

**Biofouling Monitoring for Aquatic Invasive Species (AIS) in
DFO Maritimes Region (Atlantic shore of Nova Scotia and
southwest New Brunswick): May – November, 2012 - 2015.**

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ABSTRACT

Sephton, D., Vercaemer, B., Silva, A., Stiles, L., Harris, M. and Godin, K. 2017.
Biofouling monitoring for aquatic invasive species (AIS) in DFO Maritimes Region
(Atlantic shore of Nova Scotia and southwest New Brunswick): May – December,
2012 - 2015. Can. Tech. Rep. Fish. Aquat. Sci. 3158: ix + 174p.

The establishment of four invasive tunicate species; *Ciona intestinalis*, *Botryllus schlosseri*, *Botrylloides violaceus* and *Styela clava*, has had detrimental impacts on the shellfish culture industry in Atlantic Canada, and there is a risk of introduction of additional tunicate species of concern. An annual surveillance and monitoring program for invasive tunicates, and other biofouling species, such as *Caprella mutica* and *Membranipora membranacea*, began in 2006 in DFO Maritimes Region. This report summarizes the results of annual monitoring in 2012 through 2015, conducted at geo-referenced coastal stations on the Atlantic shore of Nova Scotia (NS) and southwest New Brunswick (swNB). Thirty-two to 57 stations were monitored during three collector (monitoring plate) deployment periods: First (May – August), Second (August – October) and Full (May – October) in NS, while 14 to 18 stations were monitored in Second and Full deployment periods only in swNB. Water temperature, salinity and oxygen content were measured at each deployment and collection and hourly temperature data were collected during the Full deployment period at many sites in both regions. Four to 29 additional reports of tunicate presence or absence were received in NS during this study.

In NS, *Botryllus schlosseri* was the most widely distributed species in all years, present at 77 – 85% of all stations and 85 - 92% of sentinel stations (stations monitored in every year). Cover on monitoring plates was low (<25%) to moderate (26 - 50%) at most stations, but high (51 - 75%) to very high (76 -100%) cover was noted in the Bras d'Or Lake. *Ciona intestinalis* was the second most widely distributed species in all years, present at 72 - 76% of all stations and 76 - 86% of sentinel stations. Its cover was usually low or moderate, but cover was higher on the southwest and south shores and in Chedabucto Bay. *Botrylloides violaceus* was found throughout NS in all years at 56 - 66% of all stations and 65 - 72% of sentinel stations, usually with low cover. Fewer than 10% of stations monitored were free of tunicates.

Monthly mean water temperatures determined for seven regions of NS showed that temperature was highest, with August maxima, in the Bras d'Or Lake, and on the coast of Cape Breton in all years, followed by Chedabucto Bay in 2012, 2013 and 2014. Warmer summer temperatures were noted in 2015 on the south and east shores. 2012

was the warmest year overall, followed by 2015, although with lower May and June, and presumably winter, water temperatures. 2014 was an intermediate year, and 2013 was the coldest of the four years. Increases in cover of *C. intestinalis* were noted in 2015, and in 2013, along with *B. schlosseri*, a year following the warmest year, while increases in the cover of *B. violaceus* were greatest in 2014.

Three invasive tunicate species were detected for the first time in NS through AIS monitoring efforts in 2012 and 2013. *Asciidiella aspersa* was found in Lunenburg Harbour in 2012, 2013 and 2014 with low cover. It was not detected here in 2015, or at any other location in NS during this study. *Styela clava* was found initially in Halifax Harbour in 2012, and in Lunenburg Harbour and Chedabucto Bay in 2013. This species was present in these three areas in 2014 and 2015. *Didemnum vexillum* was first reported in the upper Bay of Fundy in 2012, and its identity confirmed in 2013.

In swNB, *Ciona intestinalis* was the most widely distributed species in all years, present at 81 - 94% of all stations and 71 - 93% of sentinel stations. Its cover was usually low or moderate, but cover was higher in 2012, at warmer, sheltered stations along the coast and in Passamaquoddy Bay. *Botryllus schlosseri* was the second most widely distributed species in all years, present at 76 – 82% of all stations and 93% of sentinel stations. Its cover was generally low, but it increased to moderate at four stations in 2013. *Botrylloides violaceus* increased its presence in swNB with time. It was present at five stations in 2012, eight stations (three new locations) in 2013, and seven stations in 2014 and 2015 (one new location in each year). Its presence is sporadic, however, due to its low cover on monitoring plates and on station structures. Only one station in the region, Musquash, remains free of tunicates.

Temperature data from two stations indicated that waters at the St. Andrews Biological Stations, in Passamaquoddy Bay, were warmer than those at Head Harbour, on Campobello Island in 2013. Temperature was highest at North Head, on Grand Manan Island, in 2015, lower at Head Harbour, and lowest at Leonardville, on Deer Island. Water temperature was warmer in 2013 than in 2015 at Head Harbour.

Caprella mutica and *M. membranacea* were present at about half of the monitoring stations throughout NS and swNB from 2012 through 2015.

RÉSUMÉ

Sephton, D., Vercaemer, B., Silva, A., Stiles, L., Harris, M. and Godin, K. 2017.

Programme de surveillance des Espèces Aquatiques Envahissantes (EAE) dans la Région des Maritimes du MPO (côte atlantique de la Nouvelle-Écosse et sud-ouest du Nouveau Brunswick): mai - décembre 2012 - 2015. Can. Tech. Rep. Fish. Aquat. Sci. 3158: viii + 174 p.

L'établissement de quatre espèces de tuniciers envahissants; *Ciona intestinalis*, *Botryllus schlosseri*, *Botrylloides violaceus* et *Styela clava*, a eu des effets préjudiciables sur l'industrie de la culture des bivalves dans le Canada atlantique, et le risque d'introduction d'espèces de tuniciers supplémentaires est préoccupant. Un programme annuel de surveillance des tuniciers envahissants et d'autres espèces de salissures, comme *Caprella mutica* et *Membranipora membranacea*, a débuté en 2006 dans la région des Maritimes du MPO. Ce rapport résume les résultats des suivis annuels de 2012 à 2015, effectués dans les stations côtières géo-référencées sur la côte atlantique de la Nouvelle-Écosse (N.-É.) et dans le sud-ouest du Nouveau-Brunswick (soN.-B.). Trente-deux à 57 stations ont été surveillées pendant trois périodes de déploiement de collecteurs (plaques de surveillance): première (mai - août), deuxième (août - octobre) et saison complète (mai - octobre) en N.- É. et 14 à 18 stations ont été surveillées pour la deuxième période et la saison complète seulement dans le soN.-B. La température de l'eau, la salinité et la teneur en oxygène ont été mesurées à chaque déploiement et les données de température ont été enregistrées pendant la période de déploiement complet dans de nombreux sites des deux régions. Quatre à 29 rapports annuels supplémentaires de présence ou d'absence de tuniciers ont été reçus en N.-É.) au cours de cette étude.

En N.-É., *Botryllus schlosseri* était l'espèce la plus répandue chaque année, présente à 77-85% de l'ensemble des stations et à 85-92% des stations sentinelles (stations surveillées chaque année). La couverture des plaques de surveillance était faible (<25%) à modérée (26 à 50%) dans la plupart des stations, mais une couverture élevée (51 à 75%) à très élevée (76 à 100%) a été observée dans le lac Bras d'Or. *Ciona intestinalis* était la deuxième espèce la plus répandue chaque année, présente à 72-76% de l'ensemble des stations et à 76-86% des stations sentinelles. Sa couverture était habituellement basse ou modérée, mais sa couverture était plus élevée sur les côtes sud-ouest et sud et dans la baie de Chedabucto. *Botrylloides violaceus* a été retrouvée dans toute la N.-É. chaque année à 56-66% de toutes les stations et à 65-72% des stations sentinelles, habituellement avec une faible couverture. Moins de 10% des stations surveillées étaient exemptes de tuniciers.

Les températures moyennes mensuelles de l'eau déterminées pour sept régions de la N.-É. ont montré que la température était la plus élevée, avec un maximum en août, dans le lac Bras d'Or et sur le littoral du Cap-Breton chaque année, suivis de Chedabucto Bay en 2012, 2013 et 2014. Les températures estivales les plus chaudes ont été notées en 2015 sur les côtes sud et est. 2012 a été l'année la plus chaude dans l'ensemble, suivie par 2015, bien que la température de l'eau des mois de mai et de juin, et probablement l'hiver, furent plus basses cette année-là. 2014 a été une année intermédiaire, et 2013 a été la plus froide des quatre années. Des augmentations de la couverture de *C. intestinalis* ont été notées en 2015, et en 2013, avec *B. schlosseri*, une année après l'année la plus chaude, tandis que les augmentations de la couverture de *B. violaceus* étaient les plus grandes en 2014.

Trois espèces de tuniciers envahissants ont été détectées pour la première fois en N.-É. grâce aux efforts de surveillance des EAE en 2012 et 2013. *Asciidiella aspersa* a été détectée dans le port de Lunenburg en 2012, 2013 et 2014 avec une faible couverture. Elle n'a pas été détectée à Lunenburg en 2015, ni ailleurs en N.-É. au cours de cette étude. *Styela clava* a été trouvée initialement dans le port d'Halifax en 2012 et dans le port de Lunenburg et la baie de Chedabucto en 2013. Cette espèce était présente dans ces trois zones en 2014 et 2015. *Didemnum vexillum* a été signalée pour la première fois dans la partie supérieure de la baie de Fundy en 2012, et son identité confirmée en 2013.

Dans le soN.-B., *Ciona intestinalis* était l'espèce la plus largement distribuée chaque année, présente à 81-94% de l'ensemble des stations et à 71-93% des stations sentinelles. Sa couverture était généralement faible ou modérée, mais la couverture était plus élevée en 2012, dans les stations plus chaudes et abritées le long de la côte et dans la baie de Passamaquoddy. *Botryllus schlosseri* était la deuxième espèce la plus répandue au cours des années, à 76-82% des stations et 93% des stations sentinelles. Sa couverture était généralement faible, mais elle a augmenté jusqu'au statut modéré dans quatre stations en 2013. *Botrylloides violaceus* a augmenté sa présence dans le soN.-B. avec le temps. Elle était présente à cinq stations en 2012, à huit stations (dont trois nouvelles) en 2013 et à sept stations en 2014 et 2015 (une nouvelle station chaque année). Sa présence est sporadique, cependant, en raison de sa faible couverture sur les plaques de surveillance et sur les structures des stations. Une seule station de la région, Musquash, reste exempte de tuniciers.

Les données de température provenant de deux stations ont indiqué que les eaux des stations biologiques de St. Andrews, dans la baie de Passamaquoddy, étaient plus chaudes que celles de Head Harbor, sur l'île de Campobello en 2013. La température était la plus élevée à North Head, sur l'île de Grand Manan, en 2015, suivi

de Head Harbour, et la plus faible à Leonardville, sur Deer Island. La température de l'eau était plus chaude en 2013 qu'en 2015 à Head Harbour.

Caprella mutica et *M. membranacea* étaient présentes à environ la moitié des stations de surveillance dans toute la N.-É. et le soN.-B. de 2012 à 2015.

1.0 INTRODUCTION

Non-indigenous species (NIS) pose great risk to native species and biodiversity, and can negatively impact native ecosystems and their function (Sala et al. 2000). Among NIS of global concern, ascidian tunicates, commonly known as sea-squirts, have affected marine ecosystems through their impacts on native species (Lambert 2001; Lutz-Collins et al. 2009) and communities (Blum et al. 2007; Dijkstra et al. 2007b; Lambert and Lambert 1998, 2003; Lengyel et al. 2009). Tunicates also pose a serious threat to shellfish aquaculture operations as they overgrow bivalves and gear (Carver et al. 2003; Bullard et al. 2007; McKindsey et al. 2007), resulting in increased operation and production costs (MacNair et al. 2006). Tunicate infestations have resulted in decreased productivity and growth of blue mussels, *Mytilus edulis* (Linnaeus, 1758) (Daigle and Herbinger 2009), and significant losses to the mussel culture industry in Prince Edward Island (PEI) and Nova Scotia (NS) since the mid-1990's (Boothroyd et al. 2002; Clarke and Therriault 2007; Howes et al. 2007; Ramsay et al. 2008).

Four species of non-indigenous, fouling tunicates are now well established in the coastal waters of Atlantic Canada (Carver et al. 2006a, b; Martin et al. 2011; Sargent et al. 2013; Sephton et al. 2011, 2014, 2015, 2016; Boothroyd et al. 2002; Clarke and Therriault 2007); two solitary species; the vase tunicate, *Ciona intestinalis* (Linnaeus, 1776), and the clubbed tunicate, *Styela clava* (Herdmann 1881), and two colonial species; the golden star tunicate, *Botryllus schlosseri* (Pallas 1766), and the violet tunicate, *Botrylloides violaceus* (Oka, 1927). Several potential invaders identified by Locke (2009) have been detected recently. The solitary European sea squirt, *Ascidella aspersa* (Muller, 1776) and the colonial compound sea squirt, *Diplosoma listerianum* (Milne-Edwards, 1841), were recorded in 2012 on the south shore of NS (Moore et al. 2014), while the colonial pancake batter tunicate, *Didemnum vexillum* (Kott, 2002) was confirmed in the Minas Basin in November 2013 (Moore et al. 2014; Vercaemer et al. 2015). Two non-tunicate biofouling species; the Japanese skeleton shrimp, *Caprella mutica* (Schurin, 1935) and the lacy-crust bryozoan, *Membranipora membranacea* (Linnaeus, 1767) are also present and threaten marine ecosystems and native species in the region.

In response to the growing threat posed by aquatic invasive species (AIS) to native coastal communities, fisheries and shellfish aquaculture in Atlantic Canadian waters, Fisheries and Oceans Canada (DFO) developed and initiated an annual, National AIS Biofouling Monitoring Program in 2006 (Sephton et al. 2011, 2014, 2015, 2016). Here we report on the annual monitoring for invasive biofouling species conducted in DFO Maritimes Region, along the Atlantic coast of NS and in southwest New Brunswick (swNB) between May and December from 2012 to 2015.

2.0 MATERIALS AND METHODS

2.1. SPECIES SUBJECT TO DETECTION AND MONITORING

Seven tunicates, one bryozoan, four crustaceans and one alga made up the suite of non-indigenous species targeted for detection and monitoring (Table 1).

Table 1: List of non-indigenous aquatic species (NIS) subject to detection and monitoring, 2012 - 2015. * indicates a species usually not attached to collector plates.

Group	Scientific Name	Common Name (s)
Tunicates	<i>Ciona intestinalis</i>	Vase tunicate
	<i>Botryllus schlosseri</i>	Golden star tunicate
	<i>Botrylloides violaceus</i>	Violet tunicate
	<i>Styela clava</i>	Clubbed tunicate
	<i>Didemnum vexillum</i>	Pancake batter tunicate
	<i>Diplosoma listerianum</i>	Compound sea squirt
	<i>Ascidella aspersa</i>	European sea squirt
Bryozoans	<i>Membranipora membranacea</i>	Coffin box, lacy crust bryozoan
Crustaceans	<i>Caprella mutica</i>	Japanese skeleton shrimp
	<i>Carcinus maenas</i> *	European green crab
	<i>Eriocheir sinensis</i> *	Chinese mitten crab
	<i>Hemigrapsus sanguineus</i> *	Asian shore crab
Algae	<i>Codium fragile</i> spp. <i>fragile</i> *	Oyster thief, Codium, green fleece

2.2 STATION SELECTION

Coastal and inland (Bras d'Or Lake, NS) monitoring stations were selected based on the presence of potential or existing "risk factors" for the introduction or spread of AIS. These included; (1) presence of shellfish or mussel processing facilities, (2) mussel or shellfish aquaculture sites, (3) commercial ports with international traffic, (4) marinas or yacht clubs with US traffic, (5) commercial fishing harbours, and (6) harbours with herring or US lobster processing facilities. Sites with air-exposure at low tide (i.e. Bay of Fundy coasts) without floating docks were not included. Stations monitored in NS and swNB at least once during the study are shown in Table 2, while all stations monitored in each year are shown in Table 3. Sentinel stations, those stations monitored in every year and in strategic locations or judged to be at greater risk of new invasions are given

in Table 3. Stations monitored in 2011 (Sephton et al. 2015) are included in Table 3 for comparative purposes.

2.3 MONITORING COLLECTORS

The saucer-petri dish-PVC plate monitoring collector shown below (Figure 1A) and described by Sephton and Vercaemer (2015) was used in NB and at some stations in NS (Table 2), while the simpler PVC plate collector (Figure 1B) described by Sephton et al. (2014) was used at most sites in Nova Scotia.

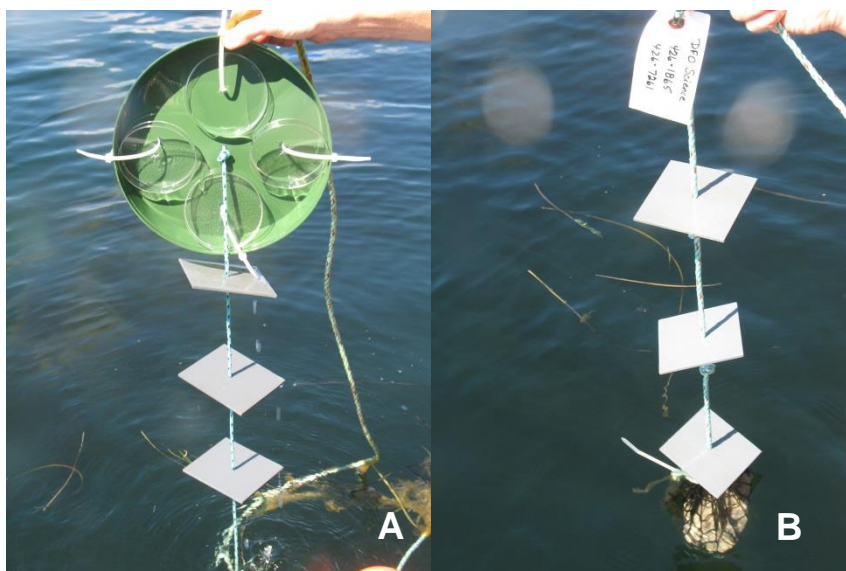


Figure 1: AIS plate collectors used in biofouling monitoring in New Brunswick (A) and Nova Scotia (A and B). The saucer-petri dish-PVC plate collectors (A) had three petri dishes only attached to the saucer, not four as pictured.

2.4 MONITORING PROTOCOL

The total number of stations monitored annually between 2012 and 2015 ranged from 50 to 74 (Table 4). Of these, 34 to 62 stations were monitored in each survey year by staff from DFO Science Branch, Maritimes Region, Coastal Ecosystem Science Division, while 12 to 16 stations were monitored by monitoring partners (Table 4). Information gathered from monitoring collectors, reports of the presence of an AIS (see Table 5 below) were also received each year, from various sources, including the Nova Scotia Department of Fisheries and Aquaculture (NSDFA), marina and harbour managers, DFO and Coast Guard staff and private citizens. These reports were confirmed by examination of photographs provided, or by site inspection and follow-up. No reports of this nature were received from swNB during this study.

Table 2: Stations monitored along the Atlantic coast of Nova Scotia and southwest New Brunswick, one or more years, 2012 - 2015. SW = southwest, S = south, E = east.

No.			°N	°W	
209	Bay of Fundy	Parrsboro	45.37040	-64.27980	Minas Basin, small cove
167	Bay of Fundy	Westport	44.26490	-66.34800	Small fishing harbour, ferry terminal, public wharf, floating dock
158	Bay of Fundy	Tiverton	44.39681	-66.21413	Small fishing harbour, ferry terminal, public wharf, floating dock
171	Bay of Fundy	Gulliver's Cove	44.61000	-65.92000	Marine Plant Farm
1	Bay of Fundy	Digby	44.63015	-65.75233	Large, mixed-use port, floating dock
2	SW shore	Meteghan	44.19365	-66.16688	Medium fishing and processing port, public wharf floating dock
162	SW shore	Yarmouth Yacht Club	43.83636	-66.12330	Yarmouth Yacht Club, large, mixed-use port, floating docks
4	SW shore	Yarmouth Bar	43.81648	-66.14785	Medium fishing and processing port, public wharf, floating dock
155	SW shore	Pinkneys' Point	43.70423	-66.05459	Small fishing and processing port, public wharf, floating dock
97	SW shore	Wedgeport: Tuna Wharf	43.71204	-65.98434	Small fishing harbour, public wharf, floating dock
6	SW shore	Wedgeport	43.71370	-65.96947	Medium fishing and processing port, public wharf, floating dock
108	SW shore	Eel Lake	43.82670	-65.90770	Shellfish aquaculture site, lines, buoys, oyster cages
154	SW shore	Dennis Point	43.61668	-65.78796	Large fishing and processing port, public wharf floating dock
156	SW shore	Fall's Point	43.59051	-65.74178	Medium fishing and processing port, public wharf floating dock

Table 2, continued.

Stn No.	Region	Location	Latitude, °N	Longitude, °W	Station Description and Deployment Structure
7	SW shore	Camp Cove	43.72360	-65.84057	Medium fishing and processing port, public wharf floating dock
8	S shore	Clark's Harbour	43.44470	-65.63510	Medium fishing and processing port, public wharf floating dock
160	S shore	West Head	43.45813	-65.65460	Medium fishing port, public wharf, floating dock
9	S shore	Port La Tour	43.49848	-65.46988	Medium fishing and processing port, public wharf floating dock
10	S shore	Ingomar	43.56273	-65.36245	Medium fishing and processing port, public wharf floating dock
11	S shore	Gunning Cove	43.68073	-65.33973	Medium fishing and processing port, public wharf floating dock
12	S shore	Shelburne	43.75750	-65.32200	Shelburne Yacht Club marina, medium, mixed-use port, floating dock
13	S shore	Lockeport	43.69950	-65.10740	Large fishing and processing port, public wharf
14	S shore	Lower Sandy Point	43.68013	-65.30135	Medium fishing and processing port, public wharf floating dock
82	S shore	Port Mouton	43.91940	-64.84340	Small fishing and processing port, public wharf, floating dock
119	S shore	East Side Port L'Hebert	43.81970	-64.92887	Small fishing port, public wharf, floating dock
17	S shore	Corkum's Island	44.36113	-64.33362	Mussel lease, moorings and lines
18	S shore	Lunenburg; Railway Wharf	44.37525	-64.33069	Large, mixed-use port, shellfish aquaculture area, public wharf, floating dock
608	S shore	Lunenburg; Fisheries	44.37540	-64.31050	Large, mixed-use port, shellfish aquaculture area, public wharf, floating dock

Table 2, continued.

Stn No.	Region	Location	Latitude, °N	Longitude, °W	Station Description and Deployment Structure
587	S shore	Lunenburg Yacht Club	44.41083	-64.32170	Lunenburg Yacht Club, private marina, floating docks
19	S shore	Indian Point	44.45598	-64.30683	Indian Point Marine Farms (IPMF), shellfish aquaculture site, mussel lines
20	S shore	Mahone Bay	44.44782	-64.37437	Public wharf, floating dock
21	S shore	Chester	44.53780	-64.23840	Chester Yacht Club, private marina, floating docks
407	S shore	Tantallon	44.65830	-63.91170	Shining Waters Yacht Club, private marina, floating docks
24	Halifax	Halifax; BIO Jetty	44.68187	-63.61187	Large, international, mixed-use port, government wharf at Bedford Institute of Oceanography, floating dock
401	Halifax	Halifax; AYC	44.63588	-63.61310	Armdale Yacht Club, private marina, floating dock
402	Halifax	Halifax; RNSYC	44.62142	-63.58022	Royal Nova Scotia Yacht Squadron, private marina, floating dock
403	Halifax	Bedford Basin Yacht Club	44.74542	-63.66415	Bedford Basin Yacht Club, private marina, floating dock
432	Halifax	Herring Cove	44.56940	-63.55700	Public wharf
426	Halifax	Purcell's Cove	44.61100	-63.57330	Public wharf, floating dock
431	Halifax	Bedford; Mill Cove	44.71410	-63.67120	Small private marina, floating dock
427	Halifax	Alderney Landing	44.66520	-63.57200	Small private marina, wharf
428	Halifax	Dartmouth Yacht Club	44.70030	-63.61170	Dartmouth Yacht Club, private marina, floating dock
430	Halifax	Shearwater Yacht Club	44.62810	-63.52110	Shearwater Yacht Club, private marina, floating dock
166	E shore	East Petpsewick Yacht Club	44.76721	-63.15100	Private marina, floating dock
25	E shore	Ship Harbour	44.81240	-62.87200	Shellfish aquaculture site, mussel lines

Table 2, continued.

Stn No.	Region	Location	Latitude, °N	Longitude, °W	Station Description and Deployment Structure
26	E shore	Cooper's Point	44.79452	-62.67595	Small port, public wharf, floating dock
30	E shore	Port Bickerton	45.10532	-61.72275	Small port, public wharf, floating dock
39	E shore	Cape Canso	45.33450	-60.98610	Small fishing harbour, public wharf, floating dock
157	Chedabucto Bay	Guysborough	45.39185	-61.49749	Guysborough Yacht Club, private marina, floating dock
40	Chedabucto Bay	Eddy Point	45.52100	-61.26368	Eddy Point Marina, small fishing and recreational marina, floating dock
41	Chedabucto Bay	Venus Cove	45.61530	-61.39010	Venus Cove Marine Park marina, small fishing and recreational marina near large, international port, public wharf, floating dock
182	Chedabucto Bay	Port Hawkesbury	45.61360	-61.36560	Strait of Canso Yacht Club, private marina, floating dock
44	Chedabucto Bay	Petit-de-Grat	45.50710	-60.96050	Medium, mixed-use port, public wharf, floating dock
45	Chedabucto Bay	D'Escousse	45.58870	-60.96180	Lennox Passage Yacht Club, marina, floating dock
47	Bras d'Or Lake	St. Peter's	45.66115	-60.87440	St. Peter's Lion's Club marina, entrance to Bras d'Or Lake, floating docks
48	Bras d'Or Lake	Gillis Cove	45.91100	-61.05390	Oyster aquaculture site, buoys
169	Bras d'Or Lake	Ben Eoin	45.98131	-60.43140	private marina, floating dock
51	Bras d'Or Lake	Whycocomagh	45.98640	-61.11260	Small recreational harbour, shellfish aquaculture area, public wharf, floating dock
52	Bras d'Or Lake	Orangedale	45.90070	-61.08955	Small fishing harbour, public wharf
54	Bras d'Or Lake	Eskasoni	45.95570	-60.58530	Small fishing harbour, private wharf, floating dock
55	Bras d'Or Lake	Baddeck	46.09990	-60.74752	Medium recreational harbour, private wharf, floating dock
58	Cape Breton	Louisbourg	45.91798	-59.98935	Medium, mixed-use port, public wharf, floating dock

Table 2, continued.

Stn No.	Region	Location	Latitude, °N	Longitude, °W	Station Description and Deployment Structure
62	Cape Breton	Sydney; RCBYC	46.13993	-60.16775	Royal Cape Breton Yacht Club, public marina, floating docks
190	Cape Breton	Sydney; DYC Yacht Club	46.13722	-60.20440	Dobson Yacht Club, private marina, floating docks
63	Cape Breton	North Sydney	46.20680	-60.24900	Large, mixed-use port, near Newfoundland Ferry terminal, public wharf, floating dock
74	Cape Breton	Little River	46.44712	-60.45936	Small fishing harbour, public wharf, floating dock
75	Cape Breton	St. Ann's Bay	46.28176	-60.55570	Mussel lease, lines and buoys
69	Cape Breton	Dingwall	46.90320	-60.46040	Small fishing port, floating dock
94	Cape Breton	Aspy Bay North	46.09702	-60.47023	Mussel lease, lines and buoys
172	North shore	Big Island	45.66000	-62.41000	Shan Daph Oyster lease, buoys
132	sw New Brunswick	Musquash (Five Fathom Harbour)	45.18670	-66.25750	Small fishing harbour, Marine Protected Area, public wharf, floating dock
133	sw New Brunswick	Dipper Harbour	45.09440	-66.41680	Medium fishing and processing harbour, public wharf, floating dock
134	sw New Brunswick	Black's Harbour	45.05590	-66.79480	Medium, mixed use harbour, ferry terminal, public wharf, floating dock
135	sw New Brunswick	Beaver Harbour	45.06880	-66.73980	Medium fishing and processing harbour, public wharf, floating dock
141	sw New Brunswick	Bay Bay	44.05610	-66.86380	Integrated multitrophic aquaculture site, mussel cages
143	sw New Brunswick	L'Etete	45.05130	-66.89550	Passenger Ferry landing, floating dock
159	sw New Brunswick	Bliss Harbour	45.02960	-66.86640	Small fishing harbour, public wharf, floating dock
151	sw New Brunswick	St. Andrews	45.06770	-67.05310	Medium, mixed use port, floating dock
152	sw New Brunswick	SABS	45.08230	-67.08470	Government Research Station wharf, floating dock

Table 2, continued.

Stn No.	Region	Location	Latitude, °N	Longitude, °W	Station Description and Deployment Structure
136	Grand Manan	North Head	44.76310	-66.74900	Medium, mixed use, harbour, public wharf floating dock
137	Grand Manan	Ingalls Head	44.66090	-66.75660	Medium fishing harbour, public wharf, floating dock
140	Grand Manan	Seal Cove	44.64740	-66.84130	Medium fishing harbour, public wharf, floating dock
144	Campobello	Head Harbour	44.94660	-66.90550	Medium fishing harbour, public wharf, floating dock
145	Campobello	Wilson's Beach	44.92830	-66.93900	Small fishing harbour, public wharf, floating dock
146	Deer Island	Leonardville	44.97160	-66.95270	Small fishing harbour, public wharf, floating dock
147	Deer Island	Indian Island	44.93490	-66.96910	Salmon aquaculture site, cages
149	Deer Island	Fairhaven	44.96400	-67.00790	Small fishing harbour, public wharf, floating dock

Table 3. Stations monitored along the Atlantic coast of Nova Scotia and southwest New Brunswick in each year between 2011 and 2015. Sentinel station numbers and locations are given in bold. The type of monitoring collector used at each station in separate years are denoted as: Petri Dish Collector = PC, and Regular Plate Collector = RC. YC = Yacht Club, SW = southwest, S = south, RW = Railway Wharf, FMW = Fisheries Museum Wharf, BIO = Bedford Institute of Oceanography, AYC = Armdale Yacht Club, RNSYS = Royal Nova Scotia Yacht Squadron, E = east, RCBYC = Royal Cape Breton Yacht Club, N = north, SABS = St. Andrews Biological Station, I = Island, MF = Marine Fish Aquaculture Site. Stations 62 and 190 are designated as the “Sydney” sentinel station.

Stn No.	Region	Location	Years Monitored				
			2011	2012	2013	2014	2015
167	Bay of Fundy	Westport			PC		
158	Bay of Fundy	Tiverton		PC	PC		RC
171	Bay of Fundy	Gulliver's Cove			PC		
1	Bay of Fundy	Digby	RC	RC	PC	RC	RC
2	SW shore	Meteghan	RC	RC	PC	RC	RC
162	SW shore	Yarmouth Yacht Club			PC		RC
4	SW shore	Yarmouth Bar	RC	PC	PC	RC	RC
155	SW shore	Pinkneys' Point		PC	RC		
97	SW shore	Wedgeport; Tuna Wharf			PC		
6	SW shore	Wedgeport		RC	RC	RC	RC
108	SW shore	Eel Lake	RC	RC	RC	RC	RC
154	SW shore	Dennis Point		PC	PC		
156	SW shore	Fall's Point		PC	RC	RC	
7	SW shore	Camp Cove	RC		RC	RC	RC
8	SW shore	Clark's Harbour	RC	RC	RC	RC	RC
160	SW shore	West Head			RC		
9	S shore	Port La Tour		RC	RC		RC
10	S shore	Ingomar			RC		
11	S shore	Gunning Cove			RC		RC
12	S shore	Shelburne	RC	RC	RC	RC	RC
13	S shore	Lockeport	RC				
14	S shore	Lower Sandy Point			PC		RC
82	S shore	Port Mouton	RC	PC	PC	PC	PC
119	S shore	East Side Port L'Hebert		PC	PC		
17	S shore	Corkum's Island					
18	S shore	Lunenburg; RW	RC	RC	RC	RC	RC
608	S shore	Lunenburg; FMW			PC		RC
587	S shore	Lunenburg YC			PC		RC
19	S shore	Indian Point	RC	RC	RC	RC	RC
21	S shore	Chester	RC		RC	RC	RC
407	S shore	Tantallon			PC		
83	Halifax	Sambro	RC				
24	Halifax	Halifax; BIO	RC	PC	PC	PC	PC

Table 3, continued.

Stn No.	Region	Location	Years Monitored				
			2011	2012	2013	2014	2015
401	Halifax	Halifax; AYC			PC	PC	PC
402	Halifax	Halifax: RNSYC			PC	PC	
403	Halifax	Bedford Basin YC			PC		
432	Halifax	Herring Cove			PC		
426	Halifax	Purcell's Cove			PC		
431	Halifax	Bedford; Mill Cove			PC		
427	Halifax	Alderney Landing			PC		
428	Halifax	Dartmouth Yacht Club			PC	PC	PC
430	Halifax	Shearwater Yacht Club			PC		PC
166	E shore	East Petpsewick YC			PC		
25	E shore	Ship Harbour	RC	RC	RC	RC	RC
26	E shore	Cooper's Point			PC		
161	E shore	Sheet Harbour		RC			
30	E shore	Port Bickerton		PC	RC	RC	
39	E shore	Cape Canso	RC		RC	RC	
157	Chedabucto Bay	Guysborough		PC			
40	Chedabucto Bay	Eddy Point		RC			RC
41	Chedabucto Bay	Venus Cove	RC		RC	PC	RC
182	Chedabucto Bay	Port Hawkesbury				PC	RC
44	Chedabucto Bay	Petit-de-Grat	RC			RC	RC
45	Chedabucto Bay	D'Escousse	RC	PC	RC		
47	Bras d'Or Lake	St. Peter's	RC	PC	RC		RC
169	Bras d'Or Lake	Ben Eoin			PC	RC	RC
48	Bras d'Or Lake	Gillis Cove				RC	
51	Bras d'Or Lake	Whycocomagh	RC	RC	RC	RC	RC
52	Bras d'Or Lake	Orangedale	RC	RC			
54	Bras d'Or Lake	Eskasoni	RC	RC		RC	RC
55	Bras d'Or Lake	Baddeck	RC	RC	RC	RC	RC
86	Bras d'Or Lake	East Bay	RC				
58	Cape Breton	Louisbourg	RC		RC		
62	Cape Breton	Sydney; RCBYC	RC	RC			
190	Cape Breton	Sydney: Dobson YC				RC	PC
63	Cape Breton	North Sydney	RC	RC	RC	RC	RC
74	Cape Breton	Little River	RC	PC	RC	RC	RC
75	Cape Breton	St. Ann's Bay	RC		RC	RC	RC
69	Cape Breton	Dingwall	RC	PC	RC	RC	RC
94	Cape Breton	Aspy Bay North	RC		RC		
172	N Shore	Big Island			RC		
132	sw New Brunswick	Musquash (Five Fathom Hole)	PC	PC	PC	PC	PC
133	sw New Brunswick	Dipper Harbour	PC	PC	PC	PC	PC
134	sw New Brunswick	Black's Harbour	PC	PC	PC	PC	
135	sw New Brunswick	Beaver Harbour	PC	PC	PC	PC	PC
141	sw New Brunswick	Bay Bay	PC	PC	PC	PC	PC
143	sw New Brunswick	L'Etete	PC	PC	PC	PC	PC
159	sw New Brunswick	Bliss Harbour	PC	PC	PC	PC	

Table 3, continued.

Stn No.	Region	Location	Years Monitored				
			2011	2012	2013	2014	2015
151	sw New Brunswick	St. Andrews	PC	PC	PC	PC	PC
152	sw New Brunswick	SABS	PC	PC	PC	PC	PC
136	Grand Manan I.	North Head	PC	PC	PC	PC	PC
137	Grand Manan I.	Ingalls Head	PC	PC	PC	PC	PC
140	Grand Manan I.	Seal Cove	PC	PC	PC	PC	PC
144	Campobello I.	Head Harbour	PC	PC	PC	PC	PC
145	Campobello I.	Wilson's Beach	PC	PC	PC	PC	PC
146	Deer Island	Leonardville	PC	PC	PC	PC	PC
147	Deer Island	Indian Island	PC	PC	PC		
149	Deer Island	Fairhaven Dock	PC	PC	PC	PC	PC
150	Deer Island	Fairhaven MF	PC	PC			

Table 4. Total number of stations monitored in each year, and number of stations monitored by DFO and by partner organizations. The numbers for each station are given for each partner in each year, see Table 2 for location details. CARP Clean Annapolis River Project, EFWC = Eskasoni Fish and Game Commission, NBDAAF = New Brunswick Department of Agriculture, Aquaculture and Fisheries, StFX = St. Francis Xavier University.

	2012	2013	2014	2015
Total Stations	50	74	50	52
DFO Stations	34	62	36	40
Partner Stations	16	12	14	12
• CARP	#1			
• EFWC	#54		#s 48, 54	
• St. F.X.			# 75	
• NBDAAF*	#s134, 141, 143, 159, 136, 137, 140, 144, 145, 146, 147, 149, 150	#s134, 141, 143, 159, 136, 137, 140, 144, 145, 146, 147, 149	#s134, 141, 143, 159, 136, 137, 140, 144, 145, 146, 149,	#s19, 25,75 #s141, 143, 136, 137, 140, 144, 145, 146, 149

Table 5: Location of AIS reports not from monitoring plates in Nova Scotia, 2012 – 2015. SW = southwest, S = south, YC = Yacht Club, FMW = Fisheries Museum Wharf, RNSYS = Royal Nova Scotia Yacht Squadron, AYC = Armdale Yacht Club, BBYC = Bedford Basin Yacht Club, E = east, N = north.

