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Lobster Resource Showing No Signs of Recovery as Research Progresses

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Lobster Resource Showing No Signs of Recovery as Research Progresses

by Nancy C. Balcom

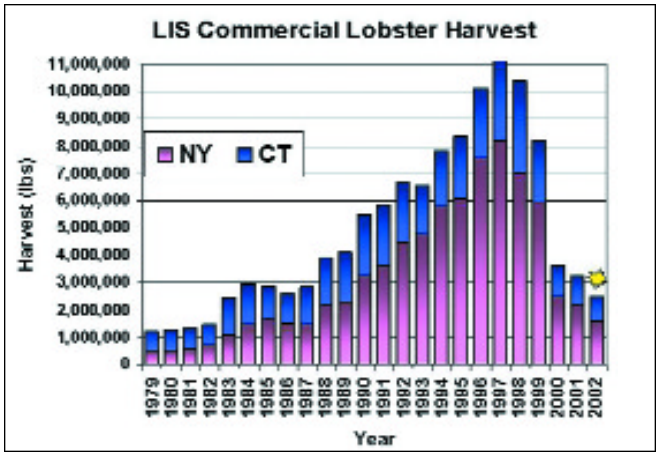
FRUSTRATION AND LOBSTERS go hand in hand these days. Frustration at the lack of lobsters, frustration and despair at the loss of a livelihood, frustration at the amount of time it takes to find answers. Frustration at watching those answers being sought in universities and a federal civil court simultaneously. Today, the problems generated by the massive Long Island Sound lobster mortality event in the fall of 1999 are still with us.

Scientists feel the answer is coming into focus, but conclusive results are not yet available, as research projects will not be completed for another six months to a year. Yet, from this massive research effort, scientists are learning a lot about lobsters, information that will prove beneficial to resource managers, policy makers, and lobster biologists in the long run. And yes, hopefully it will lead to the long-term recovery of the lobster resource in Long Island Sound. This information may help those in Rhode Island and Massachusetts, faced with their own plummeting lobster landings. It may even help those in Maine enjoying record high landings of lobsters.

Good, rigorous, reproducible research takes time. Lobster stocks may recover over time. But for lobstermen, time is the enemy.

"The lobsters are depleted and the fishermen are suffering," says Nick Crismale, president of the Connecticut Lobstermen's Association. Three years after the LIS lobster resource was declared a fishery disaster, those that have not already left the fishery are still struggling financially, waiting and wondering whether they should continue to hang on, or give up and find something else to do. Weighing and balancing the odds of a turn-around this year or next. Loving their traditional livelihood. Hating the idea of shore-based, water-less employment. Waiting for the research community to provide final results. Wondering what fisheries managers will do with the information to facilitate the recovery of the resource. Waiting for the civil lawsuit filed in 2000 against the manufacturers of mosquito control pesticides to progress.

Today, there are about half the number of licensed commercial lobstermen fishing the Sound



Source: NYS DEC and CT DEP

than there were nine years ago. The number of market-sized Long Island Sound lobsters landed went from a high of 11 million pounds in 1997 to 2.5 million pounds in 2002.

While the harvest data show that recent landing of market-sized lobsters are similar to those of 1985–1986, the difference is in the amount of effort it took to catch the lobsters, which was much greater in 2001-2002. The average number of pounds of lobsters caught per trap dropped from 23 pounds in 1986 to about 7 pounds in 2001. Nearly three times the number of traps used in the mid-1980s are used now. It takes more effort to catch fewer lobsters, and costs more, too.

A tagging study conducted by the Connecticut Department of Environmental Protection (DEP), in cooperation with some lobstermen, is in its second year. The tags, colored orange or white, have a monetary incentive associated with them, to encourage lobstermen to report any tagged lobsters they catch, before re-releasing them.

"The tag return data so far show that lobsters are not inclined to move far from their original release points after they are tagged," said Penny Howell, a DEP marine fisheries biologist. "Most move less than 5 km, although some have been found more than 20 km away from where they were tagged and released." Overall, the net movement of the lobsters is slightly to the east.

