LESS DOCUMENTED DISEASES

It should be emphasized that the absence of reported diseases for a particular species does not mean that the species is not subject to significant diseases. Molluscan species undoubtedly contract important diseases about which we know nothing. They also contract diseases that are well known but about which very little technical information is available as to their cause, prevention, and management. A number of diseases and parasites of molluscs are mentioned briefly in the technical literature but not in this guide, because too little is known about their relevance to mollusc culture or the effects on their host.

As more species of molluscs are farmed and as the production requirements for commonly cultured species become more rigorous, we will learn more about the importance of these diseases, their cause, management, and prevention. It is also important to note that diseases which are not important to one species in a given area can be important if they are introduced to a new host species or even to the same host species if it has not adapted to the disease organism.

Rickettsia and Chlamydia of Molluscs

Rickettsia and chlamydia are intracellular bacteria (that is, they live inside cells) that cause diseases in mammals, including man. Most bacteria, including those that can cause disease, do not actually reside inside living cells although they may live inside the host organism in various locations. Since there is no evidence that the similar organisms in molluscs cause diseases of mammals or man, they should be referred to as rickettsia-like or chlamydia-like.

This group comprises some of the most commonly observed microorganisms in the tissues of bivalve molluscs. They occur in healthy animals without causing any apparent detrimental effect. In several instances they have been blamed for massive mortalities of scallops, including the sea scallop (*Placopecten magellanicus*). This may eventually prove to be true, but further study on these diseases is required before we fully understand their significance. The microorganisms, essentially bacteria that are adapted to grow inside the cells of the host, are most commonly found in the epithelial tissues of the gills and digestive gland of the host bivalve mollusc.

These microorganisms occur in a variety of species of bivalve molluscs throughout the world. Chlamydia-like organisms have been reported in the bay scallop (*Argopecten irradians*), the Portuguese oyster (*Crassostrea angulata*), and the hard-shell clam (*Mercenaria mercenaria*).

Rickettsia-like organisms have been reported in the Pacific oyster (*Crassostrea gigas*), the Eastern oyster (*Crassostrea virginica*), *Donax trunculus*, the hard-shell clam (*M. mercenaria*), the soft-shell clam (*Mya arenaria*), the sea scallop (*Placopecten magellanicus*), the Pacific razor clam (*Siliqua patula*), the thin tellin (*Tellina tenuis*), the Manila clam
(Tapes philippinarum), the Japanese scallop (Patinopecten yessoensis), the European flat oyster (Ostrea edulis), and the Palourde clam (Ruditapes philippinarum).

References


**Nuclear Inclusion X (NIX)**

Nuclear inclusion X, or NIX, is a disease of the Pacific razor clam, Siliqua patula. It is caused by a highly specialized and very large type of rickettsia-like microorganism. It was first discovered on the Pacific coast in Washington in 1983 in association with a massive mortality of the razor clam. It infects the gill epithelial tissues and interferes with the respiratory processes of the clam. Virtually all clams in Washington are infected, as well as some populations in Oregon and British Columbia.

The disease persists at a low level in clams during the winter and spring. In some
years the infection can greatly increase in intensity during the summer and fall, when mortalities associated with the disease usually occur.

**Reference**

**Malpeque Bay Disease of the American Oyster**

Malpeque Bay disease is a widely known but poorly understood disease that caused severe mortalities in American oysters (*Crassostrea virginica*) in Malpeque Bay in the Canadian maritime province of Prince Edward Island starting in 1915 and continuing through the 1930s. The geographical expansion of the disease, first observed a year after substantial plantings of seed oysters imported from the United States, is considered evidence for an infectious cause of the disease. More than 90% of original stocks were reported to have succumbed to the disease.

The oysters affected by the disease reportedly show visceral shrinkage, a translucent quality, reduced growth, and failure to spawn. The cause of Malpeque Bay disease has never been determined with certainty.

