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The Marine Disease Pathology & Research Consortium is a collaboration between the New York State Department of Environmental Conservation, Stony Brook University, Cornell University College of Veterinary Medicine, South Hampton College, Long Island University, and New York Sea Grant.

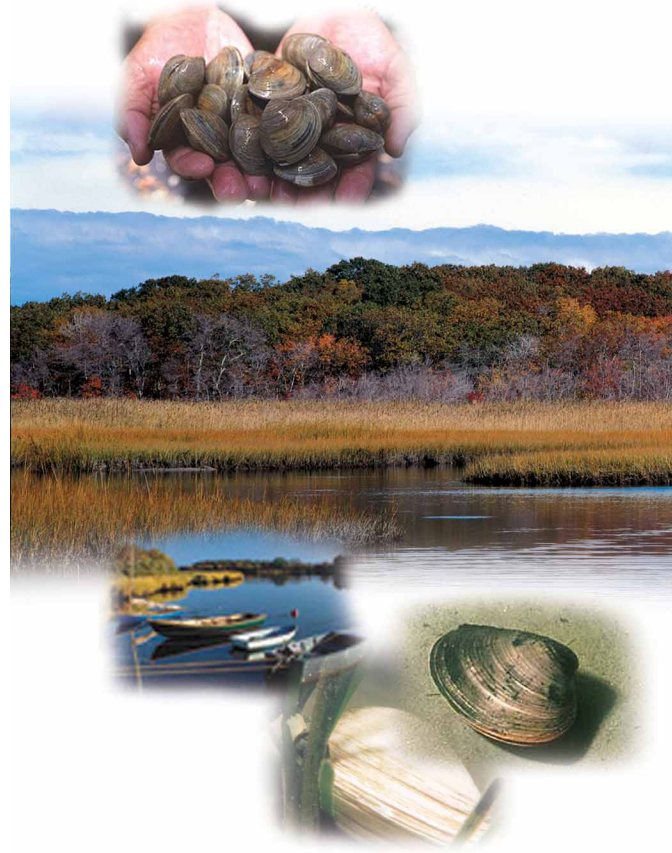
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# QPX Disease in Hard Clams

## *Quahog Parasite Unknown*



## What is QPX?

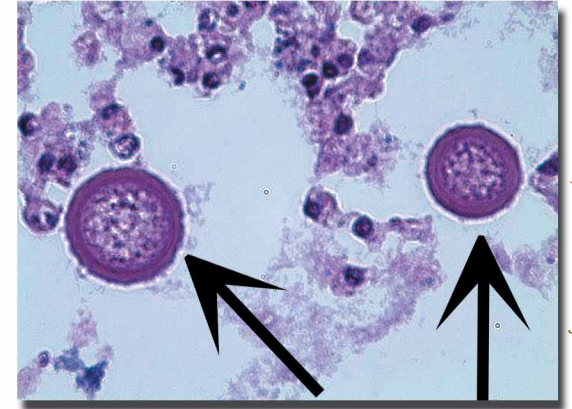
The acronym stands for **Quahog Parasite Unknown**. It is a single-celled microscopic parasite that causes a disease in hard clams known as 'QPX disease'. QPX is understood to be a species-specific parasite of the northern hard clam or quahog (*Mercenaria mercenaria*), only. **QPX is not a threat to human health.** There are no known cases of the QPX parasite infecting other marine animals or humans.

## Where does QPX come from?

The QPX parasite is one member of a large group of organisms that are common in the water column and sediments in the marine environment. They are unique because they possess characteristics of both a fungus and an animal. While the QPX parasite infects hard clams specifically, other members of this group have been found in diseased invertebrates including abalone, sea hare (nudibranch), octopus and squid. Another relative of QPX is believed to be the cause of wasting disease in eelgrass.

## How does QPX infect hard clams?

The origin of QPX disease is currently the subject of scientific debate. The life cycle of the QPX organism and the way it causes disease in clams are not well understood. One theory suggests that QPX is a *facultative parasite*. Facultative parasites are organisms that may either lead an independent existence, or live as a parasite (but do not need a host to complete its life cycle). As a faculta-



Microscopic view of QPX parasites in hard clam tissue sample.

tive parasite, the theory suggests that the QPX organism is routinely present in sediment and waters throughout the range, and it doesn't cause disease until there is extraneous environmental stress, or some other factor that makes clams less able to fight infection. Another theory is that QPX is an *obligate parasite*. Obligate parasites must live in a host at some stage in order to complete their life cycle. As an obligate parasite, the theory is that QPX is a recently introduced disease organism that is spreading when infected clams are transferred from one location to another. Neither theory has been proven at this time. Laboratory experiments have demonstrated that QPX organisms from a diseased clam can infect adjacent clams, but exactly how this process occurs is still not understood. Situations where clam density is very high are thought to enable the QPX organism to transmit more easily. Scientific research is needed to understand the QPX parasite, its life cycle, strain variations, and how it is transmitted.



