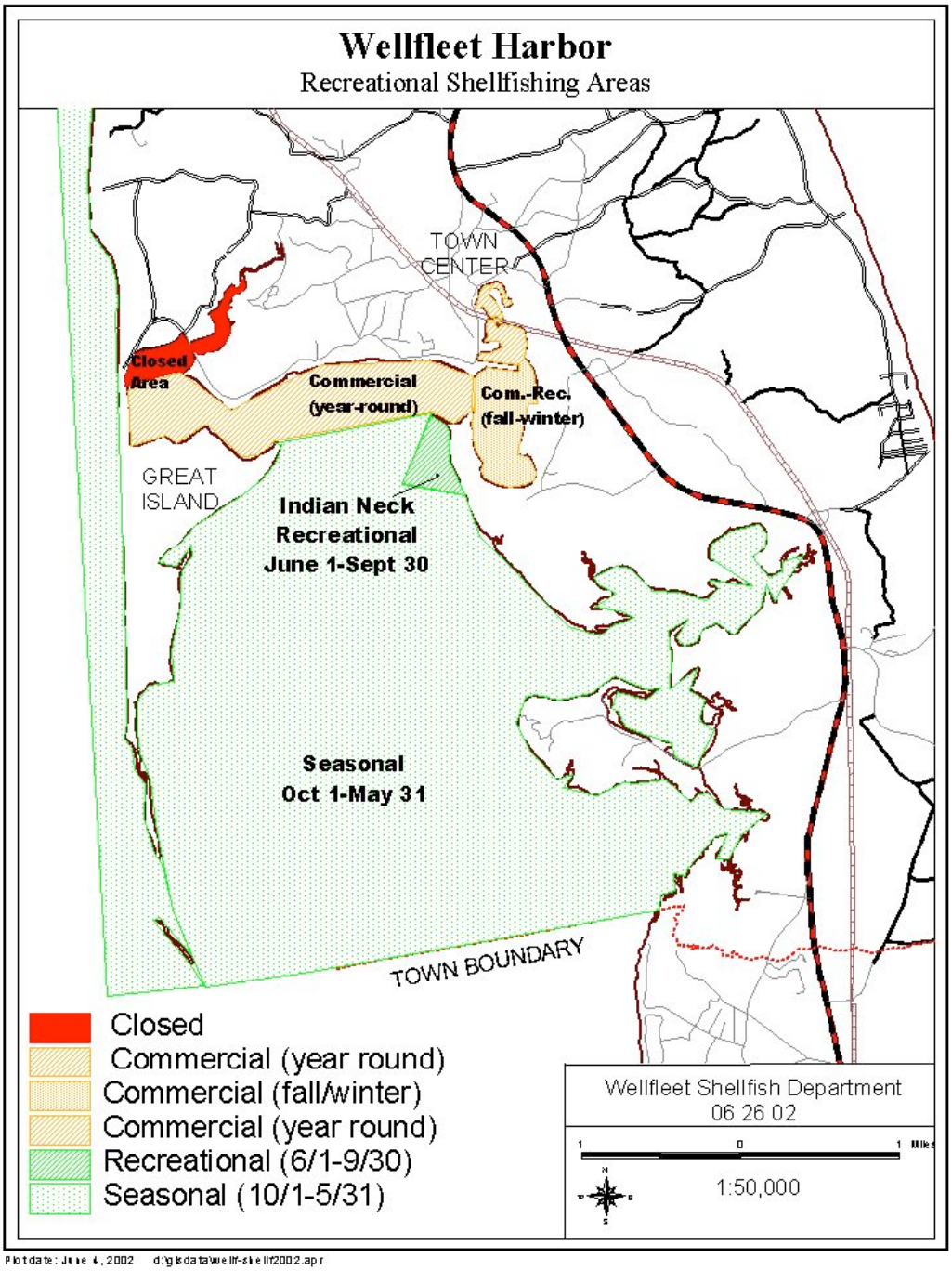


Figure 2. **Non-Commercial Shellfish Area**



2. Background

A. History of Shellfishing in Wellfleet (Some of the information and narrative in this section can be found in the Wellfleet Shellfish Management Plan 1998 and the Draft Management Plan, 2002.)

Available evidence indicates that Wellfleet Harbor has for several millennia provided a habitat especially favorable to marine fauna. The shellfish seem to have high rates of growth and proliferate into unusually high populations. This is the resultant of the high flush rate of the harbor, the abundant salt marshes and the lowered salinity in the upper end of the harbor and the estuaries.

The harbor enjoys a unique set of features. The shape of the harbor is a major factor in giving a tidal range that averages 10 feet provides better than a 70% flush rate on a twice a day basis. This flow over the generally shallow and originally clean hard sand bottom causes a complex system of rapid tidal currents of relatively warmer water. Into this water mass flow a number of estuaries and streams of varying sizes - Herring River, Mayo's Creek, Duck Creek, Fox Island Creek, Loagy Bay and Blackfish Creek with their bays and marshes as well as Sewell's Gutter, Power's Landing Meadow, Margaret's Meadow and Middle Meadow. These all contribute large amounts of fresh water which lower the salinity progressively as you move up harbor, until in the area of the Town Pier the salinity is 7- 10 parts per 1000 lower than the water off Jeremy Point. This complex system of streams, wetland and marshes which stretch inland to within a half mile of the Atlantic Ocean are the breeding grounds for the nutrient material which allow the marine fauna but especially the shellfish to prosper.

The numerous shell middens show that Wellfleet Harbor was a part of a migratory feeding route of the late Woodland period, as well as the Indian population present when the Pilgrims landed. The beds, which covered most of the inter-tidal area of the harbor, were seemingly inexhaustible.

This unique array of natural advantages existed eons before the Pilgrims arrived. However it took only one and one half centuries to deplete the resource to the point of extinction of the original Wellfleet oyster. These inexhaustible beds were in fact exhausted by the 1770's. The total depletion of the beds was recognized as a possible event, for restrictions on shellfishing appear as early as 1674. These took the form of prohibitions on the taking of shellfish by "foreigners. It is unclear as to whether that designation applied to all those living outside the North Precinct or whether all residents of Eastham were considered native. Until the exhaustion of the oyster beds there had been little concern for the quahog or soft-shell clam. The oyster could be kept alive for several months and shipped to English markets, or pickled and shipped to the West Indies as slave food; neither attribute was then shared with the quahog or soft-shell clam.

The North Precinct or Billingsgate became a separate precinct in 1763 and finally a town in 1775. As soon as the British left Massachusetts Bay the task of reestablishing the oyster beds began. It was only through relaying of oysters harvested in the Chesapeake, and other southern beds, that the resource was reestablished. During this time of depletion, the value of the quahog and soft-shell clam as a market product came to be recognized. It is evident that the quahog and soft-shell populations came under pressure.

The town faced the problem by appointing a committee at the Annual Town Meeting held on April 5th 1813, "to prevent out of town people from taking away our quahogs and clam". At the Town Meeting of April 5th 1819 a permanent committee was established "to take care of the clam flat." It was composed of Benjamin Hamblen, Nathan Mayo, John Taylor and Samuel Smith. A committee of citizens to oversee the shellfishing industry in Wellfleet has roots nearly two hundred years old.

Their efforts lead to the relaying of oysters from the Chesapeake and other southern beds. Once this vigilance was relaxed the harbor was again stripped of oysters. This process of depletion and reseeding of the oyster beds took place a second time in the 19th century. For a third time the harbor was restocked from the same southern sources. The "native" Wellfleet oysters of today are all scions of stock brought in from the Chesapeake and other beds to the south.

During this period of depletion and replenishment of the shellfish, the lands had been stripped of the climax forest of hardwoods. The open areas were tilled, and cattle, sheep, goats and pigs were turned loose to graze on the treeless moors. The residual forest floor vegetation was soon cropped to death and aeolian erosion caused top layer of the Lower Cape to be blown away, and with it Billingsgate Island. Much of the sand filled the bottom of Wellfleet harbor. The North Precinct of Eastham, which later became Wellfleet, passed by-laws restricting the grazing of sheep and goats, because their method of foraging was more damaging to the ground cover than that of horses. Great Island was for a time a "no grazing zone". This blown sand also may have extended the intertidal zone in the harbor and thus increased the area suitable for the practice of aquaculture.

