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ENVIRONMENT; Warm Water Cited in Lobster Die-Off

By JOHN RATHER
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A "PERFECT STORM" of sustained high water temperature, low levels of dissolved oxygen and the toxic impacts of ammonia and sulfides created lethal conditions for lobsters in western Long Island Sound in September 1999 and all but certainly explains why they suddenly died in tremendous numbers, according to researchers.

But in a series of reports delivered at a symposium earlier this month at Stony Brook University, they sounded less certain about whether and to what degree pesticides contributed and said it was an area that needed more study.

The die-off, which lobstermen said occurred with stunning speed between Sept. 19 and 22, 1999, abruptly ended a peak period for catches, essentially wiped out a \$100 million lobster industry, idled hundreds of New York and Connecticut lobstermen who had been hauling a record 500,000 traps, and sounded alarms as far north as Maine.

Shell disease, marked by eroded and discolored shells that make lobsters unmarketable, has also spread in eastern Long Island Sound, where the crustaceans are less plentiful.

But the impact of the 1999 die-off was greatest in western waters of the Sound, where the lobsters and the lobster industry were concentrated.

Last year the lobster catch was less than one-tenth of its peak of 8.2 million pounds in 1997.

Participants in the symposium described the die-off as a major environmental event, and in the view of some researchers it was an ominous if still tentative sign of global warming. Long Island Sound is at the southern edge of the Maine lobster's East Coast range.

"Global warming is definitely happening, and it's happening in Long Island Sound," said Karen Chytalo, a marine habitat protection official for the New York State Department of Environmental Conservation.

But Jack Mattice, director of the New York Sea Grant program at Stony Brook, was more tentative, saying anything that raised water temperature was a threat to lobsters, and "it could be global warming."

In reports delivered at the symposium, co-sponsored by the Connecticut and New York Sea Grant programs, researchers said that mosquito pesticides including methoprene,

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malathion, resmethrin and sumithrin could not account for the catastrophic 1999 die-off, even even though, the compounds were found to be extremely toxic to lobsters.

The pesticides, in different combinations and at different times, were in use both before and after the die-off in New York City, on Long Island and in Westchester and Connecticut as government and health officials reacted to the onset of mosquito-borne West Nile virus with emergency ground and aerial spraying. Genetically, lobsters are closely related to mosquitoes.

Many lobstermen believe the pivotal event came on Sept. 19, when the remnants of Hurricane Floyd, by then a tropical storm, dumped heavy rain on Long Island and flushed pesticides into the Sound in storm runoff.

But the researchers said that even assuming all the pesticides applied on land areas around Long Island Sound at the time of the die-off had been washed into the water by rain, the amounts were too small to kill lobsters or to weaken them enough that they would succumb to already hostile water conditions.

Though the researchers billed their findings as definitive, they stopped short of exonerating the pesticides and said more research was needed. They also acknowledged that pesticide concentrations in Long Island Sound in the crucial September 1999 time frame were difficult to gauge.

Researchers were emphatic, however, in depicting what they concluded were the principal causes of the 1999 die-off. They also described the die-off as a more gradual event, perhaps foreshadowed in 1997 and 1998 when smaller die-offs were already signaling trouble ahead.

By the time of the September 1999 die-off, they said, lobsters had already been exposed for more than two months to water temperatures above 68 degrees Fahrenheit, considered the upper limit of their endurance. As the creatures withdrew from shallower, warmer waters to the cooler bottom waters, they were also subjected to low oxygen levels, or hypoxia.

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Researchers said that by late summer the lobsters, in moving away from hypoxic areas, crowded more closely together, only to be overtaken by hypoxia again. Hypoxia occurs as water grows warmer, and when algae and other marine organisms die, sink to the bottom, and consume oxygen on the already low-oxygen bottoms as they decompose.

Conditions grew even more hostile because there was too little oxygen for aerobic bacteria to continue this decomposition, leaving the job to anaerobic bacteria -- or bacteria that don't use oxygen -- which release ammonia and sulfides toxic to lobsters.

The researchers said winds from a storm on Aug. 30 thoroughly mixed waters of Long Island Sound that had stratified during a dry summer, with warmer water near the surface.

Carmela Cuomo, a marine ecologist and geologist at the University of New Haven, said the mixing brought fresh oxygen to the depths, but also raised bottom water temperature by 1.5 to 2 degrees in just 6 hours, pushing it into the red zone for already weakened lobsters.

The future for the industry looked bleak. A graph of lobster larvae numbers showed an up-and-down pattern leading to 2002, when levels fell to historic lows and stayed there.

Penelope Howell-Heller, a senior fisheries biologist at the Connecticut Department of Environmental Protection, said it was the first time in 22 years of records that larval levels had stayed so low for three consecutive years. Research also showed female lobsters were at low levels.

The low numbers of larvae raised concerns about the use of mosquito pesticides on land because of the extraordinarily lethal effect even tiny amounts could have on the larvae and also on juvenile lobsters.

Researchers reported that as little as 33 parts per billion of the pesticide malathion in water would kill 50 percent of adult lobsters, with juveniles and larvae deemed even more susceptible. Malathion was used in New York City in August and September of 1999. In 2001 Congress allocated \$6.6 million to the National Oceanic and Atmospheric Administration to research the causes and economic impact of the 1999 lobster die-off and shell disease in Long Island Sound. Connecticut contributed an additional \$1 million. The National Marine Fisheries Service and environmental agencies in both

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states participated.

The relatively modest amount of money available for research left many questions unanswered and confined researchers to addressing relatively narrow issues.

The researchers agreed that more research, data and monitoring was necessary, including research into the role of mosquito pesticides in weakening or killing lobsters.

Photos: Study of the lobster die-off is being done at the Marine Sciences Research Center at SUNY Stony Brook by researchers like Al Dove. (Photographs by Maxine Hicks for The New York Times)

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