NON-INDIGENOUS AQUATIC SPECIES OF CONCERN FOR ALASKA

Fact Sheet 7 — Boring Sponge

Cliona thoosina

BIOLOGY & PHYSIOLOGY

Physical Description: Boring sponges belong to the Phylum Porifera. Poriferans are simple animals (sponges) that have no internal organs, nervous tissue, circulatory system, or digestive systems, making them the most primitive of the multi-cellular animals. Sponges produce skeletons of calcium carbonate, silica, or a soft organic material called spongin, to support and protect their soft bodies. A sponge's body is typically covered with many pores and ranges in size from a few fractions of an inch to several feet in diameter. The growth form of a sponge is polymorphic; it may be massive (thick), erect, branching, or encrusting, depending on the species and environmental conditions. Species from the genus Cliona (which includes the Boring Sponge) are also known as sulfur sponges and are typically bright yellow in color.

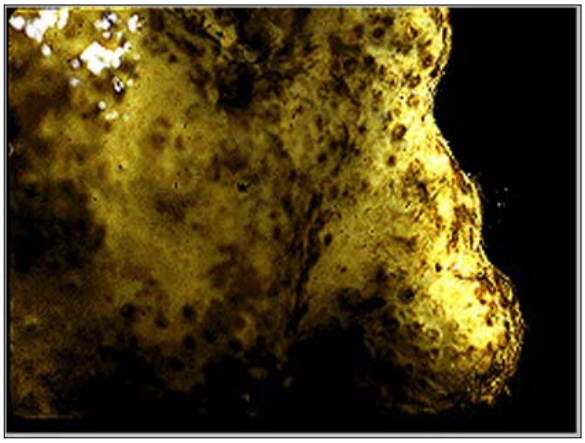

Photo by: Field Guide to the Atlantic Seashore, 1979

Nutrition Requirements: Sponges are suspension feeders. To obtain food, sponges filter the water through tiny pores located on their outer walls. Water enters the pores and flows through a system of flagellated canals. Food and other metabolites are removed from the water flow for use by the sponge. Typical food sources include: unicellular plankton (e.g dinoflagellates and bacteria), viruses, small organic debris, and dissolved organic material.

Reproduction: Sponges can reproduce clonally (asexually) and sexually. Asexual reproduction occurs by fragmentation, budding, and by formation of over wintering propagules called gemmules. Fragmentation primarily results from current or wave damage, but can also result from damage inflicted by grazing carnivores. While budding is a less common reproduction method for sponges, it can occur as parts of the sponge swell and detach from the main body. Fragments and detached sections that have been broken off or budded from the main sponge body will soon settle on a nearby surface and begin development as a new individual living sponge. Formation of over-wintering propagules called gemmules is a fall season reproductive process in which sponges produce hundreds to thousands of spore-like gemmules which initially remain dormant for a period of time before germinating into a new sponge. Sponges can also reproduce sexually. The Cliona species is oviparous, meaning that sexual reproduction is achieved by the release of sperm into the water. Sperm that is released from one sponge is transported to another sponge by currents. Internal fertilization occurs in the receiving sponge, and zygotes (the cells formed by the union of sperm and egg) are released into the water where they complete their development.

Lifecycle Stages: All sponge larvae are short-lived. They are normally released at dawn in response to a light cue. After a period of a few hours to a few days, the larvae settle and creep over the bottom in search of a suitable site for attachment. Once a site is found, the larva metamorphoses into a juvenile sponge. Sponges grow from tiny encrusting colonies a few cells thick to massive boulders with a dazzling array of form and color.

Habitat: The Phylum Porifera consists of nearly 5000 living species. Most of these are marine species, with the exception of two families, which are found in fresh water. Boring sponges are found only in marine environments, on rocks and shells of the seafloor and commonly bore holes in the objects in which it lives. These sponges burrow into calcium carbonate substrata by a chemomechanical process forming cavities which they inhabit. The chemical phase of penetration is accomplished by the etching activity of sponge cells which penetrates the substratum by a

localized secretion of enzymes that act as an etching agent. Sponges are sessile and attached organisms, although some are capable of limited movement of the body or its parts. Most species prefer relatively shallow water. They prefer habitats with little wave action because they are susceptible to scouring. They also prefer zones with low sedimentation as high sediment loads can severely inhibit sponge growth because considerable amounts of energy are required to clear blocked canals and tissues.

DISPERSAL POTENTIAL

Historical and Current Introduction/Spread: The Boring Sponge was first reported in Prince William Sound in 1998 and reported by oyster harvesters in Kachemak Bay.

Dispersal Methods: The Boring Sponge was most likely introduced into Prince William Sound, Alaska through the field-cultured oyster industry. Oysters cultured in Alaska arrive as "clean" spat derived from laboratory cultures in Oregon and Washington; however, the spat is not always as clean as the suppliers claim and are sometimes contaminated with Boring Sponges and other non-indigenous species. It is believed the field-cultured oyster industry continues to introduce Boring Sponges into Prince William Sound even today. Because of the short life span of the larval stage (1-2 days), it is unlikely that the Boring Sponge was introduced through ballast water.

IMPACTS AND CONTROL

General Impacts: Boring Sponges can form encrustations on mollusk shells, particularly oysters, and can burrow into the shell itself, weakening the shell and increasing the vulnerability to predators such as crabs and birds. In more severe cases, Boring Sponges can kill the host mollusk and even completely dissolve the shell.

Management Information: Controlling the introduction of the Boring Sponge into Prince William Sound will involve tighter controls on the oyster industry. While the oyster industry currently institutes quality control measures to ensure that clean spat is produced, failure to fully implement these measures may result in contaminated spat being transported to Alaskan waters. There are no known methods for eradicating established Boring Sponge populations.

Key Notes: Boring sponges are strongly associated with the abiotic (non-living) environment and are, therefore, very sensitive to environmental stress; this is why sponges may be useful tools as environmental indicators. Because sponges are filter feeders, they are adversely affected by silting, since a considerable amount of energy is necessary to clean the obstructed canals and orifices. On the other hand, some studies have shown that certain species of Cliona can adapt to and withstand high levels of silt. Because of their ability to break down calcareous substrates such as dead shell, corals and corallin algae, burrowing sponges play an important role in recycling.