



University of New Hampshire  
University of New Hampshire Scholars'  
Repository

PREP Reports & Publications

Institute for the Study of Earth, Oceans, and Space  
(EOS)

2005

## 2005 Shellfish Spotlight

Steve Adams  
*NH Sea Grant*

Raymond E. Grizzle  
*University of New Hampshire - Main Campus, ray.grizzle@unh.edu*

Peter Koufopoulos  
*U.S. Food and Drug Administration*

Tim McClare  
*NH Fish and Game Department*

Chris Nash  
*NH Department of Environmental Services Shellfish Program*

*See next page for additional authors*

Follow this and additional works at: <https://scholars.unh.edu/prep>

 Part of the [Marine Biology Commons](#)

### Recommended Citation

Adams, Steve; Grizzle, Raymond E.; Koufopoulos, Peter; McClare, Tim; Nash, Chris; Smith, Bruce; and Wimsatt, John, "2005 Shellfish Spotlight" (2005). *PREP Reports & Publications*. 187.  
<https://scholars.unh.edu/prep/187>

This Report is brought to you for free and open access by the Institute for the Study of Earth, Oceans, and Space (EOS) at University of New Hampshire Scholars' Repository. It has been accepted for inclusion in PREP Reports & Publications by an authorized administrator of University of New Hampshire Scholars' Repository. For more information, please contact [nicole.hentz@unh.edu](mailto:nicole.hentz@unh.edu).

---

**Authors**

Steve Adams, Raymond E. Grizzle, Peter Koufopoulos, Tim McClare, Chris Nash, Bruce Smith, and John Wimsatt

## Healthy Shellfish Equal Clean Water

THE HEALTH OF NEW HAMPSHIRE'S SHELLFISH IS AN IMPORTANT ISSUE FOR EVERYONE.

In addition to their food value, mussels, clams, and oysters are critical components of marine ecosystems that indicate and contribute to healthy waters. Shellfish help keep water clear and clean by filtering out nutrients and they're an important food source to many other creatures that call New Hampshire's estuaries home. The health of shellfish is directly related to the water quality of the local environment. Because they filter great amounts of water to take in nutrients and oxygen, shellfish absorb contaminants from the water that accumulate in their flesh. Therefore, if a clam is living in dirty water that has high levels of bacteria, that clam will also contain high levels of bacteria and be unsafe to eat. It is this close relationship to water quality that caused the New Hampshire Estuaries Project (NHEP), and many partnering agencies, to monitor shellfish in New Hampshire and make their restoration and maintenance a priority. The NHEP Management Plan includes many strategies intended to increase shellfish populations,



NHEP

**A researcher collects blue mussels at low tide that will be tested for harmful chemicals and heavy metals.**

improve water quality, open more harvesting areas, and support education about these ecologically important creatures. By implementing these strategies, the NHEP and its partners will in turn enhance and protect the overall environmental quality of the state's estuaries. It is a simple equation: Healthy shellfish equal clean water.

### Places To Find More Information on Shellfish in New Hampshire

NH Fish and Game Department  
Clam Hotline: 1-800-43-CLAMS

NHDES Shellfish Program:  
[www.des.state.nh.us/wmb/shellfish](http://www.des.state.nh.us/wmb/shellfish)  
(603) 559-1509

New Hampshire Estuaries Project:  
[www.nhep.unh.edu](http://www.nhep.unh.edu)  
(603) 862-3403

### INSIDE

<p><b>Status of Clams &amp; Oysters in New Hampshire</b></p>	<p><b>New Shellfish Harvesting Area Opened in the Bellamy River</b></p>	<p><b>Who Invited Them? Shellfish Predators in New Hampshire</b></p>	<p><b>Oyster Reef Restoration</b></p>	<p><b>Monitoring To Improve the Safety of Shellfish Harvesting</b></p>	<p><b>Enforcement: Battling Poachers</b></p>	<p><b>The Stressful Life of Oysters</b></p>	<p><b>Clam Research in Hampton-Seabrook Harbor</b></p>
--	---	--	---------------------------------------	--	--	---	--

