

What's Happening to Lobsters in Long Island Sound?



Photo: Peter Auster, NURC

The American lobster, *Homarus americanus*, is a bottom-dwelling animal.

Recently, lobsters in Long Island Sound have been experiencing unprecedented outbreaks of disease that have resulted in massive mortalities, particularly in the western Sound. Economic impacts on the lobster fishery and related industries have been devastating. For example, data from the Connecticut Department of Environmental Protection and the New York Department of Environmental Conservation show that lobster landings in some parts of the western Sound fell virtually 100% in the fall of 1999. Hundreds of thousands of lobsters have died, and more than 1,300 lobstermen Sound-wide are impacted by the loss. The Connecticut Lobstermen's Association estimates the loss to be about \$16 million

per year. A number of diseases now appear to be responsible. Other economically-important species such as blue crabs and sea urchins are also experiencing unexplained die-offs in parts of the Northeast U.S., which may or may not result from the same cause as the lobster mortality —more mysteries to investigate. There was a previous large lobster die-off in Maine in 1997-98; there are ongoing deaths of sea urchins from Massachusetts to Nova Scotia, and recent reports of unexplained deaths of blue and spider crabs in Long Island Sound.



P. Morenus, UCONN

Dr. Richard French and colleagues at the UCONN Pathology laboratory perform autopsies on Long Island Sound lobsters. The team has discovered a paramoeba present in all of the lobsters they tested.

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Paramoebiasis

Baffled by the mysterious 1999 deaths, researchers in Connecticut, Maine, and Arizona tested the western Sound lobsters for bacteria and viruses, but found nothing to indicate the cause of the huge die-off. Dr. Richard A. French, a pathologist at the University of Connecticut,

is leading a team of scientists doing diagnostic laboratory tests on Long Island Sound lobsters. These researchers have found a potential killer: a parasitic paramoeba. (A paramoeba is a tiny one-celled protozoan animal, similar to the amoeba that most people encounter in their first biology class.)

The paramoeba somehow enters the lobster's nervous system and begins to engulf and destroy the nerve tissue. The result may be a condition being called "limp lobster syndrome". Death usually follows within 24 hours.

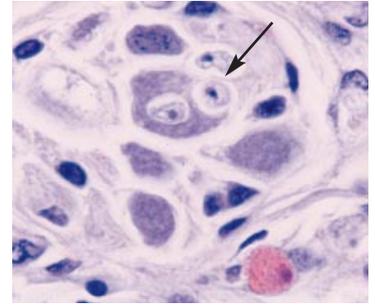


Photo: Richard A. French, UCONN

This microscopic photo shows parasitic protozoans discovered in the brain of a western LIS lobster. Characteristics are consistent with a paramoeba.

Shell Disease

Meanwhile, a completely different illness, "shell disease," is afflicting lobsters in the eastern Long Island Sound. Unlike the paramoeba-infected lobsters, shell disease, a bacterial infection, is quite noticeable from the outside of the animal. In this case, a bacterial infection colonizes and eats through the lobster's carapace (exoskeleton, or outer shell). Shell disease has been around for a while in the Sound, but it appears to have greatly increased in Connecticut, Massachusetts and Rhode Island recently. Reports show that Eastern LIS landings are down as much as 50% because of this affliction, and there is an additional economic loss to the live animal market.



Photo: Richard A. French, UCONN

A lobster afflicted with shell disease, collected from the Race near Fishers Island.

This disease, also called chitinolytic shell disease, is very common amongst crustaceans. The bacteria involved cause erosion, pitting, melanization,

and necrosis of the exoskeleton (outer shell). More than 30 different bacteria strains have been implicated, and the disease is found most often in areas where lobsters are impounded, especially if overcrowded. The American lobster is particularly aggressive, and researchers believe that damage to the carapace caused when lobsters fight as well as molt could be the point of entry for the bacteria.



Photo: Richard A. French, UCONN

Lobster claw showing shell disease (black areas) affecting the chitin.