Alterations in the Harbor over the past 150 years include dikes built across Mayo's Creek and the Herring River, the railway embankments across Duck Creek and Blackfish Creek, the building of the breakwater, numerous cranberry bogs and various highway embankments. Finally the construction of the marina, with the accompanying widening and extending of Shirttail Point dramatically altered the topography of the inner harbor. Many projects were put into place with little or no knowledge of their environmental impact. Almost all served to reduce the flow of beneficial nutrients and to alter the Harbor to the extent that siltation has since been a major problem. To compound the problems of reduced flow we are now adding high nitrogen fertilizers to lawns and gardens, which increases algal growth, and further reduces the nutrients available to the shellfish.

The story of modern shellflishing in Wellfleet is thus intimately tied to the developments within the Harbor, upland modifications and the combined changes that have occurred since Dr. Belding's studies in the early 1900s (Belding, 1910). It is increasingly apparent that the activities of humans are significantly affecting the populations of various shellfish through both direct exploitation and indirect changes in the environment, including pollution and habitat modification.

Populations of all animals fluctuate naturally, driven most notably by predators, disease and habitat modification. For exploited populations of animals, there are a number of other forces layered on top of these natural factors, including overfishing, pollution and habitat loss. Over time these human-driven forces have changed, through economic fluctuations (e.g., the increased price for shellfish), better technology (e.g., GPS, better engines, etc.), and increases in the population (with subsequent increased pressure on shellfish resources).

Wellfleet has long been envied for the productivity of its shellfish in the Harbor. Specifically, Wellfleet has the unique advantage in Massachusetts of supporting a naturally occurring oyster population. Now, after a century of commercial and recreational exploitation, the explosive growth of private aquaculture, modifications of habitat, the increasing summer population and continued upland growth, Wellfleet needs to take a proactive management stance to improve the conditions for both today's fishermen and aquaculturists as well as those of tomorrow.

B. Current Practices

In general, shellfish permits are issued during the period 1 January 1 to 30 April to allow fishing on a yearly basis (from 1 January1 to 31 December). Town shellfish regulations outline the areas in which shellfishing is permitted, the time of day in which shellfishing is permitted, seasonal closures of specific areas, size limits, daily or weekly catch limits, permissible equipment, and protections for endangered species.

Licenses are issued as follows:

1. Commercial:

Wellfleet residents, 14 years or older, may be granted commercial shellfish permits. 14-16 year olds are issued junior shellfish permits. If a person is over 65, they may obtain a senior license. Eel permits are also issued.

In addition, the Board of selectmen may issue licenses to individuals, as specified in the Town of Wellfleet Shellfishing Policy and Regulations, "for the purpose of granting exclusive rights to plant, grow and take shellfish from that area." The permit breakdown and fees are outlined in section 3.A.1.a of this plan.

2. Recreational (non-commercial):

There are several categories of non-commercial permits, with different fee schedules, that are issued by the town. These include year round permits for: a. residents (taxpayers), b. senior residents and c. non-residents as well as seasonal permits for a.

residents (taxpayers) and b. non-residents. The permit breakdown and fees are outlined in section 3.A.1.a. of this plan.

A breakdown of the types and numbers of licenses from 2001 to 2006 shows that the overall number of licenses and revenue to the town has remained fairly steady over the past five years (Table 1)

Table 1. Fisheries Permits

License Type	**2001**	**2002**	**2003**	**2005**	**2006**	**2007 cost per permit**
Eel	3	1	5	3	2	$ 3
Commercial	216	213	202	206	215	100
Junior Commercial	10	7	8	3	8	50
Senior Commercial	93	90	78	74	67	15
Resident Recreational	324	310	325	322	393	25
Senior Resident	235	251	246	245	297	5
Seasonal Resident Recreational	179	169	117	162	199	15
Non-resident	224	123	139	179	144	125
Seasonal Non-resident recreational	150	113	n/a	137	181	40
Total	1434	1277	n/a	1331	1506	
Revenues	$69,464	$54,438	n/a	$61,429	$62,446	

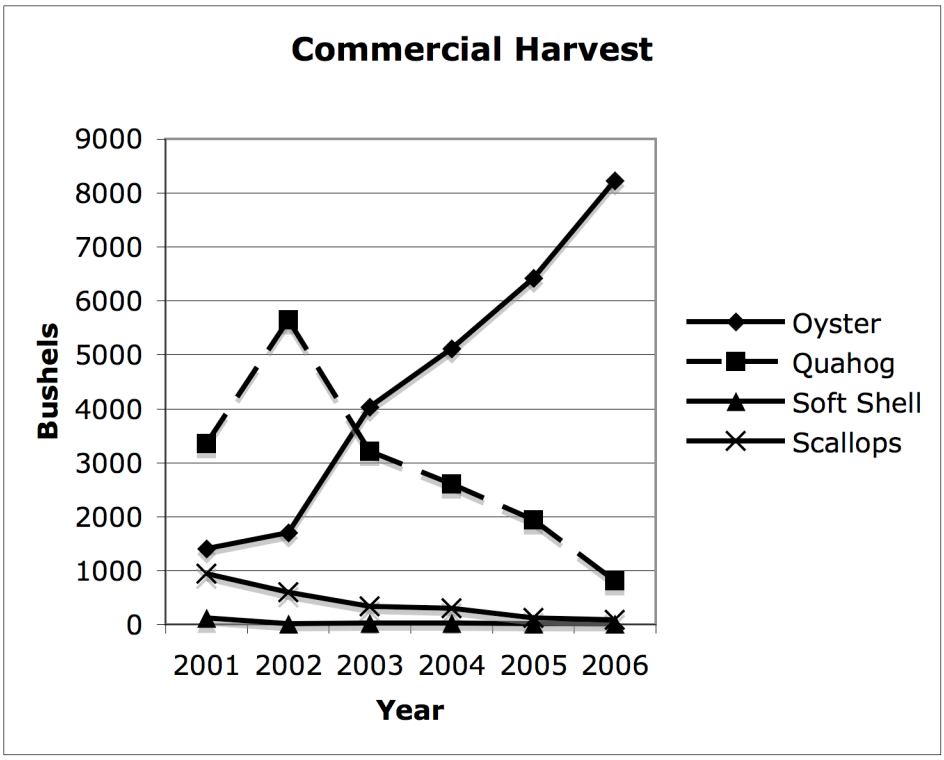
C. Catch Statistics and Trends

The catch statistics for Wellfleet, dating from1950-2001, were entered into a database by former shellfish constable, Bill Walton. The data is now stored on CD and kept in the office of the shellfish department. Catch statistics from 2001-2006 have been added to the data.

In general, "shellfish harvests from the wild fishery have fluctuated dramatically over the past half century presumably driven by a combination of human and natural factors. Clear boom-bust cycles with approximately 20 year periods are apparent in the commercial harvest" (Draft Shellfish Management Plan, 2002). The recreational fishery was more stable until the turn of the 21st century. Currently, both commercial and recreational shellfish harvest appear to be in a state of transition for a number of reasons.

It is important to note that the harvest statistics point out important trends but may not accurately reflect the natural shellfish resources in Wellfleet. **Catch statistics are not indicators of abundance and/or distribution of shellfish.** Other factors, such as methods of reporting and quantifying catch, numbers of licenses issued, effort devoted to other fisheries when they are profitable (fin fish, sea scallops, surf clams), and market demand for shellfish have an impact on catch statistics.

Fig. 3. Commercial Harvest



The commercial harvest statistics over the past five years show a dramatic increase in oyster harvest and considerable declines in the harvest of quahogs and scallops (Fig. 3).

