



## Invasive Tunicates of Concern for Prince Edward Island Aquaculture

### Background

The purpose of this fact sheet is to provide mussel producers and processors with an update on the status of several recently introduced invasive tunicate species into Prince Edward Island waters. The costs to mussel producers and processors with infested product include increased labour costs for the handling and treatment of gear and crop, additional labour at the processing plant to strip and clean the mussels, as well as higher input costs for trucking and waste disposal fees.

### Clubbed Tunicate



Clubbed tunicate

Since its introduction to the Brudenell River in the late 1990s, the clubbed tunicate (*Styela clava*) has expanded to Montague River, Murray River, St. Mary's Bay, Orwell Bay, Launching Bay and Cardigan River. In 2001, it was found in the March Water area of Malpeque Bay. While the population expansion was described as explosive in eastern Prince Edward Island, the Malpeque population has been much slower to develop. In 2003, for example, several buoys on a longline had to be examined before the tunicate was found, but in 2004 it was not uncommon to find 30 or more tunicates per buoy. While overwintering mortality of tunicates has been significant, population abundance remains very high and may have reached its highest level in 2004. The population in other areas is described as very light for Orwell Bay, moderate and light-to-moderate

in Launching Bay, and light-to-moderate in Cardigan River. Concerns about the effect of clubbed tunicates on the sustainability of aquaculture systems resulted in a restriction being implemented by the Department of Fisheries and Oceans on October 24, 2001, on shellfish transferred out of, between or within infested areas. Shellfish transfers now require permits from the Prince Edward Island Introductions and Transfers Committee.

### Vase Tunicate

A second species, the vase tunicate (*Ciona intestinalis*) was identified in Montague River in the summer of 2004, and it was reportedly observed in early spring of the same year in the upper reaches



Vase tunicate

of the river. This species was likely present the previous year but was unobserved or unreported. The vase tunicate has been problematic for mussel producers in areas of Nova Scotia resulting in loss of crop or even cessation of operations. Underwater surveys conducted by Fisheries and Oceans and the provincial department suggest the present distribution remains within a small area of the Montague River. Up to 10 animals have been counted on mussel socks in the area of infestation with clubbed tunicates exceeding the number of vase tunicates on socks by several hundred-fold. This species is a solitary sea squirt, transparent whitish or yellowish with five to seven conspicuous muscle bands on either side. The internal organs

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are clearly visible through the outer covering and the siphons have a yellow ring around the leading edge. The vase tunicate is believed to have originated in the North Atlantic but has since spread worldwide to cold water regions.

### Golden Star Tunicate



GoldenStar tunicate (grey colour) and violet tunicate (orange colour) on buoy

In 2001, a small quantity of the golden star tunicate (*Botryllus schlosseri*) was found on aquaculture gear in St. Peters Bay. This infestation may have been an isolated case as no additional reports were received. In December 2004, the golden star tunicate and the violet tunicate (*Botrylloides violaceus*) were found on mussel socks, buoys and spat lines in Savage Harbour in significant quantities. Unlike the solitary vase tunicate and clubbed tunicate, these new invaders have a colonial growth form. Colonies appear as a rubbery mass which can be highly variable in form and colour. The golden star tunicate colony is comprised of individual cells (zooids) arranged in clusters and embedded in a jelly-like matrix. Each cluster consists of an excurrent siphon surrounded by several (often five) incurrent siphons. This species is readily identified by the conspicuous star-shaped markings on the surface of the colony. Specimens can be dark with clusters of yellow or white markings, often purple or black, and sometimes yellow, green or brown. The yellow and white markings are the siphons. The colony is maintained by budding with each bud growing into a new tunicate. The individuals can bud every two to three weeks. This species also reproduces by sexual

means (production of larvae which are released from sexually mature adults). The golden star tunicate is native to Europe. It has been found on the east coast of North America and is abundant in the Bay of Fundy and Bras d'Or Lakes.

### Violet Tunicate

The second species identified from Savage Harbour is being referred to as the violet tunicate. The colonies are comprised of individuals arranged in loose circles, rows or dense clusters.



Violet tunicate encasing mussels

Colouration may vary between bright orange to reddish or dull purple. The violet tunicate also reproduces sexually through the production of motile larvae or asexually by budding. The violet tunicate originated in Japan and now occurs along the west coast of North America from Alaska to California and on the east coast from the Gulf of Maine to Virginia.

### Conclusion

The introduction of invasive tunicates to Prince Edward Island does not appear to be linked to mussel aquaculture activity, however it does represent a concern to growers involved and has potential to spread to new areas with shellfish or gear movements. In collaboration with Fisheries and Oceans and the Atlantic Veterinary College, the department will continue its efforts to monitor these invasive tunicate species, study their potential impact on the mussel industry and assess various treatments for mussel gear and crop.

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