**Reference**

**Gill Parasite of the Japanese Scallop**

The gill parasite, long recognized in Japan and described in the Japanese-language literature, was discovered in a group of scallops (*Pinctapecten yessoensis*) proposed for introduction to North America. First thought to be a parasitic barnacle, this organism is now recognized as an unusual form of parasitic copepod, *Pectenophillus ornatus*. These raised yellow bodies on the surface of the gill can be as large as 8 mm in diameter (see Figure 11). In bottom culture in Japan, it was reported that up to 60 parasites can occur on an individual scallop. The number of parasites was greatly reduced in hanging cultures of scallops. This parasite, undoubtedly a burden to the scallop when it occurs in large numbers, is of more direct aesthetic significance, since a single parasite renders the scallop unacceptable as a whole animal product.

It was also reported to occur on another species of scallop in Japan, *Chlamys akazara*. 
**Figure 11.** Japanese scallop infected with a single specimen of what is believed to be an unusual parasitic copepod, *Pectenophilus ornatus*, shown at the arrow. As many as 60 of these parasites can occur on the gills of one scallop, but a single parasite renders the scallop unmarketable as a whole animal product. (From Elston et al. 1985)

**References**


Miscellaneous Diseases

*Mytilicola orientalis* is a parasite found in the digestive tract of molluscs including several species of oysters, mussels, and slipper shells. It has been reported in Pacific oysters, *Crassostrea gigas*, in California, Oregon, and Washington. This parasite was introduced into France with imported Pacific oysters and is now present in the Arcachon region of France. *Mytilicola intestinalis* is a closely related species found in Europe.

The parasite can cause damage to the lining of the digestive tract where it attaches to the host. In Europe, it is reported that mortalities of mussels were caused by *M. intestinalis* when infestation reached levels of 5-10 parasites per mussel. Substantial mortalities associated with this parasite have not been reported in North American species of molluscs; however, infestations can lower the condition index of oysters.

Several viruses, in addition to those previously discussed, have been observed in the tissues of bivalve molluscs. These include a herpes-like virus in the American oyster, *Crassostrea virginica*, in the state of Maine. Preliminary studies suggested that virus was associated with mortalities at elevated seawater temperatures (28°C-30°C as compared with 18°C-20°C), but further studies would be required to prove that the virus caused the oyster deaths. Viruses similar to that causing velar virus disease in larval Pacific oysters, *Crassostrea gigas*, have been found in the blood cells and connective tissues of the adult Pacific oyster in France. It is not known whether these viruses cause disease or have any significant effect on the oyster.

“Australian winter disease” of the Sydney rock oyster, *Saccostrea commercialis*, is believed to be caused by a parasite known as *Mikrocystos roughleyi*. The disease was first reported in Australian oysters in 1926.

Parasites referred to as haplosporidians have been observed in a variety of molluscs. Two of the better known members of this group of parasites, *Haplosporidium nelsoni* (causative agent of MSX disease) and *Marteilia refringens* (causative agent of Aber disease), are discussed under separate headings.

Other members within this group of parasites appear to be important in causing diseases in many other molluscs, although they are less thoroughly documented. These less familiar diseases include an infection in gaper clams, *Tresus capax*, from Yaquina Bay, Oregon. The disease occurred in 43% of the clams, but only 20% had heavy infections in which clams were emaciated and sluggish and the mantle appeared watery and transparent. *Haplosporidium armoricana*, in Europe, is a parasite of the European flat oyster, *Ostrea edulis*. It appears to be well adjusted to that oyster species, occurring in fewer than 1% of oysters and causing little mortality. However, stocks of the Chilean oyster, *Ostrea chilensis*, introduced into France and exposed to *Haplosporidium armoricana* were infected to over 60% of the populations, with major mortalities.

Other haplosporidan parasites have been reported in the Pacific oyster, *Crassostrea gigas*, from Humboldt Bay, California, and the American oyster, *C. virginica*, from Tomales Bay, California, but whether or not these parasites cause any important disease in the oysters is unknown. Haplosporidan parasites are also found in several species of wood-boring bivalve molluscs.
Bucephalus haimeanus and B. cuculus are flatworm parasites of European flat oysters and American oysters. Early in the disease, white patches occur around the gonad area. Eventually, the entire reproductive and digestive tissue of the oyster is destroyed.

Nematopsis ostrearum and N. pyrtherchi are two gregarine parasites of Crassostrea virginica. Spores of the former are usually found in the mantle while those of the latter are found in the gill. Parasite-free oysters transferred into enzootic areas acquire the infection, but the infection is not lethal for the host and no sublethal effects have been documented.

References