# Status of Clams & Oysters in New Hampshire

## CLAMS

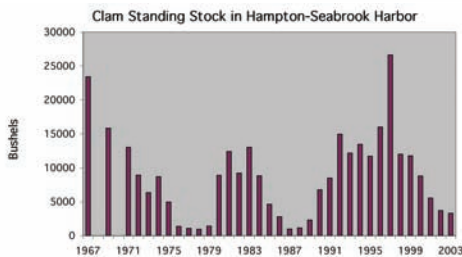
AS MANY GRANITE STATE CLAMMERS KNOW, SOME YEARS IT IS EASIER TO FIND CLAMS THAN OTHERS. IN THE MUDFLATS OF HAMPTON-SEABROOK HARBOR THE NUMBER OF HARVESTABLE CLAMS, REFERRED TO AS “STANDING STOCK,” ROUTINELY PEAKS AND CRASHES.

In 1967 and 1997 researchers estimated that there were about 25,000 bushels of harvestable clams in Hampton-Seabrook Harbor, but in 1978 and 1987 the flats held less than 1,000 bushels.

Since 1997, the standing stock has been declining. In 2003 there were estimated to be only 3,276 bushels available for harvesting. If current trends continue, the number of harvestable clams will continue to fall.

On a more positive note, efforts to improve water quality to make more resource available are working, as evidenced by the recent re-opening of the Bellamy River to shellfish harvesting.

The reasons for the current decline in clams are unclear and as with most things in life, there is not just one answer. Some scientists believe the clam ups and downs are typical of a common predator-prey relationship. Put simply, it means that when there are many clams, predators (including humans) eat them.



Once it becomes hard to find clams, the predators back off and the clams rebound.

Other researchers believe a clam disease, called

sarcomastous neoplasia, is a major cause of clam decline. Similarly, recent NHEP-funded studies in Hampton-Seabrook Harbor confirmed what biologists in NH Fish and Game Department (NHFG) and others suspected; that green crabs feed on a significant number of juvenile clams, limiting the population. The water itself makes life tough for clams, too. Swift currents displace clams, shifting mud suffocates them, and thick ice sheets scour the bottom and crush them.

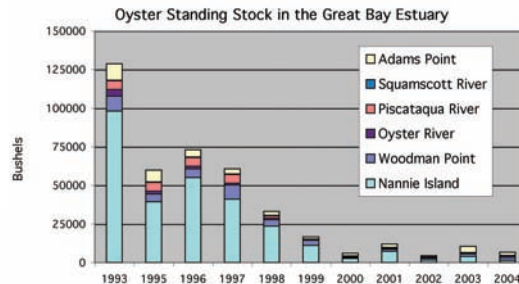
The overall “answer” to why the clams are in a current decline is a combination of these and possibly other factors yet to be explored.

More information on shellfish standing stock and other measures of shellfish health are included in the NHEP’s 2005 Shellfish Indicator Report, available at: [www.nhep.unh.edu](http://www.nhep.unh.edu).

## OYSTERS

A LITTLE OVER A DECADE AGO, OYSTERS WERE DOING PRETTY WELL IN GREAT BAY. BIOLOGISTS ESTIMATED THAT THE LARGEST BEDS HELD ABOUT 120 HARVESTABLE OYSTERS PER SQUARE METER IN 1993. TODAY, THOSE SAME BEDS HAVE ABOUT SEVEN HARVESTABLE OYSTERS PER SQUARE METER.

What happened? Most researchers believe the major cause of this decline was the impact of two oyster diseases, MSX and Dermo. These diseases weaken oysters and either kill them outright or make them more susceptible to other hazards. Oyster fisheries in the Chesapeake Bay and other mid-Atlantic estuaries also have been severely damaged by these two diseases and have not recovered.



How many oysters are left to harvest? Surveys in 2004 suggested that there are about 6,724 bushels

of harvestable oysters in Great Bay. This is in contrast to 128,646 bushels estimated in 1993.

Is there any good news? Yes, there appears to be a good number of juvenile oysters in several beds as a result of a successful breeding season in 2002. These oysters currently are at or close to harvestable size. Also, oyster restoration projects funded by the NHEP and its partners are beginning to produce positive results.