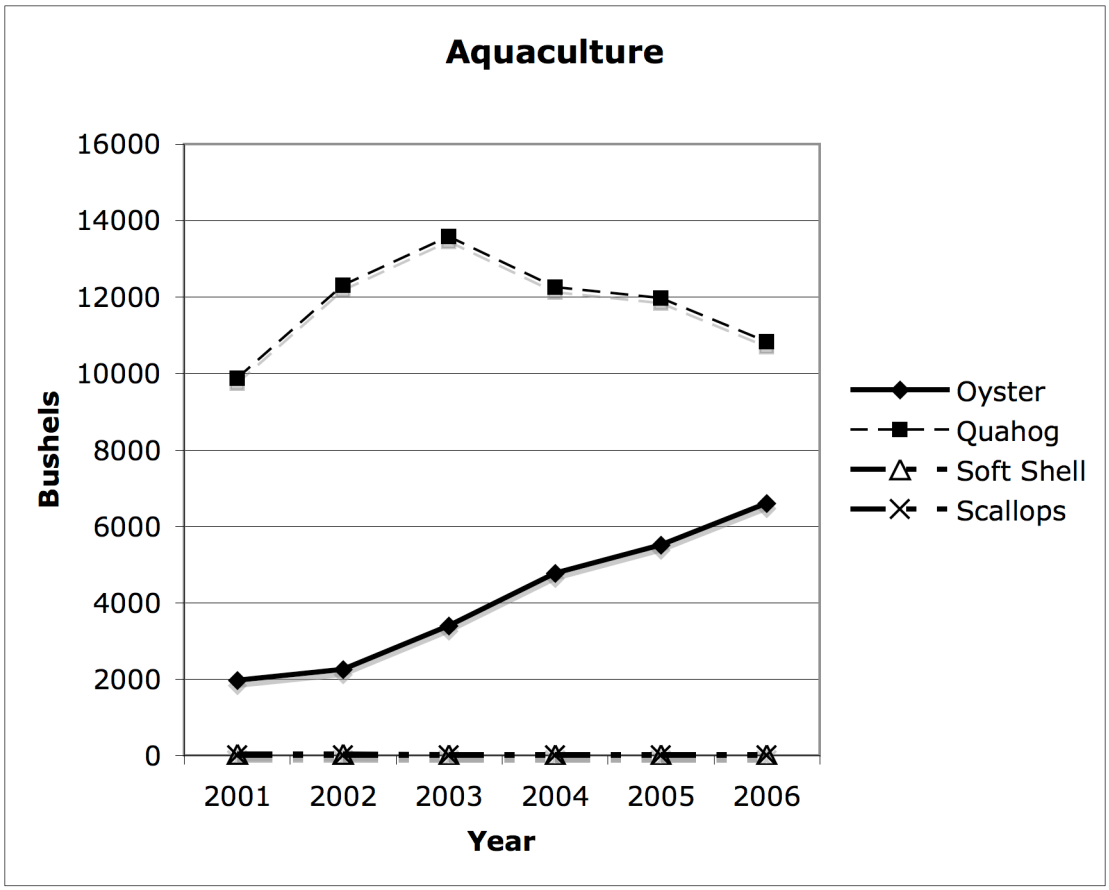
•The quahog harvest has declined since the record high of close to 13,000 bushels in 1999. One reason for this trend is market-driven: the markets for oysters have remained strong while quahog markets have dipped tremendously over the past few years.

•In 2006, the oyster harvest exceeded the record high of 7042 bushels in 1999. Some of the increased oyster catch can be attributed to the spreading of cultch (shell material that allows oysters to attach and grow) throughout the harbor which has recruited more oysters each year. In 2003, the harbor was blessed with a huge deep water set of oysters which has encouraged increased dragging.

•The ten-fold decline in scallop catch over the past 5 years is dramatic and reflects a long-term trend. Scallop harvests were traditionally over a 1000 bushels and in 1984,

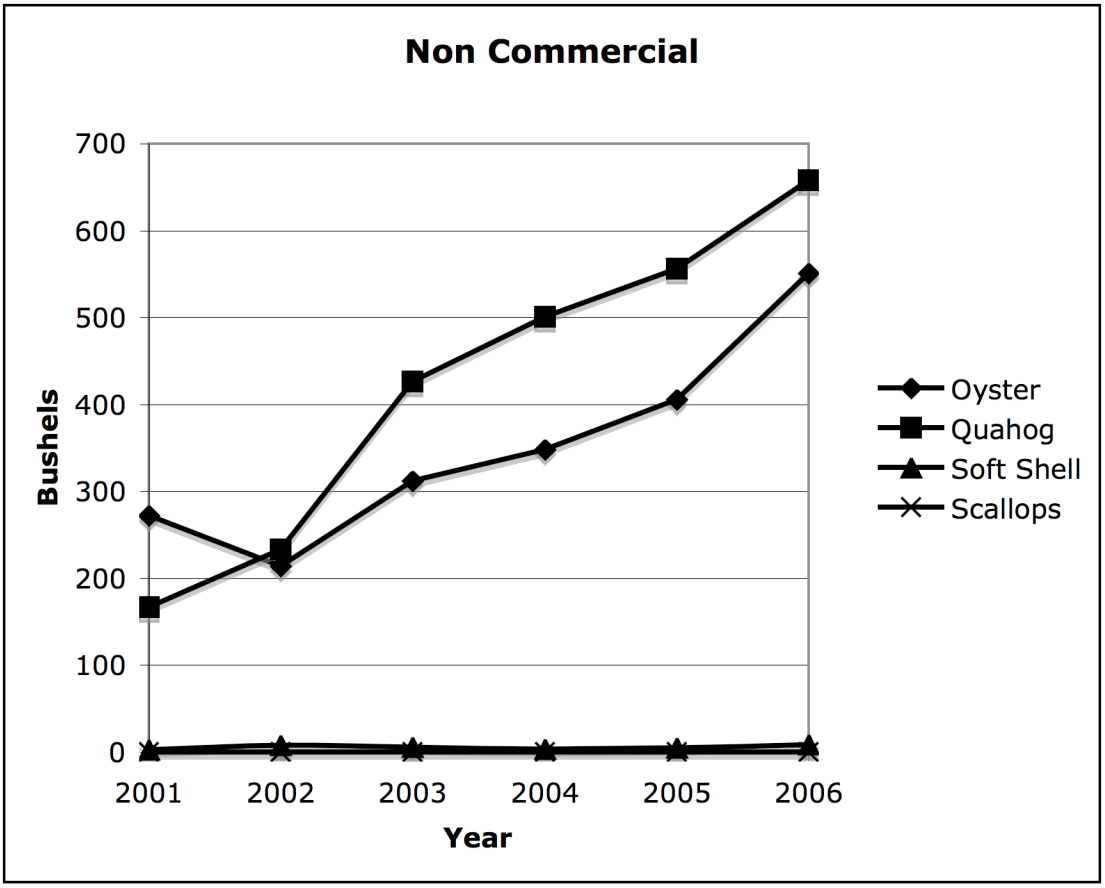
harvest was over 6000 bushels. In 2006, only 79 bushels were harvested. Decreased scallop harvest may be partially explained by market factors such as: 1. the booming oyster fishery, 2. the labor-intensive nature of the fishery (because scallops must be cut after harvest), 3. Scallop adductor muscles tend to be smaller in early Fall than in Winter in Wellfleet, yielding less meat per bushel of scallops, a situation that may discourage fishermen, 4. Scallops are found in deeper water; harvest requires a boat and the appropriate gear. In addition, the scallop population in the Harbor varies from year to year. However, over the long term, there are indications that the population has declined, along with beds of eelgrass that serve as nursery for juveniles.

Fig. 4 Aquaculture Harvest



Aquaculture catch statistics during the past 5 years (Fig. 4) also reflect market trends. Quahog harvest has been fairly level, between 10,000 and 14,000 bushels, an all-time Wellfleet record; oyster harvest has been steadily increasing. This increase primarily reflects the market price for oysters and, to some extent, the diversification of shellfish farmers who may plant two species as a hedge against disease that may cause heavy losses in a single crop.