This information becomes more interesting when it is coupled with the results of a genetic study of the Long Island Sound lobster population, conducted by

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Joseph Crivello at the University of Connecticut for the CT DEP. Crivello's study shows that overall the lobster population in the Sound functions as a distinct population from, for example, those found offshore in the Atlantic. This study further found that the lobsters in the western part of the Sound, from Bridgeport south and west, are about as genetically different from lobsters in the eastern and central sections of the Sound as they are from lobsters caught offshore.

Photo: Connecticut DEP

Lobsters are tagged by Connecticut DEP staff studying lobster movements in Long Island Sound.

"This raises concerns that in order for the lobster population in the western Sound to recover, it will have to do so from within, rather than relying on lobsters migrating west from more eastern parts of the Sound and offshore," says Howell.

Overall, the prognosis for recovery of the lobster population looks rather grim at the moment. Indexes measuring the abundances of larval, juvenile and market-size lobsters were at record lows in 2002. Lobsters take 5-7 years to grow to maturity and then to legal market size. A year or two of low numbers of larval lobsters can postpone or interrupt any natural recovery the population makes.

What progress has the research community made?

In March 2003, 225 researchers, state and federal resource managers, lobstermen, and other concerned individuals convened in Bridgeport, Connecticut for the Third Long Island Sound Lobster Health Symposium. Co-sponsored by the LIS Lobster Mortality Research Initiative and the CT DEP LIS Research Fund, the meeting was organized and hosted locally by Connecticut Sea Grant. "While the purpose of this symposium was to present preliminary results from the on-going research projects, some, in particular the lobstermen, were looking to participate in policy discussions," said Edward Monahan, Director of Connecticut Sea Grant. "They've been waiting for answers since the fall of 1999. Time has run out for many of them, and they've had to leave the fishery. But good answers will only come from good research, which takes time. It's a very unfortunate mis-match of time scales."

The current status of the lobster resource and preliminary results from 19 research efforts, funded by the Lobster Mortality Research Initiative were summarized. The research projects were loosely grouped into four topics, environmental stressors, physiological response to stress, pesticides, and parasites and disease.

"The environmental conditions (higher water temperatures, seasonal low dissolved oxygen levels, and the presence of ammonia and sulfides in the bottom waters) present in western Long Island Sound in the fall of 1999 were capable alone of causing lobster mortality, or at least to have stressed infected lobsters to the point that resulted in mass mortality," said Carmela Cuomo, a research associate at Yale University.

How do lobsters react to stressful conditions? Investigators are now gaining a better understanding of how a lobster's immune system reacts to the presence of foreign cells (e.g. disease organisms) by studying the formation of antimicrobial agents in lobster hemocytes or blood cells, said Richard Robohm, a fishery biologist with the National Marine Fisheries Service, at the symposium. They are also looking at how levels of stress proteins in a lobster change in response to unsuitable environmental conditions. Six research teams are developing these tools to better evaluate the ability of lobsters to protect themselves against disease, when exposed to environmental stresses like abnormally warm water temperatures, low dissolved oxygen levels, or sulfides.

In 1999, lobstermen reported finding egg-bearing females that were molting. Female lobsters normally carry their eggs for nine months and do not molt (shed their shells in order to grow) during this period. These "eggers" also seem to be more susceptible to the shell disease pitting the shells of lobsters living in the eastern portions of the Sound, as well as Rhode Island waters and Buzzards Bay, Massachusetts.

"We found that the level of a certain lobster hormone called ecdysone, that normally increases right before molting, is elevated at other times in shell diseased lobsters. This may be the reason why molting may be occurring while eggs are still being carried," says research team leader Hans Laufer, emeritus professor at the University of Connecticut.

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This shell disease is characterized by lesions more severe and extensive than are associated with the shell disease that has been around at fairly low levels for years. More information on how the lobsters become infected is needed, but it appears that there are at least three to seven strains of bacteria that may be associated with the disease.

In summarizing results of five lobster disease studies, Salvatore Frasca, a University of Connecticut veterinary pathologist, noted that lobsters were still dying during the summer of 2002, and that yet another disease had been described. Alistair Dove, a senior research associate at the Cornell College of Veterinary Medicine, determined that lobsters were suffering from calcinosis, a non-infectious but potentially fatal disease of lobsters, akin to the formation of kidney stones in humans. It was likely caused by the extremely warm bottom water temperatures that affected the lobsters' normal metabolism of calcium, leading to the formation of calcium crystals in the gills, and ultimately, respiratory failure.

