LONG ISLAND SOUND

Lobster Research Brief

Calcinosis in Lobsters

Highlights

- New reports of lobster die-off in the Central Basin in Summer 2002.
- Symptoms include lethargy, orange tint on abdomen, heavy accumulation of rusty colored substance on the gills, and short shelf life.
- First time that calcinosis is being reported in lobsters.
- These lobsters were believed to have died from metabolic and respiratory failure.
- Preliminary results link the latest lobster mortalities to prevailing high bottom water temperatures in Long Island Sound.

Lobstermen and researchers are engaging in cooperative research, especially to collect 'real time' information on Long Island Sound's lobster fishery. Summer 2002 was the first time that the lobster industry was able to use the new diagnostic service that has been established as part of the rapid response system for marine disease outbreaks. This laboratory began under a grant from New York State Assembly in direct response to the lobster fishery disaster of 1999.

In mid-August 2002, several lobstermen became suspicious when they noticed lobsters showing symptoms of weakness, with a short shelf life. This incident began as the lobstermen were in the last few weeks of the spring/summer season. A few lobstermen coordinated with New York State DEC to collect samples of dying lobsters from affected areas. Specimens were sent to the ***Marine Disease Pathology & Research Consortium Laboratory*** at Stony Brook University, where staff from Cornell College of Veterinary Medicine studied the physical and microscopic characteristics of the ill lobsters.

Lobster Industry Response

The reports started out in Mattituck, NY, but samples were collected from sites west, as far as Oyster Bay, NY. The pathologist noticed an unusual orange appearance of the abdomen of unhealthy lobsters, and the gills appeared to be clogged by a rusty substance. The lobsters appeared to be in a weakened state, and usually died within a few hours after they were landed. These physical symptoms are very noticeable and lobstermen shouldn't have any problems identifying these sick animals in their catch.

Tissue samples from affected lobsters were tested for common pathogens that have been associated with the northeastern lobster fishery. Of particular interest was whether this was an outbreak of *paramoebiasis*, which was first observed during the lobster die-off in 1999. The researchers couldn't find any trace of this organism, however. There was no sign of any other disease that was previously reported in lobsters, either. The evidence suggested a noninfectious disease was responsible for the unusual symptoms, and laboratory studies were started to identify its cause. The unusual coloration on the belly and the fouling that was prevalent in the gills was of particular interest. Tissue samples were studied under a microscope and it seemed as if the disease affected the antennal glands (the lobster's 'kidneys') and the gills.

Gross pathology of lobsters taken in Summer 2002. Affected lobster (right) shows unusual orange appearance of the abdominal segments.

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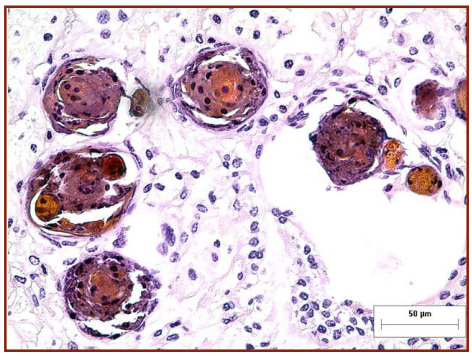
Both organs have important excretory functions. Also numerous granulomas were observed in the tissue samples. A granuloma is a type of inflammation that develops after an immune reaction.



Histological section of antennal gland tissue showing granulomas.

Special immune cells (phagocytes) try to engulf foreign bodies. If this initial response is unsuccessful, they form a wall around these foreign bodies in order to isolate and prevent further invasion into the soft tissue — this reaction results in a granuloma being formed. Studies were also done to determine the initial cause of the immune response that was being observed.

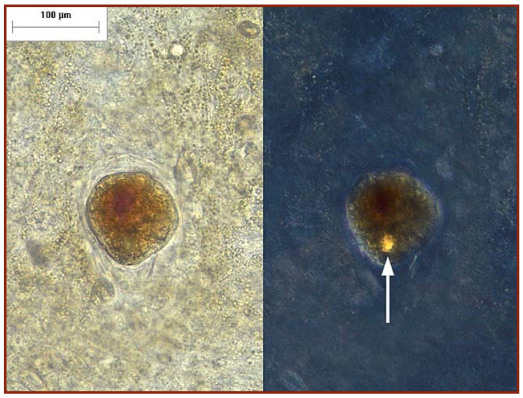
New Disease

Further testing revealed an accumulation of calcium in lobster tissue. Each granuloma contained a calcium carbonate crystal at its center. Carbon dioxide (CO_2) is a by-product of respiration, and it is probably the source of the carbonate (CO_3) that combines with the calcium. Gas exchange occurs in the twenty pairs of gills found in the gill chamber under the carapace. Oxygen is extracted from water as it is pumped over numerous hair-like filaments. The lobsters were suffering from a kind of 'kidney stone', but in this case the stones were being formed in the antennal glands and gills. Kidney stones occur in humans when minerals are deposited in the soft tissue of the kidneys. Sometimes these minerals may include calcium phosphate, however, calcium carbonate, is the cause in lobsters. It was also noticed that the blood (hemolymph) would no longer coagulate. This condition was also seen in lobsters suffering from paramoebiasis in 1999.

It is likely the calcinosis disease started out in the antennal glands, with the gills becoming affected in the advanced stages. There is significant immune reaction during the advanced stages of the disease, resulting in numerous granulomas being formed. In some cases apparently as many as 80 percent of the respiratory filaments are affected, causing the animal to suffocate.

It is unclear why calcinosis is occurring in our lobsters, but the condition may have been triggered by prolonged exposure to the unusually high temperatures that have persisted in Long Island Sound over the past few years. Research being done under *Long Island Sound Lobster Research Initiative* is providing more information about these temperature anomalies.

Preliminary analyses of datasets taken under *Long Island Sound Water Quality Monitoring Program* indicate that there has been a long and drawn out period of warm



Granuloma in soft tissue. Arrow points to the calcium carbonate crystal.

temperature in the bottom waters. These most recent mortalities are believed to be a result of unusually high temperatures that began in Summer 2001. This means that lobsters tolerated as many as thirteen months of continuously high temperatures in the bottom waters. In most cases, this sequence of high temperatures was as much as two and a half degrees above the average temperature range. It is likely the extent of this past temperature anomaly was too long for the lobsters to endure at this southern limit of their inshore range.

The researchers attribute the lobster deaths to metabolic and respiratory failure resulting from heat stress. Not all lobsters were affected by these adverse conditions, but the numbers that became ill were sufficient to get the attention of the lobster industry.

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