Fig. 5 Non Commercial Shellfish Harvest



Non-Commercial harvest statistics (Fig. 5) indicate that scallops were not harvested by recreational fishermen and very few soft shell clams were harvested. The increase in oyster catch can be attributed to good natural sets and the Shellfish Department's intensive clutching program. The increase in quahogs is entirely due to propagation efforts by the Shellfish Department and the "put and take" nature of the harvest.

D. Shellfish of Commercial Importance

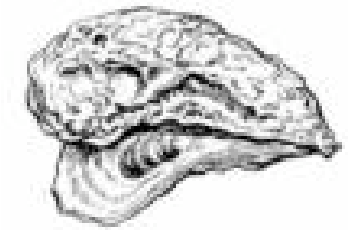
1. Biology and Cultivation of Hard clams

The hard clam or the northern quahog, *Mercenaria mercenaria*, and the variant, *M. mercenaria notatum* are bivalve mollusks. They are commonly known as littlenecks, cherrystones or chowders, depending on their size. Quahogs spawn during late spring through fall in Wellfleet. Warming water temperature stimulates the formation Fertilization occurs in the water column. By 24 hours after fertilization, the early development of the larvae is complete and the larvae swim and feed and are moved by currents and tides. The warmer the water, the less time it takes for larvae to develop their shells and sink to the bottom. Further development leads to the production of a foot which allows the larval clam to crawl along the bottom where it eventually fixes to sand grains or other materials with a threadlike structure called a byssus. Currents and tides may dislodge the developing clams from their attachment sites; they will move with the currents and reattach to other sites**.** Eventually, they develop a muscular foot, allowing them to burrow into bottom sediments and providing limited mobility. Growth of clams is dependent on water temperature, salinity, tidal movement (which provides food (algae) and removes waste), concentration of algae and dissolved oxygen levels.

It has been possible to culture clams for many years. For aquaculture applications, seed clams are obtained and grown out. Clams can be induced to spawn in hatcheries where broodstock or seed clams develop from larvae. The larvae are fed a special diet of algae and maintained under controlled conditions in the hatchery. Seed clams are sometimes further cultivated in a nursery to reduce stress and allow them to adjust to conditions found in the wild. In general, the larger the seed clams, the greater are the chances for high survival during grow-out.

In aquaculture seed quahogs (2mm or larger) are placed in substrate in protective grow-out boxes until they reach 15 mm. This usually takes three months. They are then planted into rectangular plots, called raceways, on the bottom and netted for protection from predators. The quahogs are kept in the raceways until they reach legal size (1 inch width across the hinge) and can be harvested.

2. Biology and Cultivation of Oysters



The eastern oyster, *Crassostrea virginica*, is a mollusk with a pair of rough, irregularly shaped shells. The upper shell is relatively flat, while the lower is concave and holds the body of the organism. In the north, oysters spawn when water temperatures are between 60 and 68ºF (15.5-20ºC). Sperm and eggs are synchronously released into the water column where fertilization occurs. The fertilized egg will rapidly develop into a trochophore, a microscopic, swimming larva. The lifetime of the trochophore is 24 to 48 hours after which it develops into a feeding form known as a veliger. After feeding on algae for 12 to 20 days, the veliger develops a foot, becomes a pediveliger and settles to the bottom where it crawls along until it finds a location where it will cement itself to a suitable substrate by means of a limey secretion. Here, it will become a tiny oyster, known as spat.

Most spat start out as males, some of which turn into females after the first or second spawning. Some females can revert back to males. Spat grow rapidly to become juvenile oysters or seed oysters. Growth to harvestable size depends on water temperature, salinity (they will grow from 10-30 ppt but do best when salinity is 15-18 ppt), oxygen concentration and quantity of food. Suitable water flow is important. Sedimentation can bury oysters, preventing them from obtaining food and oxygen.

Oysters can be cultured using a number of techniques. The simplest method involves picking seed oysters from one area and transferring them to another for grow out. Another method relies on spreading shells or other suitable material (cultch) to which larval oysters will attach in areas that have proper growth conditions. This is a critical method to preserve oysters in the wild because harvest of market-size oysters removes an important source of substrate to which larval oysters (pediveligers) can attach. In order for cultching to be successful, it is important that there are sufficient adult, spawning oysters within or near cultching areas.

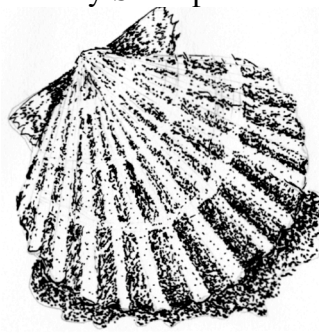
In addition to the use of cultch for larval oyster attachment, devices such as Chinese Hats became popular in the 1990s and have been successfully employed. These devices are coated with mortar with high lime content and set into the water column where and when oyster larvae are present. After the pediveligers attach, they are allowed to grow *in situ* for the duration of the season. The lime is removed and the individual

spat can be used for further cultivation.

Recent developments have led to the availability of oyster seed from hatcheries. This has become important in aquaculture operations. Hatcheries have developed systems to spawn oysters, grow free-swimming larvae, feed them with nutritious algae and allow them to set on cultch or microcultch (microscopic pieces of shell to which a single pediveliger will attach). Once they develop into spat or small seed, they can be purchased by growers.

The aquaculturist places small seed oysters into mesh grow out bags and attaches the bags to racks set in the water. As the oysters grow, they are transferred to lower density bags or trays with larger mesh to prevent crowding and to ensure a better flow of water and food to individual oysters. Some growers leave their bags on the bottom for the winter. To prevent ice damage, others remove their oysters from the water in December and store or pit them under moist, cool conditions. Pitted oysters are returned to the water in the spring and allowed to complete their growth until they are of legal size (3 inches in length). Under optimal conditions, cultured oysters can be harvested in the second summer of growth.

3. Biology and Harvest of Bay Scallops



The bay scalllop, *Argopectin irradians*, has a significantly different biology and life history than other bivalve mollusks of commercial importance. Its short life span (2 years) and motility contribute to challenging aspects of the scallop fishery. In their second year, bay scallops spawn during spring when water temperatures exceed 76ºF. Most do not live past two years. They are usually found where there is eelgrass. Although eelgrass is not essential for adult scallops, it provides protective nursery habitat for juvenile scallops which attach to the grass with byssal threads. Adults dwell deeper in the water than oysters and clams and are less subjected to winter movement due to ice.

Historically, bay scallops provided a significant shellfish crop in Wellfleet Harbor as well as an opportunity for shellfisherman to diversify. A good scallop harvest helped to compensate for poor harvests of other species and perhaps prevented additional pressures on other fisheries. The status if the fishery with regard to catch, presence of juveniles and seed has usually been noted in the Constable's annual report.

It is thought that the current population are descendants of the original Harbor population. Unlike clams which are purchased from cultivators and oysters, which have

been transported from Chesapeake Bay and also raised in hatcheries, there has been no known introduction of bay scallops. They are not easily cultivated because they have more mobility than other species; they can propel themselves in a number of ways. In, conjunction with tides and currents, movement can be considerable. Sets can occur at different location from year to year. The fishery is therefore a moveable feast, searched for and taken from the wild during a season that runs from October 1st to April 1st, the maximum period allowed by the Massachusetts Department of Marine Fisheries. This gives Wellfleet an earlier start than other state municipalities and also provides a jump on the market when there is an occasional early mortality which sometimes occurs in October. The maximum catch limit is no more than 20 bushels per day per vessel.

Eelgrass is the preferred habitat for juvenile scallops. Eelgrass beds are destroyed and/or discouraged by both dragging and water turbidity. The range over which scallops can spawn and set overlaps with licensed shellfish grant areas in Wellfleet as well as the deeper waters subjected to dragging for other species. The current protected wild range for scallops is therefore very limited.

