



NOVA SCOTIA
Agriculture and Fisheries

Distribution of the Tunicate, *Ciona intestinalis*, in Nova Scotia.

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Nova Scotia Tunicate Survey Results

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During February 2003 a survey was mailed to all aquaculturists in Nova Scotia who possessed marine aquaculture leases. The survey was designed to provide a simple assessment of the distribution of the fouling tunicate, *Ciona intestinalis*, along the coast of Nova Scotia. Of 175 surveys mailed out to lease owners, 54 replies were received. This was enough to provide a general picture of tunicate distribution in the province. It became apparent that some confusion existed regarding the species of tunicate on which the survey was focused, and some lease owners reported having tunicate fouling, but not *C. intestinalis*. However contact with lease owners made it possible to determine which species were present in locations that do not, in fact, contain *C. intestinalis*. It is important to note that the tunicate species causing the most impact in Nova Scotia, *Ciona intestinalis*, is not the same species causing problems in Prince Edward Island, *Styela clava*. However, lease owners should be diligent in reporting any new species that occur on their sites.

A geographical representation of the survey results are given in Figure #1. Three main areas of heavy infestation by *C. intestinalis* have been identified by the respondents of the survey. These areas include, the Lobster Bay area in South Western NS, St. Margaret's Bay and Mahone Bay on the South Shore, and two small areas on the Northern and Southern portions of Isle

Madame in Cape Breton. A light infestation was reported at the eastern portion of St. Margaret's Bay. Some growers along the Eastern and Northern Shores of the mainland also indicate that they had moderate to heavy infestations of *Ciona intestinalis*. Conversations with the growers in these areas revealed that other organisms that are locally called sea-squirts are being mistakenly identified as *Ciona intestinalis* for this survey. These organisms are either Sea Grapes, *Mogula sp.* or Sea Anemones, *Metridium senile*. In Cape Breton, particularly in the Bras d'Or Lake, growers are reporting a heavy infestation of tunicates as well, this species is the Star Tunicate, *Botryllus schlosseri*, a small colonial species.

Growers reported a number of control mechanisms that they were using to manage the tunicates. Physical removal of tunicates by hand scrubbing, scraping or high pressure spraying were the most common treatments used to remove tunicates that had become established on gear. These removal methods worked for the short term but tunicates quickly re-established their populations within short periods and growers reported that up to three or four treatments per season were required to keep tunicate numbers at a minimum. A few growers tried treating tunicates with vinegar or acetic acid sprays and dips, with some degree of success, these require further evaluation. It was also reported that gear deployment in areas with tunicates could be limited to periods when tunicate settlement is not occurring. This would require tunicate larvae identification and monitoring, some future studies of these processes should be carried out. Accommodating tunicate predation by Rock Crabs, *Cancer irroratus*, resulted in some success by sinking culture gear to the bottom, however timing of gear retrieval is important to avoid predation of mussels, *Mytilus edulis* and *Mytilus trossulus*, by starfish *Asterias vulgaris*, *Asterias forbesi*.

It has been suggested that using a high socking density in mussel socks reduces the available suitable setting environment for tunicate larvae. One grower reported some positive results with this technique but indicated that the higher socking density reduced the growth rate of the mussels and did not deter the tunicates from setting in the second growth season. Situating sites in high energy areas (wind, wave and current) has also been suggested as a deterrent for tunicate settlement. Again, trials with this method had varying results and although a reduction in tunicate recruitment occurred, eventually the tunicates became established over a period of time. Air drying and gear rotation were mentioned as good control methods, but these are methods that relate to shellfish species that can be easily removed from the water for extended periods of time and includes mainly those species that are grown cages.

This survey provides a baseline of data that will be used in the future to track the movement of *C. intestinalis* in Nova Scotia. The results of the survey can be also used to identify the risk of importing *C. intestinalis* into tunicate-free areas via shellfish shipments, or, at least pinpoint areas that should practice diligence in cleaning seedstock or market shellfish prior to shipments within the province. In addition to the movement of *C. intestinalis*, new invading species of tunicates hold the potential to move into the waters of Nova Scotia. Growers should continuously check their farms for unusual species on a regular basis. In particular, *Styela clava*, the club tunicate, is responsible for the present damage to the mussel industry in Prince Edward Island. *Styela clava* is native to Asia and has managed to live in a wide variety of environments. It's present proximity to Nova Scotia should not be overlooked as it is possible that *S. Clava* could easily reach Nova Scotia waters by traversing the Northumberland Strait via attachment to boat hulls or in shipments of live shellfish.