Stn. No.	Region	Location	Latitude (°N)	Longitude (°W)	2012	2013	2014	2015	Description
209	Bay of Fundy	Parrsboro	45.37040	-64.27980		x		x	Minas Basin, small cove
415	Bay of Fundy	Sandy Cove East	44.48789	-66.08580	x				Marine Plant farm
177	SW shore	Sluice Point	43.77270	-65.95030		x			Small harbour
178	SW shore	Morris Island	43.73470	-65.88730		x			Small harbour
176	SW shore	Shag Harbour	43.49227	-65.70520		x			Small harbour
175	S shore	Newellton	43.47261	-65.63390		x			Small harbour
179	S shore	Cripple Creek	43.48892	-65.56040		x			Small harbour
180	S shore	South Side	43.44732	-65.56800		x			Small harbour
181	S shore	Stoney Island	43.46804	-65.56720		x			Small harbour
409	S shore	Smithville	43.48567	-65.46350		x			Small harbour
411	S shore	Upper Port La Tour	43.56273	-65.36250		x			Small harbour
13	S shore	Lockeport	43.69950	-65.10740	x				Large fishing harbour
100	S shore	LaHave River YC	44.31160	-64.40830	x				Yacht Club
17	S shore	Corkum's Island	44.36113	-64.33360	x	x			Mussel aquaculture lease
608	S shore	Lunenburg; FMW	44.37540	-64.31050	x				Large fishing harbour
21	S shore	Chester YC	44.53780	-64.23840	x				Yacht Club
512	Halifax	St. Margaret's Bay	44.68060	-63.91750	x				Small cove, mooring
425	Halifax	Lower Prospect	44.44905	-63.72760	x				Small cove, marker buoy
407	Halifax	Tantallon	44.65830	-63.91170	x				Shining Waters Yacht Club
432	Halifax	Herring Cove	44.56940	-63.55700	x				Small cove, public wharf
210	Halifax	Skull Cove	44.66569	-63.58020			x		Small cove
426	Halifax	Purcell's Cove	44.61100	-63.57330	x				Small cove, public wharf
402	Halifax	Halifax; RNSYS	44.62140	-63.58020	x				Royal Nova Scotia Yacht Squadron marina
401	Halifax	Halifax; AYC	44.63590	-63.61310	x				Armdale Yacht Club
431	Halifax	Halifax; Mill Cove	44.71410	-63.67120	x				Private marina
403	Halifax	Halifax; BBYC	44.74540	-63.66420	x				Bedford Basin Yacht Club
428	Halifax	Dartmouth YC	44.70030	-63.61170	x				Dartmouth Yacht Club
429	Halifax	Wright's Cove	44.69550	-63.12800	x				Small cove, buoy
427	Halifax	Alderney Landing	44.66520	-63.57200	x				Private marina
430	Halifax	Shearwater YC	44.62810	-63.52110	x				Shearwater Yacht Club
25	E shore	Ship Harbour	44.81240	-62.87200	x		x		Mussel lease
104	E shore	Country Harbour	45.23220	-61.75900	x				Small harbour, mussel lease
36	E shore	Whitehead	45.23940	-61.15260	x				Mussel lease
30	E shore	Port Bickerton	45.10532	-61.72275				x	Small harbour
39	E shore	Cape Canso	45.33450	-60.98610				x	Small harbour, marina
173	Chedabucto Bay	Pirate Harbour	45.58707	-61.38330		x			Small harbour
40	Chedabucto Bay	Eddy Point	45.52100	-61.26370	x				Small harbour, marina
44	Chedabucto Bay	Petit-de-Grat	45.50710	-60.96050	x				Medium harbour
182	Chedabucto Bay	Port Hawkesbury	45.61360	-61.36560	x	x			Strait of Canso Yacht Club
46	Chedabucto Bay	Little Harbour	45.58330	-60.74070	x				Medium fishing harbour
54	Bras d'Or Lake	Eskasoni	45.95570	-60.58530		x		x	Small harbour
211	Bras d'Or Lake	Bras d'Or	46.25304	-60.29990			x		Small harbour
212	Bras d'Or Lake	New Harris	46.23900	-60.50000			x		Small harbour
76	Bras d'Or Lake	Big Bras d'Or	46.28117	-60.42500			x		Medium harbour
77	N shore	Pictou	45.67440	-62.71180	x				Public marina
213	N shore	Arisaig	45.76100	-62.17200	x				Public wharf
214	N shore	Cribbon's Point	45.75580	-61.89710	x				Public marina

Two (in NB) or four (in NS) collectors (Figure 1) were deployed (hung) per station with the top plate approximately 1 m below the water's surface in late May to mid-June. Collectors deployed on shellfish aquaculture leases (Stn #s 108, 17, 19, 25, 75 and 94) were hung at the depth of the mussel socks or oyster cages. Collectors were deployed in such a way that multiple areas representative of differing habitats of the station were sampled. In NS only, early season differences in colonization were determined by removing two collectors in mid-August (First deployment period). Two additional collectors were deployed in NB and NS in mid-August for retrieval in late October (Second deployment period). Two collectors that were deployed in late-May to mid-June and had remained in the water were also retrieved in late-October to mid-November and were used to assess full season colonization (Full deployment period) on collector plates. At sites where biofouling had been low in previous years, or when it was not logistically feasible to visit the site in summer, the four collectors deployed in late-May to mid-June were retrieved in late-October to mid-November (Full deployment period only). Dates and details of collector deployment for all stations in 2012, 2013, 2014 and 2015 are shown in Appendices 1, 2, 3 and 4, respectively.

A Garmin eTrex Unit (Garmin International, Inc., Olathe, Kansas, USA) was used to determine or verify the geo-referenced position of each monitoring station and photographs of new stations were taken in May or June. Temperature ($^{\circ}\text{C}$), salinity, conductivity (mS cm^{-1}), oxygen content (% saturation and mg L^{-1}) and chlorophyll A ($\mu\text{g L}^{-1}$) were measured at collector depth using a YSI 6600 Sonde (YSI Incorporated, Yellow Springs, Ohio, USA) during each deployment and retrieval at most stations, except in 2015 when a YSI Pro Plus meter was used. A YSI 85 was used at Eskasoni, Orangedale, Gillis Cove and Whycocomagh.

HOBO (Onset Computer Corp., Bourne, MA, USA) temperature loggers were attached to one of the Full season monitoring collectors (Figure 1) at selected stations (see Appendices 1 - 4) to record temperature at hourly intervals throughout the deployment period. A visual check of surfaces and structures adjacent to collectors was made at each station during each visit to document the presence of tunicates and other NIS (Table 1).

Following the prescribed monitoring period (see Appendices 1 - 4), collectors were removed and collector ropes, tags and weights, as well as plates and petri dishes, were examined in the field for the presence of tunicates, other NIS and biofouling native species. Individual monitoring plates were placed bottom-side up in sequence (i.e., top plate = left (1), middle plate = centre (2) and bottom plate = right (3)) on a white, labelled background, and plates and Petri dishes were photographed (see Figure in Sephton et al. 2015) using a frame-mounted Panasonic Lumex TS3 (Panasonic Inc., Mississauga,

Ontario) digital camera. Ideally, photographs were taken in the field, but under adverse weather conditions or when partners shipped collectors to the Bedford Institute of Oceanography (BIO), photographs were taken indoors within 24 h of collection. All data and photographs were entered into a Microsoft ACCESS database for further analysis.

2.5 DETERMINATION OF PRESENCE AND PERCENT COVER OF TUNICATES

Presence of tunicate species was determined as a positive observation on either a DFO monitoring collector (plates, rope, tag or weight), on any submerged surface inspected at the monitoring station, or as a confirmed report provided by a monitoring partner. In cases where an AIS was observed at a station, but not on the monitoring plates or Petri dishes, a value of “1” was assigned to plate 1 of collector #5 (Full deployment period) for entry in the database.

Percent cover of each tunicate species was determined by visual examination of the bottom (under) surfaces of each plate and petri dish. Categories for the percent cover were: 0 (absent); 1: < 25% coverage (low); 2: 25 – 50% coverage (moderate); 3: 51 – 75% coverage (heavy), 4: 76 - 100% coverage (very heavy). Median numerical values for each coverage category were, 0, 1: 12.5%, 2: 37.5%, 3: 62.5% and 4: 87.5%.

The average annual median value for each species of tunicate at each station was determined by first converting all coverage category values from all plates and petri dishes, deployed in all deployment periods (maximum of 6 collectors, with 18 plates plus 18 Petri dishes if Petri collectors were deployed) into their median values. Next, the sum of all median values was divided by the total number of plates and Petri dishes recovered in all deployment periods. The average median value was then converted to the appropriate percent cover category value (i.e., 0 - 4), to create the distribution maps for each species. This variable is hereafter referred to as average annual plate cover.

2.6 TEMPERATURE ANALYSES

In addition to the hourly HOBO temperature data collected during the Full deployment period as described above, hourly temperature data collected as part of other research programs was provided for additional sites in 2013, 2014 and 2015 (Table 6, Appendices 2, 3 and 4 for details). These data were collected by either Aquastar CT2X Conductivity Smart Sensors (INW Corp., Kent, WA, USA), Seabird SBE37M Microcat (Sea-Bird Electronics, WA, USA) or Minilog-II-T (Vemco, Bedford, NS, Canada). Hourly temperature data were available for 18 - 24 selected stations each year (see Appendices 1 – 4 for details), were used to determine monthly temperatures [$^{\circ}\text{C}$ +/- standard deviation (SD)] and the minimum and maximum temperature values at these stations during the deployment period of monitoring collectors. Midnight of the day

following the First deployment was selected as the first datum, and midnight of the day preceding the date of the final retrieval was selected as the final datum. Limited data were available for the months of May and November in any year and were excluded from the analyses.

Monthly mean temperatures ($^{\circ}\text{C} \pm \text{SD}$), were determined from June to October in seven general areas, within three main geographic regions as follows; (1) Southern Nova Scotia; stations along the southwest and south shores (Digby to Chester), (2) Central Nova Scotia: stations in Halifax Harbour, along the eastern Shore and in Chedabucto Bay (Tantallon to Petit-de-Grat), and (3) Cape Breton: stations along the Cape Breton coast and in the Bras d'Or Lakes (Louisbourg to Dingwall, and St. Peter's to Whycocomagh) Data from all stations within each of the seven areas were pooled to determine monthly mean temperatures for the area in each year. Regional values were calculated from all stations within the region of interest.

Table 6: Locations where hourly temperature data was collected in each Region and Area in 2012, 2013, 2014 and 2015. Data sources are: X = AIS Monitoring Program, KM = K. Murphy, St. Francis Xavier University, BL = B. Lowen, DFO, AD = A. Drodowski, DFO, and JF = J. FitzGerald, DFO.

Region	Area	Station	2012	2013	2014	2015
Southern NS	Southwest Shore	Digby	X	X	X	X
		Tiverton		X		
		Meteghan	X	X	X	
		Yarmouth Bar	X	X	X	KM
		Wedgeport			X	X
		Eel Lake		X		BL
		Camp Cove			X	KM
		Pinkney's Point	X			KM
		Wedgeport	X			
		Dennis Point	X			
		Falls Point	X		X	
	South Shore	Clarks Harbour	X	X	X	X
		Port La Tour	X			X
		Gunning Cove				X
		Shelburne	X	X		X
		Port L'Hebert	X			
		Port Mouton	X	X	AD	X
		Corkums Island		X		
		Lunenburg		X		X
		Indian Point	X	X	X	KM
		Mahone Bay				X
		Chester				X
Central NS	Halifax	Halifax BIO Jetty	X		X	JF
		Halifax 700		AD		
	East shore	Ship Harbour	X		X	KM
		Liscomb 29		AD		
		Port Bickerton	X		X	
	Chedabucto Bay	Guysborough	X			
		Eddy Point	X			
		Cape Canso		X	X	
		Petit-de-Grat			X	KM
		D'Escousse	X			
Cape Breton	Cape Breton coast	Venus Cove			X	KM
		Sydney	X			X
		North Sydney	X	X	X	X
		Louisbourg		X		
		Little River		X	X	KM
		St Ann's Bay		X	X	KM
		Dingwall	X		X	KM
	Bras d'Or Lake	North Harbour		X		
		Baddeck	X	X	X	X
		Whycocomagh	X			
		Ben Eoin		X		
		Gillis Cove		X		
		St. Peter's	X	X	AD	X

3.0 RESULTS

3.1 NOVA SCOTIA, 2012 - 2015

3.1.1 General occurrence of non-indigenous tunicates and environmental measures

General monitoring results for the presence of non-indigenous tunicate species in NS in 2012, 2013, 2014, and 2015 are given in Table 7, and percentage values for all records, and for sentinel stations only, are given in Table 8. The locations where non-indigenous tunicates were present in 2012 to 2015 are shown in Figures 2 to 5, respectively.

Botryllus schlosseri was the most common tunicate present in all years, ranging from a low of 47 of 61 (77%) records in 2012 to a high of 33 of 39 (85%) records in 2014 (Tables 7 and 8). This species was found in all regions of NS between 2012 and 2015 (Figures 2 to 5, respectively), and it was the predominant tunicate found in the Bras d'Or Lake in all years. It was found at all reported locations in southwest NS in 2012 (Figure 2) and in Chedabucto Bay in 2012 and 2013 (Figure 3). In 2014, *B. schlosseri* was found at all reported locations in most regions, with the exception of the Bay of Fundy and Cape Breton shores (Figure 4). In 2015, it was present at all monitoring stations in Halifax Harbour (Figure 5). It was present at more than 85% of sentinel stations in all years (Table 8).

Ciona intestinalis ranked a close second to *B. schlosseri*, present from a low of 44 of 61 (72%) of records in 2012 and 29 of 39 (72%) of records in 2014 to a high of 33 of 42 (79%) of records in 2015 (Tables 7 and 8). This species was found in all regions of NS between 2012 and 2015 (Figures 2 to 5, respectively), with the exception of the inner Bras d'Or Lake, although it was present at St. Peter's (Stn 47), at the southern entrance to the Lake, in 2012 (Figure 2), 2013 (Figure 3) and 2014 (Figure 4). In 2012 (Figure 2), it was found at all recorded locations in the Bay of Fundy, southwest NS and Chedabucto Bay. In 2013 (Figure 3) and 2015 (Figure 5), it was found at all recorded locations in Halifax Harbour and in Chedabucto Bay. In 2014, it was found at all recorded locations in most regions, with the exception of the Bay of Fundy and Cape Breton shores (Figure 4). It was present at 85 - 95% of sentinel stations between 2012 and 2015 (Table 8).

Botrylloides violaceus was the third most common tunicate recorded in NS during 2012 -2015, present from a low of 34 of 61 (56%) of records in 2012 to a high of 47 of 71 (66%) of records in 2013 (Tables 7 and 8). It was found in all regions of NS between

Table 7: Total occurrence of non-indigenous tunicates (monitoring records [^M] or other reports [^R]) in Nova Scotia, May to December, 2012 – 2015. * = report from Strait of Canso Yacht Club (SCYC) Port Hawkesbury, designated as a station in 2014. ND = not detected.

Species	2012 Total Records	2013 Total Records	2014 Total Records	2015 Total Records
<i>Ciona intestinalis</i>	44 of 61 (23 ^M , 21 ^R)	53 of 71 (45 ^M , 8 ^R)	29 of 39 (26 ^M , 3 ^R)	32 of 42 (30 ^M , 2 ^R)
<i>Botryllus schlosseri</i>	47 of 61 (28 ^M , 19 ^R)	57 of 71 (51 ^M , 6 ^R)	33 of 39 (30 ^M , 3 ^R)	35 of 42 (32 ^M , 3 ^R)
<i>Botrylloides violaceus</i>	34 of 61 (20 ^M , 14 ^R)	47 of 71 (37 ^M , 10 ^R)	23 of 39 (19 ^M , 4 ^R)	26 of 42 (24 ^M , 2 ^R)
<i>Styela clava</i>	4 of 61 (1 ^M , 3 ^R)	4 of 71 (3 ^M , 1 ^R)	5 of 39 (4 ^M , 1 ^R)	5 of 42 (5 ^M)
<i>Didemnum vexillum</i>	ND	1 of 71 (1 ^R)	1 of 39 (1 ^R)	1 of 42 (1 ^R)
<i>Diplosoma listerianum</i>	1 of 61 (1 ^R)	ND	ND	ND
<i>Ascidella aspersa</i>	3 of 61 (1 ^M , 2 ^R)	3 of 71 (2 ^M , 1 ^R)	1 of 39 (1 ^M)	ND
No Tunicates	6 of 61 (2 ^M , 4 ^R)	6 of 71 (4 ^M , 2 ^R)	2 of 39 (2 ^M)	3^M of 42 (3 ^M)
Number of Monitoring Stations	32	57	34	38
Number of Reports	29	14	5	4

2012 and 2015 (Figures 2 – 5, respectively), but it was only found once in the Bras d'Or Lake, in 2013 (Figure 3), at Baddeck (Stn 55). It was found at all stations monitored in Chedabucto Bay in 2013 (Figure 3) and 2014 (Figure 4). This species was present at 65 – 72% of sentinel stations between 2012 and 2015 (Table 8).

Four additional species of non-indigenous tunicates were recorded less frequently at several stations between 2012 and 2015 (Tables 7 and 8). *Styela clava* was first recorded in 2012 at BIO (Stn 24) in Halifax Harbour (Figure 2), and at two additional stations (Stn 428: Dartmouth Yacht Club (DYC) and Stn 429: Wrights' Cove). It was also reported at the Lunenburg Fisheries Museum wharf (Stn 608) in Lunenburg Harbour in 2012. It was present as 7% of all records and at 5% of sentinel stations in 2012 (Table 8). In 2013, it was present at four monitoring stations (Figure 3); BIO (Stn 24) and DYC (Stn 428) in Halifax Harbour, the Lunenburg Fisheries Museum wharf (Stn 608), and for the first time in Chedabucto Bay at Venus Cove (Stn 41). The presence of *S. clava* was reported at the Strait of Canso Yacht Club (SCYC) in Port Hawkesbury

Table 8: Total occurrence (%) of non-indigenous tunicates at all stations (black text) and sentinel stations (red text) in Nova Scotia, May – December, 2012 - 2015.

* = not detected at a sentinel station. ND = not detected.

Species	2012		2013		2014		2015	
	All	Sentinel	All	Sentinel	All	Sentinel	All	Sentinel
<i>Ciona intestinalis</i>	72	86	75	76	74	85	76	77
<i>Botryllus schlosseri</i>	77	95	80	96	85	92	83	85
<i>Botrylloides violaceus</i>	56	68	66	72	59	65	62	65
<i>Styela clava</i>	7	10	7	12	13	15	12	15
<i>Didemnum vexillum</i>	ND		0	0*	2	0*	2	0*
<i>Diplosoma listerianum</i>	2	0*	ND		ND		ND	
<i>Asciidiella aspersa</i>	5	5	4	4	2	4	ND	
No Tunicates	10	0	8	4	5	4	7	4
Number of All Stns and Reports	61		71		39		42	
Number of Sentinel	22		25		26		26	

(Stn 182), consequently designated as a new sentinel station in Chedabucto Bay, for a total of 7% of all records, and 12% of sentinel stations. In 2014, *S. clava* was reported from another location in Chedabucto Bay, Pirate Harbour (Stn 173) (Figure 4). It was found at a total of five locations (Table 6), in three separate areas; Lunenburg Harbour, Halifax Harbour and Chedabucto Bay in 2014 (Figure 4) and 2015 (Figure 5), for 13% and 12% of all records, respectively, and at 15% of sentinel stations in both years (Table 7). *Diplosoma listerianum* was only found in 2012, and at only one station; Lunenburg Fisheries Museum wharf (Stn 608) (Table 7, Figure 2). *Asciidiella aspersa* was first recorded in 2012 (Table 6) at two stations in Lunenburg Harbour (Figure 2): Railway Wharf (Stn 18), and at the Fisheries Museum wharf (Stn 608), and reported from a third location just outside the Harbour, Corkum's Island (Stn 17). In 2013, it was recorded again at these three stations (Figure 3), and again at Railway Wharf (Stn 18), the only station monitored in Lunenburg Harbour in 2014 (Figure 4). It was not detected anywhere in Lunenburg Harbour in 2015 (Figure 5). It was present at 5% or less of all records from 2012 – 2015 (Table 8), and about 5% of sentinel stations. *Didemnum vexillum* was recorded at only one monitoring station, off Parrsboro, NS, during the course of this study. It was confirmed as present in 2013, from a benthic sample

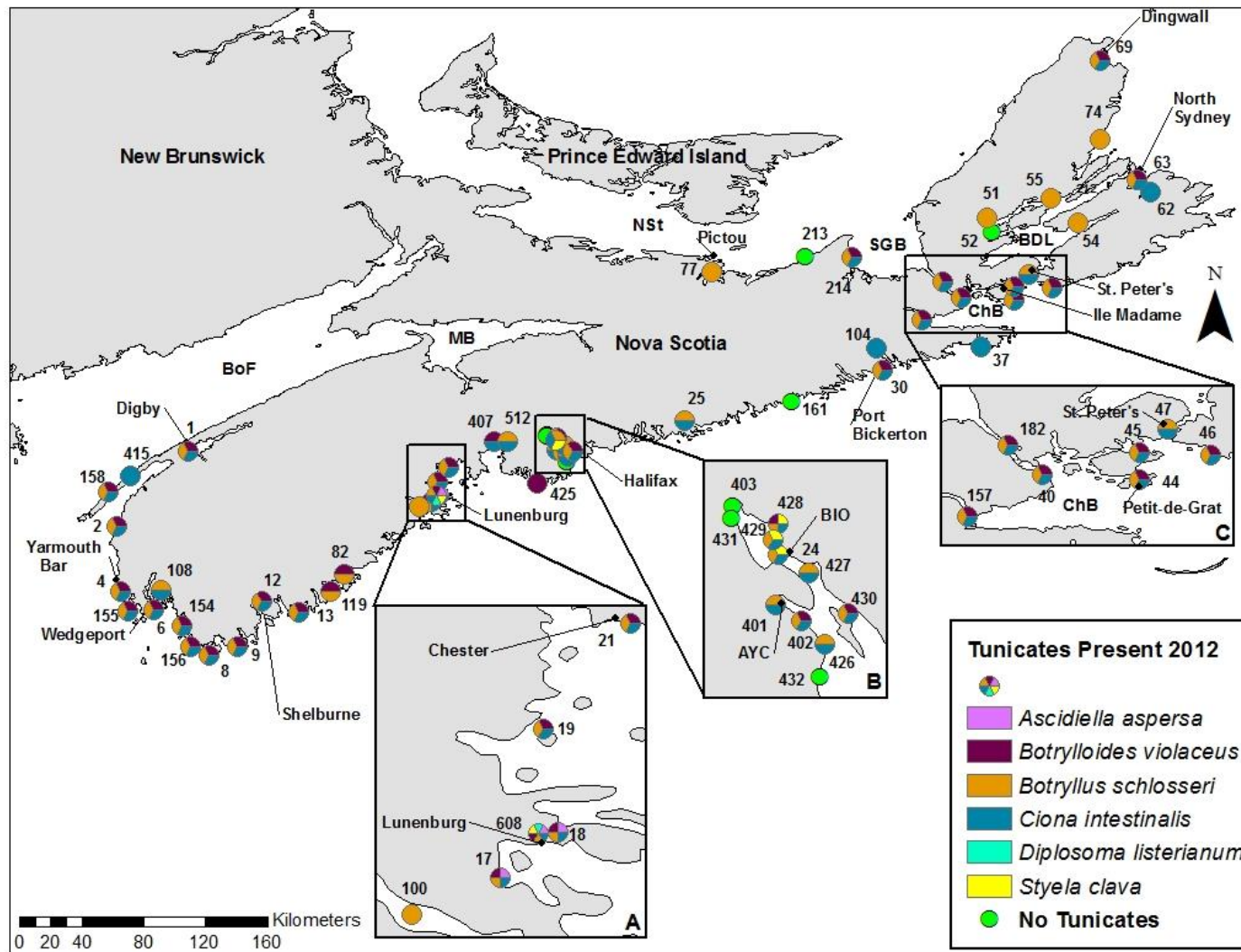


Figure 2: Presence of non-indigenous tunicates in Nova Scotia in 2012. BoF = Bay of Fundy, ChB = Chedabucto Bay, NSt = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

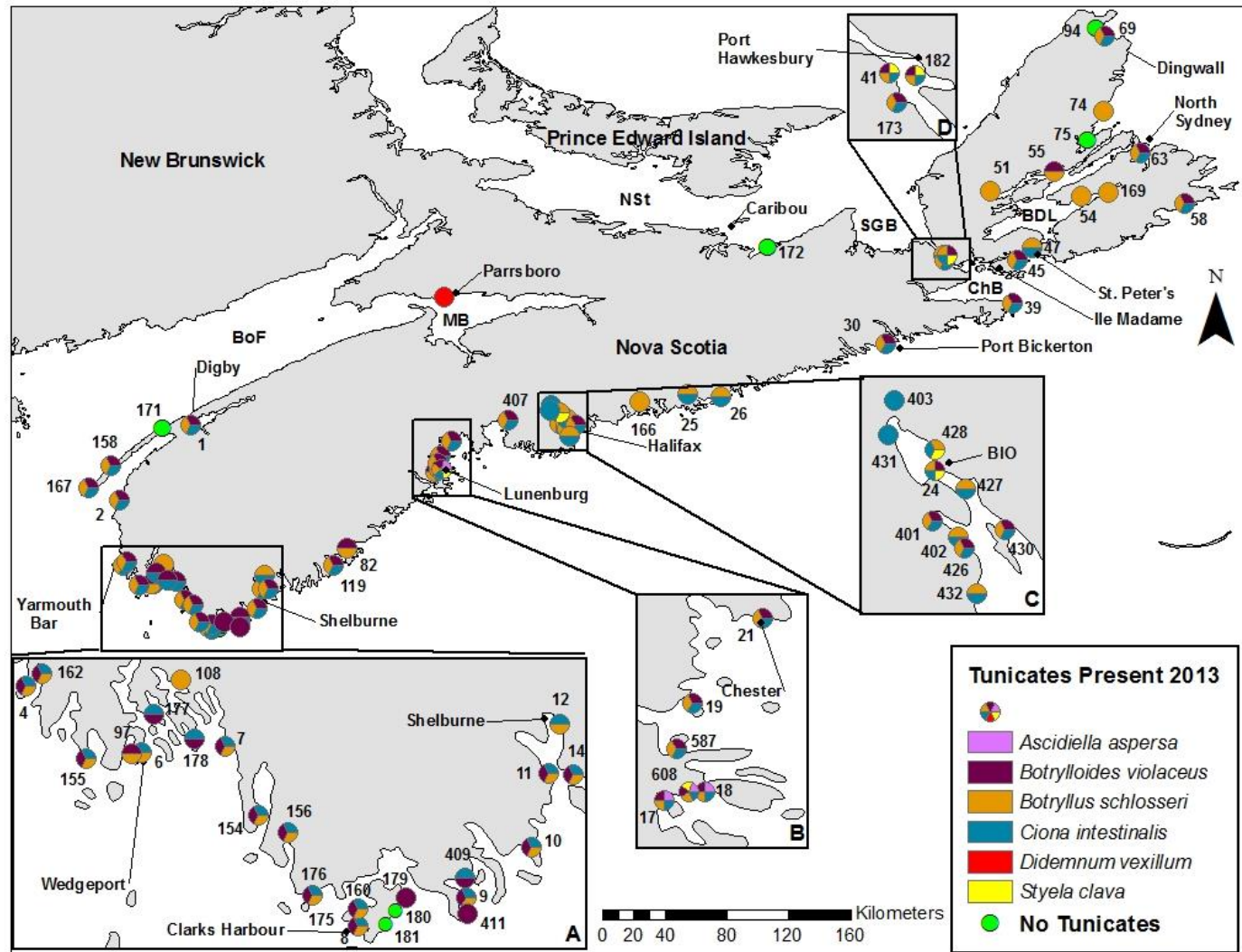


Figure 3: Presence of non-indigenous tunicates in Nova Scotia in 2013. BoF = Bay of Fundy, ChB = Chedabucto Bay, NST = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

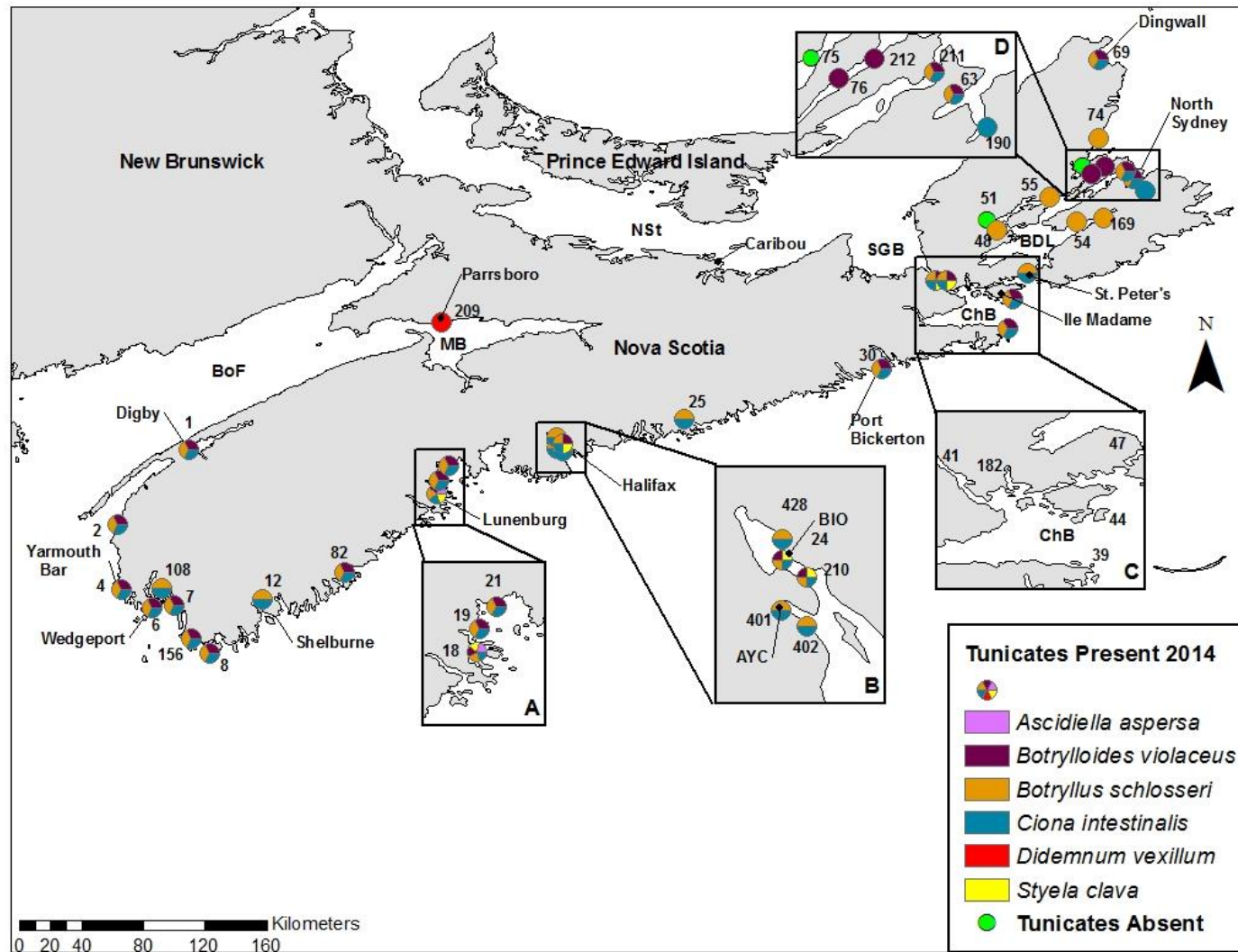


Figure 4: Presence of non-indigenous tunicates in Nova Scotia in 2014. BoF = Bay of Fundy, ChB = Chedabucto Bay, NSt = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

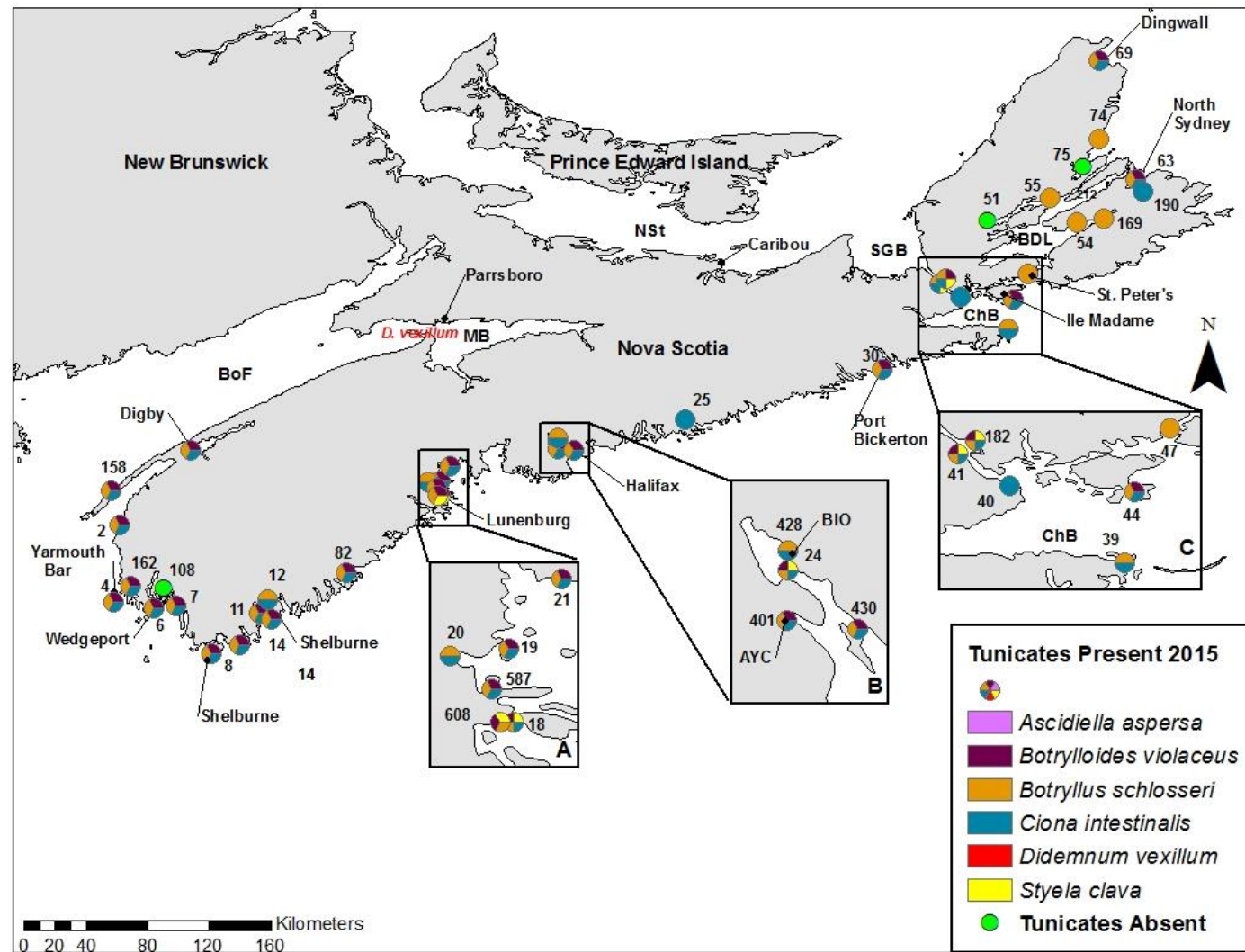


Figure 5: Presence of non-indigenous tunicates in Nova Scotia in 2015. BoF = Bay of Fundy, ChB = Chedabucto Bay, NSt = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake. *Didemnum vexillum* was reported in Minas Basin, but no GPS co-ordinates were available.

obtained by a recreational diver (Moore et al. 2014). In 2014, it was present on a benthic groundline (Vercaemer et al 2015) deployed in the same area, and it was again reported off Parrsboro by divers in 2015.

Non-indigenous tunicates were absent from one or two stations in several regions between 2012 and 2015. In 2012 (Figure 2), several stations in Halifax Harbour (Bedford Basin Yacht Club, Stn 403; Mill Cove, Stn 431 and Herring Cove, Stn 432), Sheet Harbour (Stn 161) on the east shore, and Orangedale (Stn 52) in the Bras d'Or Lake were free of tunicates. In 2013, tunicates were not detected at two locations on the southwest shore (South Side, Stn 180; and Stoney Island Stn 181), and mussel aquaculture sites in St. Ann's Bay (Stn 75) and North Harbour (Stn 94) in Cape Breton (Figure 3). In 2014, Whycocomagh (Stn 51), in the Bras d'Or Lake, and St. Ann's Bay (Stn 75) were the only stations where tunicates were not detected (Figure 4). Finally, tunicates were absent from Whycocomagh (Stn 51) and St. Ann's Bay (Stn 75) in 2015 (Figure 5), and also at the Eel Lake (Stn 108) oyster farm in southwest Nova Scotia.

The ranges of environmental temperature, salinity, and dissolved oxygen, determined at each deployment and retrieval visit in 2012 to 2015, for sites where each non-indigenous tunicate species was present, are given in Table 9. All discrete environmental measurements taken at stations each year are given in Appendices 5 to 8, respectively.

Botryllus schlosseri was found at the warmest stations in 2012 to 2015, although *C. intestinalis* was also noted at Shelburne (Stn 12) in 2015, where summer temperatures reached 25.80°C. *Botrylloides violaceus* was found at stations with cooler maximum temperatures compared with *C. intestinalis*. Colonial tunicates were found at stations with lower salinity ranges; 13.38 for *B. schlosseri* in 2012, and 15.30 in 2013. *Botryllus violaceus* also tolerated lower salinities; to a low of 13.76 in 2014. *Ciona intestinalis* was found at a station with minimum salinity of 17.78 in 2014. There was no difference in the ranges of dissolved oxygen at stations where *C. intestinalis*, *B. schlosseri* and *B. violaceus* were present in 2012 to 2014 (Table 9).

Styela clava, *A. aspersa* and *D. listerianum* were present within a narrower range of temperature, salinity and oxygen (Table 9) compared with *C. intestinalis*, *B. schlosseri* and *B. violaceus*, but this may reflect that these species were present at only a few stations. *Didemnum vexillum* occurred at only one location, off Parrsboro, and the environmental range given is the 2014 deployment in June and retrieval in October. The stations where no tunicates were present also showed narrower ranges of temperature, salinity and oxygen, probably due to the fact that there were fewer than five stations in this category in any year.

Table 9: Ranges of water temperature, salinity, and dissolved oxygen at monitoring stations in Nova Scotia where non-indigenous tunicates were present from 2012 to 2015. Values given are the minimum and maximum point values recorded at deployment or retrieval of monitoring collectors. Minimum water temperatures were taken during collector deployment in May or June. ND = not determined due to equipment failure, NA = not applicable.