There appears to be an inverse correlation between the intensity of dragging for other species and the subsequent size of the bay scallop harvest. In November of 1978, during the time that Robert Wallace was the Shellfish Constable, a two year protection of habitat experiment was initiated. From May through October of 1979, 150-200 acres of the harbor was closed to dragging. The closed area was in the vicinity of the location where most scallops were historically found. The scallop harvest, recorded as 6,407 bushels, was the largest on record in the past 45 years. Currently, certain areas of the Harbor remain closed to dragging. It would be useful to know if, and when more scallops are found in those locations. It would also be useful to know if there are additional areas in the Harbor that might be more productive for scallops.

Aside from loss of habitat, the scallop population is diminished by extreme, adverse weather conditions and predators such as crabs, starfish, oyster drills and birds. If the fishery is well managed, harvest by humans is not a significant factor in their decline because harvest is only permitted during their second year, after they have spawned and just before they will die. Scallops are also impacted by competition for food and space by oysters, clams, seaweeds like codium, and serpula (worm tubes). Because of their low tolerance for sulfur dioxide found in sediments, they tend to move when the sediment is disturbed by dragging. They are perhaps the least tolerant of locally harvested shellfish to eutrophication, loss of habitat and chemical pollution. They are the “canaries in the coal mine” of the Harbor’s waters

At present, Wellfleet bay scallops are only harvested by boat. No record of fishing for them by hand exists, although this is an accepted method in other states. Scalloping is not a major aspect of the commercial fishery; most of the adult scallops are usually taken during the first weeks of open harvest. Catch records show a significant, over ten-fold, decline in scallop harvest over the past five years (section 2C). Currently, there is no management plan for the species with the exception of enforcement of shellfish regulations.

4. Soft Shell Clams

The soft shell clam, *Mya arenaria*, develops major sets in the soft bottom areas of Wellfleet Harbor. Within the second year of these congested sets, worms begin to attack the clams. The beds can be decimated by the third year. It takes 10-12 years for the worm population to die off. The cycle then repeats. The last big set in Wellfleet Harbor was in 1994.

There has been some specific success in trapping soft shell clam seed using fine mesh "tents." The Field Point to Indian Neck area has had some positive results using these tents. For the most part, wild harvest of soft shell clams results in an occasional bumper crop in Wellfleet.

5. Razor Clams

The razor clams, *Ensis directus* is also known as the Atlantic jackknife clam or razor fish (due its swimming ability). It has long, thin, flat shells that are slightly curved and sharp at the ends. Colonies are found in intertidal areas They can dig very rapidly into the sediments with their strong muscular foot and their production of jets of water.. This edible clam species can be found in Wellfleet Harbor but currently, there is no significant harvest. The status and distribution of the species in Wellfleet is not known.

6. Mussels

There are two species of mussels in Wellfleet Harbor. The ribbed mussel, *Geukensia demissa*, lives in and around *Spartina*, half buried in the mud. It rarely colonizes open areas and is considered inedible. The second species, the blue mussel, *Mytilus edulis*, is edible, but not cultivated in Wellfleet Harbor. Due to the tendency of the blue mussel to overwhelm clam and oyster populations, its growth is discouraged. Blue mussels grow to full size rapidly and have a life cycle of eighteen months. Shellfish regulations state that there is no limit to the taking of blue mussels but there is no record of a commercial harvest.

Blue mussels are gregarious settlers. If they find suitable substrate, such as rocks, pilings or other shellfish, they attach with byssal threads; they can even attach to each other. A heavy, smothering blanket of mussels can grow over aquaculture bed over a

short time, killing the oysters or clams beneath. Thus, the cultivation of "blue gold" is regarded as a dangerous practice in Wellfleet. They are however, encouraged as a commercial crop in neighboring Eastham, in the Nauset system with 25-30 acres in use for their habitat.

Blue mussel predators include hermit crabs, oyster drills. Green crabs, eider ducks and humans. In the 1960s, the Department of Marine Fisheries paid people to harvest and destroy them in an effort to reduce their competition with clam and oyster fisheries.

E. Natural Predators

1. Whelks: *Busycon* species

Whelks are large marine gastropods (snails) that are sometimes confused with conches. Both are gastropods but the shells of whelks are more slender. Whelks are scavengers and carnivores, equipped with an extensible proboscis that is tipped with a file-like radula. The radula is used to bore holes through the shells of clams, crabs and lobsters. Whelks also have a large, muscular foot with which they hold victims.

On Cape Cod, two whelk species, the knobbed whelk, *Busycon carica*, and the channeled whelk, *Busycon canaliculatum*, are common bivalve predators of the intertidal mudflats and offshore to 26 fathoms (48 meters). The knobbed whelk, having tubercles (or spines) along the shoulder, is the larger species, ranging up to 16 inches. The channeled whelk is slightly smaller and has a smooth shell.


Knobbed and Channeled Whelk

Whelk egg case
(http://en.wikipedia.org/wiki/Busycon_carica)

2. Moon snail: *Euspira heros*

Moon snails have smooth round grey/brown shells. Adults can reach about three inches in diameter. They glide along the bottom on a large mucus covered body part called a foot. They are often found under the mud at low tide. If these snails encounter a clam or even another moon snail, they envelope it in their fleshy foot, and use a mouth part called a radula to drill a hole and eat their prey. The radula is similar to a tongue with teeth that rasps until a hole is made. A chemical secretion help to soften the hard shell of its prey, and the drilling process is slow and methodical. The beveled hole is often located near the hinge of the clam.

http://www.naturepark.com/msnail.htm

The Moon snail discharges its eggs along with a volume of mucus that is molded by the foot and takes the shape of a round collar. Sand adheres to the collar and helps it retain its circular shape. It will never be a complete circle since the snail starts the egg laying and terminates it without joining the ends. Snails pass through several free swimming larval stages before they develop into tiny Moon snails.

3. Oyster Drill: *Urosalpinx cinerea*

The oyster drill inhabits intertidal and subtidal regions and it often found among rocks and shells. It preys upon barnacles, oysters, clams and mussels. Its dull brown/grey shell has raised whorls and ridges and are pointed at the ends. The shells of adults are about one inch long. Oyster drills produce small, urn shaped egg cases in spring and early summer.

http://www.jaxshells.org/drilx.htm

Oyster drills are boring snails that attack bivalves by making a small hole through the shell, using a drill-like organ called the radula. The drill produces secretions containing sulfuric acid which helps to soften the shell. After the drill bores through the shell, it consumes the prey and allows other predators access to the oyster meat.

4. Crabs

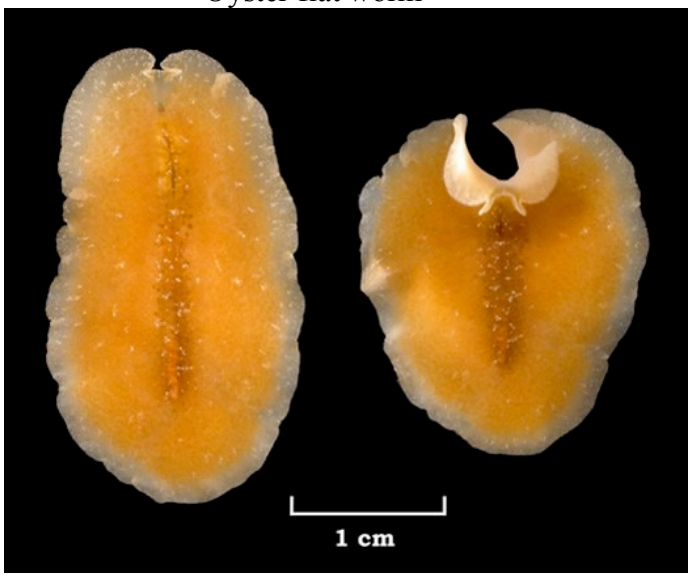
Crabs of several types can prey on quahog and oyster seed as well as larger bivalves. They are very abundant in Wellfleet Harbor and can cause considerable damage to shellfish. Representative species include: green crabs (introduced from Europe), Asian shore crabs (introduced from southeast Asia) and native varieties such as lady crabs (or calico crabs), spider crabs, rock crabs, mud crabs and horseshoe crabs. Crabs typically crush seed and small shellfish and chip away at the edges of the larger shellfish.