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## Where has QPX disease been found?

Although the first reports of QPX-like organisms were in dead or dying clams in New Brunswick, Canada in 1959 and in Barnegat Bay, New Jersey in 1976, it wasn't until the 1990s that QPX disease began to be more widely associated with clam die-offs in the Northeast and Mid-Atlantic. A QPX-like organism was identified in diseased clams in the Mitchell River in Chatham, MA in 1992, when high clam mortality was observed for a period of more than 8 months. A significant die-off associated with a high prevalence of the QPX organism was documented during summer and fall of 1995 in both farm-raised and wild hard clam populations in Duxbury and Provincetown, MA. Hard clams being farmed in the Watchapreague, VA area on the ocean side of the eastern shore were diagnosed with QPX in 1996, but there were no other clam mortalities associated with QPX in VA until 2001. QPX was also discovered in Pleasant Bay (Orleans, MA) and Barnstable Harbor (Barnstable, MA) on Cape Cod in winter and spring of 2001. The QPX organism was found in a population of hard clams from Raritan Bay near Staten Island, New York in summer 2002; these clams were being harvested as part of a controlled transplant program.



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## What are the signs of QPX disease?

Several signs have been reported in hard clams infected with the QPX organism. Prior to 1995, clam death was the only reported gross sign of the disease. Decreased new shell growth, swollen and discolored mantles, and chipping shell edges were reported in the 1995 outbreaks in Provincetown and Duxbury. The QPX parasite was found most frequently in the mantle and gills of clams. Clams usually show an intense inflammatory response to the parasite. Parasite infection was found throughout the internal organs of infected hard clams in the 2002 outbreak in New York, and the previously reported signs associated with the mantle and shell were not common.

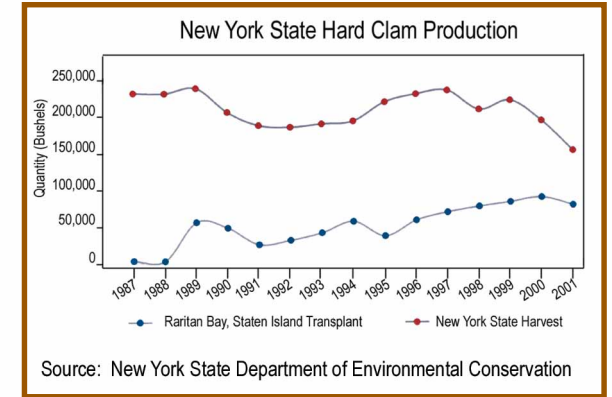
## Why are we concerned about QPX in New York?

It is not known with certainty whether or not QPX disease has occurred in New York's hard clams prior to 2002. However, large numbers of dead or dying clams were reported in Raritan Bay off the coast of Staten Island in 2002, and the QPX organism was identified in these clams. A dense population of hard clams has been harvested from this area since 1987 under the Raritan Bay Shellfish Transplant Program supervised by the New York State Department of Environmental Conservation. This transplant program allows licensed baymen to harvest clams from uncertified waters under state supervision. Shellfish transplanting is normally undertaken on a seasonal basis from April through October, when water temperatures are high enough to allow the shellfish to remain active and

adequately pump and cleanse themselves for a minimum of 21 days before they are released into the market. Hard clams harvested under the Raritan Bay Shellfish Transplant Program have increased since the program began in 1987, and as many a half of the hard clams that were marketed in 2001, came from this program. National Marine Fisheries Service statistics indicate that the total dockside value (amount of money paid to baymen) for hard clams harvested in New York was approximately \$13.5 million in 2001. The dockside value of the clam resource directly affected by the QPX disease outbreak in 2002 is estimated to be between \$4-\$5 million.

## What is being done about QPX in New York?

The New York State Department of Environmental Conservation collected samples for analysis after receiving reports of dead and dying clams in the Staten Island area in August of 2002. The transplant program was suspended immediately after the presence of QPX organism was confirmed in infected hard clams, in order to prevent possible transmission to wild clams in the Peconic Bay and other receiving waters of the state. New York State Department of Environmental Conservation will be collecting samples from various wild populations of hard clams in Peconic Bay to determine possible background levels of QPX. A major survey of the Raritan Bay population was undertaken as a collaboration between the New York State Department of Environmental Conservation and the Marine Disease Pathology and Research Consortium at Stony Brook University. An unacceptable high level of QPX was found during the survey, and the disease was most prevalent in



the center of the most productive part of the fishing ground. The New York State Department of Environmental Conservation has since announced its decision to suspend the Raritan Bay Shellfish Transplant program for 2003, based on the results of the survey. The agency will evaluate the status of clam populations in the marine district, and continue to monitor the Raritan Bay clam population for QPX prevalence in cooperation with the Marine Disease Pathology and Research Consortium.

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