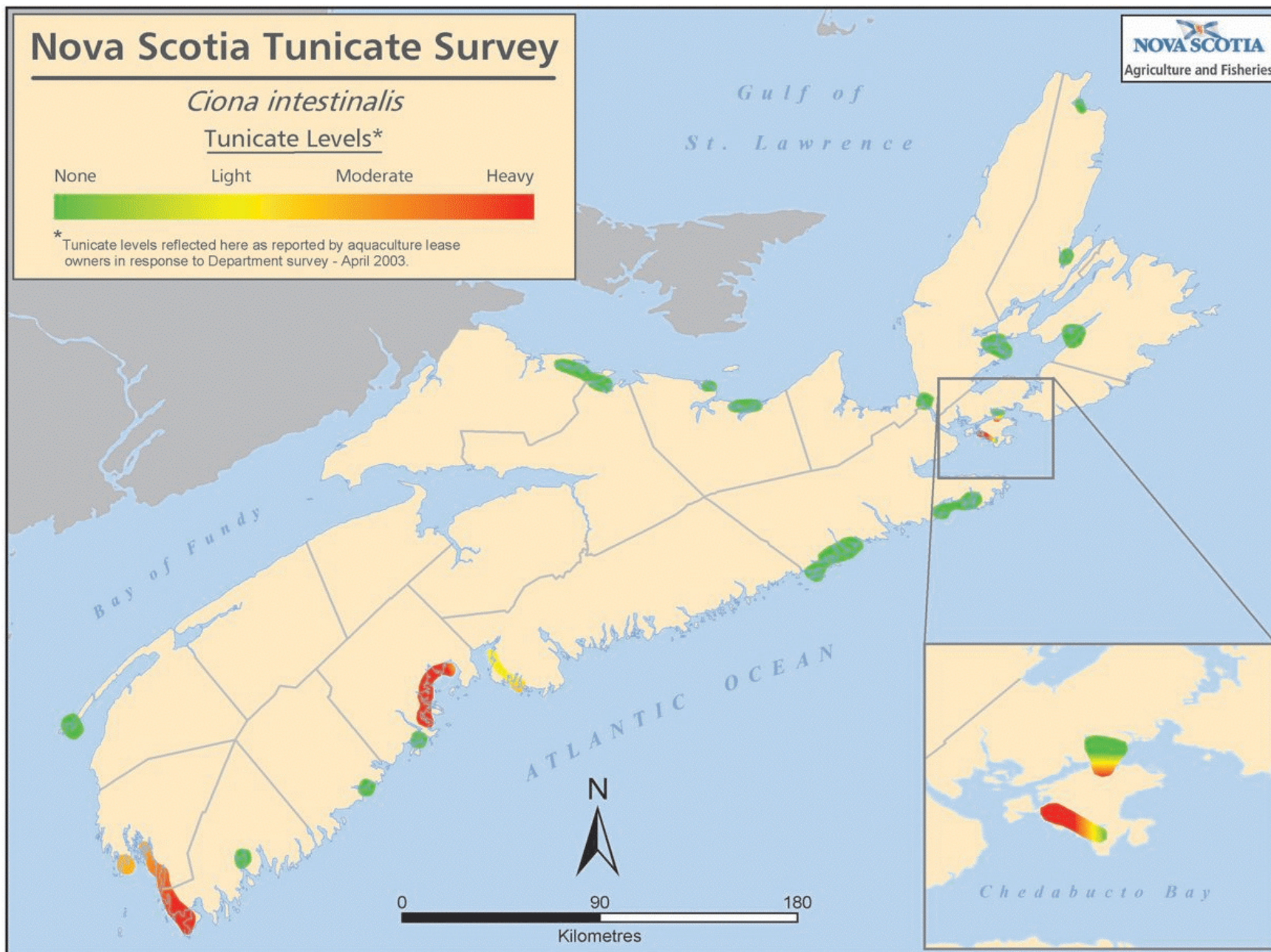


Figure #1: *Ciona intestinalis* distribution in NS.

Acknowledgments

We would like to thank those lease holders that took the time to reply to the survey. Your suggestions and comments are welcome, please call 902-424-0353, fax 902- 424-0353 or mail responses to;

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