The use of traps to catch crabs was considered as a method of pest control. However, crab traps can potentially trap and drown diamondback terrapins, a threatened turtle that is protected by state law. In addition, diamondback terrapins are the main predator and voracious consumer of crabs.

5. Worms

The oyster flatworm, sometimes referred to as the oyster leech, feeds on oysters and barnacles. This one inch long worm can slide into the shell of its prey when it is open for feeding. Once inside, it consumes the oyster within the shell. The milky ribbon worm is found in the intertidal region. It digests primarily soft shell clams but has also been known to prey on razor clams and quahogs. There are no know control methods for these predators.

Oyster flat worm



http://www.calacademy.org/education/outreach/wildcity/species/marine_invertebrates/flatworm.html

F. Diseases and Parasites

1. Oyster Diseases:

a. MSX (Multinucleated Sphere Unknown) is caused by the protozoan, *Haplosporidium nelsoni*. Infection of adult oysters causes their meat to become thin and watery. Warmer temperatures and brackish to saltier water promotes the spread of the disease. Although not harmful to humans who eat the oysters, the infection causes a poor condition of the oyster and a decline in its commercial value. In Wellfleet, it is most prevalent from July to September. MSX has caused die offs in Wellfleet Harbor.

b. Dermo is caused by the protozoan, *Perkinsus marinus*. The causative agent was originally known as *Dermocystidium*, hence the name. Similar to MSX, infection causes the condition of oyster meat to become thin and watery. The disease is also prevalent in warm, saltier water. Dermo is more prevalent in September and October. Dermo has been associated with die off events in Wellfleet, as recently as Fall, 2006.

c. Others: JOD is juvenile oyster disease. It is caused by the bacterium *Roseovarius crossostreae* and seen primarily in hatcheries. The disease typically affects younger oysters and is promoted with high salinity. JOD has not been seen in Wellfleet.

SSO or Seaside organism, *Haplosporidium costale*, causes problems with condition and mortality similar to Dermo and MSX. It has thus far not been detected in Wellfleet but made its appearance on Martha's Vineyard in 1998.

2. Quahog disease:

QPX or Chytrid-like disease: QPX, originally named Quahog Parasite Unknown is a Thrausochytrid pathogen that can cause significant mortality of quahogs. It destroyed the quahog fishery in Provincetown in 1995 and the fishery there has not recovered. Although QPX may have been present in Wellfleet waters for many years, the first massive QPX infection in Wellfleet was reported during winter, 2004. QPX is found in many marine environments and prefers high salinity. It does not depend on clams as a host. The reasons why clams become infected are not known but stress, due to high planting densities and/or genetic factors may contribute to the susceptibility of clams to the disease. Once a clam is infected with QPX is may be able to spread it to nearby clams. An intermediate host does not appear to be required.

G. Environmental Disturbances

1. Water quality and fecal coliforms.

A summary of the issues surrounding closure of shellfish beds due to bacterial contamination is presented in the Wellfleet Harbor Management Plan, 2006.

Three areas of the Harbor are currently closed to shellfishing due to high fecal coliform counts: Duck Creek upstream of Uncle Tim's Bridge, Hatches Creek and the Herring River, adjacent to and upstream of the dike. Immediately after heavy rains, the entire Herring River Estuary is closed. There are routine seasonal closures in Chipman's Cove, and Duck Creek downstream of Uncle Tim's Bridge .

High fecal coliform concentrations in Herring River, upstream of the dike, have been traced to waterfowl and are enhanced by poor water conditions which favor the growth of the microbes: low salinity, low pH and low dissolved oxygen. It has been predicted that restoration of tidal flow in the Herring River estuary will decrease the bacterial loads.

The Massachusetts Department of Marine Fisheries is responsible for coliform testing as it relates to regulation of the shellfish industry.

2. Harmful algal blooms (HABs).

Harmful algal blooms (HABs), commonly known as red tides, are due to the appearance and growth of algal species that produce toxins that are harmful to humans. The algae and their toxins do not harm shellfish, but shellfish can bioconcentrate the

toxin. When an HAB occurs, shellfish beds must be closed until all traces of the toxin disappear. In 2005, an HAB caused by the proliferation of *Alexandrium fundyense,* originating in the Gulf of Maine, led to closure of Welllfeet shellfish beds from May 27 until July 2. *Alexandrium* produces cysts which fall to the bottom and can remain in sediments for long periods of time. The dormant cysts are activated and induced to grow when nutrient supplies and temperature are favorable.

3. Resource Planning and Management

A. Departments and Committees

1. Role and Structure of the Shellfish Department

The Wellfleet Shellfish Department consists of three full-time members. Their roles include oversight and management of the wild fishery as well as aquaculture operations. In addition, the members of the department enforce the town shellfish regulations and implement propagation efforts. The Shellfish Department also works directly with the Natural Resource Advisory Board and the Shellfish Advisory Committee.

Department Expenditures: For Fiscal Year 2006, the Town of Wellfleet budgeted a total of $189,002. This includes the departmental operating budget of $156,267 (salaries, and Department operating expenses) and the shellfish conservation and propagation budget of $31,735. In addition, another $1000 was encumbered for conservation/propagation.

2. Role and Structure of the Natural Resource Advisory Board (NRAB)

The NRAB consists of at least three members, appointed by the Selectmen for three overlapping terms. Their role is to create a Harbor Management Plan, to continue to review and update the Harbor Management Plan and the Shellfish Management Plan and to identify the natural resources of significant importance in the town and take appropriate action to preserve and protect these resources.

3. Role and Structure of the Shellfish Advisory Board

The Shellfish Advisory Board (SAB) was formed in 1965. The membership increased from 5 members to five members and two alternates in 1986. In 1999, the board expanded to 7 members and two alternates. At least three members must be commercial fishermen. The role of SAB is to " serve as a shellfish advisory board to the selectmen and to make a study of the existing shellfish conditions and to advise relative to any plan for the future improvement and development of the industry".

B. Location of Shellfish Areas

1. Status:

a. Wild fishery: The wild commercial and non-commercial shellfishing areas are described in Section 1.B. There has not been a systematic survey of natural oyster, clam and scallop populations.

b. Leases: There are two main areas of the Harbor in which aquaculture leases have been granted: the northern licensed areas (Appendix 1) and the southern licensed areas (Appendix 2). The licensing program consists of one "block grant" area near Egg Island. Other areas were licensed to individuals who have applied to the town and satisfied state and local conditions.

2. Accessibility: Accessibility to shellfishing areas is site-dependent. Many areas are accessible from town landings. Vehicle access is possible for some licensed areas: the north side of Blackfish Creek, Indian Neck, the inner Harbor and Mayo Beach. There is no direct vehicle access to Egg Island nor licensed areas on the south side of Blackfish Creek in compliance with conditions set by the Conservation Commission. There are regulations regarding the size of vehicles and the areas in which vehicles may traverse the intertidal zone.

3. Other Marine Resources: The Wellfleet Harbor Management Plan, 2006 describes other marine resources such as: finfish, shorebirds, turtles (diamondback terrapin and marine turtles, squid, jellyfish, blackfish (pilot whales) and porpoises, mackeral, alewives and horsehoe crabs.

C. Resource Management

1. Current shellfish regulations were last updated May 23, 2006 (Appendix 3)

2. Relays and Transplants. In the l800s and 1900s, when shellfish stocks declined, Wellfleet procured and accepted shellfish from Chesapeake Bay, Buzzards Bay and other areas. Other than propagation efforts by the Wellfleet Shellfish department, there are currently no relays no transplants of shellfish in Wellfleet Harbor. These practices may lead to the introduction of diseases and invasive species.

3. Seed program; The Town of Wellfleet purchases oyster seed from hatcheries. In 2005, 1 million seed oysters were purchased. The town receives hatchery-produced quahog seed from Barnstable County. The seed is grown out before planting. The Shellfish Department employed a floating upweller on the town pier with mixed results. The growth of the hatchery stock was suboptimal; Beginning in 2007, the

Department plans to transfer quahog seed to trays on town beds and to grow out oysters using a floating system with cages on the town's oyster barge.