## ACKNOWLEDGEMENTS

Shellfish management and restoration in New Hampshire is a cooperative effort among many agencies and organizations. The NHEP wishes to thank the members of the NHEP Shellfish and Living Resources Team and the following individuals for providing or reviewing content for this publication:

**Steve Adams**  
NH Sea Grant

**Ray Grizzle**  
University of New Hampshire

**Peter Koufopoulos**  
U.S. Food and Drug Administration

**Tim McClare**  
NH Fish and Game Department

**Chris Nash**  
NH Department of Environmental Services Shellfish Program

**Bruce Smith**  
NH Fish and Game Department

**John Wimsatt**  
NH Fish and Game Department

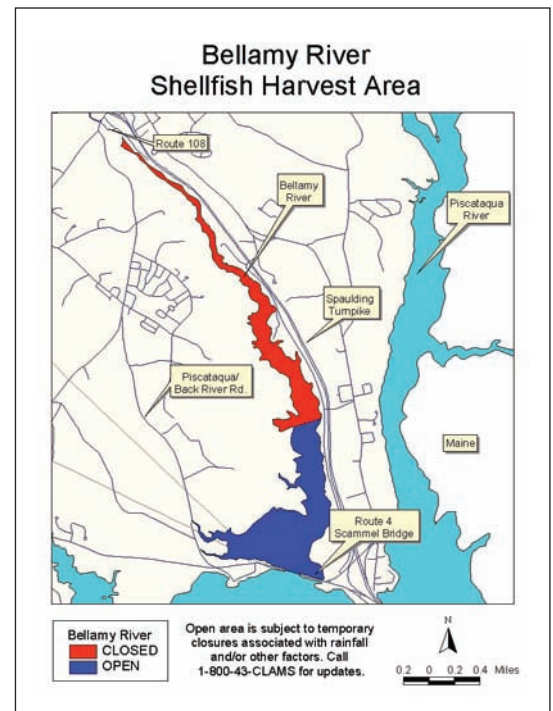
## NHEP MISSION

**This publication was produced by the New Hampshire Estuaries Project, whose mission is to protect, enhance, and monitor the environmental quality of the state's estuaries.**

# New Shellfish Harvesting Area Opened in the Bellamy River

**THERE IS SOME GOOD NEWS FOR SHELLFISH HARVESTERS IN THE GREAT BAY ESTUARY.**

After completing a sanitary survey, the NH Department of Environmental Services (NHDES) Shellfish Program has opened the lower (southern) portion of the Bellamy River for recreational shellfish harvesting. Program staff reminds harvesters that they should always check the status of any flat before going shellfishing by calling the NH Fish and Game Department Clam Hotline at 1-800-43-CLAMS or the NHDES Shellfish Program office at (603) 559-1509. Typical of other New Hampshire tidal waters, temporary closures occasionally will be necessary. Harvesting will be suspended following rainfall events equaling one inch or more and/or significant discharges of improperly treated sewage from the Durham and/or Dover wastewater treatment facilities. For more information, call the Clam Hotline at 1-800-43-CLAMS.



new area will be closed to all shellfishing during the months of June, July, and August. The northern portion of the river will not be opened for harvesting.

## Who Invited Them? Shellfish Predators in New Hampshire

IMAGINE YOU HAVE JUST SAT DOWN IN A MOVIE THEATER AND THE MAN NEXT TO YOU REACHES INTO YOUR POPCORN BUCKET AND HELPS HIMSELF. WHAT DO YOU DO? DO YOU IGNORE HIM AND HOPE HE LEAVES SOME FOR YOU? OR DO YOU DO SOMETHING ABOUT IT?

Most of us would do something about it. After all, it's not fair if an intruder gobbles up our food. But that is exactly what is happening on the oyster beds and clam flats every day in New Hampshire.