Species	Year	Temperature, (°C)	Salinity, (psu)	Oxygen, (mg L ⁻¹)
<i>C. intestinalis</i>	2012	5.36 - 23.57	23.57 - 33.24	6.04 – 10.35
	2013	3.70 – 20.32	19.45– 33.40	6.30 – 11.45
	2014	7.65 – 21.26	17.78 – 33.73	5.19 – 11.86
	2015	3.80 - 25.80	27.28 - 33.89	ND
<i>B. schlosseri</i>	2012	5.36 - 24.10	13.38 – 33.24	6.04 – 10.64
	2013	3.70 – 21.99	15.30– 33.40	6.30 – 11.45
	2014	5.60 – 22.32	13.76 – 33.73	5.19 – 11.86
	2015	3.80 - 25.80	14.34 - 33.89	ND
<i>B. violaceus</i>	2012	5.36 - 22.10	24.48 - 33.24	6.04 – 10.35
	2013	3.70 – 20.32	24.32 – 33.40	6.30 – 11.45
	2014	7.65 – 20.21	13.76 – 33.73	5.19 – 11.86
	2015	3.80 - 21.00	27.28 - 33.89	ND
<i>S. clava</i>	2012	10.89 - 18.85	29.31 - 30.76	7.82 – 8.45
	2013	7.29 – 18.91	27.37 – 30.51	7.74 – 10.17
	2014	9.05 – 19.26	29.36 – 31.76	8.10 – 11.86
	2015	7.30 – 20.50	29.25 - 31.59	ND
<i>A. aspersa</i>	2012	12.70 – 18.85	30.33 – 30.76	7.82 – 8.45
	2013	7.29 – 18.91	27.37 – 30.51	7.43 – 10.17
	2014	9.05 - 19.05	30.81 - 31.76	8.10 – 9.98
	2015	NA	NA	NA
<i>D. vexillum</i>	2014	10.85 – 14.88	30.78 – 32.70	7.74-9.58
No tunicates	2012	8.17 – 20.68	2.19 – 28.02	NA
	2013	8.71 – 15.02	21.57 – 28.21	9.30 – 10.12
	2014	12.82 – 19.76	11.75 – 28.22	8.23 – 9.54
	2015	16.70 – 19.70	14.25 - 20.80	ND

3.1.2 Tunicate Cover (Degree of Infestation)

As was noted in 2010 (Sephton et al. 2014) and 2011 (Sephton et al. 2015), there was variation (i.e., “patchiness”): (1) among individual plates on a collector, (2) between duplicate collectors at a station during a deployment period, and (3) among deployment periods in 2012, 2013, 2014 and 2015 (Appendices 1, 2, 3, 4, respectively). The average annual plate cover, determined from data recorded from all monitoring plates of collectors deployed during a survey year, gave a comparable approximation of the level of infestation on fouled structures at each station.

3.1.2.1 *Ciona intestinalis*: The average annual plate cover for *C. intestinalis* recorded at all stations monitored in 2012, 2013, 2014 and 2015 is shown in Figures 6, 7, 8 and 9, respectively.

Four areas of coastal NS experienced the highest average annual plate cover, based on the greatest numbers of stations with moderate (26 - 50%), high (51 - 75%), and very high (76 - 100%) coverages, of *C. intestinalis* in all years: southwest NS and along the south shore to Shelburne, the Lunenburg area, Halifax Harbour, and Chedabucto Bay. In southwest NS, plate cover was highest overall in 2012 (Figure 6) and 2014 (Figure 8), and it was also highest at Port La Tour (Stn 9) and Shelburne (Stn 12), on the south shore, in 2012. Further along the south shore in the Lunenburg area, however, plate cover was highest in 2013 (Figure 7). Plate cover by *C. intestinalis* was also highest in Halifax Harbour in 2013 (Figure 7) and again in 2015 (Figure 9), with somewhat lower cover in 2014 (Figure 8). In Chedabucto Bay, plate cover was highest in 2014 (Figure 8) and 2015 (Figure 9), with predominantly low (<25%) cover in 2013.

In other areas, lower and/or sporadic plate cover of *C. intestinalis* was noted among years. At Digby (Stn 1), in the Bay of Fundy, plate cover was low, high, low and moderate in 2012, 2013, 2014 and 2015, respectively (Figures, 6, 7, 8, 9). Along the east shore, plate cover was low at both sentinel stations: Ship Harbour (Stn 25) and Port Bickerton (Stn 30) until 2015, when moderate cover was observed at Ship Harbour. Plate cover at stations along the Cape Breton coast was low to moderate between 2012 and 2015, however, one station, Dingwall (Stn 69) had heavy plate cover in 2013, and very heavy plate cover in 2015.

Ciona intestinalis was absent from one or more stations in all regions in every year, except in 2014, when it was present at all stations monitored along the southwest, south and east shores, in Lunenburg Harbour or Halifax Harbour, and in Chedabucto Bay (Figure 8). This species was not recorded in the inner Bras d'Or Lake in any year, although it was present at St. Peter's (Stn 47), at the western entrance to the Lake, and reported at Big Bras d'Or, at the northern entrance to the Lake in 2014.

3.1.2.2 *Botryllus schlosseri*: The average annual plate cover for *B. schlosseri* recorded at all stations monitored in 2012, 2013, 2014 and 2015 is shown in Figures 10, 11, 12, and 13, respectively.

Plate cover by *B. schlosseri* was generally low (<25%) to moderate (26 - 50%) in all years and in all regions, with high (51 - 76%) plate cover noted on the south shore at Port Mouton (Stn 82) and Gunning Cove (Stn 11), in 2015 (Figure 13). Highest plate

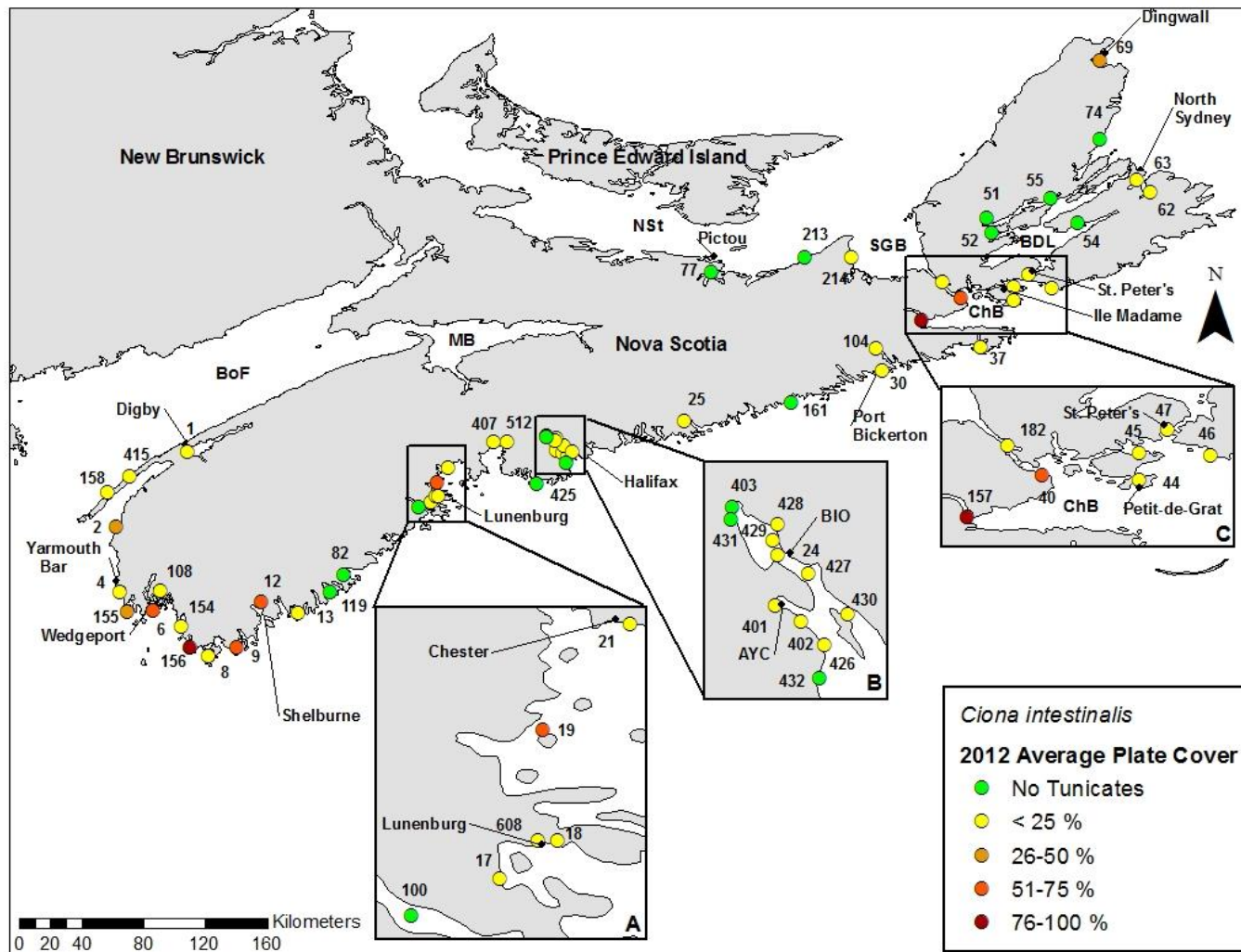


Figure 6: Average annual plate cover for *Ciona intestinalis* on monitoring collectors in Nova Scotia in 2012. Non-monitoring plate reports (see Table 3) are given as absent or present (< 25%). BoF = Bay of Fundy, ChB = Chedabucto Bay, NSt = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

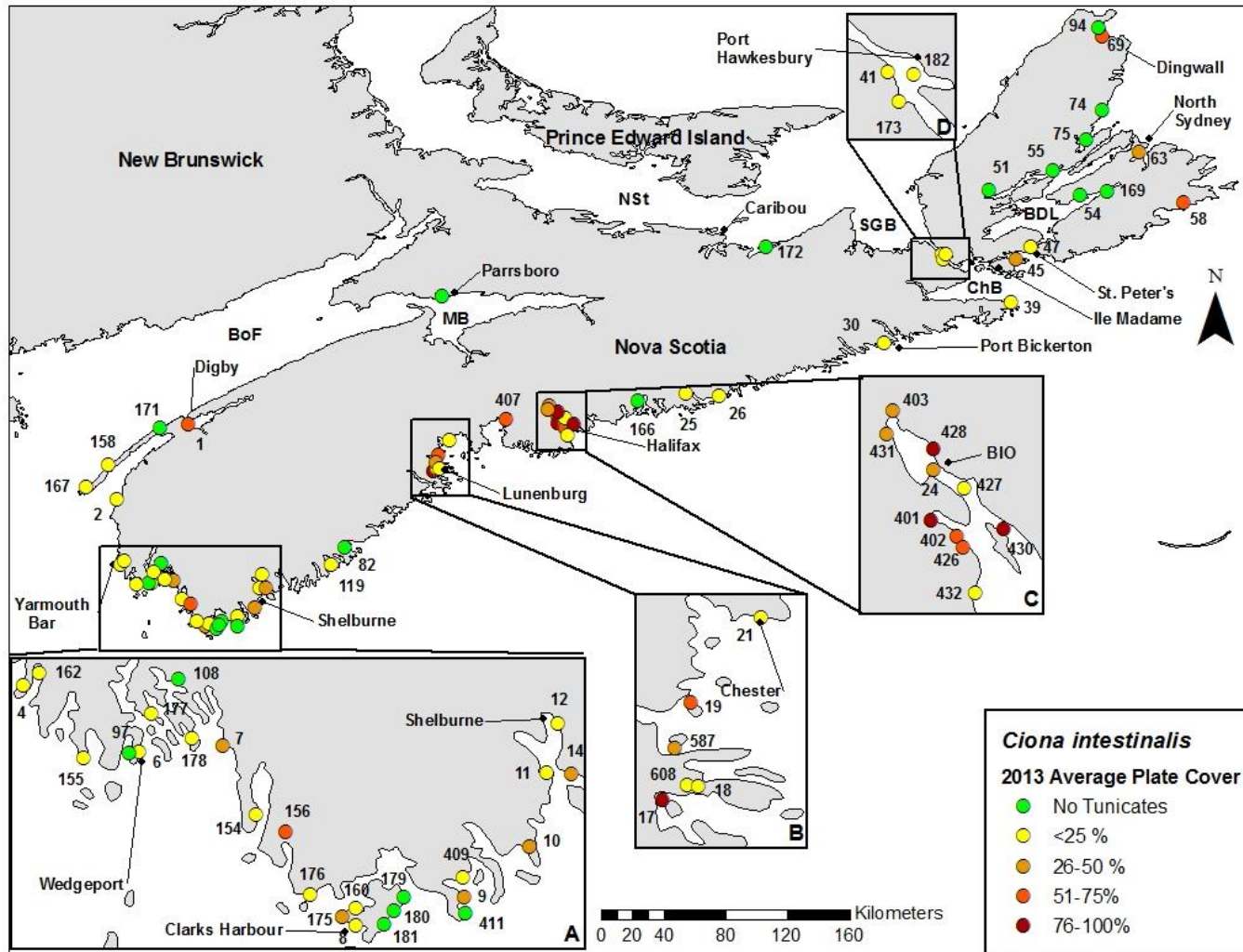


Figure 7: Average annual plate cover for *Ciona intestinalis* on monitoring collectors in Nova Scotia in 2013. Non-monitoring plate reports (see Table 3) are given as absent or present (< 25%). BoF = Bay of Fundy, ChB = Chedabucto Bay, NSt = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

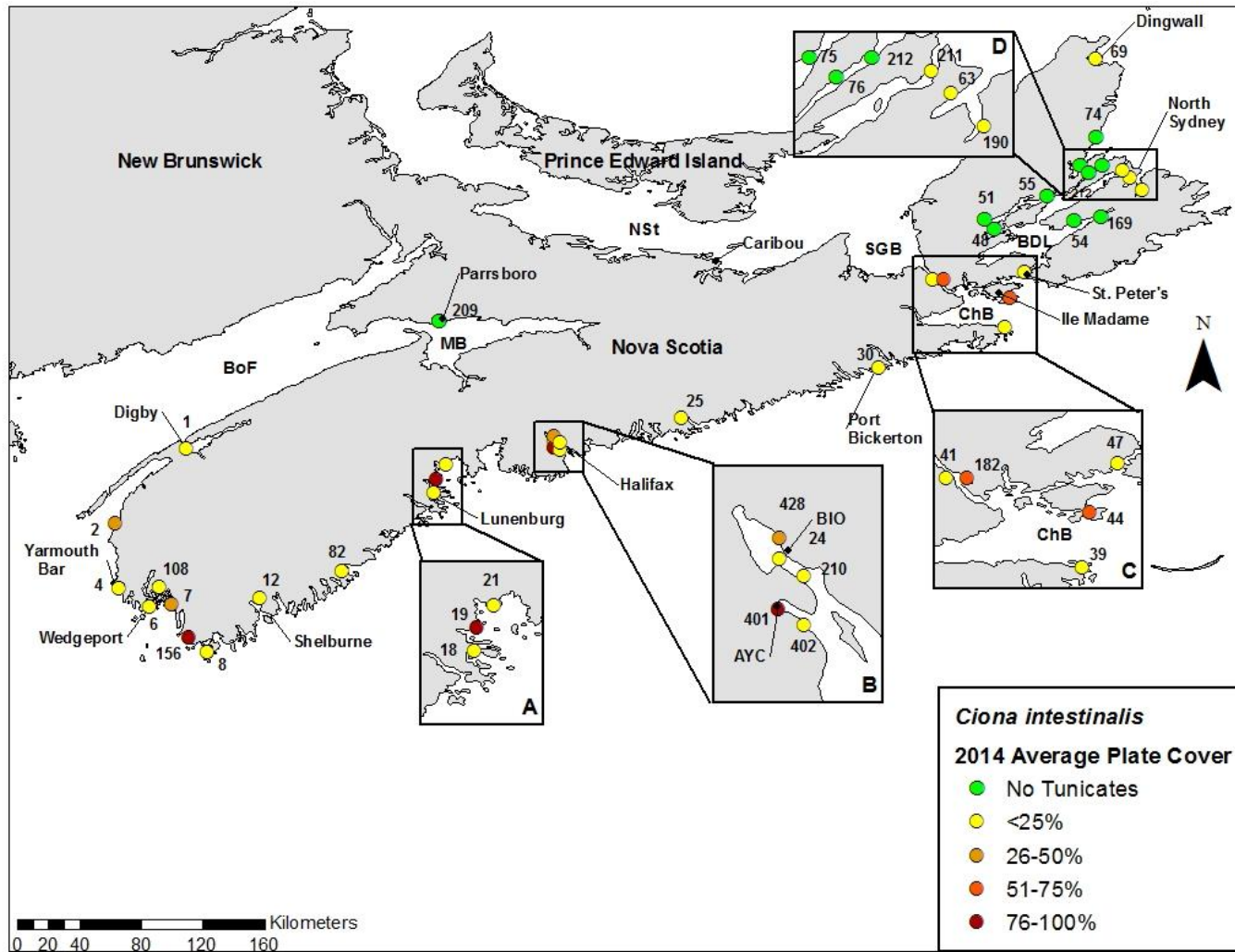


Figure 8: Average annual plate cover for *Ciona intestinalis* on monitoring collectors in Nova Scotia in 2014. Non-monitoring plate reports (see Table 3) are given as absent or present (< 25%). BoF = Bay of Fundy, ChB = Chedabucto Bay, NSt = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

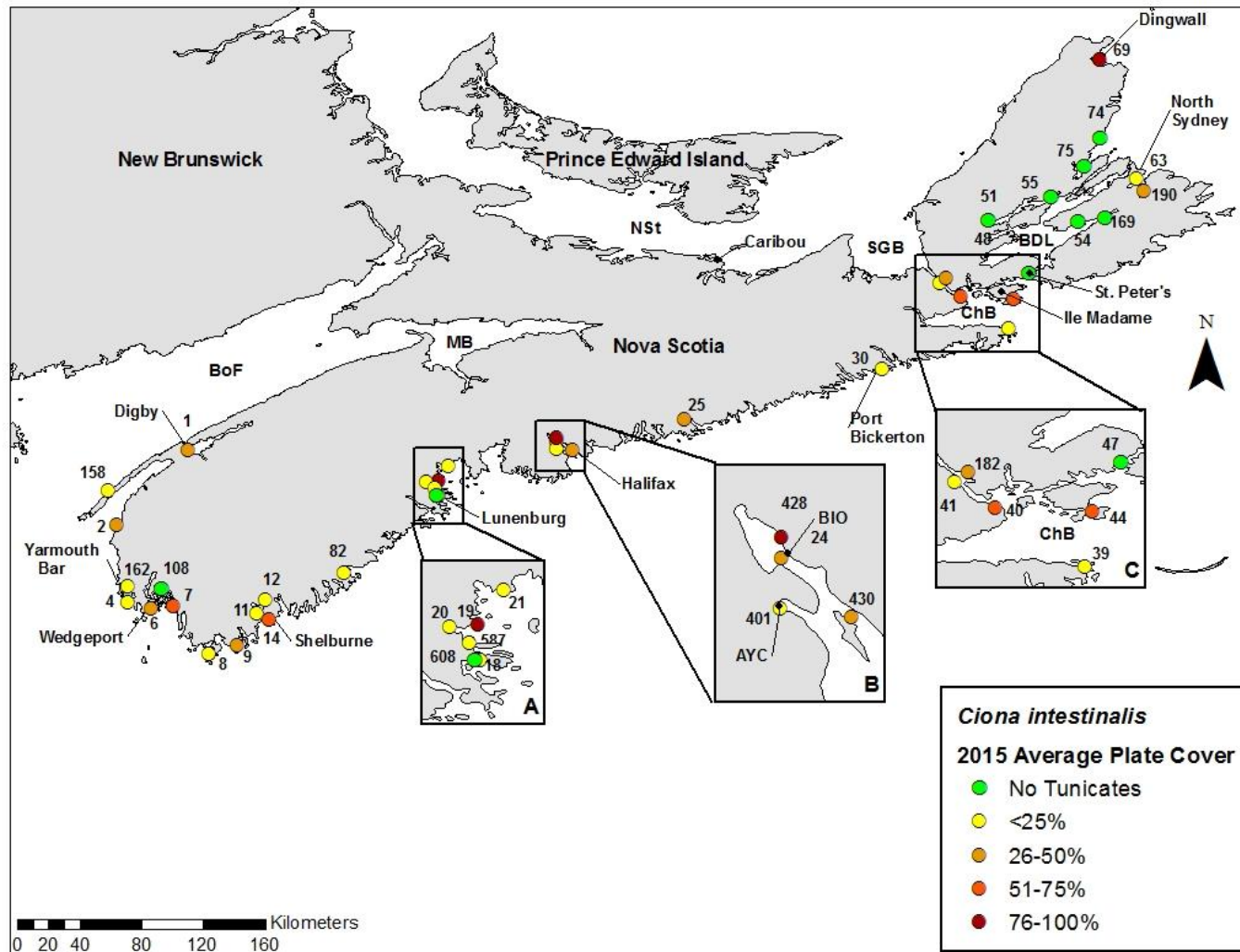


Figure 9: Average annual plate cover for *Ciona intestinalis* on monitoring collectors in Nova Scotia in 2015. Non-monitoring plate reports (see Table 3) are given as absent or present (< 25%). BoF = Bay of Fundy, ChB = Chedabucto Bay, NST = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

cover was noted in the Bras d'Or Lake (Gillis Cove (Stn 48) in 2014 (76 - 100%), and St. Peter's (Stn 47) in 2013), where it was generally the only species present. Plate cover at St. Peter's at the southern entrance to the Lake was high, very high, high and moderate in 2012 (Figure 10), 2013 (Figure 11), 2014 (Figure 12) and 2015 (Figure 13), respectively. Cover at all stations in the Lake was highest in 2013 (Figure 11), followed by 2014 (Figure 12). This species was present at every station monitored in Lunenburg Harbour in all years (Figures 10, 11, 12, 13), in Halifax Harbour in 2014 (Figure 12) and 2015 (Figure 13) and at every station monitored in Chedabucto Bay in 2012 (Figure 10), 2013 (Figure 11) and 2014 (Figure 12).

Botryllus schlosseri was not detected at one or more stations in many regions of NS in separate years, although there was no consistent pattern in any year. The only station monitored consistently where it did not occur was St. Ann's Bay (Stn 75).

3.1.2.3 *Botrylloides violaceus*: The average annual plate cover for *B. violaceus* recorded at all stations monitored in 2012, 2013, 2014 and 2015 is shown in Figures 14, 15, 16 and 17, respectively.

Botrylloides violaceus was present at several stations in all regions of NS in all years, generally with low (<25%) plate cover. In 2012 (Figure 14), plate cover was moderate (26 - 50%) at North Sydney (Stn 63), in Cape Breton, and high (51 - 75%) at Port Bickerton (Stn 30), on the east shore. In 2015 (Figure 17), it had moderate cover at Dingwall (Stn 69), in Cape Breton, and at the Lunenburg Railway Wharf (Stn 18) on the south shore. Plate cover was somewhat higher in 2013 (Figure 16), when four stations, in four different regions, had moderate cover: Pinkney's Point (Stn 155), on the southwest shore; Lunenburg Railway Wharf (Stn 18), Port Bickerton (Stn 30), and Dingwall (Stn 69). Highest plate cover was observed in 2012 (Figure 16), when three stations on the southwest shore; Yarmouth Bar (Stn 4), Wedgeport (Stn 6) and Clark's Harbour (Stn 8), had moderate plate cover, along with BIO (Stn 24), in Halifax Harbour, and Port Bickerton (Stn 30). It was found at most stations monitored in southwest Nova Scotia, Lunenburg Harbour and Chedabucto Bay from 2012 to 2015.

This species was absent from several stations in all regions in each year. It was absent from half of stations monitored in Halifax Harbour in 2012, 2013 and 2014 (Figures 14, 15 and 16, respectively), and it was only found once in the Bras d'Or Lake, at Baddeck (Stn 55) in 2013 (Figure 15).

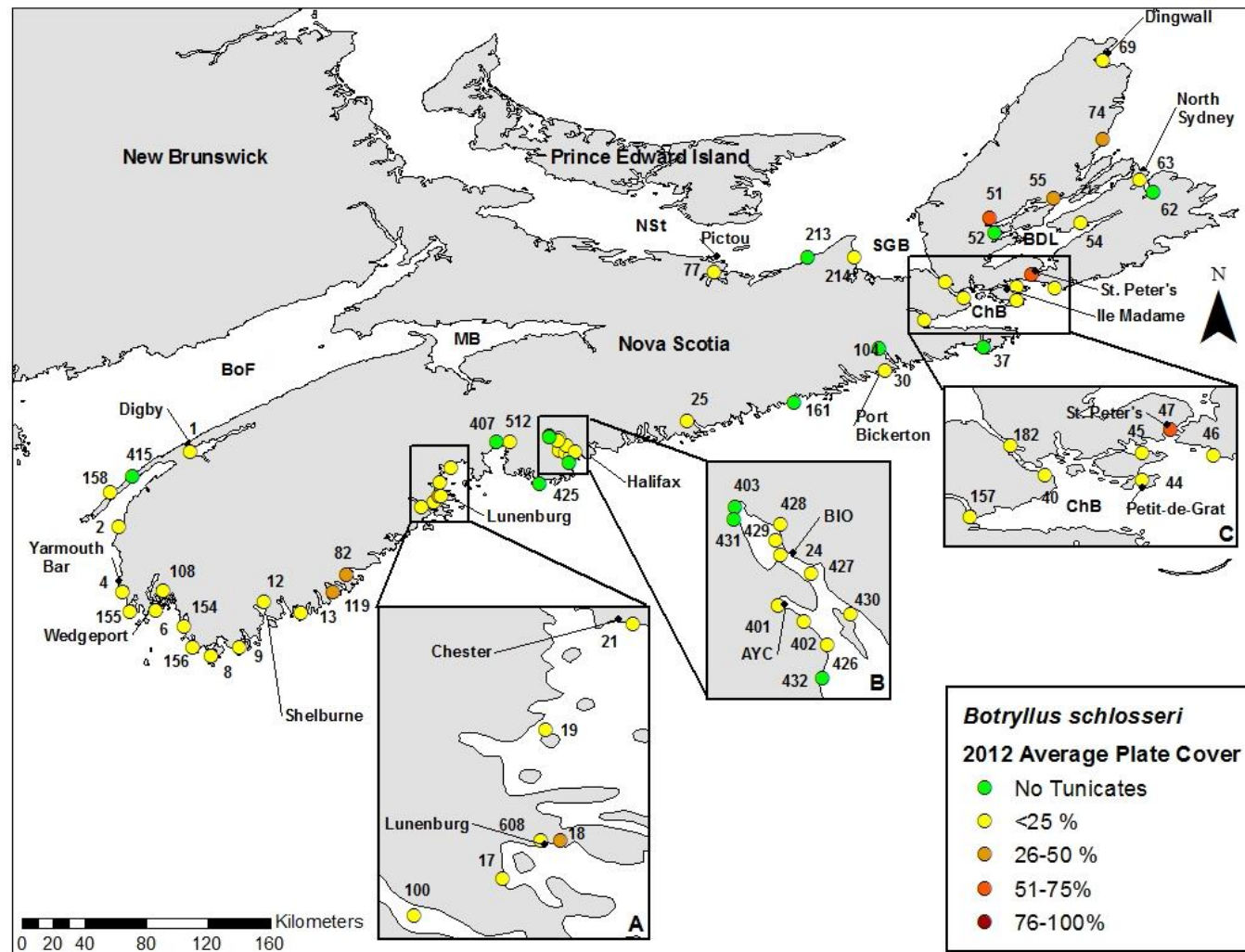


Figure 10: Average annual plate cover for *Botryllus schlosseri* on monitoring collectors in Nova Scotia in 2012. Non-monitoring plate reports (see Table 3) are given as absent or present (< 25%). BoF = Bay of Fundy, ChB = Chedabucto Bay, NSt = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

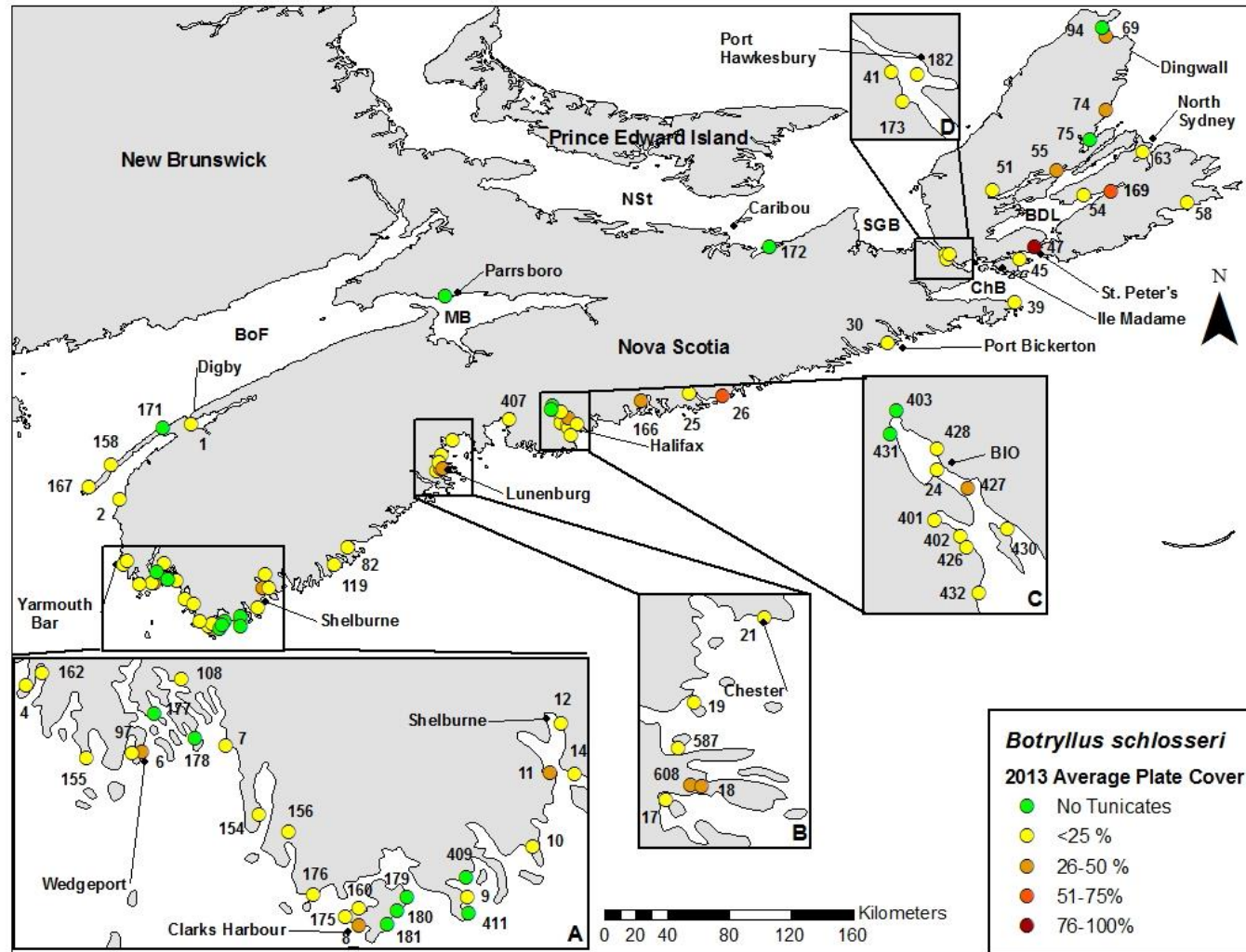


Figure 11: Average annual plate cover for *Botryllus schlosseri* on monitoring collectors in Nova Scotia in 2013. Non-monitoring plate reports (see Table 3) are given as absent or present (< 25%). BoF = Bay of Fundy, ChB = Chedabucto Bay, NSt = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

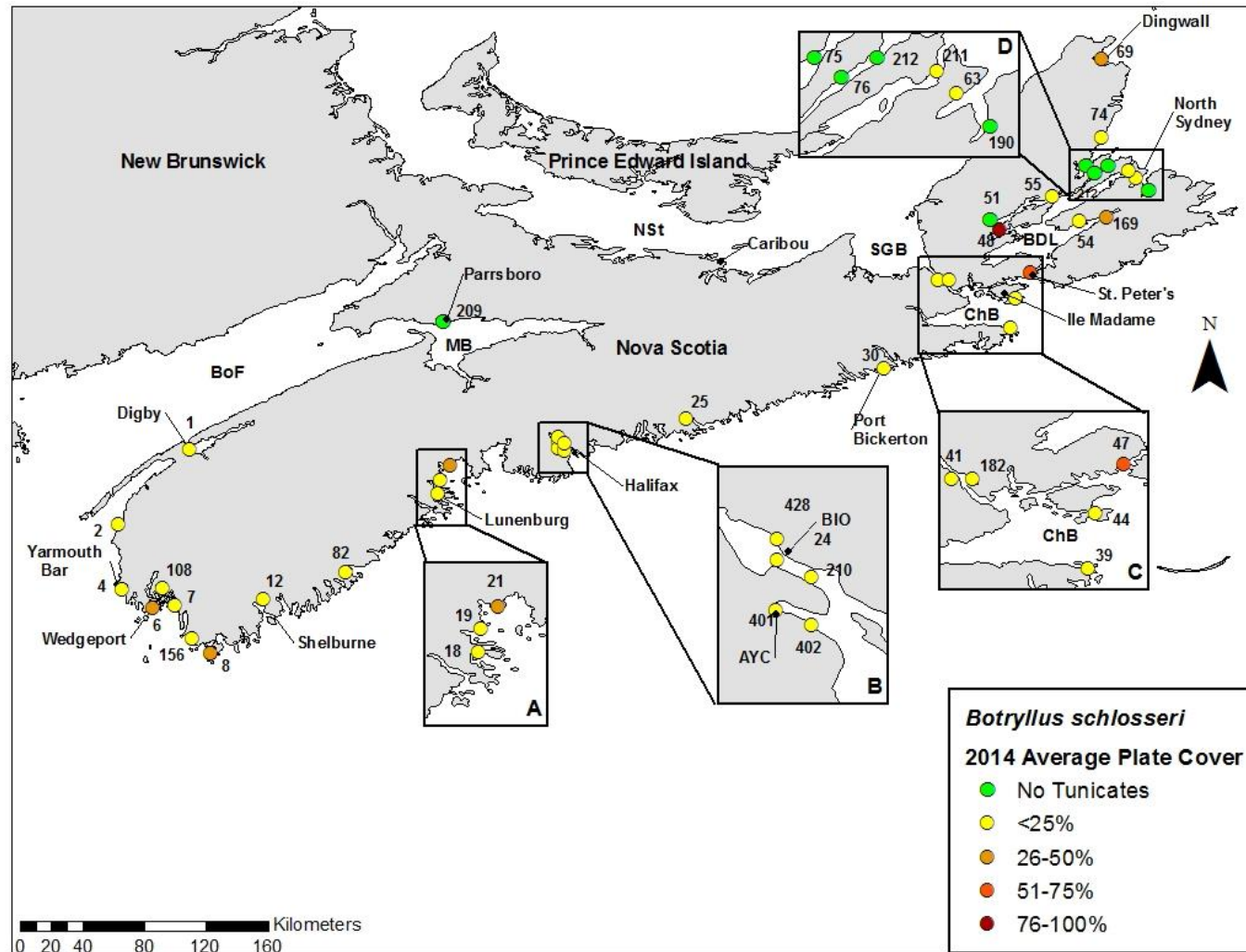


Figure 12: Average annual plate cover for *Botryllus schlosseri* on monitoring collectors in Nova Scotia in 2014. Non-monitoring plate reports (see Table 3) are given as absent or present (< 25%). BoF = Bay of Fundy, ChB = Chedabucto Bay, NST = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

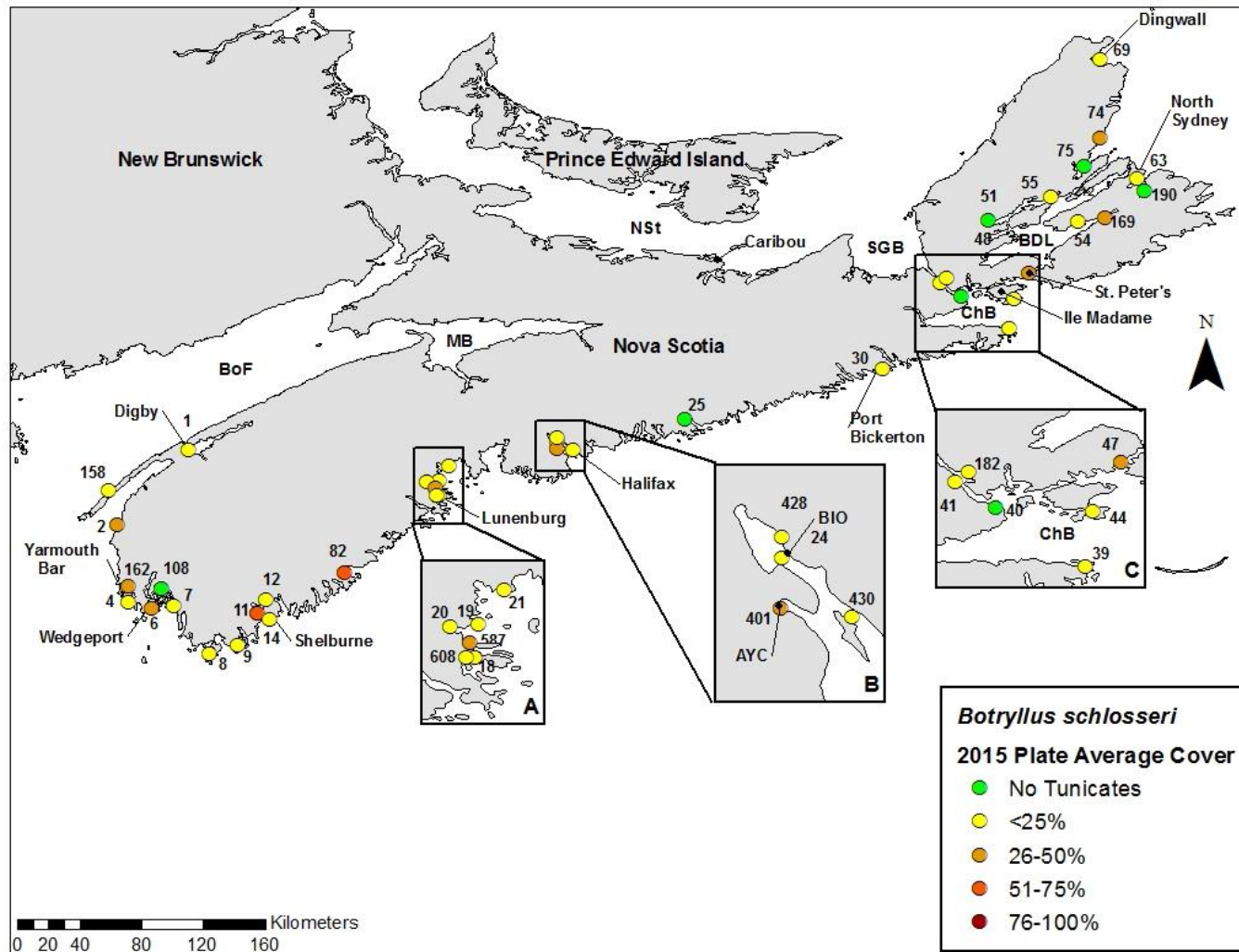


Figure 13: Average annual plate cover for *Botryllus schlosseri* on monitoring collectors in Nova Scotia in 2015. Non-monitoring plate reports (see Table 3) are given as absent or present (< 25%). BoF = Bay of Fundy, ChB = Chedabucto Bay, NSt = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