Red Tail, or Gaffkemia

In previous years, notably in 1991 and 1993, yet another lobster disease, *Gaffkemia*, caused declines in lobster landings in LIS, but probably not to the extent being experienced now. In this situation, the bacterium *Aerococcus viridians* var. *homari* infects the circulatory system, invading the heart and blood vessels. It impairs blood circulation and may cause the lobster to have a fatal hemorrhage.

Gaffkemia, or “red tail” disease has affected lobsters in many other locations worldwide, both in wild and impounded populations, and its occurrence in Long Island Sound is not well documented. This disease was noticed in Maine as long ago as 1946.

Other Bacterial Diseases in Lobsters

Bacterial diseases are common in crustaceans and other marine animals, and *Vibrio* bacteria are often the culprit. A large lobster mortality that occurred two years ago in Maine, which many observers have compared to the Long Island Sound events, is thought to have been caused by one of the *Vibrio* bacteria species.

Grey Crab Disease

So-called Grey Crab Disease affected blue crabs in the Chesapeake Bay area. Like the recent LIS lobster mortalities, this disease is attributed to a paramoeba, but probably a different species. The implicated species, *Paramoeba perniciosa*, turns the crab a grayish color. Because of the timing, researchers think that the parasite may affect molting crabs, invading through lesions in the carapace being shed and then entering the circulatory system.

Bumper Car Disease

“Bumper Car Disease”, or Ciliate Disease, is caused by a protozoan, *Anophrhoides haemophilia*. This disease has caused mortalities in places where captive lobsters are held, in Maine and various provinces in Canada. The protozoans wave their cilia, or tiny hairs, as they make swimming motions whose patterns resemble the movements of carnival bumper cars to the scientists observing them. To date, this disease has not been reported in Long Island Sound, although it has been recorded in Maine.

Is the Sound Sick?

Part of solving the “big picture” in the lobster mystery will be to examine the creatures of the Sound in their own habitat. Many people believe that the lobster and crab illnesses and deaths imply that something is wrong with the health of the Long Island Sound estuary itself. Could factors like changes in temperature or climate, storms, or pollution be weakening the animals so that they become susceptible to disease and parasites? There are many such questions that can be looked into if scientists are able to do a full-scale monitoring of Long Island Sound as an ecosystem.

What Will Scientists do to Address the Lobster Problem?

Researchers will autopsy and examine blood and tissue samples of both sick and healthy lobsters, looking for changes. They will also seek out any viruses, bacteria and parasites that may be present and try to determine whether these invaders would kill the animal. In addition, they will perform toxicology tests - tests to find any harmful chemicals such as metals, PCBs, or pesticides that may have gotten into the animals from the water or sediments, or their food.

What Else Can Scientists Tell from the Lobsters?

Scientists and lobstermen hope to work together to start a lobster tracking program, which would compile records of lobster observations, including, age, sex, location, condition, etc. Further study could reveal whether the diseases are part of a natural cycle that fluctuates from year to year, or a completely unexpected, one-time catastrophic event. They also hope to make records of the distribution of each disease outbreak and how frequently it occurs, and what conditions were present at the time. Databases of such information could provide clues as to what triggers the onset of a disease outbreak.

Recovery Hopes for the Surviving Lobster Population

At this time, the long-term effect on the surviving lobster population of the losses due to paramoeba and shell disease is not known, nor is the effect on the structure of the ecosystem as a whole. Scientists and managers don't know how many of the dead lobsters were egg-bearing females, so they do not know yet what quantity of larvae may survive to be available for the next generation of adult lobsters. Lobsters take seven years to mature. It may possibly become necessary to attempt to restock lobsters in Long Island Sound.

Fact Sheet written by Peg Van Patten, Connecticut Sea Grant Communications and Richard A. French, UCONN Department of Pathobiology. Photos contributed by Dr. Richard Alan French, Peter Auster, and Peter Morenus.

For more information, contact:
Nancy Balcom
Connecticut Sea Grant
Extension
University of Connecticut
1084 Shennecossett Road
Groton, CT 06340
Tel. (860) 405-9127

E-mail:
balcom@uconnvm.uconn.edu