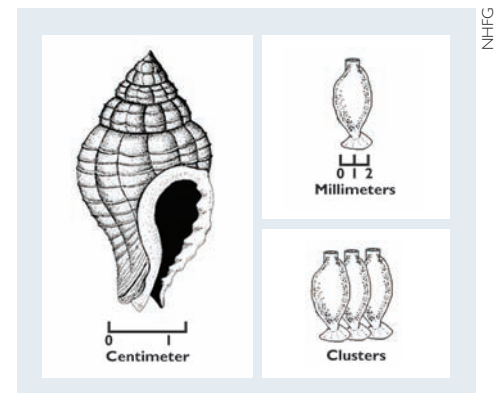
Two troublesome creatures that are helping themselves to New Hampshire shellfish are the oyster drill and green crab.

A native species, the oyster drill is a snail that bores holes in oysters, mussels, and other shelled creatures and eats the animal inside. Its attacks are especially deadly to juvenile oysters.

For clams, the obnoxious invader is the European green crab. This small crab uses

its powerful claws to dig up, crush, and tear apart juvenile clams.

So do you want to do something about it? When oystering, collect oyster drills and their egg cases and destroy them. Do not return them to the water. Green crabs are trickier, because you will never be able to collect and kill enough to control the population. You may be able to reduce their numbers by encouraging their use as fishing bait or even as food. Entrepreneurs in Maine and Canada have been test marketing green crab puree, green crab cakes, and even green crab cheese puffs. If you see some in the grocery store, give them a try.



(clockwise from left) Adult oyster drill, single egg case, and cluster of egg cases.

# Oyster Reef Restoration

**DR. RAY GRIZZLE AND HIS TEAM OF RESEARCHERS AT THE UNIVERSITY OF NEW HAMPSHIRE ARE WORKING HARD TO IMPROVE OYSTER REEFS IN GREAT BAY AND ITS TRIBUTARIES.**

Their work is needed because the oyster reefs of Great Bay have recently experienced significant stock reduction.

A natural oyster reef is comprised of a mound of empty shells from past generations and a top layer of living oysters. These living oysters keep the top of the reef relatively clear of mud and provide a good hard surface on which young oysters, or spat, can settle and begin life. After the recent outbreak of MSX, many reefs lost their cap of living oysters and began accumulating mud. This leaves no place for the oyster spat to settle. Therefore, oyster reef construction and maintenance is a key component to restoring oysters in Great Bay.

With funding from the NHEP, Grizzle's group is studying reef structure alternatives in an area near Nannie Island in Great Bay where two reef designs were built and evaluated. One design mimics a large reef, while the other imitates a series of smaller reefs clustered together. The researchers will study each design and see which one best promotes spat abundance, survival, and growth. The reefs were built with crushed granite mounded up eight inches and then seeded with about 200 young oysters per square yard. The research study also will compare natural spat density on the constructed reefs to density on natural reefs.

The study areas have been clearly marked with buoys to prohibit harvesting on these experimental beds. The results from the study are still being analyzed and a final report should be available in the spring of 2006. Lessons learned from this project will help create a blueprint for future oyster restoration projects in New Hampshire.

Another oyster reef study is occurring in the Bellamy River in Dover. With funding from the NHEP, the Natural Resources Conservation Service, The Nature Conservancy (TNC), and the City of Dover, UNH researchers surveyed and mapped the bottom of the river using a video camera and found the best place to build a group of mini-reefs. These reefs were seeded in the fall of 2005 with about 500,000 oyster spat of native Great Bay oysters that were grown on a nursery raft near Jackson Estuarine Laboratory. The City of Dover is also using this experiment as a learning opportunity for some of their high school students. Several Dover teachers have been working with UNH researchers to implement an education program at Dover High School that will include guest lectures and possibly field trips to the study sites. In 2006 and 2007, UNH and TNC, with additional funding from the National Atmospheric and Oceanic Administration will develop an "oyster gardening"

program to enlist help from local communities and shoreline residents to collect and raise young oysters for planting at historic reef sites.

Finally, Grizzle's team is tackling the problem of shrinking reefs from another angle. Jennifer Greene, Grizzle's laboratory research supervisor, is developing a shell recycling program that will provide opportunities for oystermen to return the shells from their locally harvested oysters to a shell recycling bin, likely to be located at Adams Point. The returned shell will be used in restoration projects in Great Bay and its tributaries. Partners in this project will include New Hampshire Sea Grant, NHFG, and the NHEP.