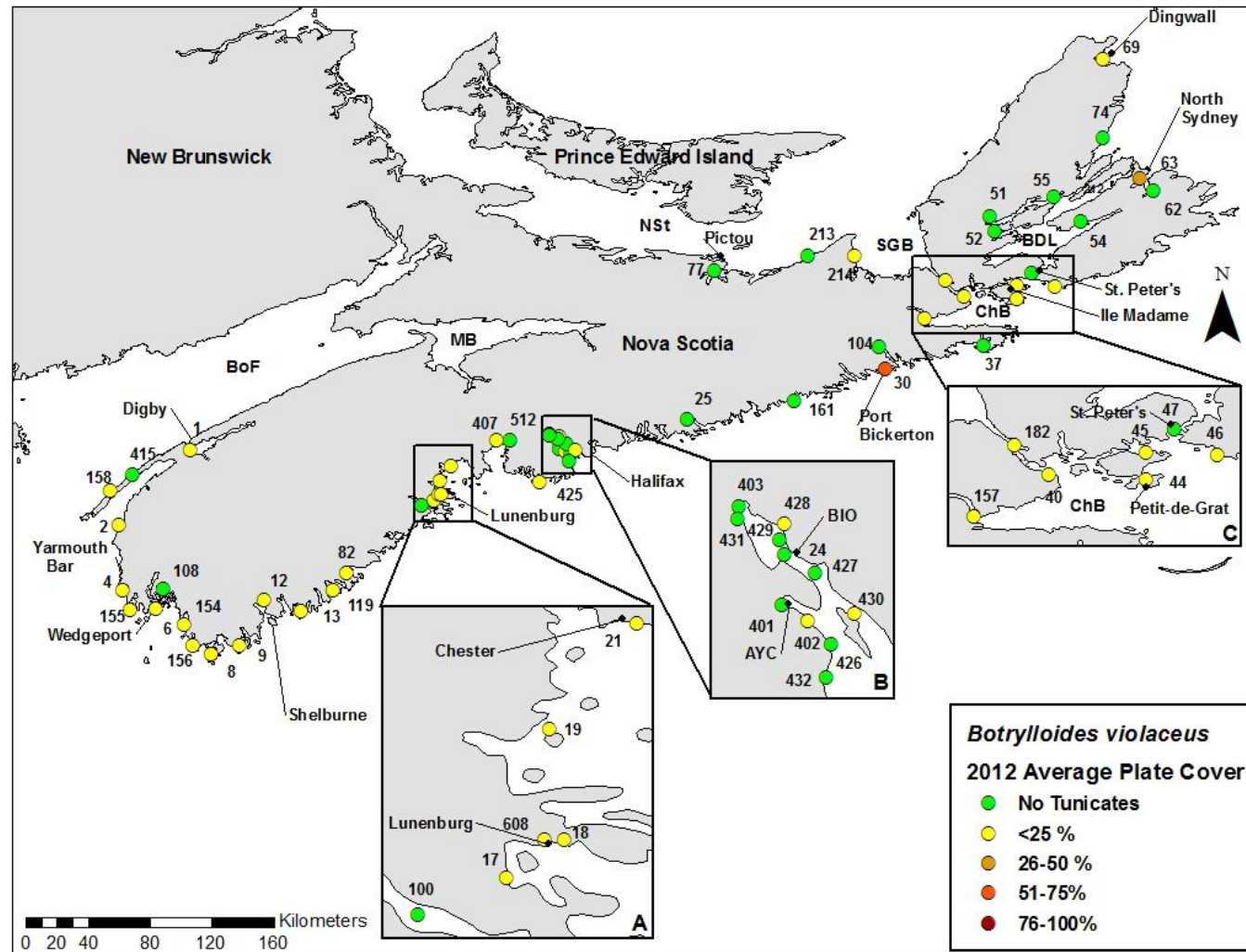


Figure 14: Average annual plate cover for *Botrylloides violaceus* on monitoring collectors in Nova Scotia in 2012. Non-monitoring plate reports (see Table 3) are given as absent or present (< 25%). BoF = Bay of Fundy, ChB = Chedabucto Bay, NST = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

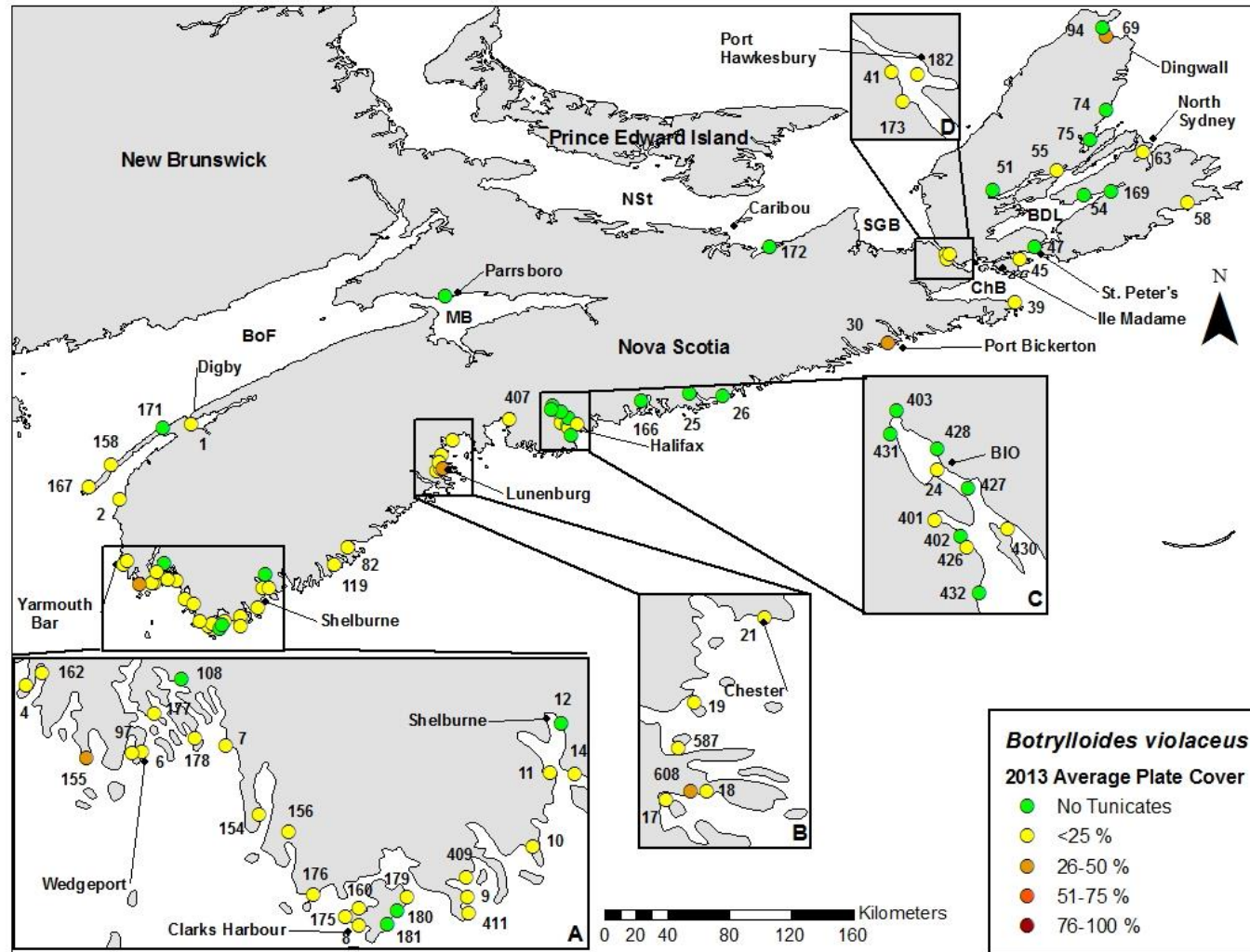


Figure 15: Average annual plate cover for *Botrylloides violaceus* on monitoring collectors in Nova Scotia in 2013. Non-monitoring plate reports (see Table 3) are given as absent or present (< 25%). BoF = Bay of Fundy, ChB = Chedabucto Bay, NSt = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

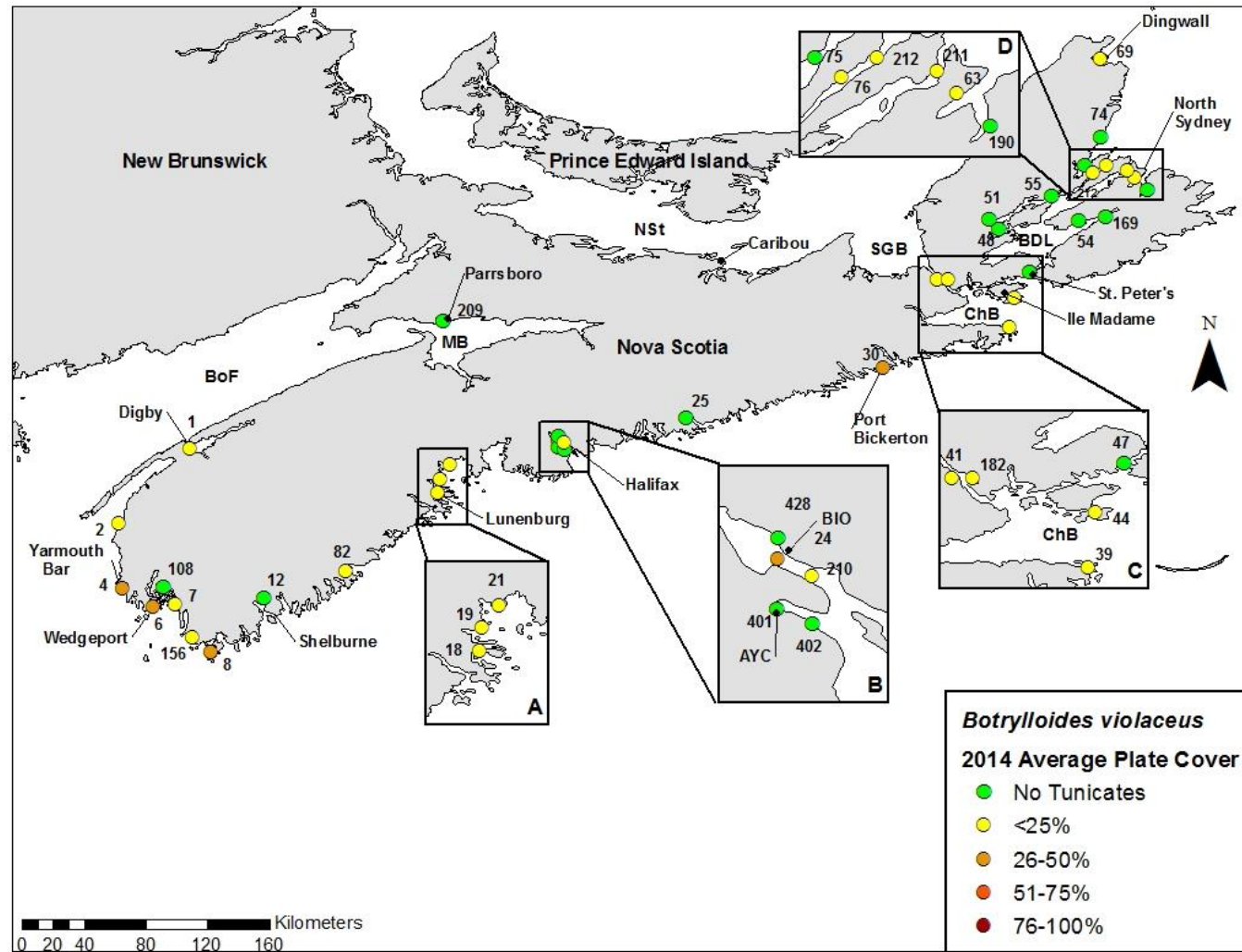


Figure 16: Average annual plate cover for *Botrylloides violaceus* on monitoring collectors in Nova Scotia in 2014. Non-monitoring plate reports (see Table 3) are given as absent or present (< 25%). BoF = Bay of Fundy, ChB = Chedabucto Bay, NSt = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

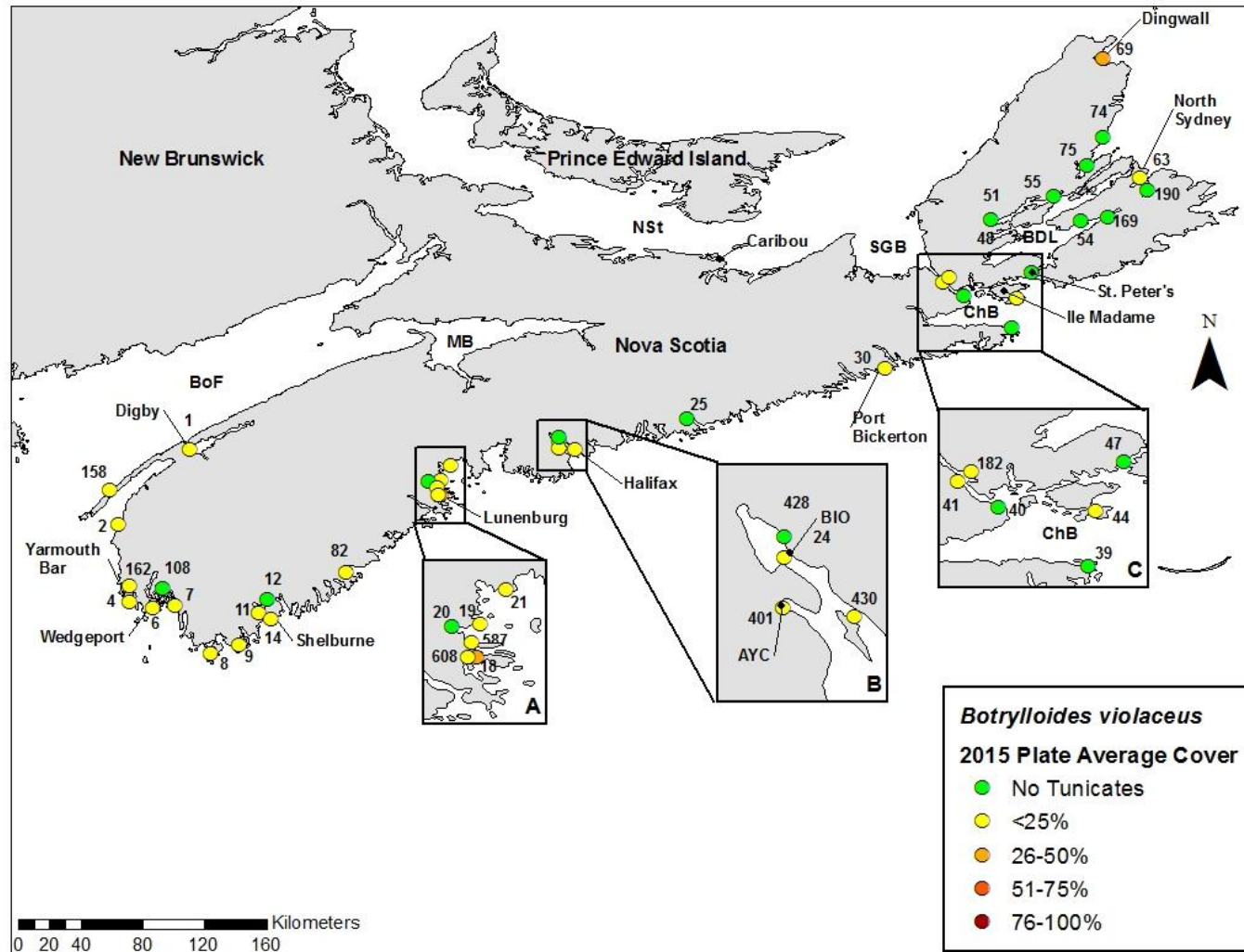


Figure 17: Average annual plate cover for *Botrylloides violaceus* on monitoring collectors in Nova Scotia in 2015. Non-monitoring plate reports (see Table 3) are given as absent or present (< 25%). BoF = Bay of Fundy, ChB = Chedabucto Bay, NSt = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

3.1.2.4 Other tunicate species: *Styela clava*, *Ascidrella aspersa*, *Diplosoma listerianum* and *Didemnum vexillum*: The average annual plate cover for *S. clava* was consistently low (<25%). In 2012, when this species was first detected in Nova Scotia, research and monitoring plates in Lunenburg Harbour, and Halifax Harbour (Figure 2) had fewer than 20 individuals per plate (Moore et al. 2014; Vercaemer and Sephton 2015) (Appendix 1). When *S. clava* was present on monitoring plates deployed in Lunenburg Harbour and Halifax Harbour in 2013, 2014 and 2015, (Appendices 2, 3 and 4, respectively) it was found on Second deployment and Full deployment collectors only (Aug - Oct), and with low cover. This species was first recorded in Chedabucto Bay in 2013 as a report from the SCYC (Stn 182) in Port Hawkesbury, and observed attached to the wharf at Venus Cove (Stn 41). By 2014, the population at Venus Cove was noticeably larger, however, but plate cover on First deployment collectors, and average high plate cover (51 - 75%) on Full deployment plates, while Full deployment collectors at SCYC had low cover on Full deployment collectors only. In 2015, however, *S. clava* was only noted on one Full deployment collector at Venus Cove, and it was not found on collectors deployed at SCYC.

Ascidrella aspersa was only detected in Lunenburg Harbour; at two locations (Stns 18 and 608) in 2012 (Appendix 1), and 2013 (Appendix 2), and at one location in 2014 (Stn 18) (Appendix 3), always at low coverage. It was not recorded in 2015 (Appendix 4).

Diplosoma listerianum was detected only once, at Stn 608, in 2012, and not on monitoring plates (Moore et al. 2014), so no estimates of percentage cover are available. Likewise, *D. vexillum* as only every been found at Parrsboro, and on benthic groundlines with much greater area (Vercaemer et al. 2015) compared with monitoring plates.

3.1.3 Other Biofouling Organisms

The presence of *Caprella mutica* and *Membranipora membranacea* in 2012 to 2015 are shown in Figures 18 to 21 and 22 to 25, respectively.

3.1.3.1 *Caprella mutica*: The Japanese skeleton shrimp, *Caprella mutica*, was present at fewer than 50% of recorded locations throughout Nova Scotia in 2012 to 2015 (Table 6, Figures 18 - 21), ranging from a low of 18 of 61 (30%) records in 2012, to a high of 20 of 42 (48%) records in 2015. It was not recorded in the Bras d'Or Lake in any year (Figure 18 - 21), nor in Halifax Harbour in 2012 (Figure 18). Its presence was sporadic from year-to-year in many areas, for example, in Chedabucto Bay, and also in the Lunenburg area, where it was present at one station only in 2012, but at all stations surveyed in 2013.

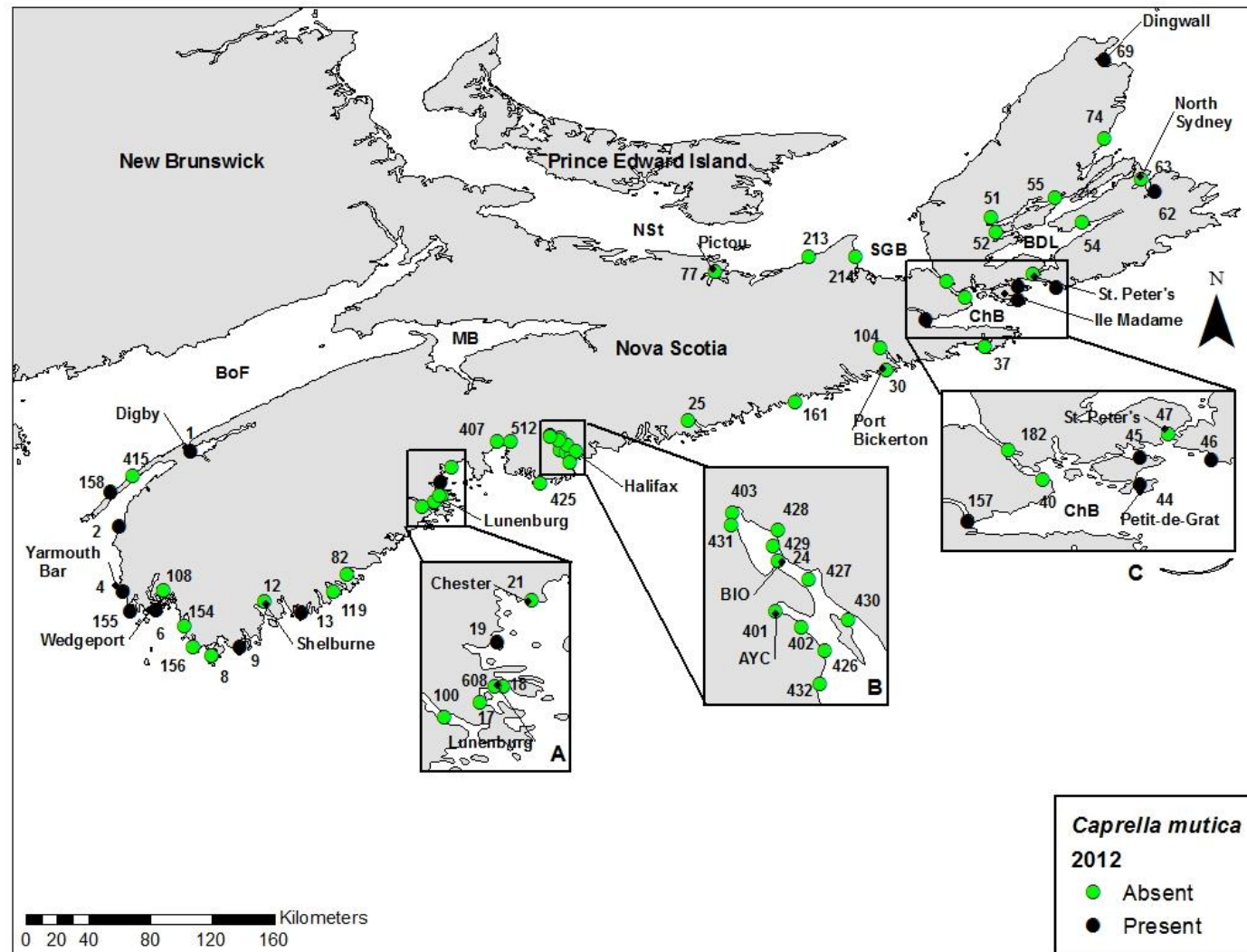


Figure 18: Presence of *Caprella mutica* in Nova Scotia in 2012. BoF = Bay of Fundy, ChB = Chedabucto Bay, NSt = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

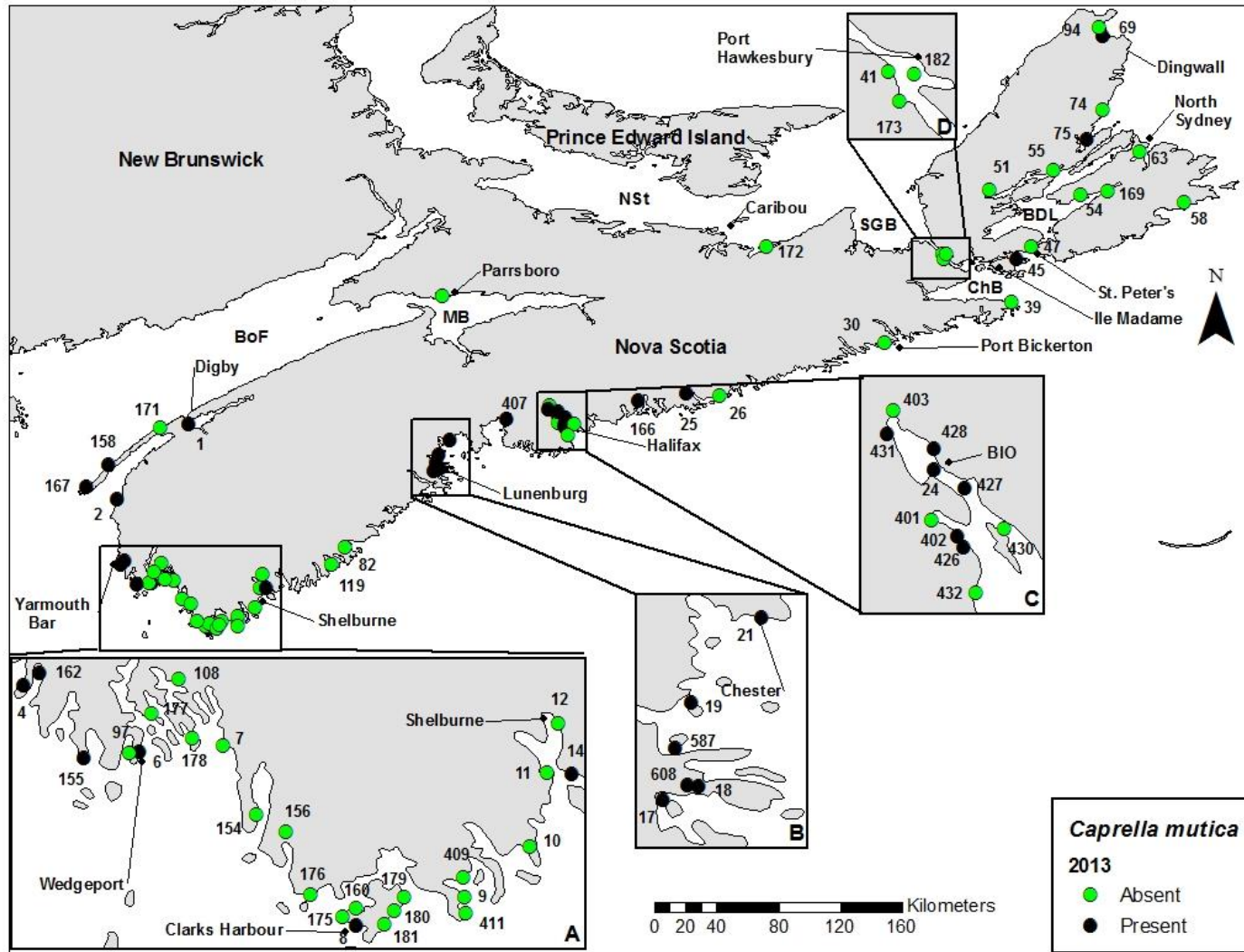


Figure 19: Presence of *Caprella mutica* in Nova Scotia in 2013. BoF = Bay of Fundy, ChB = Chedabucto Bay, NSt = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

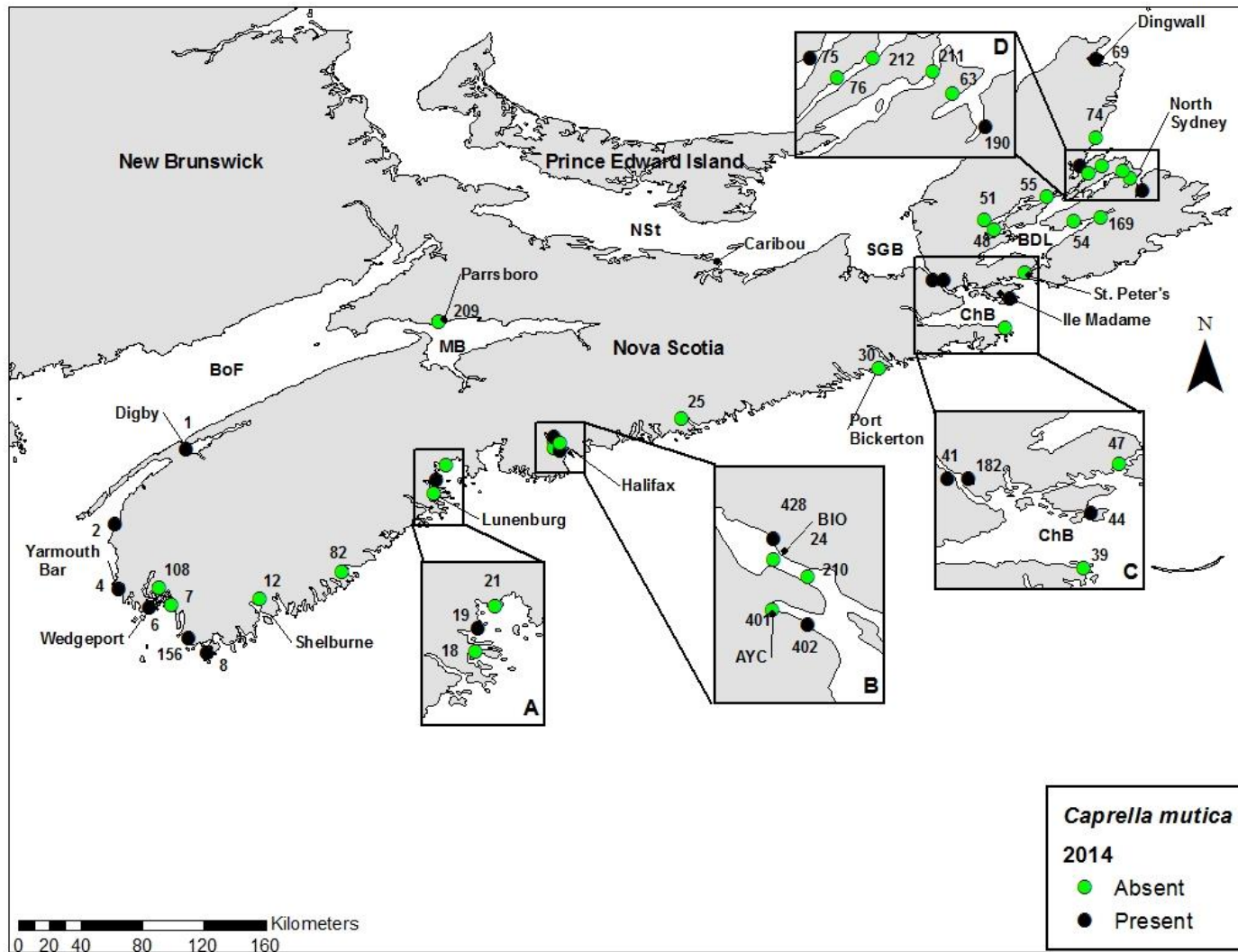


Figure 20: Presence of *Caprella mutica* in Nova Scotia in 2014. BoF = Bay of Fundy, ChB = Chedabucto Bay, NSt = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

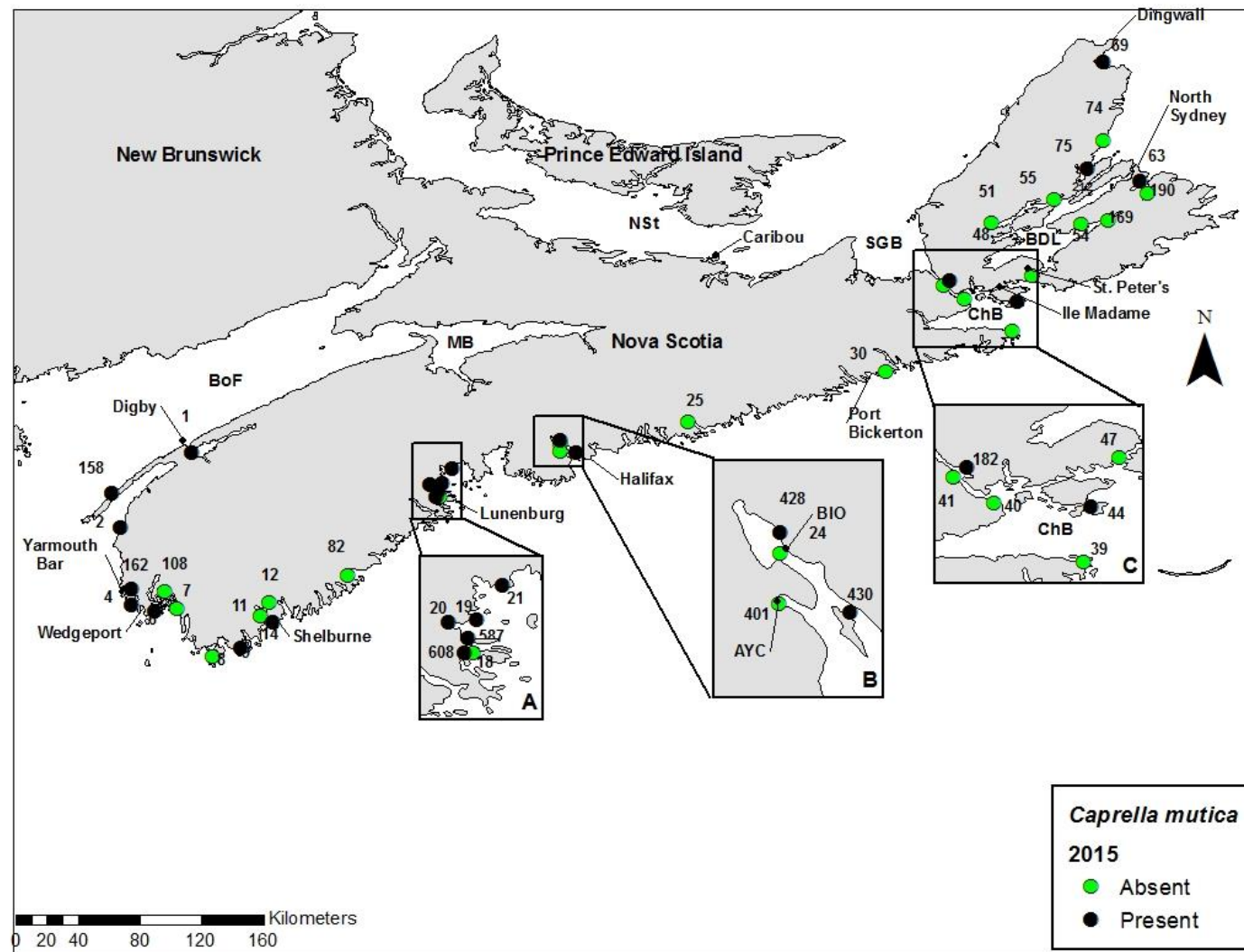


Figure 21: Presence of *Caprella mutica* in Nova Scotia in 2015. BoF = Bay of Fundy, ChB = Chedabucto Bay, NSt = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

3.1.3.2 *Membranipora membranacea*: The lacy crust bryozoan, *Membranipora membranacea*, was present at fewer than 51% of recorded locations throughout Nova Scotia in 2012 to 2015 (Table 6, Figures 22 - 25), ranging from a low of 10 of 42 (24%) records in 2015, to a high of 20 of 39 (51%) records in 2014. It was not recorded in the Bras d'Or Lake in 2014 (Figure 24), nor in Chedabucto Bay in 2015 (Figure 25). Similar to *C. mutica*, its presence was sporadic from year-to-year at many stations, such as Dingwall (Stn 69) and Lunenburg Railway Wharf (Stn 18), and in many areas, such as Chedabucto Bay where it was absent in 2014, but present at all sites in 2015.

3.1.4 Annual and regional temperature trends

3.1.4.1 General temperature trends, 2012 - 2015: Mean monthly temperature from May to November for southern NS (Digby to Chester), Central NS (Halifax, east shore and Chedabucto Bay) and Cape Breton (coast and the Bras d'Or Lake) for 2012, 2013, 2014 and 2015 are given in Appendix 9 and Figures 26, 27, 28 and 29, respectively. Year-to-year and regional variability was observed in all months and in all years.

A general pattern of heating through May (Appendix 9, the coldest month in all years) and June, with maximum temperatures usually in August (sometimes in July, September, or October; Figure 27), and then cooling again through September and October was observed in all years and in all regions. The lowest mean monthly water temperature (8.39°C) during the study period was recorded along the east shore in 2013 and the highest (22.76°C) in the Bras d'Or Lake in 2012.

3.1.4.2 Yearly temperature patterns and seasonal variability:

3.1.4.2.1 2012: Of the four years, 2012 (Figure 26) was the warmest overall, driven by warmer temperatures in June and August. June mean monthly temperatures were warmest ($>14^{\circ}\text{C}$) in four areas (southwest and south shores, Halifax Harbour and the Bras d'Or Lake) and ranged from 14.08°C (southwest shore) to 16.02°C (Bras d'Or Lake). Cooler temperatures (≤ 14) were observed along the Cape Breton coast (12.29°C) and in Chedabucto Bay (13.66°C). Temperatures were intermediate in July ranging from 15.77°C (east shore) to 19.86°C (Bras d'Or Lake). August was warmer with temperatures $\geq 17^{\circ}\text{C}$ in all areas except along the east shore, with a low of 16.62°C (Port Bickerton), and a high of 22.76°C in Bras d'Or Lake. Temperatures decreased in September and October ranging from 11.65°C to 15.69°C along the east shore and in Bras d'Or Lake, respectively.