4. Cultch Program: Wellfleet began a culching program in the late 1980s. Since that time the method for cultching in Wellfleet Harbor has significantly evolved. For the first ten years, a town dump truck was used to transport cultch material to the town pier where it would be dumped onto a motorized barge. Volunteers would then manually shovel material off the barge in various locations throughout the Harbor. The method proved to be backbreaking and time consuming. Around 1999, one of the members of the Shellfish Department suggested using an old salt sander from one of the DPW (Department of Public Works) to spread the cultch material. An old, retired sander was lowered onto the town barge and greatly improved the efficiency of the clutching operation. No longer were ten volunteers needed each day; one or two members of the Shellfish Department could operate the machine. In addition, the two week operation now only takes about five days.

Through trial and error, the best cultch material was found to be whole surf clam (*Spissula solidissima*) shells. Of all the types of shell that were tried, this material caught the best set of oysters. The timing of cultch operations is of great importance. The Shellfish Department starts clutching in the second week of June to ensure that all the material is distributed by July 1st. The shells are dry and rough when first distributed, which makes a good surface for attachment of oyster spat. If the shells are dispersed too soon, they can develop a coating of slimy algae which can hamper the ability of spat to attach. Oysters will start to release spat when the water temperatures reach about 70oF, which usually occurs in early to mid-July. By timing the release of cultch into the Harbor, using water temperature as a guide, the greatest possibility of a good set can be achieved. Cultching operations for various areas of the Harbor are described below:

Duck Creek: This area has traditionally caught a good set of oysters and has been clutched over the past ten years. This area has an abundant adult and juvenile stock. However, the west side of the creek, in front of the cottages has not been particularly productive in recent years. The Shellfish Department has clutched this area for the past three years will good results.

Chipman's Cove: The Cove is the most productive area in Wellfleet Harbor and receives cultch every year. Because of its size, a large portion can still be developed. The outer bars, near the channel, have a very high concentration of oysters while the flats inside of the bars and the southern part of the cove could be clutched for several more years.

Mayo Beach: Due to heavy usage of this area by bathers and boaters, Mayo Beach may not be a candidate for clutching. The area off Keller's Corner has been productive in the past, but it is mainly a deep water spot which is worked by divers and hand pickers during extreme tides. Although not an area for clutching, Keller's Corner has proved to be a good location for the Shellfish Department to spread juvenile oysters that can be harvested at maturity. Because of the sediment in the area, the oysters seem to be insulated during the winter months but have been able to pump themselves out in the

Spring. This area is also not particularly vulnerable to ice damage; however, oyster drills have been prevalent in the past. The Shellfish Department plans to continue its propagation efforts in this area.

Herring River: Herring River has traditionally been a very productive area. However, because of poor water quality, a large portion of the River has been closed to shellfishing. resulting in a higher level of effort in a more concentrated area. Cultching in the River has been hit or miss in the past, perhaps due to the rapid growth of algae on the cultch, thus inhibiting attachment of spat.

West Side: The West Side area of the Harbor has traditionally been productive especially for draggers, and continues to produce for both draggers and hand pickers. In the last 2-3 years, the Shellfish Department has clutched this area with very good results. Due o the "no drag" line running from the tip of the breakwater through Old Saw Rock. The Department has clutched two separate areas in order to meet the needs of both draggers and hand pickers. One area is just north of Old Saw Rock and the other is inside of Flat Rock.

Indian Neck: Indian neck is an area that is on the rebound, due to clutching efforts in the last few years. There is a "no drag" line that separates the commercial from the non-commercial area. The Shellfish Department has clutched both sides of this line in order to provide non-commercial permit holders a location to harvest oysters during the summer when they are more restricted.

Blackfish Creek: Blackfish Creek is also an area on the rebound. It was a traditionally productive area but because of over fishing, it has not produced well until recently. In 2003, the Shellfish Department began cultching the area near Pleasant Point with remarkable results. Because of its distance from the inner Harbor, and the time consuming nature of the operation, it has been difficult to deliver cultch. Calm weather is required. Today, this area produces year-round.

5. Predator and Disease Control: Wellfleet currently does not have standardized programs or procedures for predator and pest control.

6. Rotation of areas: Rotation of shellfishing areas has the potential to be an effective way to sustain the fishery and prevent depletion of stock. The possibility of rotation of shellfish areas continues to be debated in Wellfleet. Some seasonal closures, due to water quality issues, prevent harvest from Chipman's Cove, Duck Creek below Uncle Tim's bridge and the lower Herring River for certain periods during the year.

7. Enforcement: The Board of Selectmen of the Town of Wellfleet or the Director of the Division of Marine Fisheries may revoke an area license in accordance with provisions set forth by Massachusetts General Laws, Chapter 130, Sections 57 and 65. The Board of Selectmen designate the Shellfish Constable, the Assistant Shellfish Constable, the Police Department and, at times, other officials to enforce all sections and subsections of the Shellfish Regulations. Members of the Shellfish Department make

daily rounds of all shellfish harvesting areas and enforce regulations (Appendix I). The Department also monitors catch brought into the town pier by boat, responds to complaints and mediates issues regarding licensed area boundaries, infractions in no drag zones and illegal taking of shellfish.

Goals and Recommendations

Goal 1. Protection of Water Quality

First and foremost, in order for shellfishing to be a viable commercial and recreational endeavor, water quality must be ensured. Many of the recommendations for shellfish management overlap with recommendations of the Natural Resources Advisory Board as outlined in the 2006 Wellfleet Harbor Management Plan.

Recommendations:

A. Herring River restoration and monitoring; It is important to monitor the effects of the proposed Herring River Restoration, in particular, the effect of this large project on shellfish beds in the Herring River and on licensed shellfish areas in nearby Harbor locations.

B. As stated in the Wellfleet Harbor Management Plan, 2006 : "Steps must be taken to remediate nutrient overloads, especially in Duck Creek, the Cove, Mayo Beach and in Blackfish Creek."

C. Marina issues: The Marina must have effective programs to educate boat owners about avoiding fuel and boat waste spills as well as introduction of invasive species. The Marina must also have a plan to cope with these issues.

D. Storm water runoff: According to Wellfleet General Bylaws, Section 30, no road should be resurfaced, graded, constructed or maintained that diverts or directs road runoff into any wetland. The Wellfleet Harbor Management Plan, 2006, offers further improvements to the run off problem and states that "road and marina storm water runoff must be controlled by completing a system of catchments and funding regular maintenance of these "(Wellfleet Harbor Management Plan, 2006).

E. To prevent contamination by fecal coliforms and enteric viruses:

1. Improved sanitary facilities must be available. We recommend that the Marina Advisory Committee, the Harbormaster, the Beach Administrator, the Shellfish Advisory Board, and the Health and Conservation agent combine efforts to address the issue of water pollution by humans and look for alternative solutions.
2. Animal control and beach regulations and penalties must be strictly enforced. Pet owners must be required to pick up after their pets. Signage, plastic bags and trash barrels must be provided at all town landings throughout the year. (also stated in the Wellfleet Harbor Management Plan, 2006)

Goal 2. Maintenance and enhancement of wild populations of oysters, quahogs, bay scallops, soft-shell clams.

Traditionally, humans have demonstrated the ability to over harvest fishery resources. Eminent scientists have predicted a dramatic decline in commercial fishery species within the 21st century. Although the shellfish industry is currently prosperous in Wellfleet, it is possible that this may be part of a long term boom/bust cycle. Proactive steps must be initiated to restore and protect Wellfleet's shellfish resources for current as well as future generations. To accomplish these goals, it is important to rebuild substrate in the Harbor in areas that historically have caught a good set of oysters and allow the oysters to mature. The Harbor must be managed to maintain a breeding population of oysters.

To maintain or increase oyster harvest in the Harbor, it may also be necessary to rebuild historic oyster bars, populated with Wellfleet oysters. It remains a challenge to design programs to sustain genetically diverse native quahog and scallop beds.