## Monitoring To Improve the Safety of Shellfish Harvesting

**IT IS SIMPLE LOGIC THAT WE NEED TO MANAGE OUR NATURAL RESOURCES TO ENSURE THAT WE HAVE ENOUGH CLAMS, MUSSELS, AND OYSTERS TO HARVEST...**

...but it is equally important to know that those shellfish are suitable to eat. That is the task of the NHDES Shellfish Program.

This program, with assistance from state laboratories at the NH Department of Health and Human Services (NHDHHS) and NHDES, makes it possible for residents to experience a native clam bake or enjoy a day of oystering on Great Bay. Without their rigorous monitoring of the sanitary quality of

shellfish harvesting areas, no clamming, oystering, or mussel harvesting would be allowed in the state.

In addition to enabling recreational harvest of shellfish, the NHDES Shellfish Program also makes aquaculture possible in New Hampshire. Farming oysters and mussels holds great promise for seafood lovers and the state's economy, but these commercial ventures would not be viable without the evaluations conducted by the program.

So how does the program determine if the state's shellfish are suitable for consumption? First of all, the staff regularly collects water samples from over 75 locations in state tidal waters and shellfish meat samples from 15 locations. Water and shellfish samples are sent to state labs in Concord where they are tested for bacterial contamination.

Secondly, the program, with assistance from NHFG and the Great Bay Coast Watch, monitors the occurrence of paralytic shellfish poison (PSP), also called red tide, in New Hampshire's waters. In 2005, it was the NHDES Shellfish Program that first detected a record-breaking red tide outbreak in New Hampshire, which closed the offshore shellfish areas for 12 weeks. PSP can affect the human nervous system within 30 minutes and result



**(clockwise from upper left) UNH researchers deliver oyster spat to nursery raft, a NHDES biologist rakes oysters from a Great Bay oyster bed to evaluate their condition, and a laboratory technician prepares mussel tissue for analysis.**

Grizzle/UNH, NHDES Shellfish Program, and NHEP

in numbness, uncoordinated movements, incoherent speech, nausea, and possibly death. To test for PSP, blue mussels are collected weekly from April to October and transported to the NHDHHS laboratory for testing.

Finally, the program conducts in-depth environmental studies of shellfish growing areas, called sanitary surveys. These surveys are required before an area can be open to shellfishing. They involve intensive water monitoring and shoreline inspections, coupled with an analysis of the impacts of wastewater treatment plants, private septic systems, development, boating, and other activities that affect shellfish growing areas because of pollution. Depending on the sanitary survey findings and the extent to which pollution sources can be eliminated or controlled, the program classifies areas as open or closed for the harvest of shellfish. Most areas in the state's tidal waters that are approved for harvest are open on a conditional basis, meaning that certain conditions (e.g., rainfall, sewage releases from wastewater treatment plants) will close areas down for harvest until the NHDES Shellfish Program determines that a reopening is appropriate.

Clearly, harvest area closures are determined through rigorous monitoring and closures should be taken seriously. The U.S. Food and Drug Administration, which certifies the work of NHDES Shellfish Program, suggests that consumers confirm the origin of shellfish before eating them to ensure they were purchased from a licensed distributor or were harvested from approved waters.

## Enforcement: Battling Poachers

**ILLEGALLY HARVESTING SHELLFISH NOT ONLY HAMPERS THE MANAGEMENT OF THE RESOURCE, BUT IT CAN BE HAZARDOUS TO ONE'S HEALTH.**



NHDES Shellfish Program

The decision to close shellfishing areas by the NHDES Shellfish Program is based on stringent testing for evidence of contamination from sewage, which sometimes contains disease causing organisms. Because shellfish filter their food from the water, they will concentrate bacteria and viruses, making them at times harmful to eat. After a rain, runoff from the land often washes bacteria into the water, which in turn can contaminate the shellfish. There is always some inherent risk in eating shellfish, but the risks are significantly reduced if you obey the law and harvest only when the shellfish areas are open.

Illegal harvesting of clams was a big problem in Hampton-Seabrook Harbor area in the early 1990s. NHFG Conservation Officer Tim McClare has policed the clam flats for 19 years, working to stop this illegal and potentially dangerous activity.