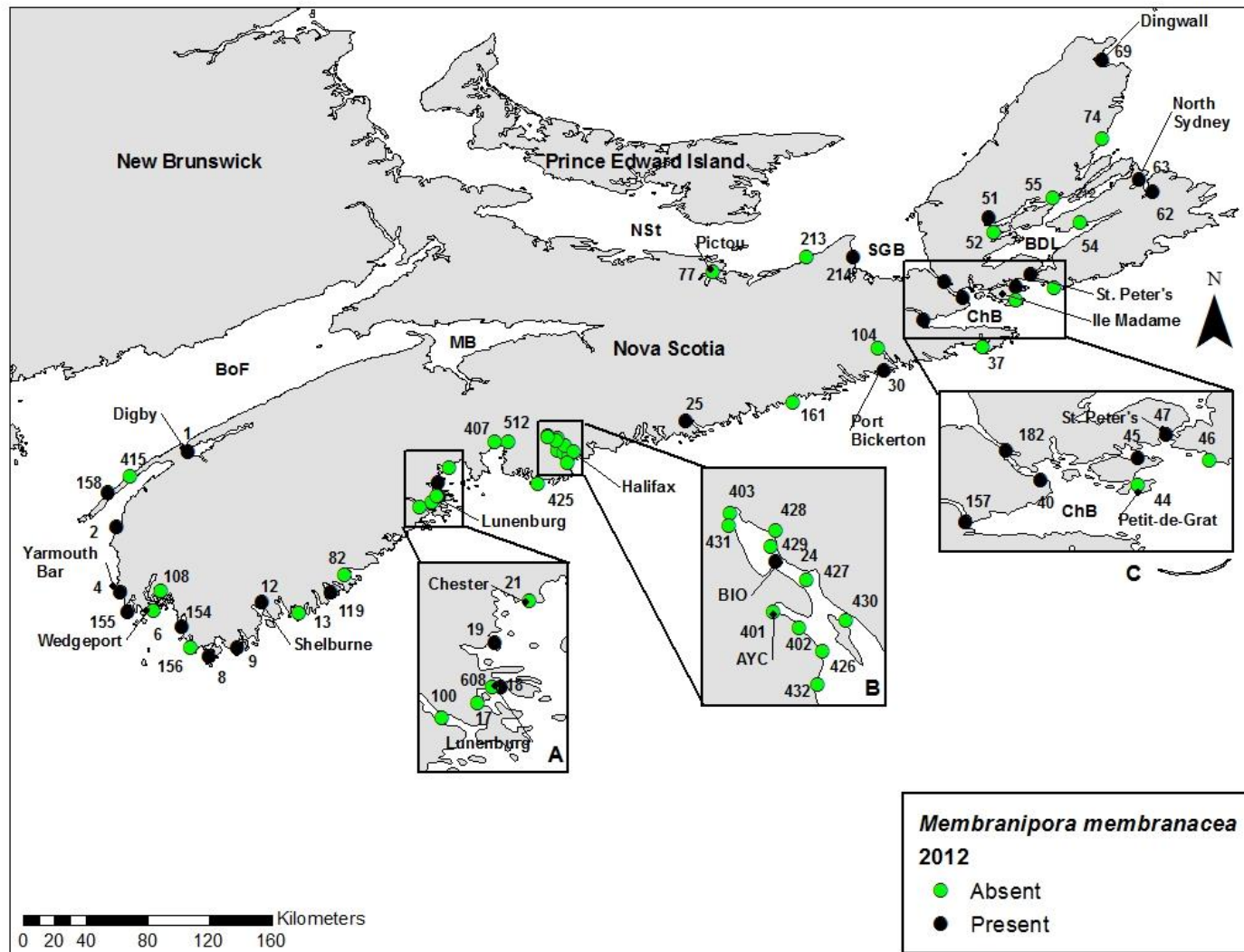


Figure 22: Presence of *Membranipora membranacea* in Nova Scotia in 2012. BoF = Bay of Fundy, ChB = Chedabucto Bay, NSt = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

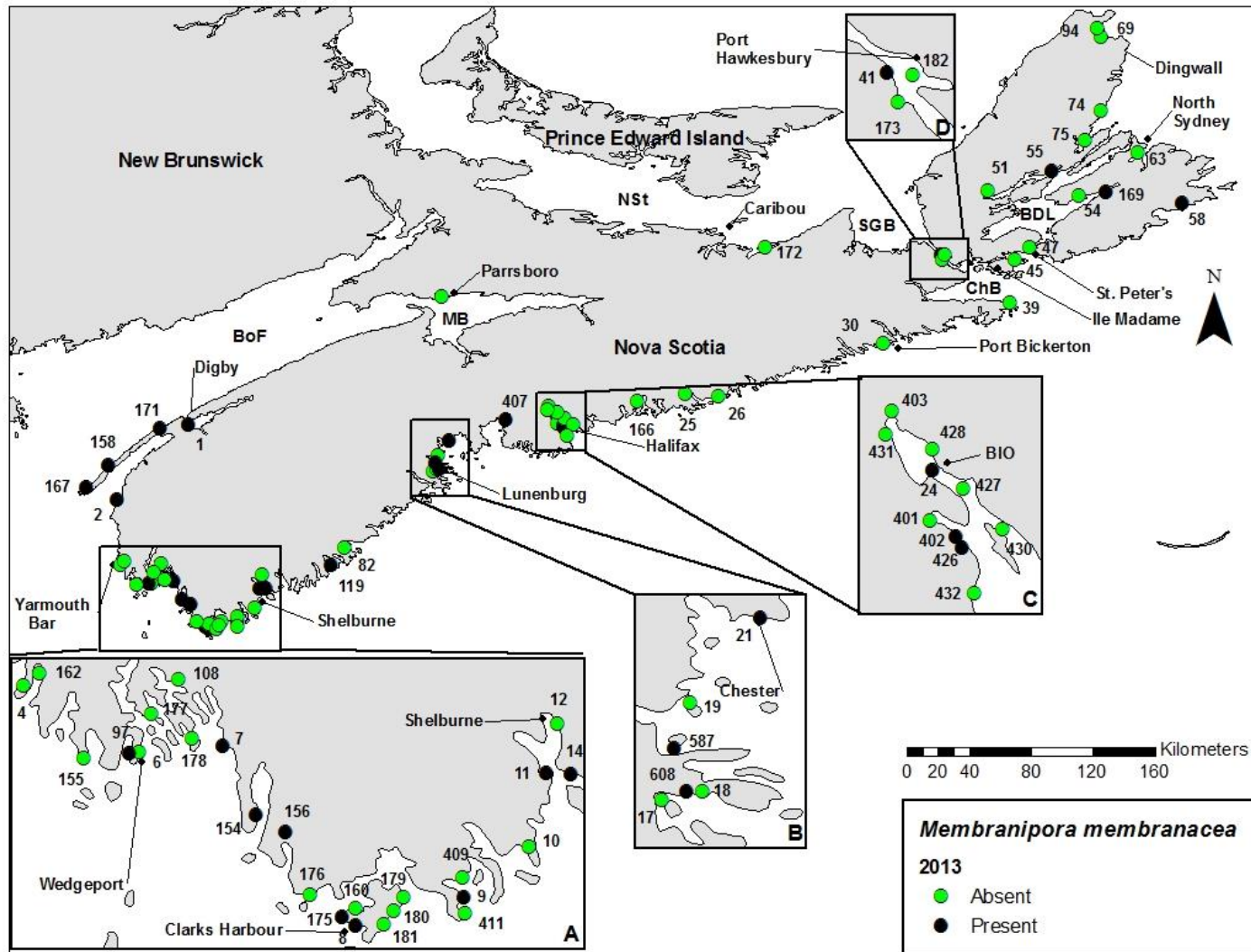


Figure 23: Presence of *Membranipora membranacea* in Nova Scotia in 2013. BoF = Bay of Fundy, ChB = Chedabucto Bay, NST = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

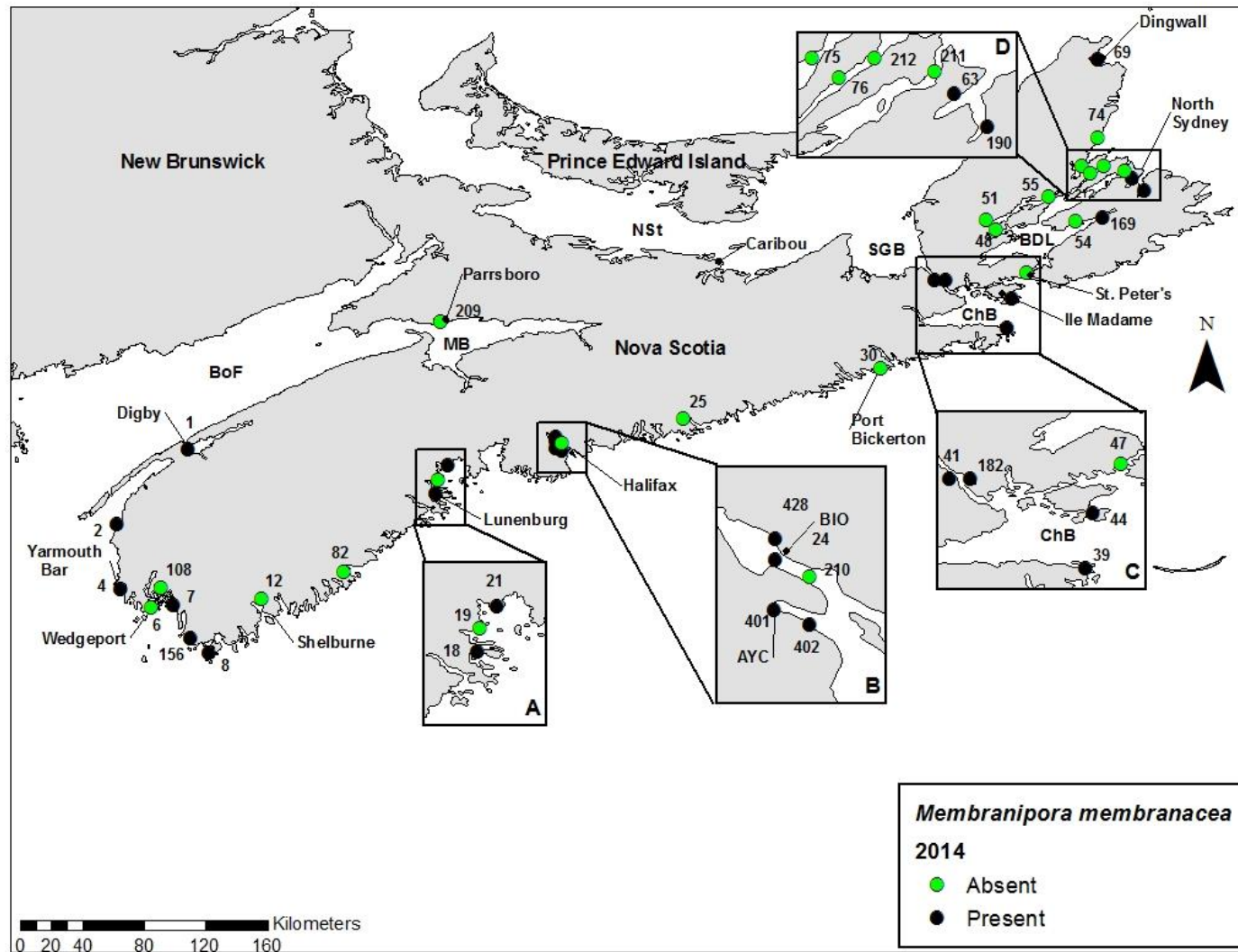


Figure 24: Presence of *Membranipora membranacea* in Nova Scotia in 2014. BoF = Bay of Fundy, ChB = Chedabucto Bay, NSt = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

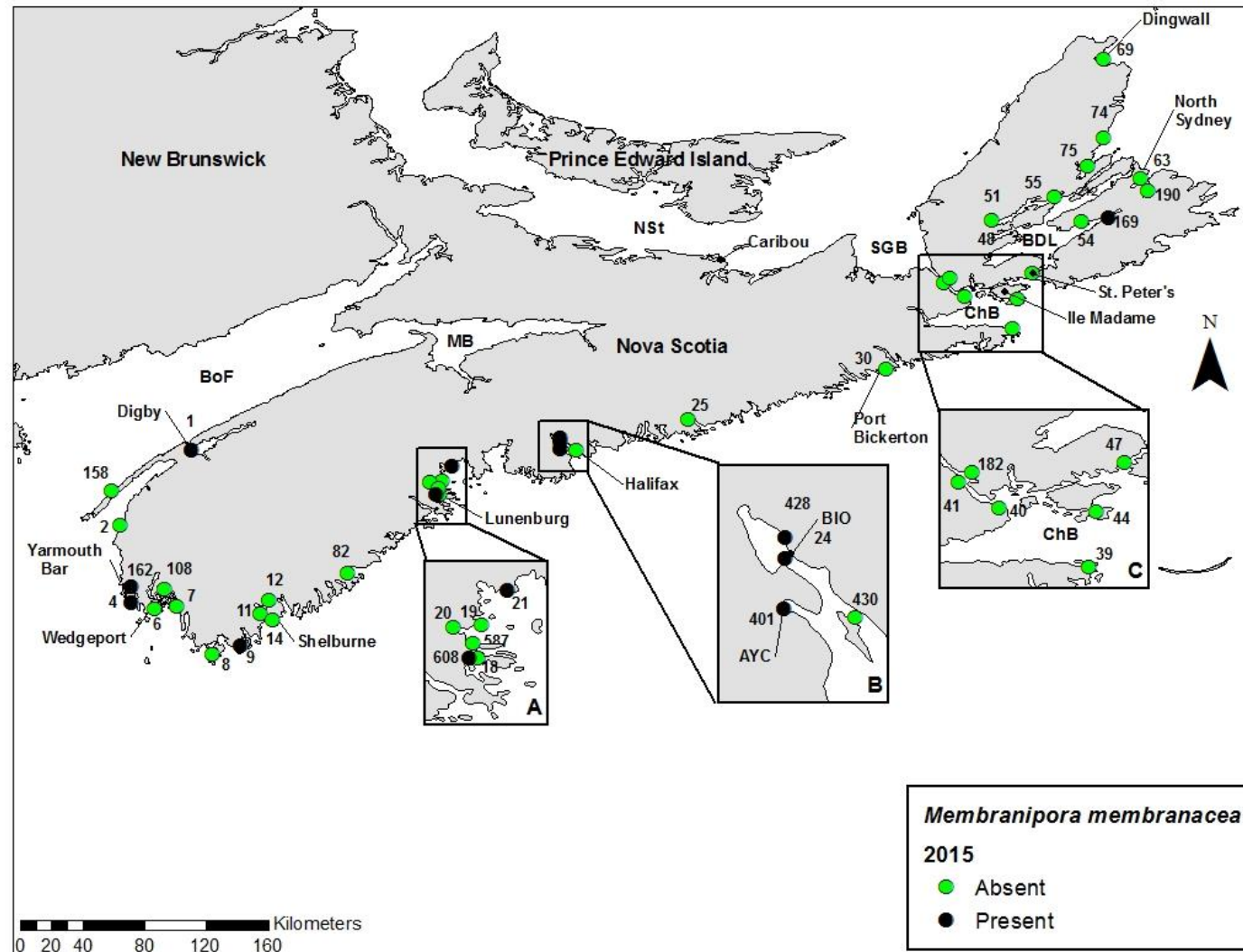


Figure 25: Presence of *Membranipora membranacea* in Nova Scotia in 2015. BoF = Bay of Fundy, ChB = Chedabucto Bay, NSt = Northumberland Strait, SGB = St. Georges Bay, MB = Minas Basin, and BDL = Bras d'Or Lake.

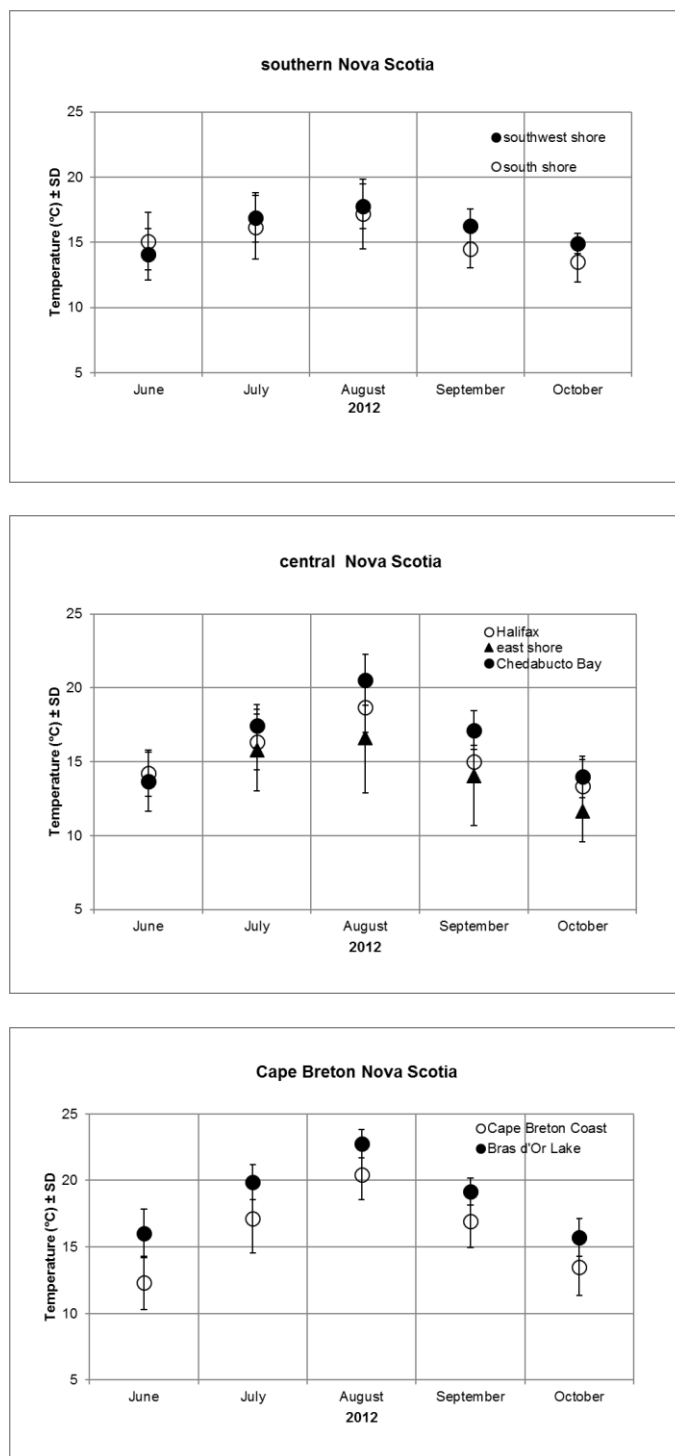


Figure 26: Mean monthly temperature ($^{\circ}\text{C} \pm \text{SD}$), for June to October, 2012, for the southern, central and Cape Breton regions of Nova Scotia. Individual area within each region are presented separately.

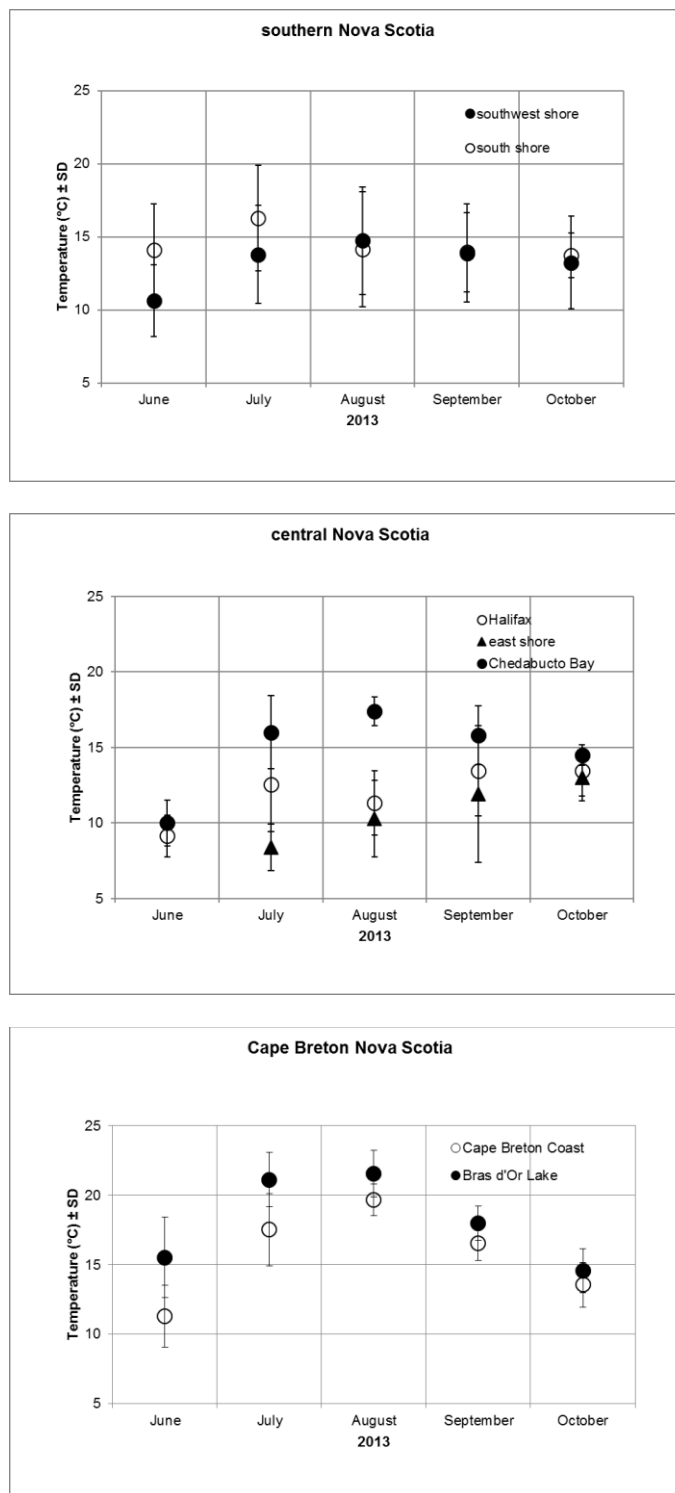


Figure 27: Mean monthly temperature ($^{\circ}\text{C} \pm \text{SD}$), for June to October, 2013, for the southern, central and Cape Breton regions of Nova Scotia. Individual areas within each region are presented separately.

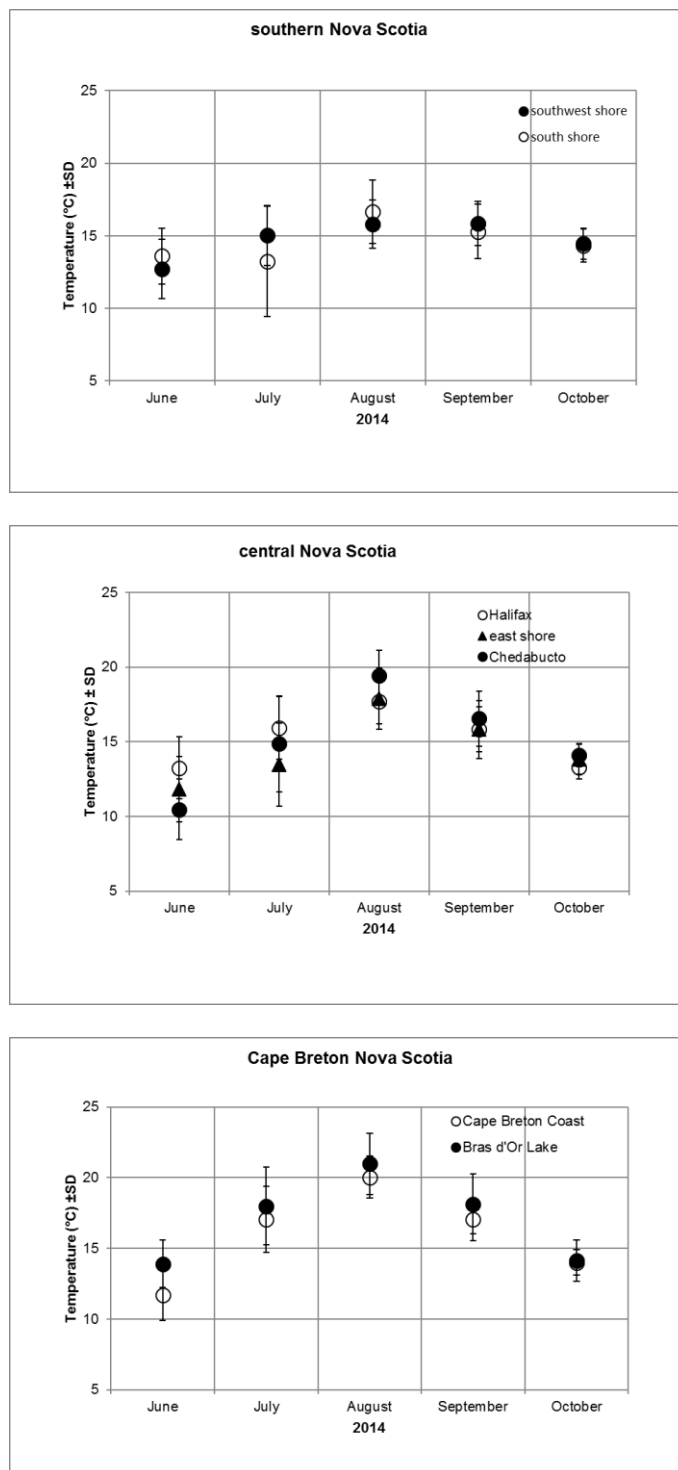


Figure 28: Mean monthly temperature ($^{\circ}\text{C} \pm \text{SD}$), for June to October, 2014, for the southern, central and Cape Breton regions of Nova Scotia. Individual areas within each region are presented separately.

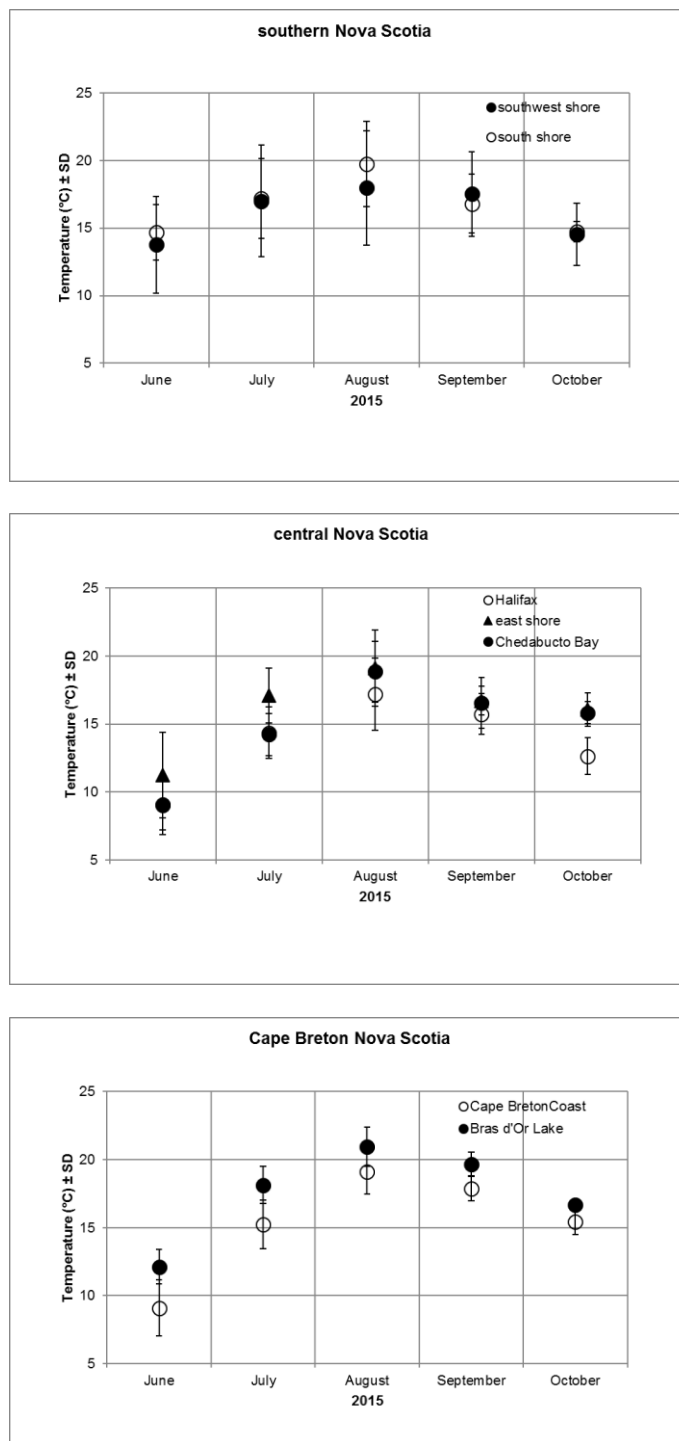


Figure 29: Mean monthly temperature ($^{\circ}\text{C} \pm \text{SD}$), for June to October, 2015, for the southern, central and Cape Breton regions of Nova Scotia. Individual areas within each region are presented separately.

3.1.4.2.2 2013: Compared with 2012, 2013 (Figure 27) was a cooler year. Water temperature in June was generally $\leq 14^{\circ}\text{C}$ in most areas, ranging from 9.14°C (Halifax Harbour) to 11.27°C (Cape Breton coast). Warmer waters ($>14^{\circ}\text{C}$) were observed in July, ranging from 14.11°C to 15.51°C along the south shore and in the Bras d'Or Lake, respectively. Temperatures were intermediate in July, ranging from 8.39°C (east shore) to 21.11°C (Bras d'Or Lake). Peak temperatures were recorded along the south shore (16.3°) and temperatures in Halifax Harbour were also slightly higher in July (12.6°C) than in August. August 2013 was generally colder compared with 2012, when mean temperature were $<17^{\circ}\text{C}$ along the east (10.28°C), south and southwest (14.74°C) shores and in Halifax Harbour. Furthermore, two areas were colder than the previous month: the south shore (14.13°C) and Halifax Harbour (11.33°C). The warmest temperatures were recorded in Chedabucto Bay (17.38°C), along the Cape Breton coast (19.64°C) and in the Bras d'Or Lake (21.53°C). Water temperatures fell in September and October 2013, decreasing to 13.23°C (southwest shore) to 14.54°C (Bras d'Or Lake). Halifax Harbour and the east shore had the coldest temperatures from June to August, but the warmest temperatures in October, 13.46°C and 13.03°C , respectively.

3.1.4.2.3 2014: Mean monthly water temperature was warmer than in 2013, and was $\leq 14^{\circ}\text{C}$ in all areas in June 2014 (Figure 28), and the range of mean temperature varied from 10.47°C (Chedabucto Bay) to 13.61°C (south shore). Intermediate temperatures were recorded in July, from 13.22°C (south shore) to 18°C (Bras d'Or Lake). Temperature along the south shore, dropped below (13.22°C) the average June temperature (13.61°C), and indeed, was the lowest of the June to September period. August temperatures were $\geq 17^{\circ}\text{C}$ in most areas (Halifax Harbour, east shore, Chedabucto Bay, Cape Breton coast and Bras d'Or Lake) and the overall temperature ranged from 15.80°C (southwest shore) to 20.99°C (Bras d'Or Lake). The lowest temperatures occurred along the southwest (15.80°C) and south shores (16.64°C). Temperature decreased in September and October 2014 ranging from 13.30°C (Halifax Harbour) to 14.46°C (south shore).

3.1.4.2.4 2015: Temperatures in May were cooler than in all other years (Appendix 9), ranging from 5.50°C (Halifax Harbour) to 11.30°C (south shore), although data were limited for most areas. June was also a cooler month, with temperatures ranging from 9.03°C (Chedabucto Bay) to 13.77°C (southwest shore) (Figure 29). The only warmer area was the south shore (14.68°C). Temperatures were intermediate in July, and August was warmer ($\geq 17^{\circ}\text{C}$) in all areas, ranging from 17.22°C (Halifax Harbour) to 20.94°C (Bras d'Or Lake). Temperatures fell in September and October ranging from 12.63°C (Halifax Harbour) to 16.68°C (Bras d'Or Lake).

3.1.4.3 Regional temperature variability, 2012 - 2015:

3.1.4.3.1 Southern Nova Scotia: The southwest and south shores were warmer in June (~14.08°C - 15.08°C) and in August (17.10°C - 17.70°C) in 2012, compared with 2013 and 2014. June temperatures were slightly cooler in 2015 (13.77°C – 14.68°C) compared with 2012, although by August this area had the highest temperatures (17.97°C - 19.74°C). Data for September and October 2015 indicate that September 2015 was the warmest (17.50°C - 16.70°C) of all years in both regions, while, October of 2015 the warmest (14.70°C) of all years on the south shore.

Temperatures in this region are more moderate; warmer in the spring, and not reaching the high mid-summer temperatures seen in other regions, before cooling again through September and October.

3.1.4.3.2 Central Nova Scotia: Halifax Harbour and Chedabucto Bay were warmest of during June 2012 (14.20°C - 13.60°C) compared with other years, but data were lacking for the east shore. Data for Halifax Harbour, east shore and Chedabucto Bay indicate that August 2012 was the warmest of the four years (18.60°C; 16.60°C, 18.68°C, respectively). August 2013 was unusually cold in Halifax Harbour (11.30°C), and much colder on the east shore (10.28°C). August 2014 and 2015 were slightly cooler than 2012 in this region. September and October of 2015 were the warmest of all years on the East Shore (16.70°C and 16.07°C, respectively).

This region experiences the greatest variability in temperature, driven by the colder waters on the east shore, and sometimes in Halifax Harbour, compared with warmer temperatures in Chedabucto Bay (except in 2015, Figure 29). The east shore may be slower to warm (Figure 27, 2013), with peak temperatures occurring in September and remaining warmer into the fall.

3.1.4.3.3 Cape Breton: The Cape Breton coast and Bras d'Or Lakes were warmest in June (12.3°C - 16.0°C) and August (20.4°C - 22.8°C) of 2012, compared with other years. August temperatures from 2013 to 2015 (19.1°C - 20.9°C, in 2015) were slightly cooler. September and October 2015 were also warmest of all years; 17.8°C and 15.4°C, respectively along the Cape Breton coast and 19.6°C and 16.6°C, respectively in the Bras d'Or Lake.

Temperatures are cooler along the Cape Breton coast compared with the Bras d'Or Lake, the warmest area in Nova Scotia.

3.2 New Brunswick, 2012 - 2015

3.2.1 General occurrence of non-indigenous tunicates and environmental measures

General results for the presence of non-indigenous tunicate species in swNB in 2012, 2013, 2014, and 2015 are given in Table 10 and the locations where *C. intestinalis*, *B. schlosseri*, and *B. violaceus* were present are shown in Figures 30, 31, 32 and 33, respectively. No reports of non-indigenous tunicates were received in 2012 to 2015 outside the DFO biofouling monitoring.

Table 10: Total occurrence (%) of non-indigenous tunicates at all stations (black text) and sentinel stations (red text) in southwest New Brunswick, May to December, 2012 - 2015. The number of stations is given in brackets.

Species	2012		2013		2014		2015
	All	Sentinel	All	Sentinel	All	Sentinel	Sentinel
<i>Ciona intestinalis</i>	94 (17)	86 (12)	94 (16)	93 (13)	81 (13)	71 (10)	93 (13)
<i>Botryllus schlosseri</i>	78 (14)	93 (13)	82 (14)	93 (13)	76 (13)	93 (13)	93 (13)
<i>Botrylloides violaceus</i>	28 (5)	29 (4)	47 (8)	57 (8)	44 (7)	43 (6)	50 (7)
<i>Styela clava</i>	ND		ND		ND		ND
<i>Didemnum vexillum</i>	ND		ND		ND		ND
<i>Diplosoma listerianum</i>	ND		ND		ND		ND
<i>Asciidiella aspersa</i>	ND		ND		ND		ND
No Tunicates	6 (1)	7 (1)	6 (1)	7 (1)	12 (2)	14 (2)	7
Nb. of Stns	18		17		16		14
Nb. of Sentinel stations	14		14		14		14

Ciona intestinalis was the most widely distributed tunicate in all years, present at 81 - 94 % of all stations and 71 - 93% of sentinel stations (Table 10). *Botryllus schlosseri* was the second most abundant tunicate species, present at 76 – 82 % of all stations, and at 93% (13 of 14) sentinel stations in any year. *Botrylloides violaceus* was found at increasing numbers of stations from 2012 -2015, but was the least abundant tunicate in this region (Table 10).

The occurrence of non-indigenous tunicates at the 14 sentinel stations from 2012 through 2015 gives a more accurate picture of their spread (Table 10). While *C. intestinalis* and *B. schlosseri* were consistently present at 12 or 13 sentinel stations during this period, *B. violaceus* was detected at more stations over time, from 36% (five

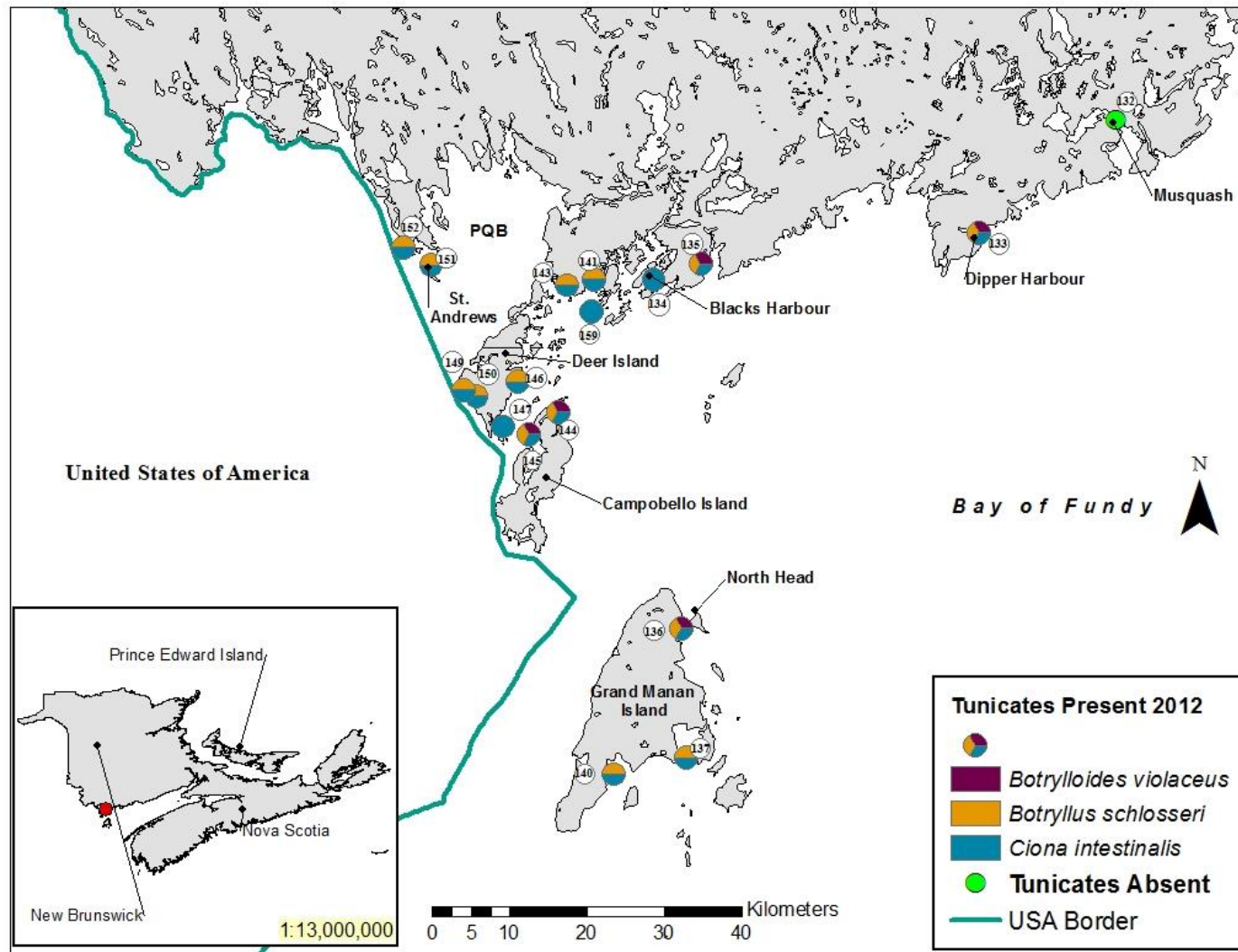


Figure 30: Presence of non-indigenous tunicates in southwest New Brunswick in 2012. P QB = Passamaquoddy Bay.