The new disease was affecting lobsters in addition to the earlier-described Paramoebiasis, a fatal, infectious disease caused by a parasitic paramoeba that engulfs lobster nervous tissues. It was discovered in the dead and dying lobsters in the fall of 1999 by pathologists at the University of Connecticut (see *Wrack Lines* Vol. 1:1, 2001.) Researchers are closer now to identifying the organism, believed to be a Neoparamoeba species, and are developing tools to rapidly detect it in lobster tissues, as well as water and sediment samples.

Photo: P. Van Patten

UCONN pathologist Sylvain De Guise injects an animal with malathion to determine the effects of the pesticide on lobster physiology.

The presentation on pesticides by Sylvain De Guise, a veterinary pathologist with the University of Connecticut, was the one most eagerly awaited, and debated, during the symposium. Lobstermen had recently learned that the lawsuit filed on their behalf against several manufacturers of mosquito control pesticides had been certified as a class action, and were looking forward to hearing the preliminary results of the three pesticide research projects. They contend that pesticides sprayed to control mosquitoes carrying the West Nile virus resulted in the massive die-off of lobsters in western Long Island Sound in 1999.

Laboratory tests on adult and larval lobsters show that lobsters are sensitive to the lethal effects of all three mosquito pesticides used–malathion and resmethrin (sprayed aerially for adults) and methoprene (larvicide).

"It really doesn't take much to kill lobsters," says De Guise, noting that his lab studies showed that 33 parts per billion of malathion killed off half the adult lobsters in the study within 96 hours.

"One part per billion is equivalent to 1 drop of water in a billion drops of water, or one person in China," De Guise said. However, what concentration of these pesticides, which degrade rapidly in the environment, lobsters may have been exposed to in the Sound is not known, and therefore a direct link from the lethal and sub-lethal effects seen in the lab to the Long Island Sound environment cannot be made at this time. The New York State Department of Health is required by law to maintain a database of all pesticide applications in New York. This database is only accessible to researchers, and no one has yet worked through the reams of data to determine the amount of pesticide that may have realistically entered the Sound's waters during 1999. It is unclear if a similar database exists for pesticide applications in Connecticut.

In 1999, tests to measure the levels of any pesticides in the water came back negative. It is unknown if this was because no pesticides were present, or because the equipment and techniques available were not sensitive enough to record any measurable levels. Anne McElroy and Bruce Brownawell at SUNY Stony Brook have now developed methods for measuring levels of substances (like pesticides) in water in the range of parts per trillion, 1000 times more sensitive than the methods used in 1999.

As answers start coming into focus, more questions also arise. Key missing information is how to culture the paramoeba and the

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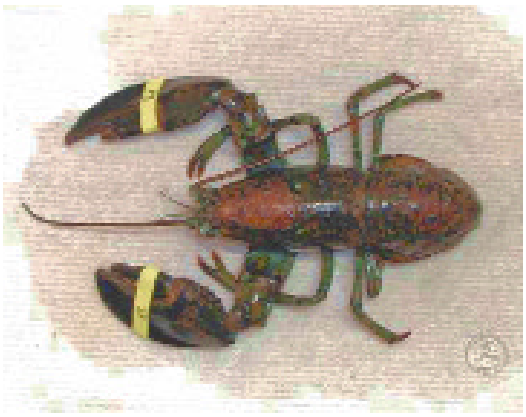

Photo: R. Smolowitz

Lobster exhibiting the effects of severe shell disease. While not known to harm humans, the disease looks nasty and therefore affects market value.

bacteria associated with the shell disease, so that infectivity studies of healthy lobsters can be conducted to learn how these diseases are transmitted. These efforts are underway, but so far, have been unsuccessful. Data on pesticide applications from New York and Connecticut await detailed analysis to calculate how much pesticide lobsters may have been exposed to in 1999.

Nevertheless, researchers are learning more every day about how the lobster fits into and is affected by its environment, both natural and anthropogenic. When the research is completed, the next logical step will be for resource managers to use the information to make some decisions regarding the recovery of the lobster resource and its associated commercial fishery–in time, hopefully, for at least some of the lobstermen. WL

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