"Night digging on the flats was a real problem. We would have some guys digging two to three bushels of clams

in closed areas. That is a lot when you consider that the legal limit is 10 quarts and there are 32 quarts in one bushel," McClare said. "We devised an approach that caught many of these illegal clammers, and we made quite a few arrests. Some repeat offenders spent some jail time." It is illegal to commercially harvest clams in New Hampshire, but McClare said that the activity, known locally as bootlegging, was significant in the past and likely occurs on a smaller scale today. Sometimes clammers think the flats are closed arbitrarily and that taking a few from a closed area can't cause harm. McClare says this is a big mistake. He notes, "The staff at the NHDES Shellfish Program really wants to open areas up for harvesting and they do careful, frequent testing of the clams to know exactly when they are up to FDA standards for consumption. Therefore, if they say a flat should be closed, you better believe them. It's just not safe to ignore the warnings."

Even after a flat is closed there are still the occasional clammers who will ignore the law and dig. This is where citizens can help protect the public resource and public health. Operation Game Thief is a poaching tip line established by NHFG, in partnership with many area businesses, to provide an easy way for people to report illegal activity. The toll-free number to report a wildlife crime is 1-800-344-4262. Officers ask that you report as much information as you can about the incident, including the date and time, vehicle description, location, and suspected violation.

## The Stressful Life of Oysters

**LIFE CAN BE STRESSFUL IF YOU'RE AN OYSTER. CRABS AND OYSTER DRILLS PROWL THE BEDS TRYING TO END YOUR LIFE.**

Disease causing parasites wait for you to let your guard down so they can take up residence in your flesh. Pollution, hot weather, and scores of other dangers cause you stress. Sometimes the stress is so great it can be deadly.

Just before a stressful death, oysters can be so weak that they don't completely close their shells. Known as gapers, these

over-stressed oysters may look fine and have meat inside, but they remain slightly open when you handle them out of the water. NHFG wants to know if you are seeing gapers in your catch because the presence of gapers may suggest a problem.

You are invited to report the occurrence of gapers in your catch in one of two ways. You can fill out a form online at

[www.nhep.unh.edu/gapers](http://www.nhep.unh.edu/gapers). If you would prefer to report your gaper catch by phone, you can call Bruce Smith at NHFG at (603) 868-1095.



**A gaper (as shown on the left) does not close when handled and emits a foul odor.**



# Clam Research in Hampton-Seabrook Harbor

DR. BRIAN BEAL, A RESEARCHER FROM THE UNIVERSITY OF MAINE AT MACHIAS, WITH FUNDING AND STAFF SUPPORT FROM THE NHEP, IS CONDUCTING A CLAM RESTORATION RESEARCH PROJECT IN HAMPTON-SEABROOK HARBOR...

...that evaluates the feasibility of using mesh netting to enhance survival of juvenile clams. Previous work done by Beal and his research team indicated that juvenile clams are often eaten by green crabs, so an effective seeding program must involve some protection for the vulnerable shellfish. For the past two years, he has been testing the effectiveness of mesh netting to keep the ravenous predators at bay, and in April 2006 he will again set out mesh nets of various sizes on the Willows and Middle Ground flats. His research team will measure the growth



NHEP

**Nets anchored to the Willows flats are part of a NHEP-funded juvenile clam experiment in Hampton-Seabrook Harbor. The young clams under the nets are about the size of a thumbnail.**

and survival of wild and hatchery-reared clams in protected and unprotected plots. Ultimately, Beal's research will help managers determine if a large-scale netting effort could be an effective approach to restore clam populations in Hampton-Seabrook Harbor.

The experimental plots consist of rows of large nets buried in mud. Beal asks that anyone who sees these experiments to please leave them undisturbed. The NHEP encourages anyone interested in learning more about this project to contact the office at (603) 862-3403.

## Harvesting Techniques

To learn more about the proper way to harvest soft-shell clams go to the NHDES Shellfish Program website at [www.des.state.nh.us/wmb/shellfish/howtodig.htm](http://www.des.state.nh.us/wmb/shellfish/howtodig.htm)