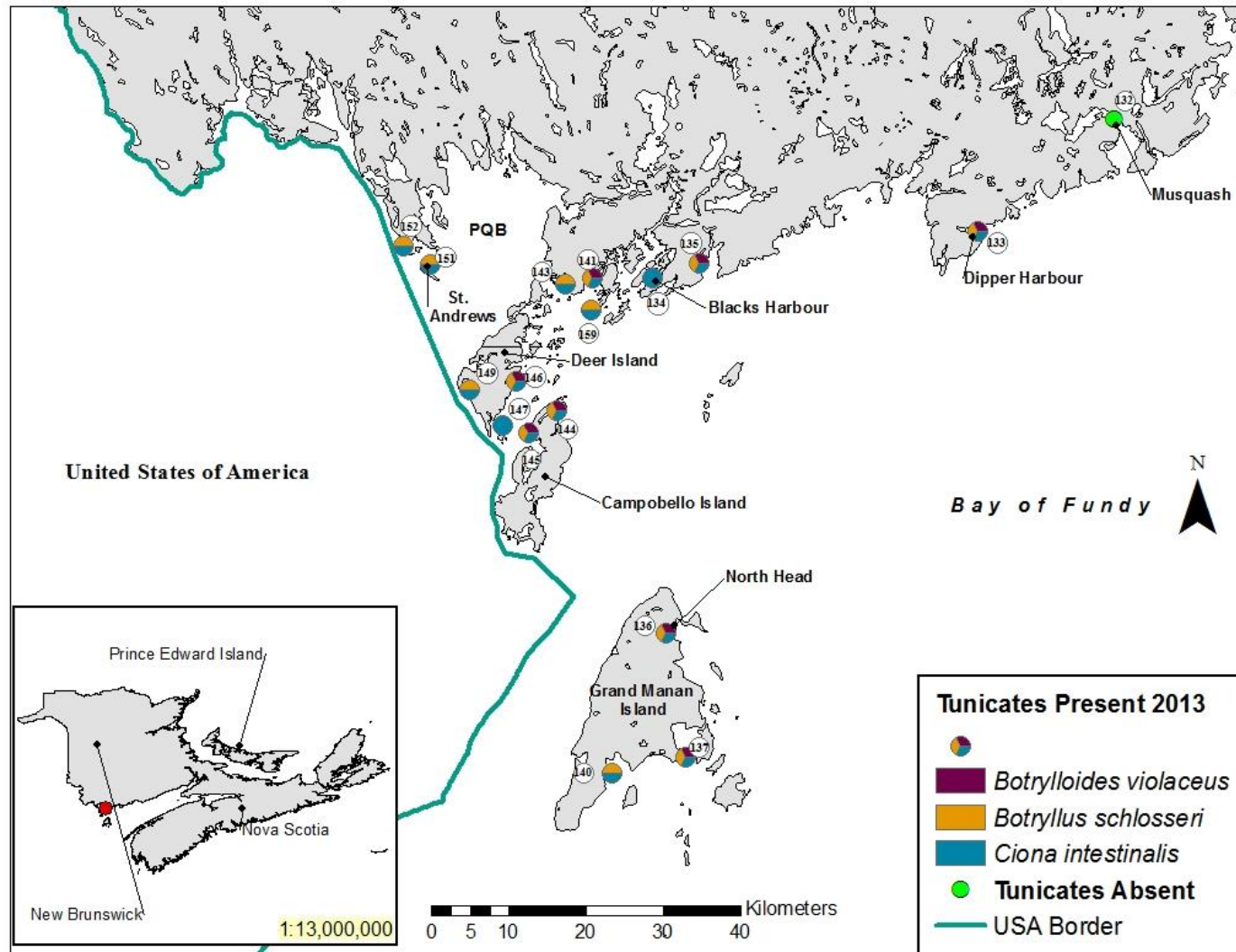


Figure 31: Presence of non-indigenous tunicates in southwest New Brunswick in 2013. P QB = Passamaquoddy Bay.

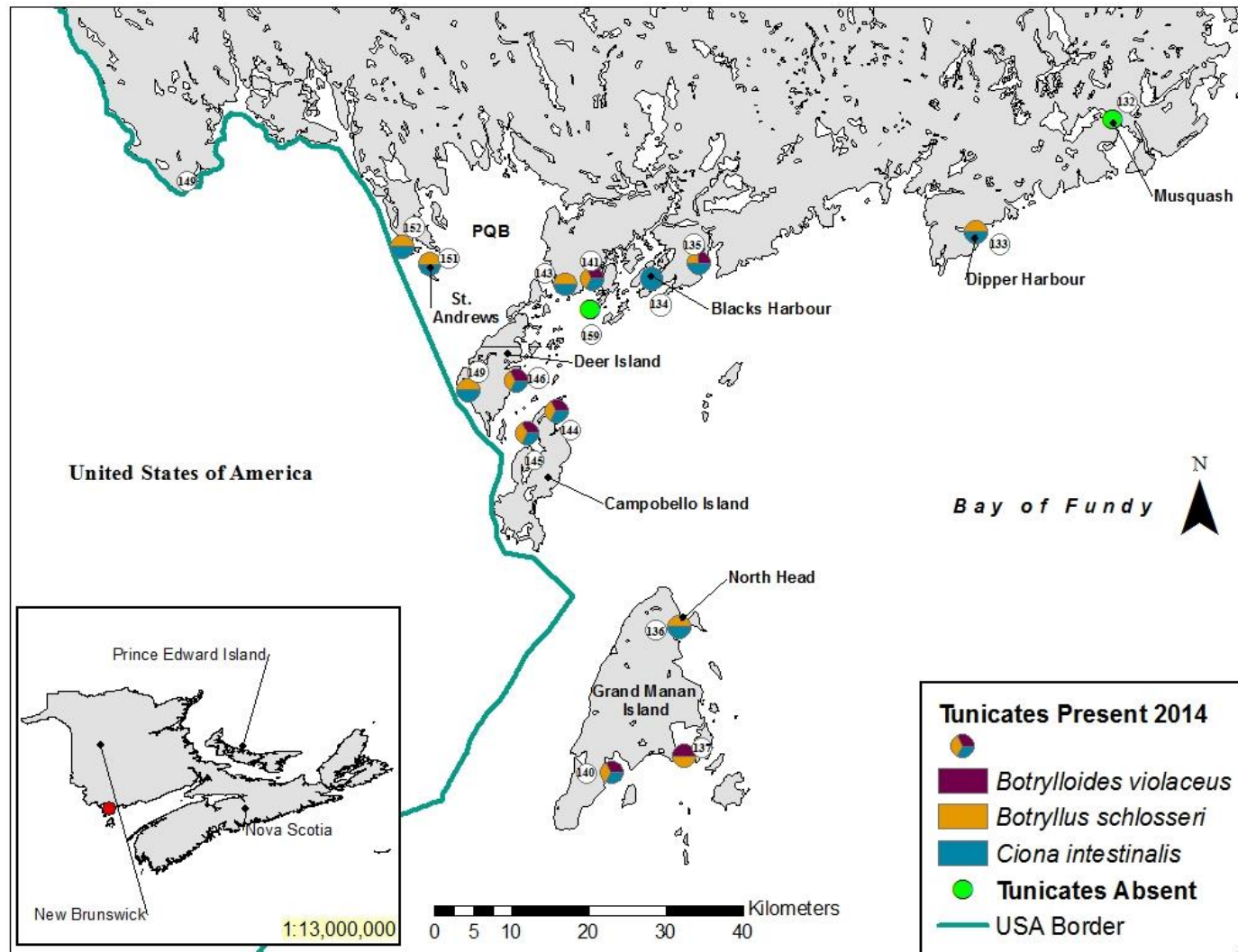


Figure 32: Presence of non-indigenous tunicates in southwest New Brunswick in 2014. P QB = Passamaquoddy Bay.

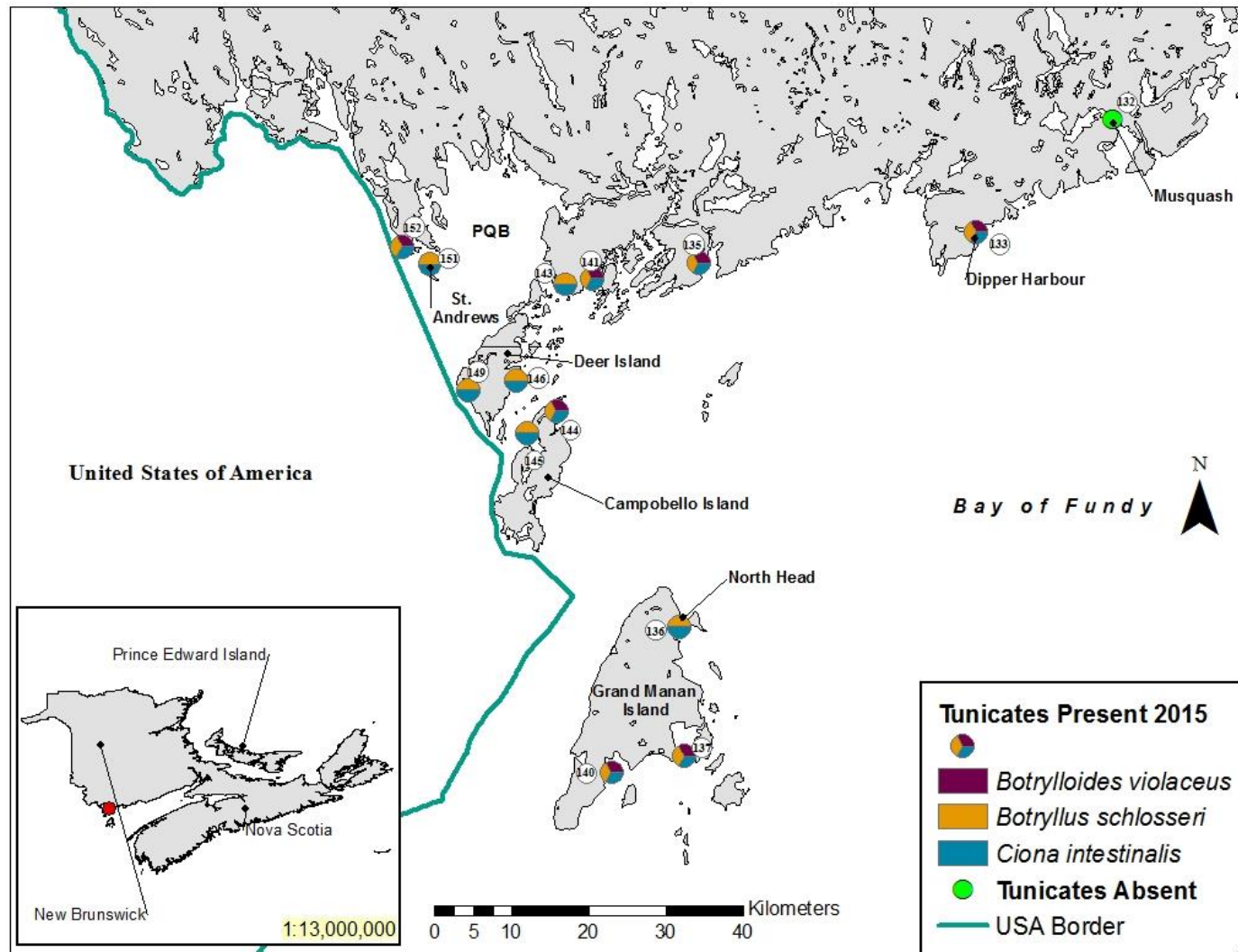


Figure 33: Presence of non-indigenous tunicates in southwest New Brunswick in 2015. P QB = Passamaquoddy Bay.

stations) in 2012, to 50% (seven stations) in 2015 (Table 10). They were detected in all regions monitored in 2015, when this species was recorded on plates at SABS (Stn 151), on the western side of Passamaquoddy Bay, in the St. Andrew's area.

No *Styela clava*, *Diplosoma listerianum*, *Ascidiella aspersa* or *Didemnum vexillum* were detected in swNB by biofouling monitoring from 2012 to 2015.

Tunicates were not detected at Musquash (Stn 132) from 2012 to 2015, or at Bliss Harbour (Stn 159) in 2014.

Environmental measures were taken at deployment and retrieval at coastal monitoring stations only (Stns 132, 133, 135, 151 and 152) and are given in Appendices 5 to 8. The ranges of temperature, salinity and dissolved oxygen where non-indigenous tunicates were present at these stations during the study period are shown in Table 11.

Table 11: Ranges of water temperature, salinity, and dissolved oxygen at monitoring stations in southwest New Brunswick where non-indigenous tunicates were present in 2012 through 2015. Values given are the minimum and maximum point values recorded at deployment or retrieval of monitoring collectors. Minimum water temperatures were recorded during collector deployment in May or June. ND = not determined due to equipment failure. *No mid-summer (August) measurements were obtained in 2015.

Species	Year	Temperature, (°C)	Salinity, (psu)	Oxygen, (mg L ⁻¹)
<i>C. intestinalis</i>	2012	9.99 – 16.67	26.15 – 32.40	7.54 – 9.60
	2013	9.20 – 14.49	24.43 – 29.64	7.99 -10.24
	2014	7.43 – 14.60	28.41 – 33.65	6.83 – 10.61
	2015	7.00 – 11.00*	28.34 – 33.56*	ND
<i>B. schlosseri</i>	2012	9.99 – 16.67	26.15 – 32.40	7.54 – 9.60
	2013	9.20 – 14.49	24.43 – 29.64	7.99 -10.24
	2014	6.75 – 14.60	28.23 – 33.65	6.83 – 10.61
	2015	7.00 – 11.00*	28.34 – 33.56*	ND
<i>B. violaceus</i>	2012	11.87 – 15.62	31.80 – 32.40	7.54-8.74
	2013	7.15 – 14.49	27.69 – 29.64	8.34 – 9.81
	2014	7.71 – 14.60	28.41 – 33.65	6.83 – 10.10
	2015	7.00 – 11.00*	28.34 – 33.56*	ND
No tunicates	2012	11.53 – 15.77	21.61 – 31.20	9.02 – 9.13
	2013	10.70 – 14.74	8.08 - 23.02	8.57 – 11.04
	2014	10.78 – 17.16	12.48 – 33.17	7.75 – 10.12
	2015	11.40 – 19.40*	13.50 – 29.20*	ND

The ranges of environmental measures where *C. intestinalis*, *B. schlosseri* and *B. violaceus* occur, and where tunicates are not present, are comparable in all years, and very narrow, due to the limited number of stations where data were available. Unfortunately, these sites were not visited in August in 2015, so the temperature ranges given are even narrower compared with other years. Water temperature at Musquash (Stn 132), was very high in June 2015, however (Appendix 8).

3.2.2 Tunicate cover (degree of infestation)

As noted previously (Sephton et al. 2014; 2016), there was some variation (i.e. “patchiness”): (1) among individual plates on a collector, (2) between duplicate collectors at a site during a deployment period, and (3) among deployment periods (Appendices 1 - 4). Furthermore, some collectors were lost due to harsher conditions in swNB, compared with NS (Appendices 1 – 4). The average annual plate cover (average coverage over all plates and collectors) gave a comparable approximation of the level of infestation on fouled structures at each station.

3.2.2.1 *Ciona intestinalis*: Average annual plate cover of *C. intestinalis* for 2012 to 2015 is shown in Figures 34 through 37, respectively. Plate cover was generally low (<25%) in 2012 with the exception of SABS (Stn 152) and at three of four (Leonardville, Stn 146; Fairhaven MF, Stn 150 and Fairhaven dock, Stn 149) stations on Deer Island. In 2013, prevalence of this solitary tunicate increased to high (51 - 76%) at SABS, increased to moderate (26-50%) at L’Etete (Stn 143) and Bliss Harbour (Stn 159) but decreased to low (<25%) at stations on Deer Island. In 2014 and 2015, plate cover of *C. intestinalis* either decreased to low at the stations mentioned above or remained low. *Ciona intestinalis* was not detected at two stations: Bliss Harbour (Stn 159) and Ingalls Head (Stn 137), in 2014 where it had been detected previously. In 2014, plate cover increased to moderate (26 - 50%) at Beaver Harbour (Stn 135) only. In 2014 and 2015, Beaver Harbour and Head Harbour (Stn 144) on Campobello Island were the only stations with moderate cover in the area, and fouling was more pronounced on full season collectors (Appendices 1 - 4). This species was not detected at Musquash (Stn 132) in any year, and was not detected at Bliss Harbor (Stn 159) and Ingall’s Head (Stn 137) in 2014.

3.2.2.2 *Botryllus schlosseri*: Average annual plate cover of *B. schlosseri* for 2012 to 2015 is shown in Figures 38 through 41 respectively and it remained low (<25%) across all years and stations with the exception of 2013. In 2013, four sentinel stations: Beaver Harbour (Stn 135), Fairhaven Dock (Stn 149), North Head (Stn 136) and Ingalls Head (Stn 137) and an additional station: Bliss Harbour (Stn 159), showed an increase in the plate cover of this colonial tunicate, from low to moderate (26 - 50%) and from absent to low, respectively, followed by a decrease in 2014. It was never

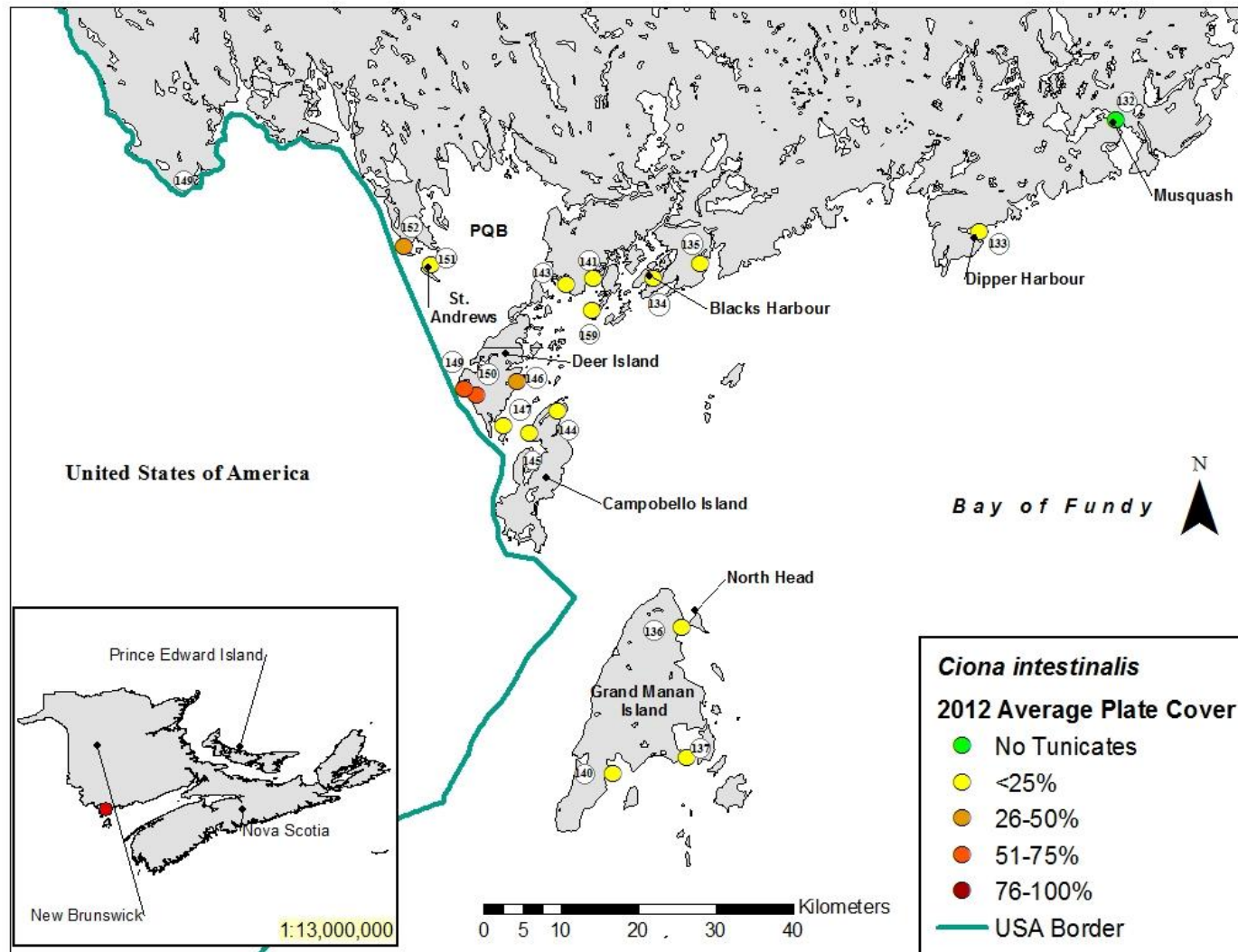


Figure 34: Average annual plate cover for *Ciona intestinalis* on monitoring collectors in southwest New Brunswick in 2012. P QB = Passamaquoddy Bay.

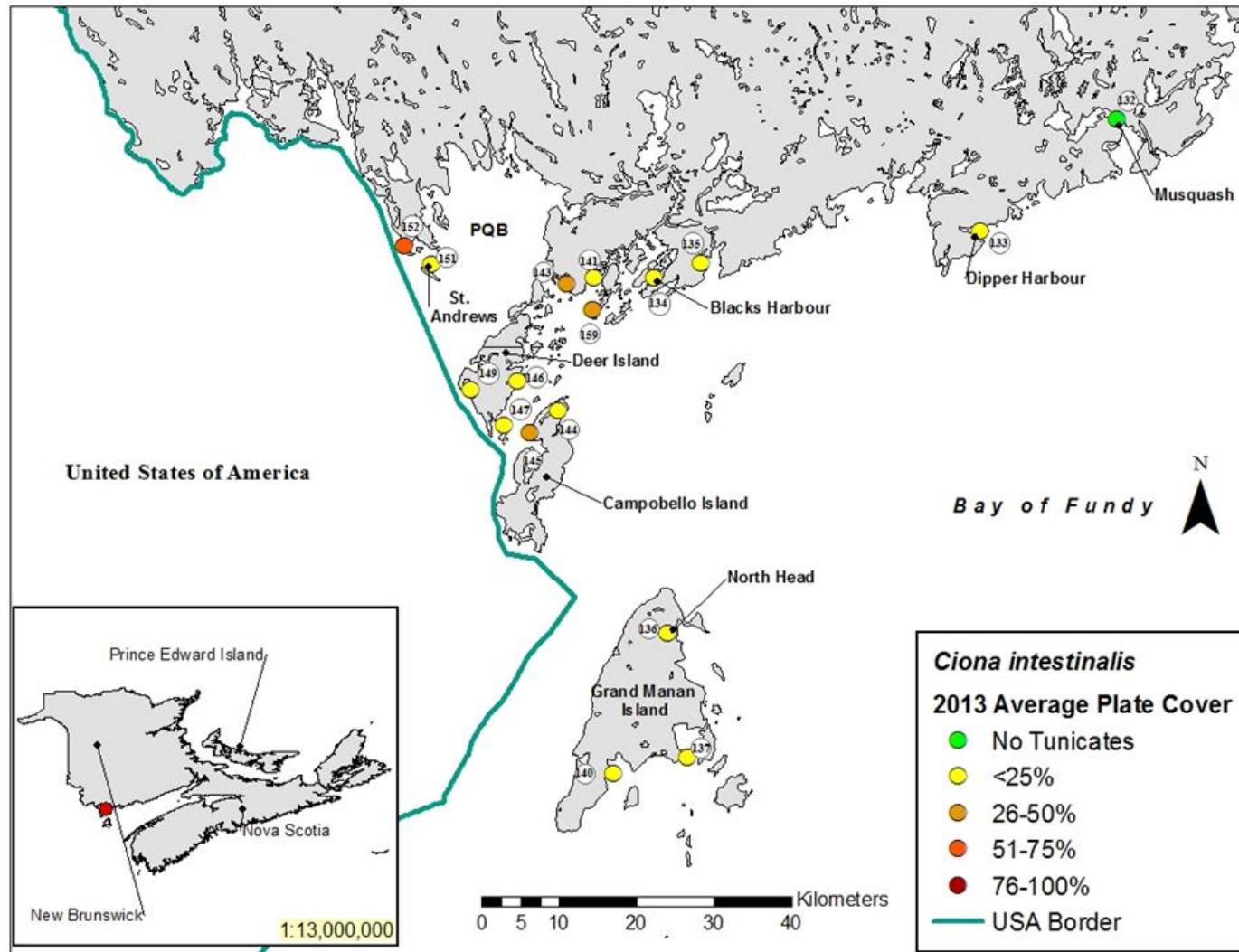


Figure 35: Average annual plate cover for *Ciona intestinalis* on monitoring collectors in southwest New Brunswick in 2013. P QB = Passamaquoddy Bay.

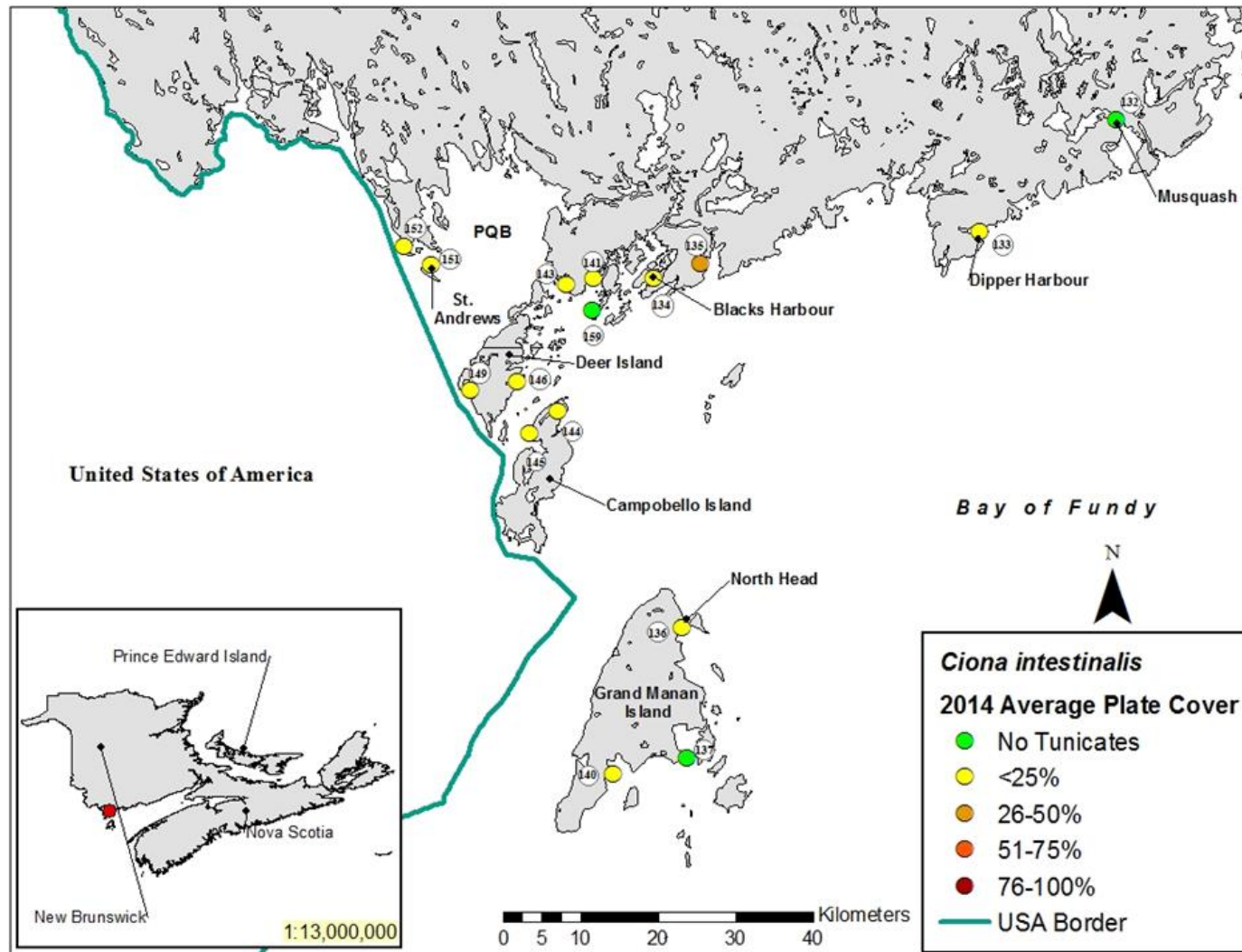


Figure 36: Average annual plate cover for *Ciona intestinalis* on monitoring collectors in southwest New Brunswick in 2014. P QB = Passamaquoddy Bay.

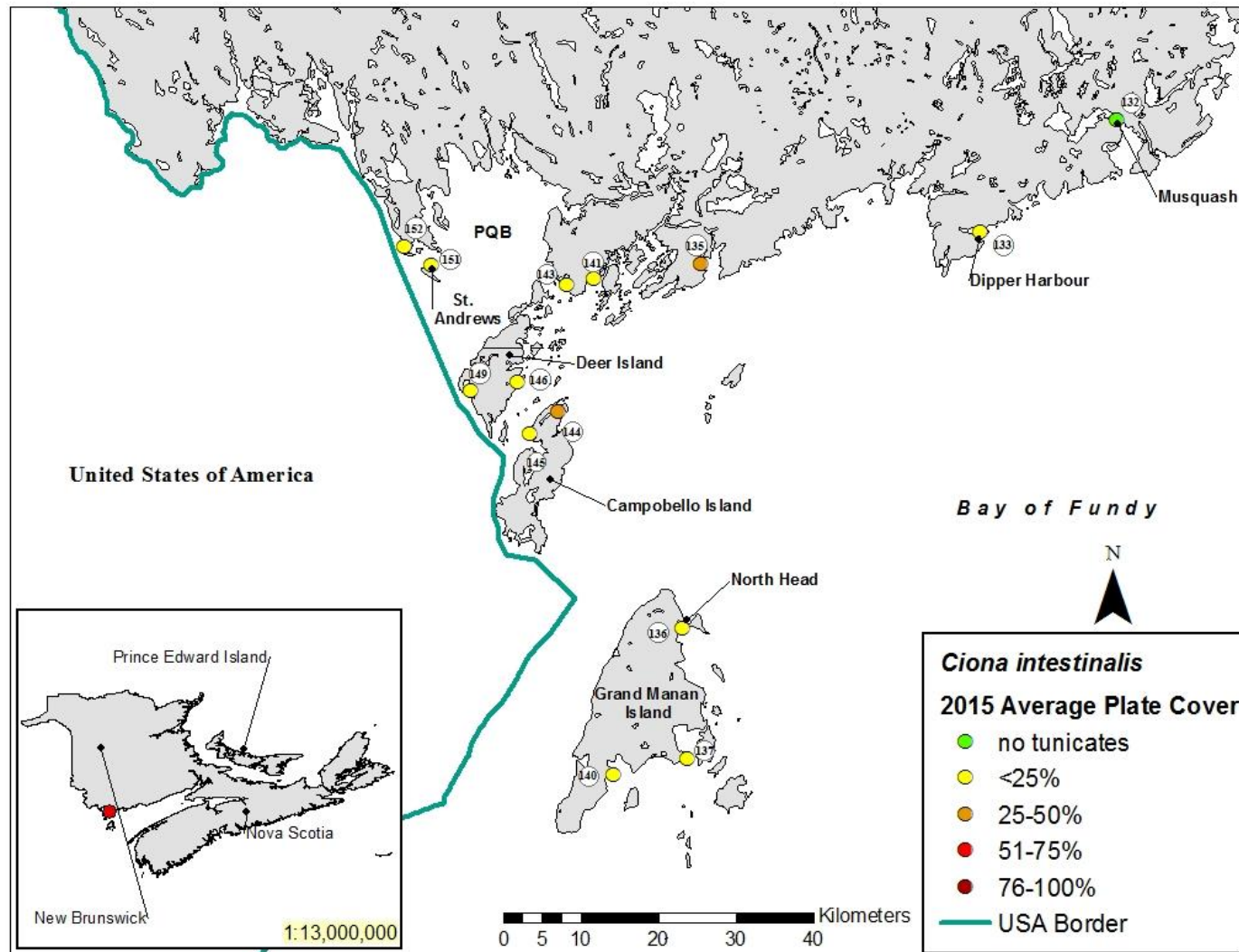


Figure 37: Average annual plate cover for *Ciona intestinalis* on monitoring collectors in southwest New Brunswick in 2015. PQB = Passamaquoddy Bay.

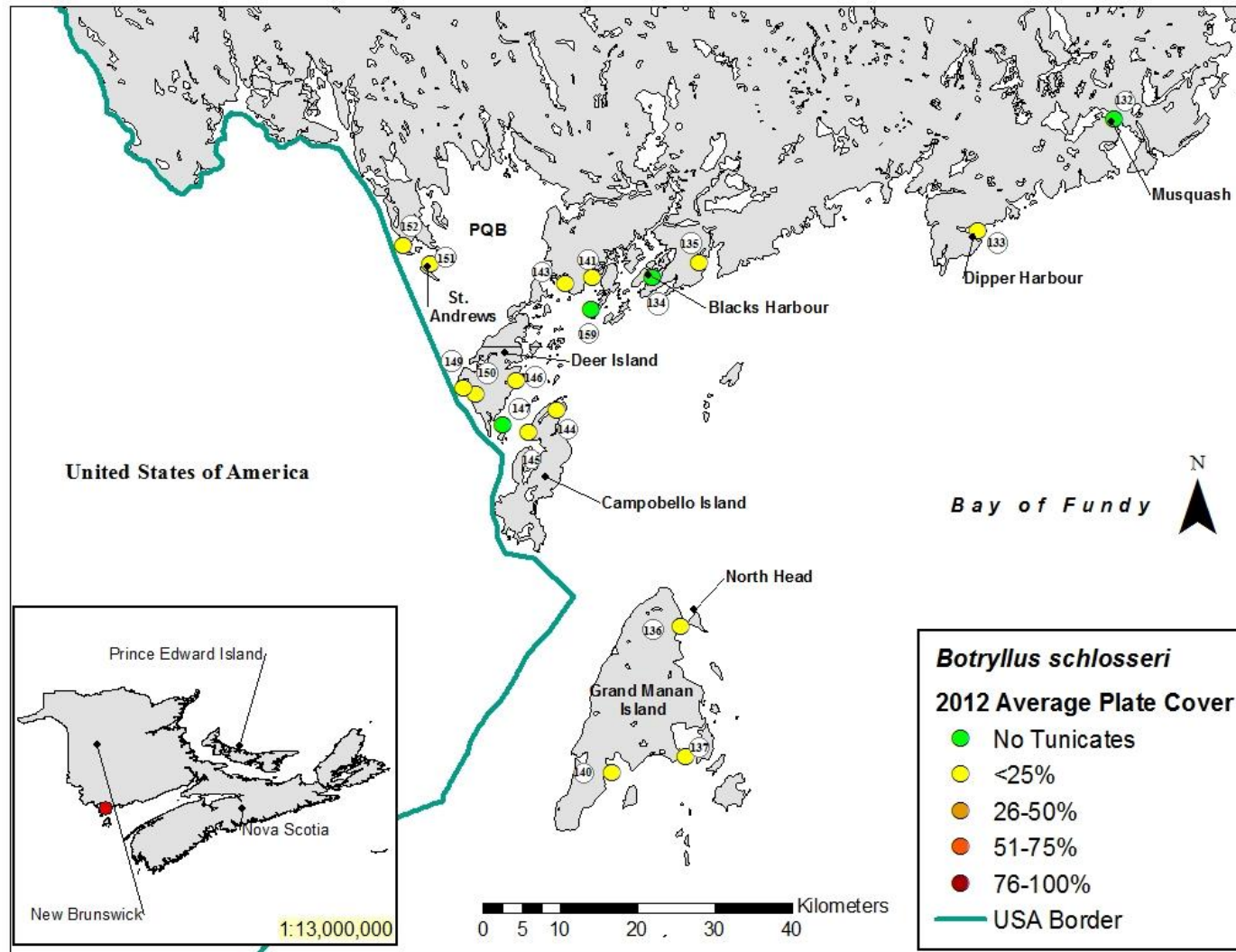


Figure 38: Average annual plate cover for *Botryllus schlosseri* on monitoring collectors in southwest New Brunswick in 2012. PQB = Passamaquoddy Bay.

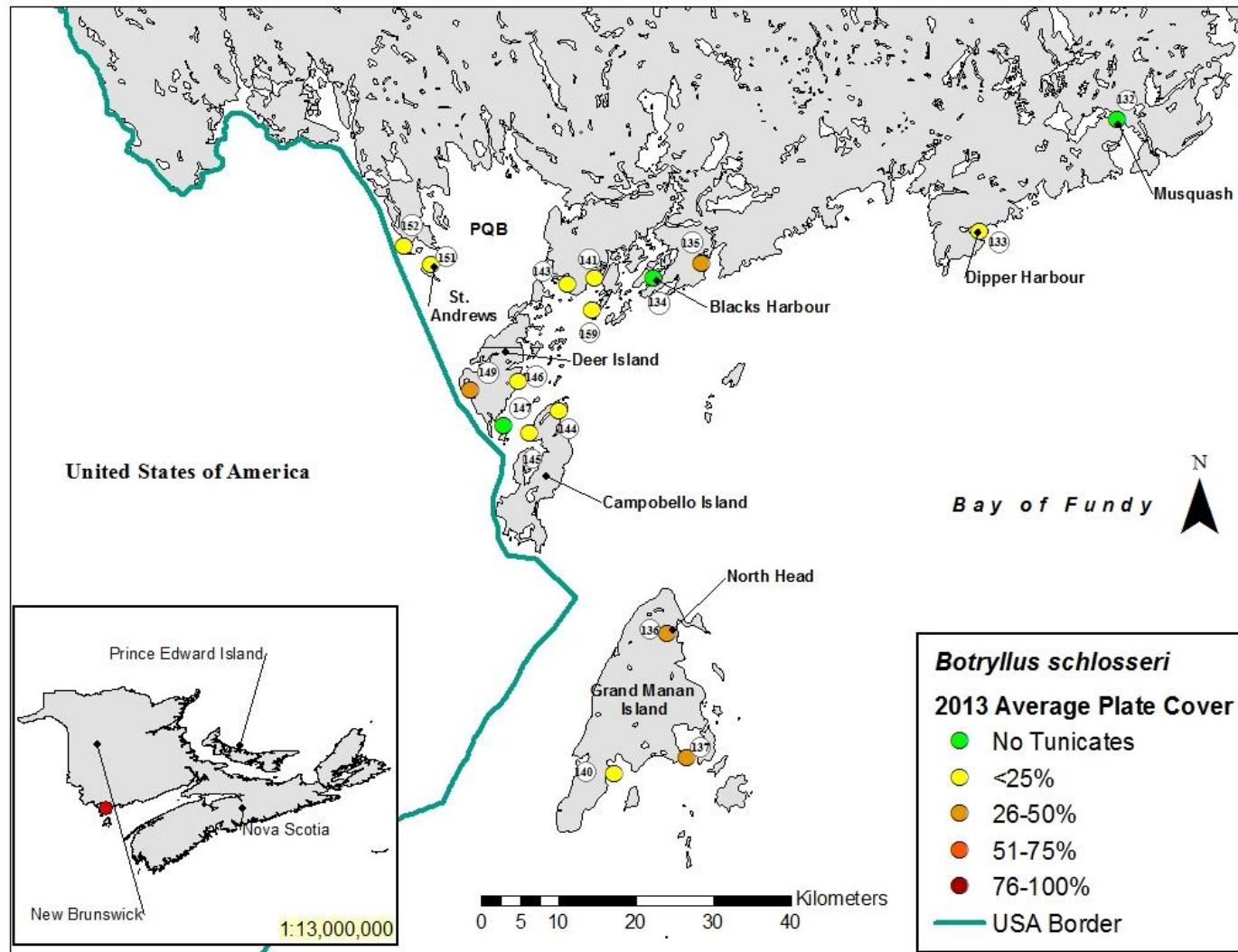


Figure 39: Average annual plate cover for *Botryllus schlosseri* on monitoring collectors in southwest New Brunswick in 2013. P QB = Passamaquoddy Bay.