Recommendations:

A. Cultch Operations

The Shellfish Department has explored areas of the Harbor which are suitable for cultching.

Duck Creek: The Department should continue to deploy cultch to create a sustainable oyster bar.

Chipman's Cove: Although Chipman's Cove is very productive, oysters are not uniformally distributed. The Shellfish Department should continue to cultch this area and explore methods to distribute oysters from densely set areas to less densely set areas.

Mayo Beach: Mayo Beach is restricted to recreational use and is utilized by swimmers, sailors, vacationers and the Wellfleet Recreation Department for summer activities. The beach area should not be cultched. The Department has spread juvenile oysters, grown from seed, at Keller's Corner since 2004 and should monitor the success of this seeding effort.

Herring River: Due to the proposed plans to restore tidal flow to the Herring River Estuary, this area should not be cultched. Various baseline studies of the existing conditions have been in progress for some time. When the restoration commences, this area should continue to be carefully monitored for water quality, shellfish distribution and shellfish health.

West Side: This area is worked year-round by draggers. It is a large area that should continue to be cultched every year in efforts to sustain the harvest.

Indian Neck: This recovering area could benefit from continued cultching efforts. The Shellfish Department must continue to monitor the area.

Blackfish Creek: There is a productive area near Pleasant Point and other candidate areas that have been identified for cultching by the Shellfish Department such as Old Wharf Point and an area east of Fox Island.

In general, cultching should be continued in areas in which it has made a significant difference. Because of limited cultching material available each year an area should be clutched heavily until it produces a sustainable oyster bar. If an area is shown to be sustainable under harvest pressure, then new areas can be considered for cultching. Cultched areas will not be equally successful in catching a set of oysters. There is annual variability in the success of the cultching efforts at various locations. It is important to cultch at least 5-6 areas to ensure a good set in some areas. By monitoring areas on a regular basis the stocks can be assessed to determine whether the plan is working. If the cultching program is not working, it should be reevaluated.

B. Town propagation program:

To provide for the non-commercial shellfish program and limited commercial harvest, it will be necessary for the Shellfish Department to continue propagation efforts. Hatchery seed is currently cost effective and suitable for growing littlenecks for the "put and take" practice for non-commercial shellfish harvest on Indian Neck between the jetty and Burton Baker Beach and in also in Town Cove for commercial and non-commercial harvest when the area is open.

C. Oyster reefs and sanctuaries:

Although the town has an oyster propagation program, the use of hatchery-reared oysters to seed the Harbor may not be the best long-term conservation strategy. While hatchery-reared oysters may be suitable for aquaculture purposes, their limited genetic variation may make them very susceptible to new diseases or to changes in Harbor conditions. In order to maintain the genetic diversity of Wellfleet oysters and ensure stocks of wild breeding oysters, the town must plan for the establishment of oyster sanctuaries and/or rotate harvestable areas on an annual basis. To sustain the wild oyster population while still allowing harvest, some areas should be designated "no take" zones. Currently, the restricted areas such as the Herring River estuary, Duck Creek and temporary, seasonal closures, such as Chipman's Cove, are serving the purpose of an oyster sanctuary and source of broodstock. If the proposed restoration of the Herring River results in lifting of harvest restrictions, or if broodstock are depleted from Chipman's Cove and other areas seasonally closed to harvest, this protected reservoir of broodstock would be lost.

Efforts to create or maintain shellfish sanctuaries must be supported. Further study of the issue, in consultation with scientists and fisheries management experts will be needed to determine the best sites for such areas, the best methods and technology, and the appropriate regulations and protocols (no take sanctuary vs. limited harvest licensed area).

Goal 3. Maintenance of biological and habitat diversity

To maintain the ecological balance in Wellfleet Harbor that has been conducive to the recruitment and growth of shellfish, to protect and encourage species that were historically abundant , including eels, river herring, razor clams, horseshoe crabs, sea

worms, softshell clams, tautogs and diamondback terrapins and to maintain the environmental quality of the Harbor, proactive measures are needed.

Recommendations:

A. Encourage research to understand habitat use by all species.

B. Promote shellfishing methods that have minimal negative impact on the environment.

C. Continue to organize annual Harbor cleanups to remove trash from salt marshes and bay beaches and upland areas throughout the Harbor.

D. Eelgrass Restoration: The Natural Resources Advisory Board has proposed an eel grass restoration project that may increase the bay scallop population in the Harbor and thus boost the scallop industry. A firm sandy bottom is needed. The restoration beds should be marked as off limits to boaters and draggers. The possibility of eelgrass restoration should be further explored and efforts to study and experiment with this project should be supported.

Goal 4: Maintenance and improvement of shellfish industry

The shellfish industry in Wellfleet is guided by the *Shellfishing Policy and Regulations* (Appendix 3), Massachusetts General Law and the Massachusetts Department of Marine Fisheries. As the industry evolves, the regulations should be reviewed to reflect changing conditions. In addition, the industry should follow the recommendations developed by the Massachusetts Shellfish Growers in collaboration with the Southeastern Massachusetts Aquaculture Center (SEMAC) and published in *Best Management Practices for the Shellfish Culture Industry in Southeastern Massachusetts, Version 09-04a*

Recommendations:

A. Ongoing review and update of rules and regulations by the Shellfish Advisory Board working with the Board of Selectmen and the Wellfleet Shellfish Department. .

B. Assessment of the feasibility of seasonal closure of the Harbor for dragging.

C. Permit Fees: Review of fee structure and propose changes as necessary that improve the industry and/or protect shellfish resources

D. Encourage legislators and the Department of Marine Fisheries to expand resources in order to speed testing and monitoring for HABs (Harmful Algal Blooms) and shellfish diseases as well as adequate budget for the Department of Marine Fisheries and the Environmental Police so that those involved in the shellfish industry have the most up-to-date information about issues that may impact their operations.

E. Disseminate information about identification and control of predators and pests.

F. Legal gear, gauges and containers: All individuals who have permits and licenses to harvest shellfish must have suitable equipment to measure the size of each individual and the amount of harvest. Appropriate gauges and containers must be used.

Goal 5: Promotion of a thriving shellfish aquaculture industry consisting of small scale, private, commercial, licensed areas.

The Wellfleet shellfishing community and other residents of the town wish to preserve the town's character while supporting shellfish aquaculture. Small-scale farms provide environmental and economic balance while affording the best approach to minimizing user conflicts, sharing of shellfish resources, and maintaining a historic industry that characterizes the town.

Recommendations

A. Develop local protocols for communication about shellfish diseases and rapid response programs to address disease outbreaks.

B. Encourage the Board of Selectmen and Conservation Commission to understand the underlying issues and repercussions of policies regarding expansion of licensed areas vs. granting new licenses

C. Enforce regulations regarding harvest and use of licensed areas

Goal 6: Identify and minimize conflicts between shellfish aquaculture and other human activities within the Harbor

As a result of the 1994 "Pazolt" decision of the Massachusetts Supreme Judicial Court, most shellfish aquaculture practices have been classified as "farming" and aquaculturists do not have the same protections as those who fish in the wild. " Because of the practices and the equipment used, aquacuture may cause conflicts with upland shoreline owners. Many of the titles to intertidal lands are uncertain, depending on whether or not the ownership was separated from the upland ownership. Long range management of the harbor may require better knowledge of title issues." (Wellfleet Harbor Management Plan, 2006).

Recommendations

A. Encourage license holders to resolve conflicts with upland owners whenever possible.
B. Work with Coastal Access Committee, Conservation Commission and Board of Selectmen to preserve and protect town landings and promote public access.
C. Recognize rights and needs of multiple users.

Goal 7. Encourage shellfish research and education

Recommendations:

A. Incorporate an educational component into the planning and design of a proposed new Shellfish Department facility on the town pier.
B. Work with SPAT/ Oysterfest to identify initiatives that are important to the character of Wellfleet in relation to the shellfish industry
C. Solicit community involvement by starting a shellfish preservation volunteer program. (example: predator control task force)
D. Work with the Wellfleet elementary schools to propose and design a shellfish education component for the life and physical science curriculum