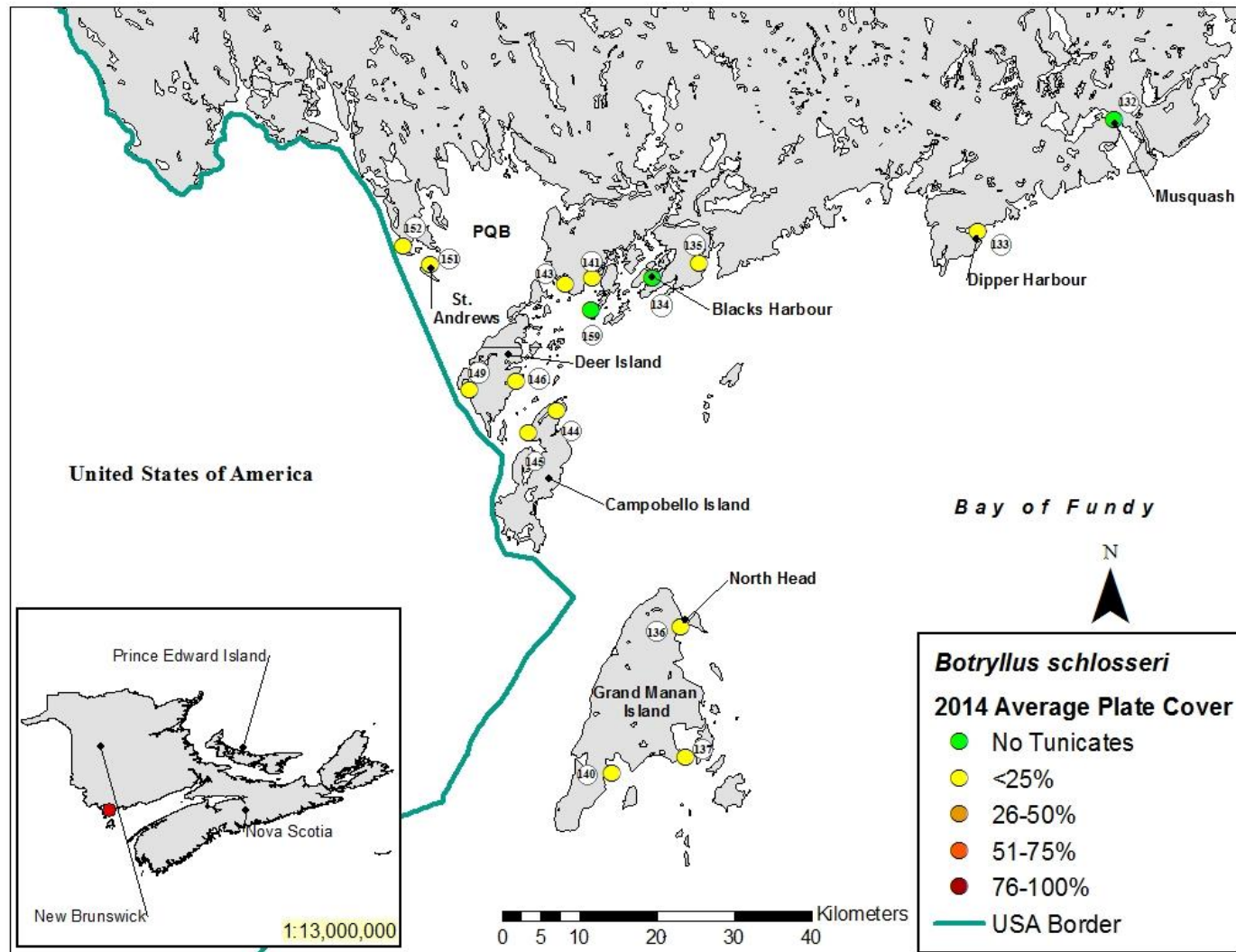


Figure 40: Average annual plate cover for *Botryllus schlosseri* on monitoring collectors in southwest New Brunswick in 2014. P QB = Passamaquoddy Bay.

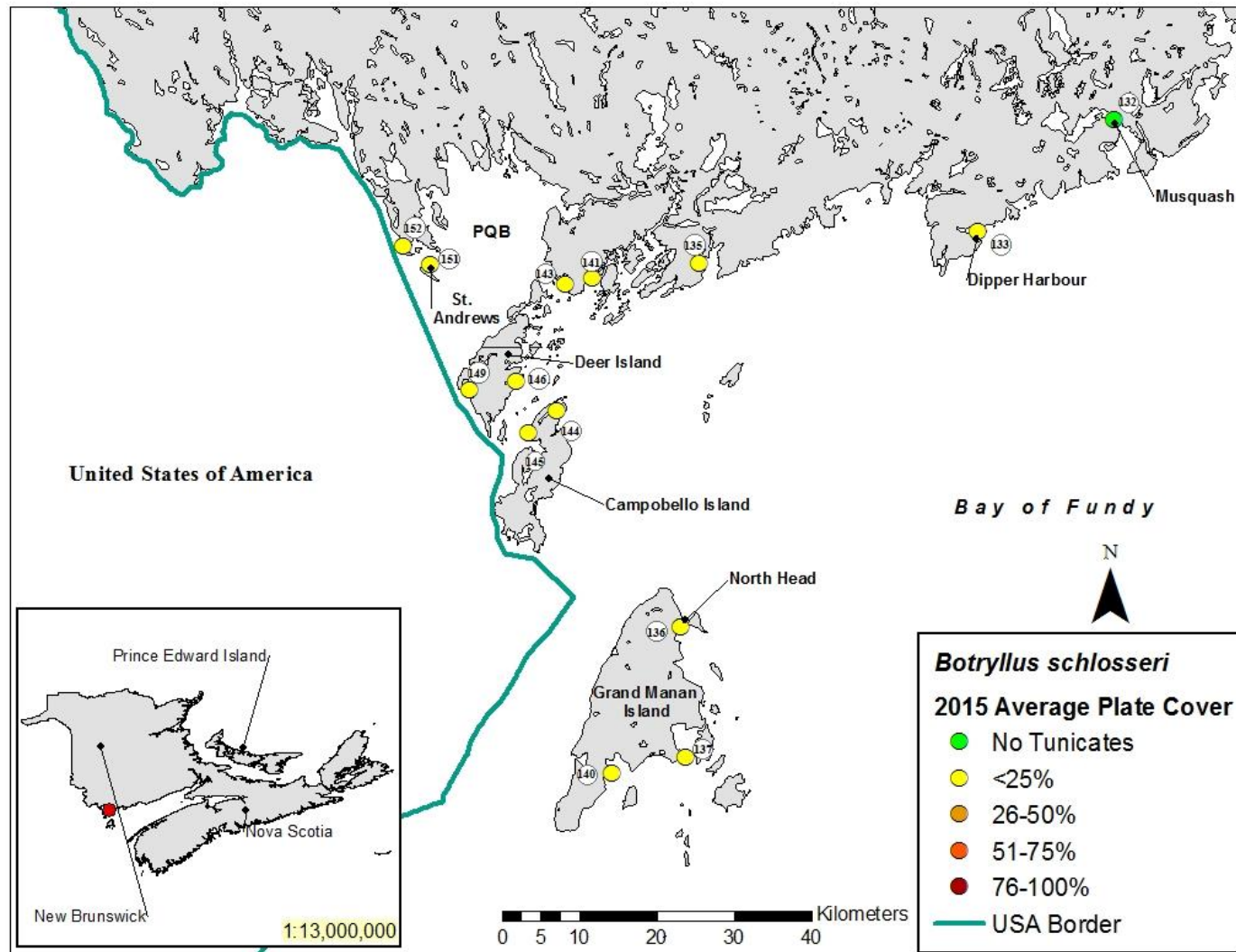


Figure 41: Average annual plate cover for *Botryllus schlosseri* on monitoring collectors in southwest New Brunswick in 2015. PQB = Passamaquoddy Bay.

detected at Musquash (Stn 132), or at Black's Harbour (Stn 134), Bliss Harbour (Stn 159) and Indian Island (Stn 147) in 2012 and 2013, or at Black's Harbour and Bliss Harbour in 2014.

3.2.2.3 *Botrylloides violaceus*: Average annual plate cover of *B. violaceus* for 2012 - 2015 are shown in Figures 42 through 45 respectively. Over the years, the colonial tunicate spread from three stations to seven or eight, but plate cover was consistently low (<25%) and often only small, single colonies were observed on monitoring plates. Since its initial detection at Head Harbour (Stn 144) on Campobello Island in 2009, the two stations on the island have consistently showed a low plate cover, with the exception of 2015 when it was not detected at Wilson's Beach (Stn 145). Further north on Deer Island, this species was detected at only one station, Leonardville (Stn 146) in 2013, and plate cover remained low in 2014, but it was not detected in 2015. On Grand Manan Island, *B. violaceus* was first detected in 2012, at North Head (Stn 136), followed by Ingalls Head (Stn 137) in 2013 and Seal Cove (Stn 140) in 2014. It was not detected at North Head in 2014 and 2015, however. It has been present on the southwest shore of NB at Beaver Harbour (Stn 135) since its initial detection in 2010 (Sephton et al. 2016) with low plate cover. It has since spread to Dipper Harbour (Stn 133) in 2012, Back Bay (Stn 141) in 2013 and SABS (Stn 152) in 2015. It was not detected at Dipper Harbour in 2014 and it has never been recorded at Indian Island (Stn 147), Bliss Harbour (Stn 159) or Blacks Harbour (Stn 134), or at the Musquash (132), St. Andrews (Stn 151), L'Etete (Stn 143) and Fairhaven MF (Stn 150) sentinel stations between 2012 and 2015.

3.2.3. Other biofouling organisms

3.2.3.1 *Caprella mutica*: The Japanese skeleton shrimp, *C. mutica*, was also found throughout the region, on monitoring collectors deployed at 10 out of 18 (55 %), 9 out of 17 (53 %), 8 out of 16 (50 %), and 6 out of 14 (43 %), of monitoring sites, in 2012, 2013, 2014, and 2015, respectively (Figures 46, 47, 48, and 49). Only three sentinel stations, Musquash (Stn 132), Back Bay (Stn 141) and L'Etete (Stn 143), were consistently free of the skeleton shrimp but it was consistently found at two sentinel stations, Dipper Harbour (Stn 133) and North Head (Stn 136), and on Grand Manan and in Passamaquoddy Bay. Stations on Deer Island, Campobello Island and Grand Manan Islands were positive for the presence of *C. mutica* for at least one year over the 2012 to 2015 monitoring. There was no clear spatial temporal pattern of occurrence or pattern of presence at particular sites with a particular use.

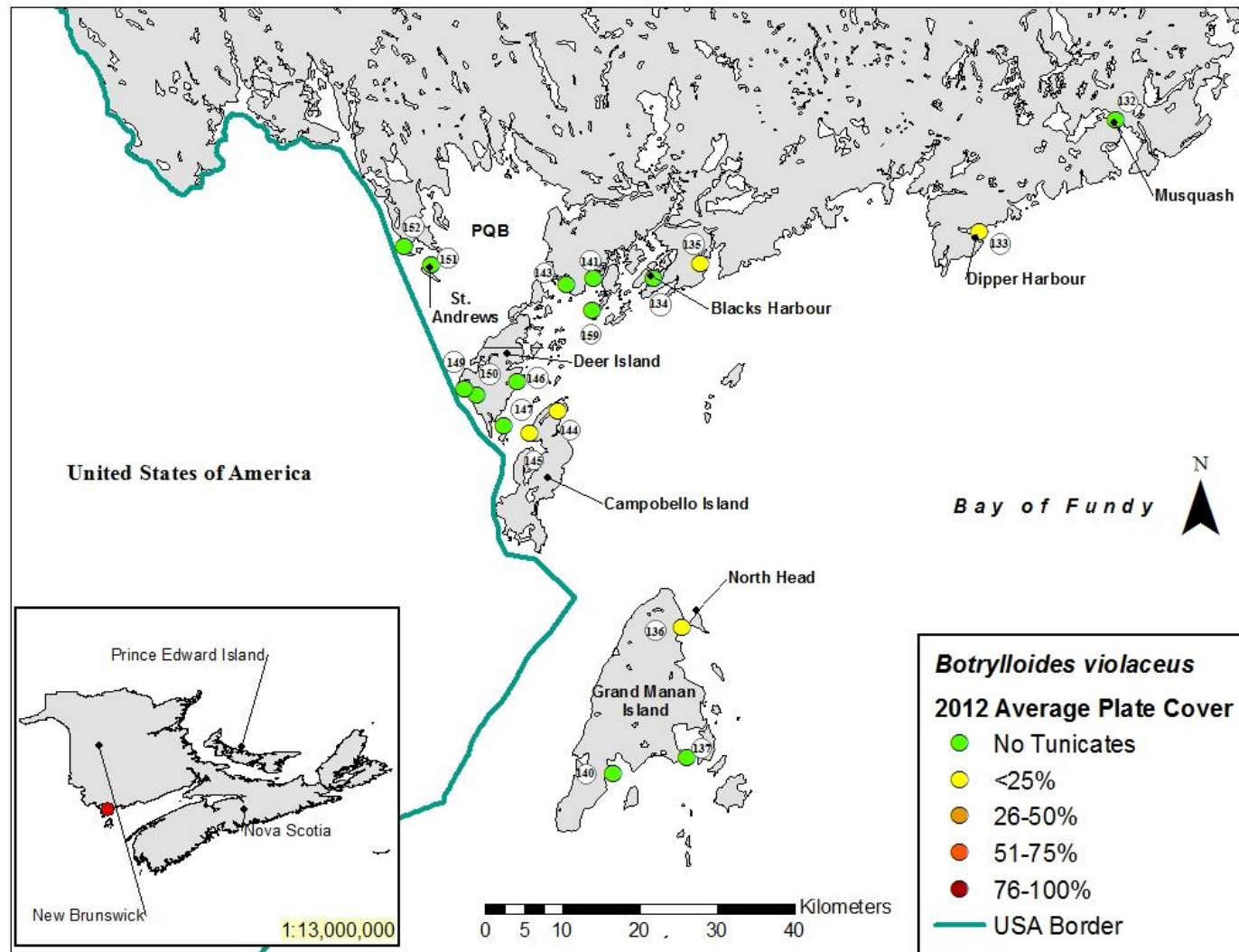


Figure 42: Average annual plate cover for *Botrylloides violaceus* on monitoring collectors in southwest New Brunswick in 2012. PQB = Passamaquoddy Bay.

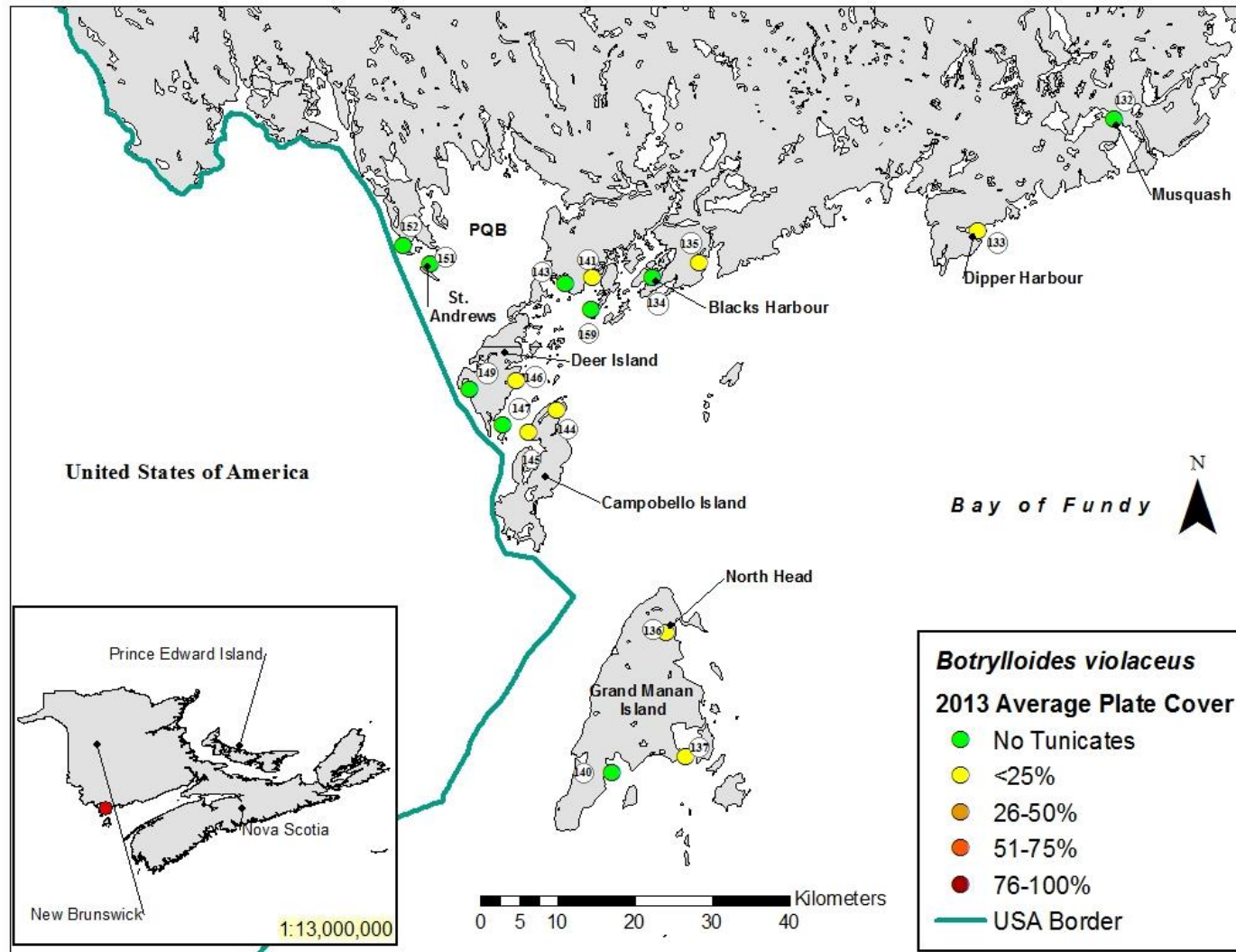


Figure 43: Average annual plate cover for *Botrylloides violaceus* on monitoring collectors in southwest New Brunswick in 2013. P QB = Passamaquoddy Bay.

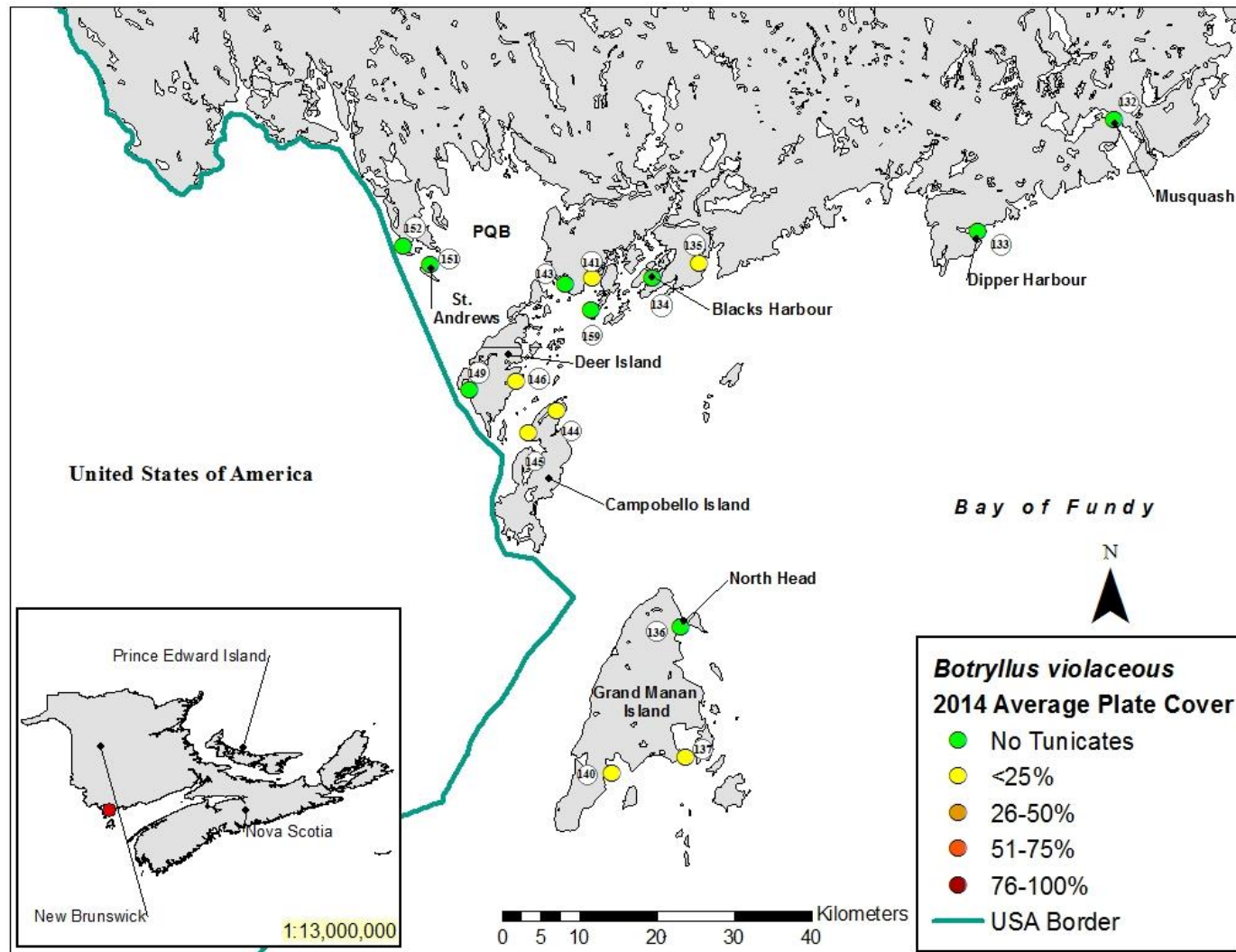


Figure 44: Average annual plate cover for *Botrylloides violaceus* on monitoring collectors in southwest New Brunswick in 2014. P QB = Passamaquoddy Bay.

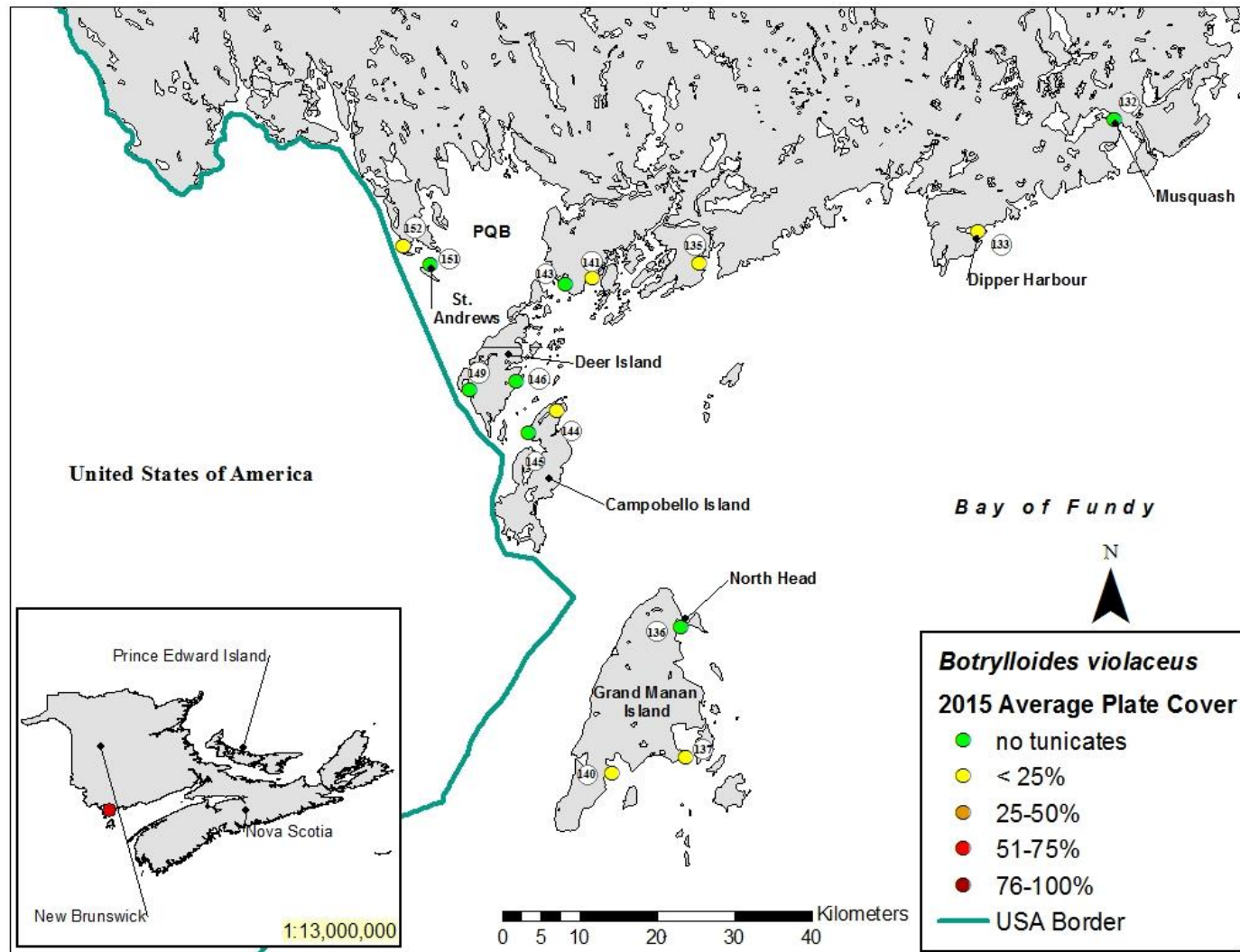


Figure 45: Average annual plate cover for *Botrylloides violaceus* on monitoring collectors in southwest New Brunswick in 2015. P QB = Passamaquoddy Bay.

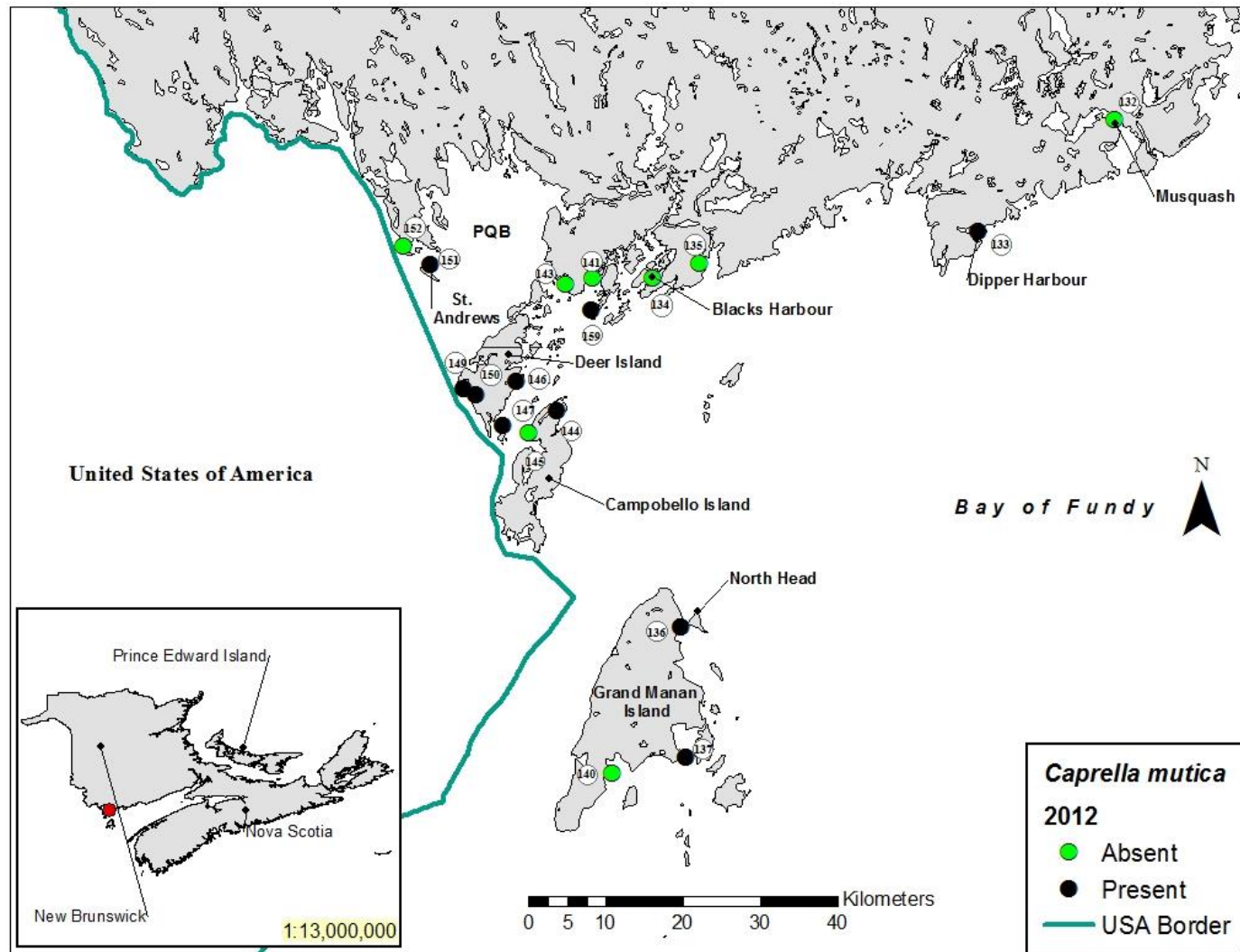


Figure 46: Presence of *Caprella mutica* in southwest New Brunswick in 2012. PQB = Passamaquoddy Bay.

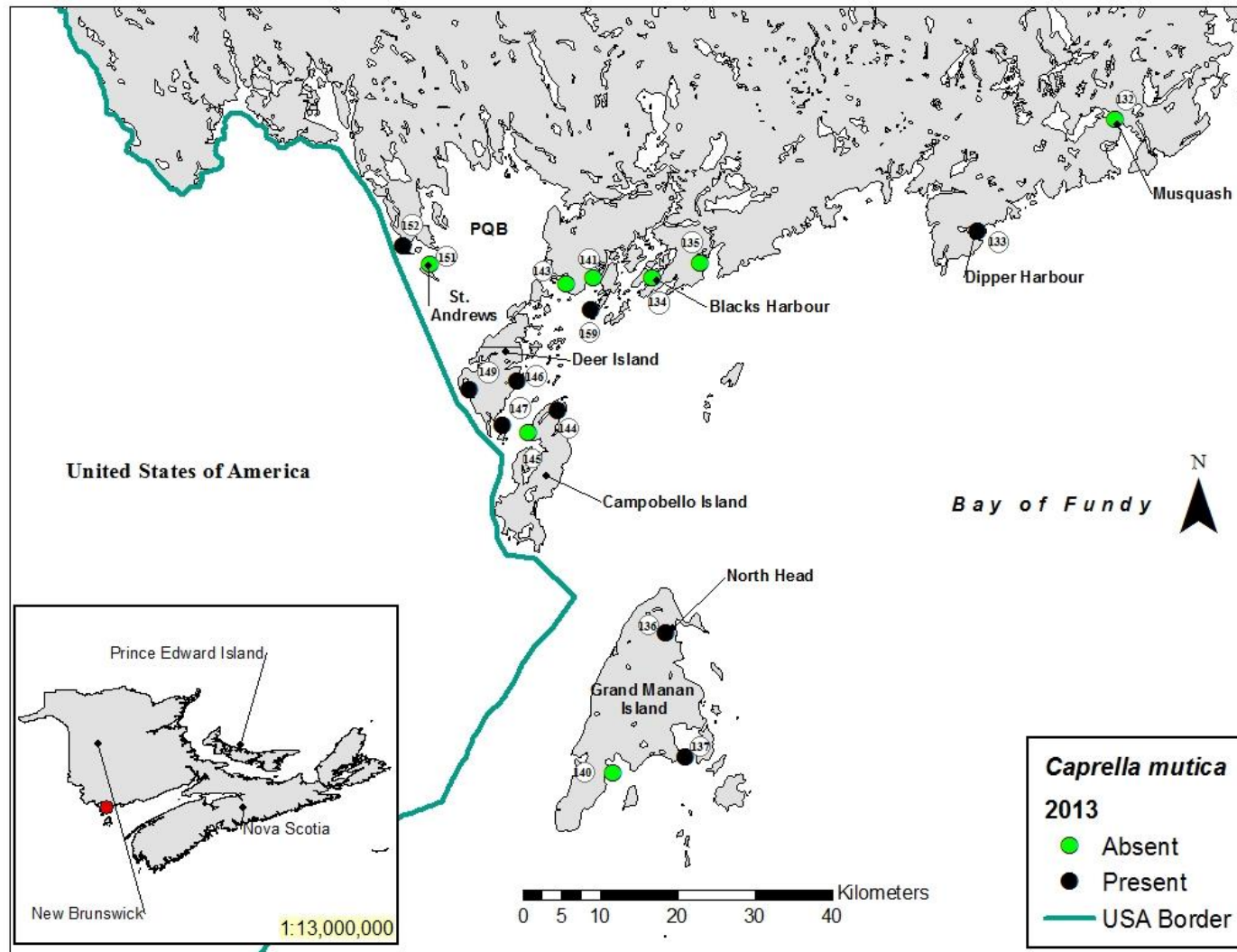


Figure 47: Presence of *Caprella mutica* in southwest New Brunswick in 2013. PQB = Passamaquoddy Bay.

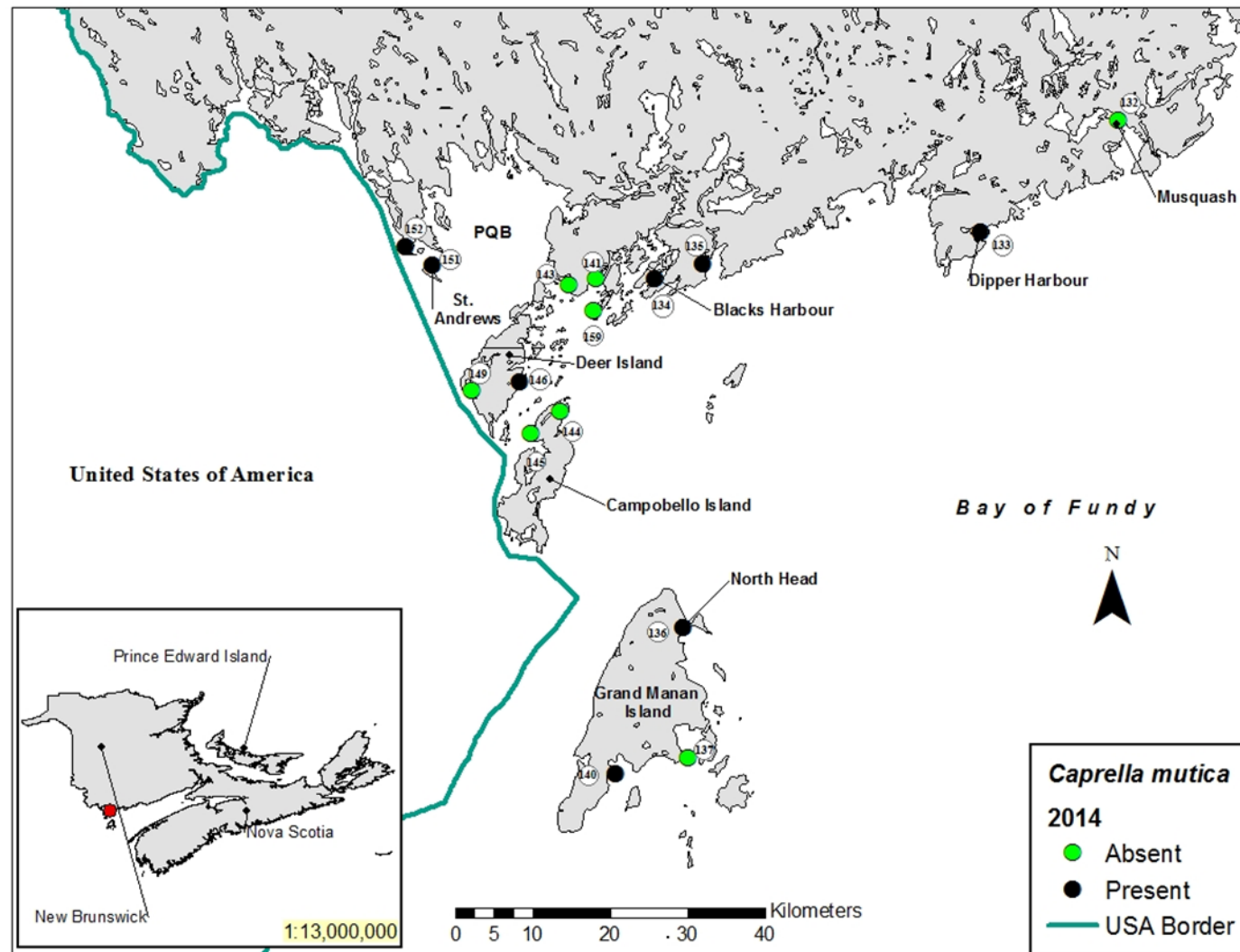


Figure 48: Presence of *Caprella mutica* in southwest New Brunswick in 2014. P QB = Passamaquoddy Bay.

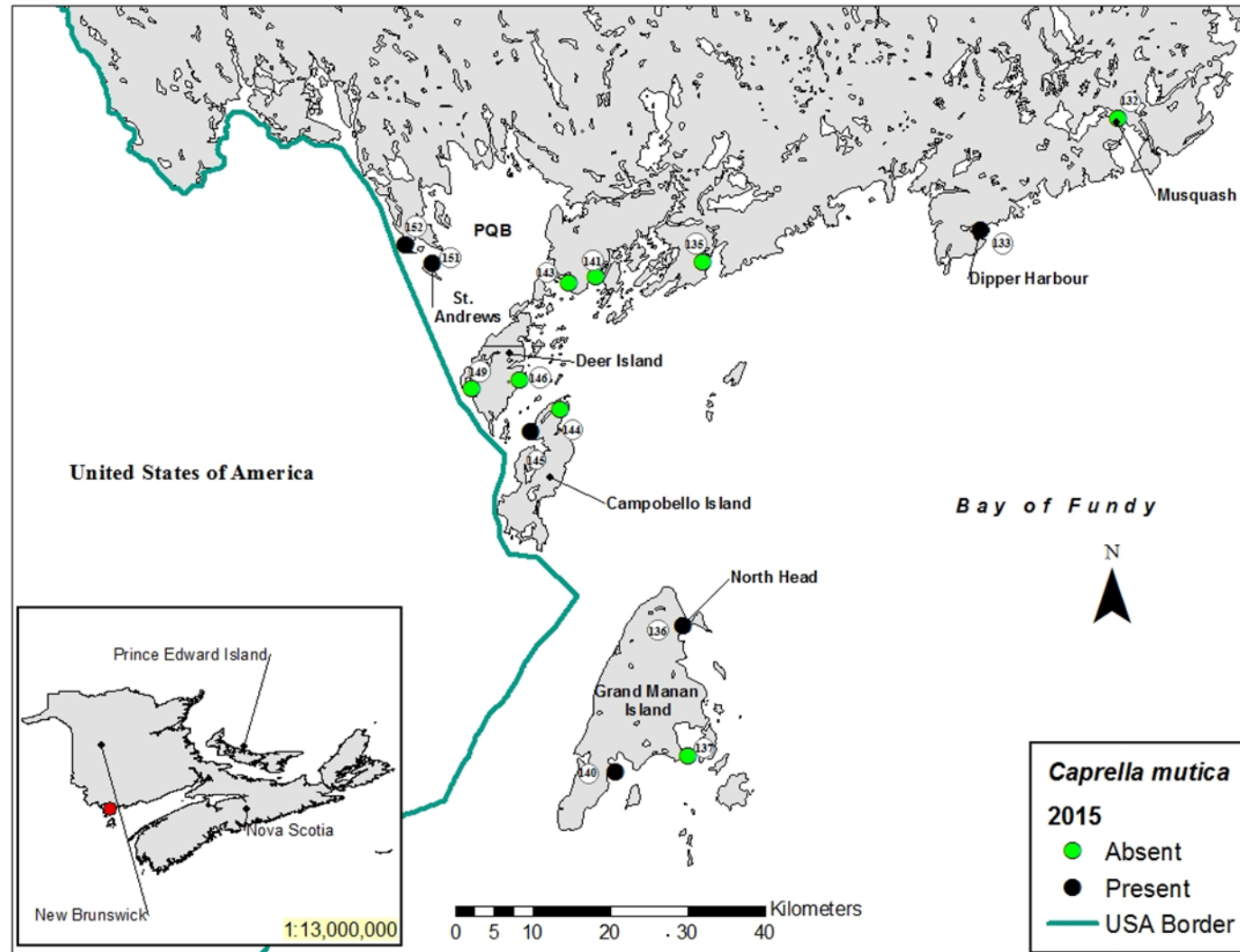


Figure 49: Presence of *Caprella mutica* in southwest New Brunswick in 2015. P QB = Passamaquoddy Bay.

3.2.3.2 *Membranipora membranacea*: The lacy crust bryozoan, *M. membranacea*, was present at 17 of 18 (94 %), 9 out of 17 (53 %), 9 out of 16 (56 %), and 7 out of 14 (50 %) of all monitoring sites in 2012, 2013, 2014, and 2015, respectively (Figures 50, 51, 52, and 53). *Membranipora membranacea* was present at all sentinel stations (n=17) in 2012. There was an alternating pattern of presence and absence for the years 2013 to 2015 at many sites and only three sentinel stations were consistently free of the bryozoan: Head Harbour (Stn 144) on Campobello Island, Ingalls Head (Stn 137) on Grand Manan Island and at coastal Back Bay (Stn 141). But *M. membranacea* was also consistently present, at nearby stations in the same areas, at Wilson's Beach (Stn 145) on Campobello Island, at North Head (Stn 136) on Grand Manan Island.

3.2.4 Annual and regional temperature trends

Temperature data were limited to two stations, SABS (Stn 152) and Head Harbour (Stn 144) in 2013, and to three stations, Head Harbour, Leonardville (Stn 146) and North Harbour (Stn 136) in 2015, so it is difficult to present year-to-year or regional trends.

In 2013, the mean monthly temperature was $>15^{\circ}\text{C}$ for 3 weeks at SABS, from the end of July to mid-August (Figure 54), while temperature at the Head Harbour station was lower, ranging from 10 to 14°C throughout the summer.

In 2015, mean monthly temperature was obtained at three stations, in three areas. Temperature at the Head Harbour station (Stn 144) on Campobello Island stayed within the 10 to 14°C range all summer, similar to 2013 (Figure 54), but without the mid-summer warming to 15°C observed in 2013. The Leonardville station (Stn 146) on Deer Island was slightly cooler than Head Harbour, with summer temperatures between 10 Temperature at North Head (Stn 136) on Grand Manan was a bit higher, notably in June (10°C) and reached 14 - 15°C for several days at the beginning and end of August and stayed warm $\sim 12.5^{\circ}\text{C}$ until retrieval on Oct. 20 (Figure 54). Temperature at North Head (Stn 136) on Grand Manan was a bit higher, notably in June (10°C) and reached 14 - 15°C for several days at the beginning and end of August and stayed warm $\sim 12.5^{\circ}\text{C}$ until retrieval on Oct. 20 (Figure 54).

Discrete temperature measurements taken at collector deployment and retrieval (Appendices 5 – 8) show variations in temperature in the region, however, most of these data are restricted to the coastal region from Musquash to SABS. Dipper Harbour (Stn 133) is usually 1 - 2°C colder than Beaver Harbour (Stn 135) from May to August in all years. Musquash (Stn 132) is consistently 3 - 4°C warmer than all of the swNB stations at deployment and retrieval times.

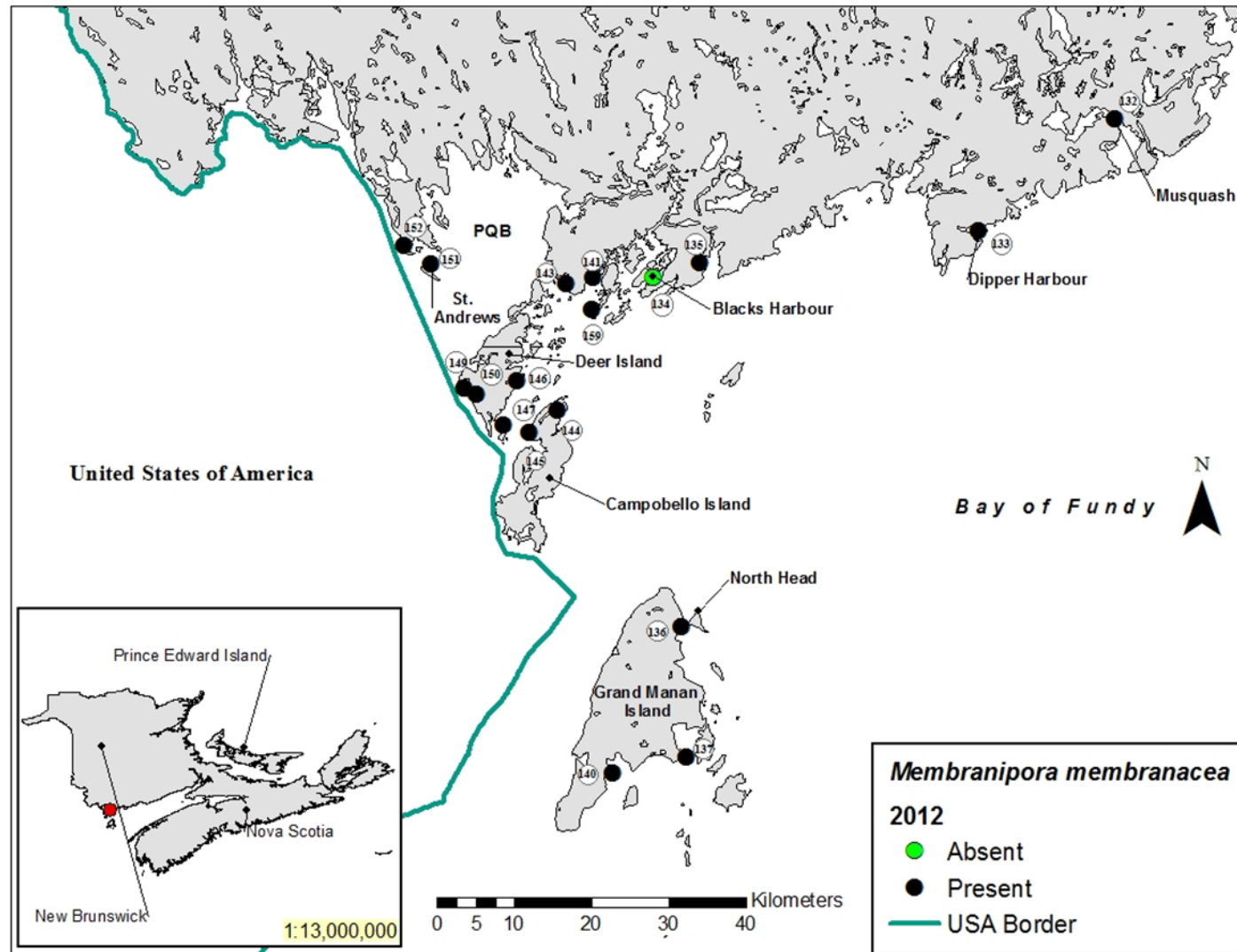


Figure 50: Presence of *Membranipora membranacea* in southwest New Brunswick in 2012. PQB = Passamaquoddy Bay.

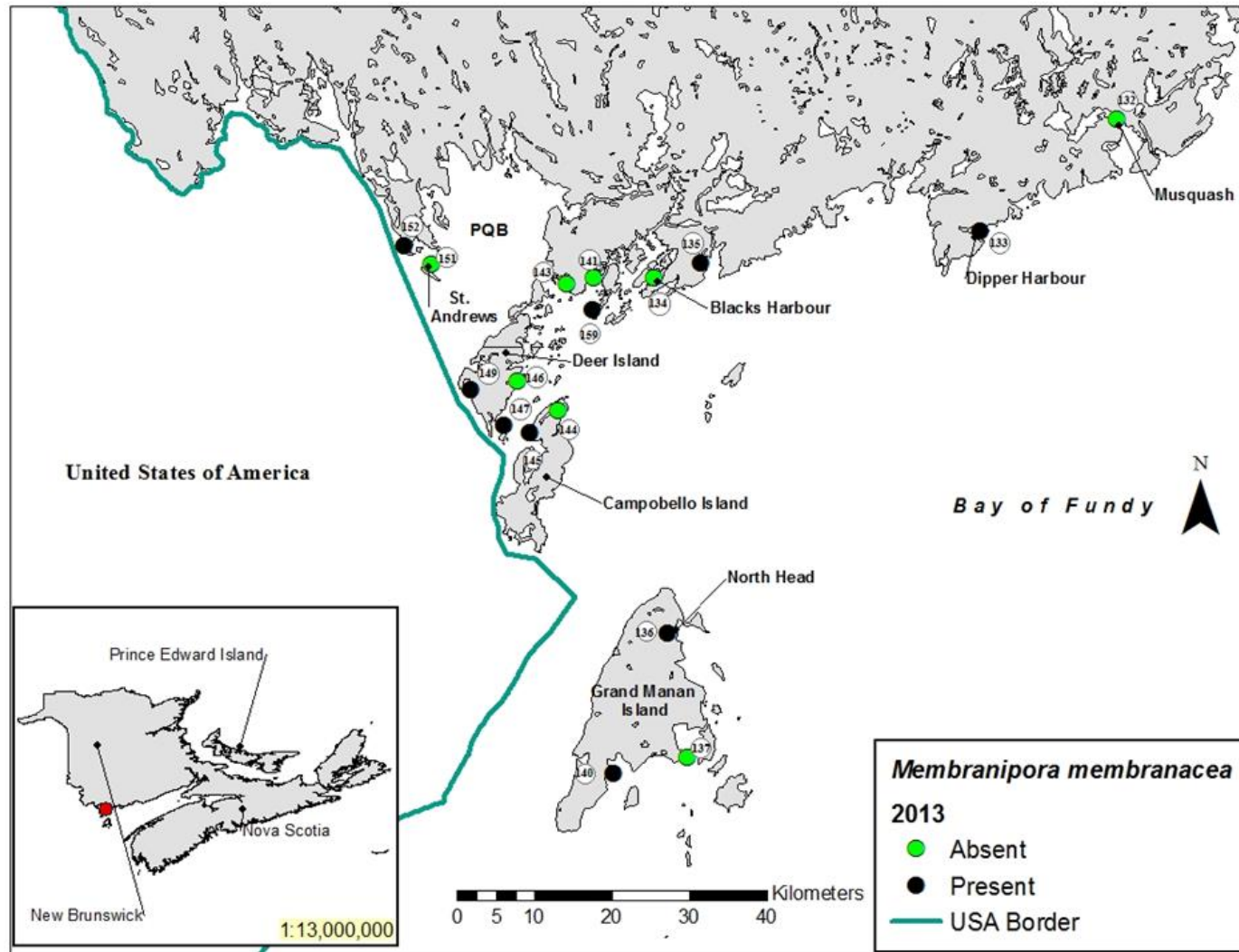


Figure 51: Presence of *Membranipora membranacea* in southwest New Brunswick in 2013. PQB = Passamaquoddy Bay.

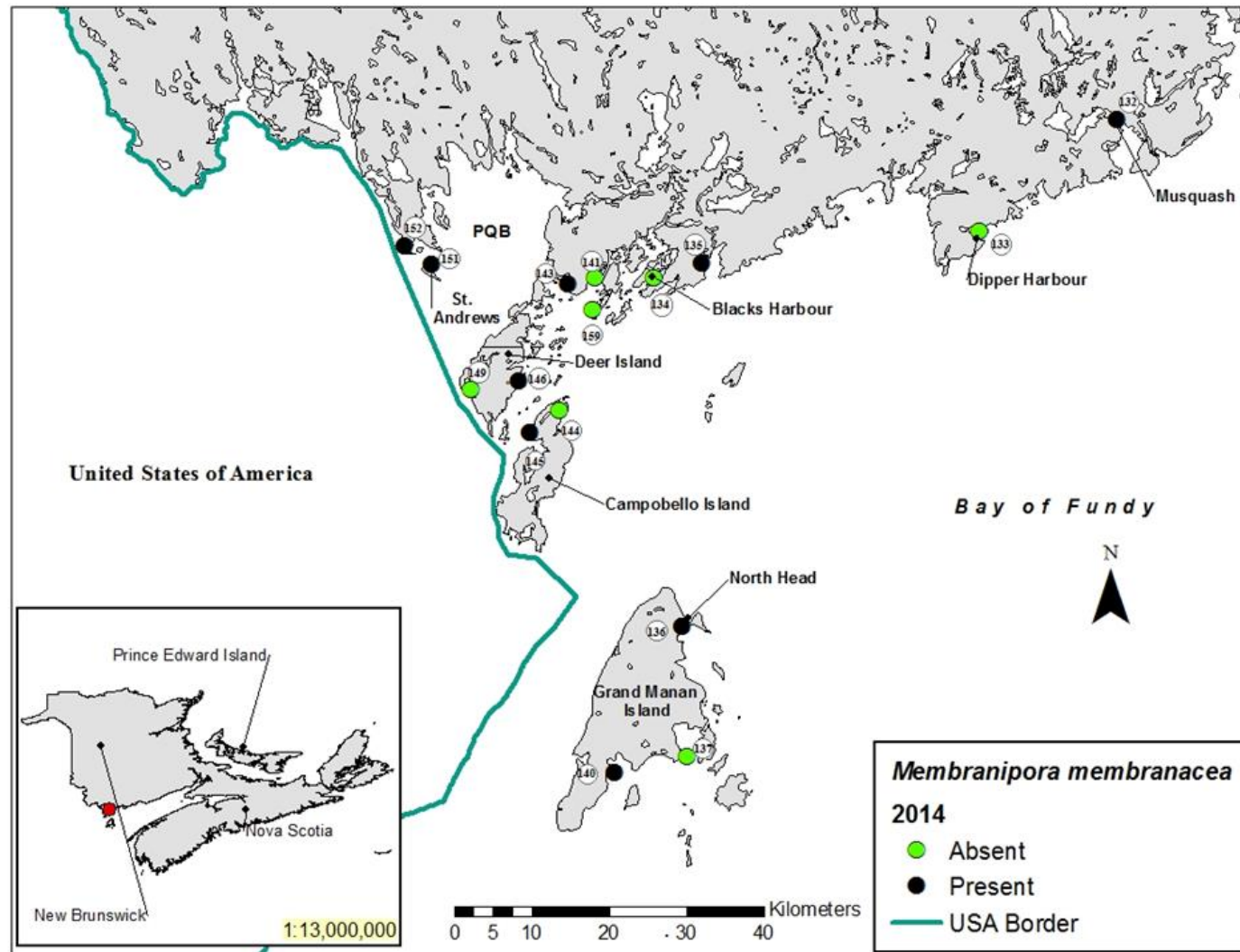


Figure 52: Presence of *Membranipora membranacea* in southwest New Brunswick in 2014. PQB = Passamaquoddy Bay.

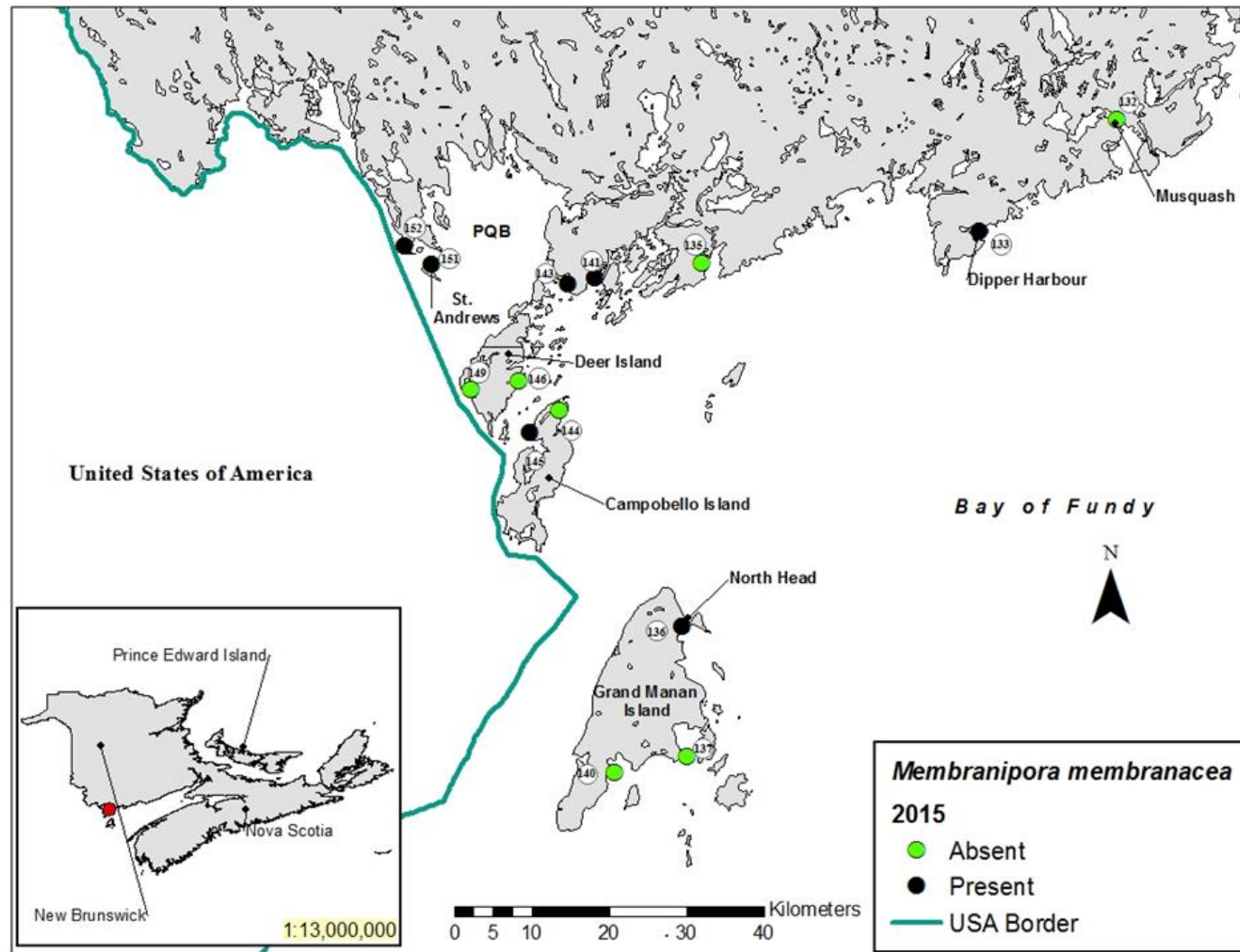


Figure 53: Presence of *Membranipora membranacea* in southwest New Brunswick in 2015. P QB = Passamaquoddy Bay.

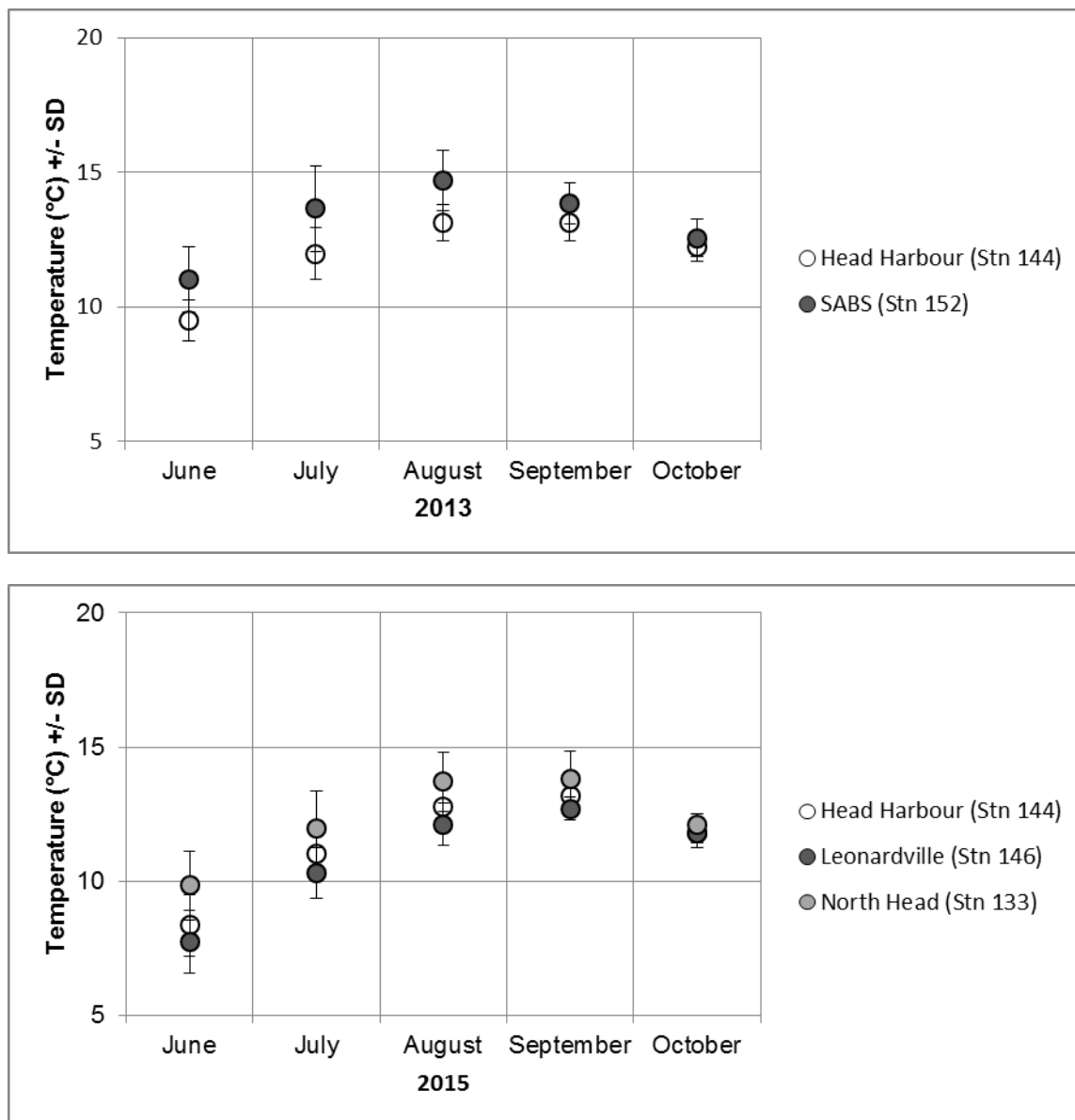


Figure 54. Mean monthly temperature ($^{\circ}\text{C} \pm \text{SD}$) at selected stations in southwest New Brunswick in (A) 2013, and (B) 2015.

4.0 DISCUSSION

4.1 TUNICATE PRESENCE, ESTABLISHMENT AND SPREAD, 2012 – 2015.

The results of annual biofouling monitoring conducted from 2012 through 2015 indicate that populations of one or more of *C. intestinalis*, *B. schlosseri* and *B. violaceus* are well established at many stations, and in all geographic regions monitored along the Atlantic coast of NS and in the Fundy Isles Region of swNB. Moreover, the presence of these species at monitoring stations has increased since the beginning of the program in 2006 (LeGresley et al. 2008; Martin et al. 2011; Sephton et al., 2011, 2014, 2015, 2016).

Presence of these species was highest in 2015, when *C. intestinalis* was present at 77% of all stations monitored and 76% of sentinel stations in NS, and 93% of sentinel stations in swNB. *Botryllus schlosseri* was present at 83% of all stations monitored and 96% of sentinel stations in NS and at 93% of sentinel stations swNB in 2015.

Botrylloides violaceus was less prevalent in both regions, but it has spread during the past decade and was present at 62% of all stations monitored and 65% of sentinel stations in NS, and 50% of sentinel stations in swNB in 2015.

Many of these populations, particularly those of *B. violaceus*, are small, and an alternating pattern of absence and presence is evident at several stations from year-to-year. This may be the result of the inability of the current monitoring protocol, based on the deployment of four or six monitoring collectors in a year per station, to detect the presence of very small tunicate populations (Moore et al. 2014). Year-to-year variation in the presence of these tunicates, and other NIS, may also reflect changes in environmental factors, such as temperature and salinity, which may influence the size of tunicate populations at monitoring sites. Specific examples of this phenomenon will be discussed separately for each province, but it is important to note that non-detection of an NIS in one year does not necessarily mean that that species has failed to survive and establish at that location following its introduction.

Discrete temperature, salinity and oxygen measurements taken during collector deployment and retrieval, as well as temperature data gathered hourly throughout the deployment periods in 2012 through 2015 at many stations indicates, however, that environmental conditions throughout swNB and along the Atlantic coast of NS are within the tolerance ranges of the most prevalent species (Carver et al. 2006a, b). Many locations are also within the tolerance ranges of the three new tunicate species detected in NS in 2012 (Moore et al. 2014): *A. aspersa* (MacKenzie, 2011a), *D. listerianum* (MacKenzie, 2011b) and *S. clava* (Clarke and Therriault 2007). While *D. vexillum* was detected and confirmed in benthic habitat offshore of Parrsboro, NS in 2013 (Moore et al. 2014) it has not yet been detected at any monitoring stations along

the coast of NS, or in swNB (Martin et al. 2011; Sephton et al. 2011, 2014, 2015, 2016) or in deeper offshore waters in swNB (Sephton and Vercaemer; 2015; Vercaemer et al. 2015). There are many locations where environmental conditions (Daniel and Therriault 2007; Lowen and DiBacco 2017) and substrate type (Therriault and Herborg 2007) are suitable for establishment of this species. Given the presence of multiple vectors for introduction and spread in both regions (Lacoursiere-Roussel et al. 2012a, b; Moore et al. 2014), *D. vexillum* now present will likely continue to spread. Furthermore, the introduction of new species (Locke 2009) may be inevitable in light of predicted climate change which may allow these species to establish in and spread to areas which at present are inhospitable (Lowen and DiBacco 2017).

4.1.1 Nova Scotia

4.1.1.1 Established species; *Ciona intestinalis*, *Botryllus schlosseri* and *Botrylloides violaceus*: *Ciona intestinalis* is present in all geographic regions monitored along the Atlantic coast of NS, although this tunicate species has not infiltrated the Bras d'Or Lake, probably due to its brackish nature (A. Moore, pers. comm). Its sporadic presence at St. Peter's, at the western end of the Lake and always in very low numbers (often <5 individuals), may be the result of a very small, yet resilient population adapted to the varying salinity at this location. It is also possible that this tunicate is subject to repeated introductions of limited success from near-by marine waters in Chedabucto Bay and Isle Madame, one of the "hot-spots" for this species (Carver et al. 2006a; Sephton et al. 2011). Its absence at this site in 2015 may also reflect non-detection by the current monitoring protocol.

Establishment and proliferation of *C. intestinalis* was first noted in several areas of NS in mid-1990's (Carver et al. 2003; Carver et al. 2006a); along the southwest and south shores, and in the Isle Madame area. The species still proliferates in these areas, along with others, such as Halifax Harbour (Sephton et al. 2011, 2014, 2015). It has now spread to new areas, such as the east shore, where it is present at Ship Harbour and at Cooper's Point, and a population is also now established at Caribou, on the north shore (R. Bernier, pers. comm.). Once established, tunicate species do not tend to disappear, but proliferate and spread when and where conditions are suitable.

Botryllus schlosseri has been present in NS waters for several decades (Carver et al. 2006b), and it is now widespread in NS. It is the dominant tunicate found in the Bras d'Or Lake, where it tends to reach high cover on monitoring plates and other submerged structures, possibly due to the higher water temperatures in August and September, compared with other regions. The absence of *C. intestinalis*, which usually settle in late spring-early summer on monitoring plates and prevent settlement of other species may also account for the heavy to very heavy cover of *B. schlosseri* on monitoring plates in the Lake.

While *Botrylloides violaceus*, first detected in NS in 2001 in the Lunenburg and Mahone Bay area (Carver et al. 2006b), is now present in all regions of NS and populations of this species are usually very small (i.e. low plate cover). It was detected for the first time in the Bras d'Or Lake at Baddeck in 2013 (Figure 15), and at three additional sites in 2014 (Figure 16). Recent research conducted on colonial tunicates in the Lake has revealed its presence at many locations (K. Ma, pers. comm). Again, it may not be detected from year-to-year at stations with very small populations (e.g. Shelburne, several stations in Halifax Harbour). This species has shown moderate to heavy cover at Dingwall in 2013 and 2015 and at North Sydney in 2012 on the Cape Breton Coast, and also at Port Bickerton in 2012, 2013 and 2014 on the east shore, and Lunenburg in 2013 and 2015.

4.1.1.2 New introductions: *Ascidiella aspersa*, *Diplosoma listerianum*, *Styela clava* and *Didemnum vexillum*: The presence of *A. aspersa* in Lunenburg Harbour from 2012 to 2014, and *S. clava* in Lunenburg Harbour and Halifax Harbour (Vercaemer and Sephton 2014) from 2012 to 2015, and also in Chedabucto Bay from 2013 to 2015 is indicative of establishment of these species following their introduction at these locations. *Ascidiella aspersa* has never been noted outside of Lunenburg Harbour and its approaches (Vercaemer et al., 2012), however, and it was not found on monitoring plates in 2015, so it is possible that this population has declined, and has so far been confined to this area. Spread of *S. clava* has not been noted outside of Lunenburg Harbour or Chedabucto Bay. It appears to be spreading within Halifax Harbour, however, with a report from Skull Cove (Stn 210, Figure 4), on the east side of the harbour, in 2014. Given the volume of commercial and recreational boating in these three locations (Moore et al. 2014), these species may spread to new locations in time.

Diplosoma listerianum has not been detected in NS since 2012, the warmest year of the four years between 2012 and 2015, when a few small colonies were found at one location in Lunenburg Harbour (Moore et al. 2014). It was first discovered in Canadian waters in 2008 in Harve-Aubert, Quebec, in the Magdalen Islands (Simard et al. 2013), but no colonies have been detected since then. While no colonies have been detected in PEI, water samples collected at Nine Mile Creek in 2011 tested positive for *D. listerianum* DNA (Ma et al. 2016). Dijkstra (2007a) describes its distribution as temporally variable on the east coast of the USA, and the same may be true of eastern Canadian waters, although this may change with sea water warming (Lowen and DiBacco 2017).

Didemnum vexillum has never been detected at coastal monitoring sites in NS on monitoring plates (Sephton et al. 2011, 2014, 2015, 2016), or on benthic groundlines deployed in 2015 and 2016, with the exception of a single colony found off Parrsboro in 2016 (a. Silva, pers. comm.). Surveys conducted in 2014 noted its presence in shallow

waters off Parrsboro, Digby and Yarmouth (Moore et al. 2014, Vercaemer et al. 2015). Lowen and DiBacco (2017) predict that *D. vexillum* may establish within the Northumberland Strait, Gulf of St. Lawrence, Strait of Canso and into Placentia Bay, Newfoundland, by 2075, based on ecological niche modelling.

4.1.2 Southwest New Brunswick

4.1.2.1 Established species; *Ciona intestinalis*, *Botryllus schlosseri* and *Botrylloides violaceus*: *Ciona intestinalis* and *B. schlosseri* are now well established in swNB, although the degree of infestation is much lower on average (Sephton et al. 2016) compared to the infestations seen in NS (Sephton et al 2011, 2014, 2015). Increase in their presence at monitoring stations have been noted consistently in swNB since 2006, particularly for *B. schlosseri*, second in dominance after with *C. intestinalis*, present at 36% to 81% of stations between 2006 to 2011 (Sephton et al. 2016). This species is now present at 93% of the sentinel stations, similar to *C. intestinalis* (Table 5).

Botrylloides violaceus was the least frequently recorded tunicate during the years 2012 - 2015; however, it has rapidly spread since its first detection in 2009 at Head Harbour, on Campobello Island (Sephton et al. 2016). It was not detected there in 2010, but at another station on Campobello: Wilson's Beach, and further afield at a coastal location; Beaver Harbour and it was present at these three sites in 2011. In 2012, spread was evident to a second coastal site; Dipper Harbour, and to Grand Manan at North Head. It was detected at three new locations in 2013, one of which was in a new area; Deer Island. In 2014, it appeared for the first time at Seal Cove on Grand Manan Island, and in 2015 it reached the St. Andrews area. Given that these are very small populations, the pattern of alternating presence/absence from year-to-year on monitoring plates has been evident at several stations, namely Beaver Harbour, Leonardville, Wilson's Beach and North Head. This type of stepping-stone spread, from one location to another nearby, or to different bays or regions in an area, may have resulted from the movement of commercial boats associated with the salmon aquaculture industry (Martin et al. 2011), or the transfer of gear and equipment from site to site. In addition, currents in the area have demonstrated potential (Chang et al. 2005) to move floating fragments of colonial tunicates, so it is not surprising that this species has spread quickly following its introduction. This highlights the need for continued monitoring at all sentinel sites in this region, in view of the potential for the introduction and spread of new tunicate species, including another colonial tunicate, *D. vexillum*.

4.1.2.2 Absence of *Styela clava*, *Asciidiella aspersa*, *Diplosoma listerianum*, and *Didemnum vexillum*: *Styela clava*, *A. aspersa*, *D. listerianum*, and *D. vexillum*, were not

detected in the region between 2012 and 2015 (Sephton and Vercaemer 2015), nor were they detected between 2006 and 2011 (Sephton et al. 2016). *Didemnum vexillum* is present in Eastport, Maine, only 1 km and 2 km from Deer and Campobello Island, respectively, and the native colonial tunicate, *D. albidum* is present in the area (Martin et al. 2011; A. Silva, pers. comm.). It is difficult to separate these two species based on morphological characteristics in this region, however, and genetic tissue analysis is necessary for reliable identification (Sephton and Vercaemer 2015) however. Analysis of about 30 tissue samples is pending, so it is possible that the presence of *D. vexillum* may be confirmed in swNB. *Didemnum vexillum*, along with *D. albidum* (A. Silva, pers. comm), is present in the Minas Basin of the upper Bay of Fundy (Vercaemer et al. 2015). As mentioned above, currents may spread this species from the Eastport area (Chang et al., 2005), and the dominant counter clockwise pattern of circulation in the Bay of Fundy (Aretxabaleta et al. 2008) has potential to move *D. vexillum* into this area from the upper Minas Basin. *Didemnum vexillum* remains a species of concern in this region, because of its negative effects on ecosystems elsewhere, and its potential for establishment and spread in the future (Lowen and DiBacco 2017) so monitoring efforts should continue.

Asciidiella aspersa, *D. listerianum* and *S. clava* are all present along the US east seaboard (Carmen et al. 2007; Moore et al. 2014), with potential spread to swNB and NS waters by commercial shipping and recreational boating. As well, *A. aspersa* and *S. clava* may be spread via commercial and recreational traffic from Lunenburg Harbour and Halifax Harbours and from Chedabucto Bay (Lacoursierre-Roussell 2012a; Moore et al. 2014). *Styela clava* has been present on mussel aquaculture leases in Prince Edward Island since 1998 (Clarke and Therriault 2007), and several pilot integrated multitrophic aquaculture (IMTA) in the Lime Kiln Bay area have been in operation for about a decade. Thus, there is opportunity for this species to be introduced through contaminated mussel seed or gear, although management through an established Introductions and Transfers permitting process in east Canadian waters (Locke et al. 2009) has minimized the risk of introduction via this vector.

Only the Musquash station (Five Fathom Harbour) continued to be free of tunicates as of 2015, probably because the station is located inland in the Musquash estuary where the tidal river Musquash meets the Musquash Harbour. This station is subject to high currents and siltation, and fluctuating salinity which ranged from 8.08 to 33.17 during the course of this work, conditions unsuitable for the establishment of tunicates (Carver et al. 2006a,b; Clarke and Therriault 2007; Daniel and Therriault 2007). *Membranipora membranacea*, the only fouling NIS detected at that station, was absent in 2015 when Musquash was notably warmer (3 – 4°C) than any of the stations at the June deployment. European green crab *Carcinus maenas* (Vercaemer and

Sephton, 2016) is present at Musquash so monitoring for NIS will continue here indefinitely because of its Marine Protected Area status.

4.2 VARIATIONS IN TEMPERATURE AND ANNUAL AVERAGE TUNICATE COVER, 2012 – 2015

Variation (i.e. “patchiness”) in the presence and cover of tunicates has been noted in previous monitoring in swNB (LeGresley et al. 2008, Martin et al. 2011, Sephton et al. 2016) and in NS (Sephton et al. 2011, 2014, 2015), and was evident at many stations during the course of this work (Appendices 1 – 4). While spatial variation may be accounted for by the placement of monitoring plates within a station and the fact that larval dispersal and settlement is restricted due to their short lifespan and limited swimming ability (Carver et al. 2006a, b; Kanary et al. 2009), seasonal patterns of settlement observed during different deployment periods and density of settlement (cover) may be influenced by environmental factors such as temperature (Carver et al. 2006a, b).

Temporal variation (year-to-year) in the cover (degree of infestation) of tunicates, as well as their presence or absence, has been noted previously from 2006 to 2011 (Sephton et al. 2015). The collection of hourly temperature data at many stations, and in all regions, during the course of this study allowed us to examine the effect of temperature on year-to-year variations in the prevalence of *C. intestinalis*, *B. schlosseri* and *B. violaceus*.

4.2.1 Nova Scotia

Of the four years, water temperature was warmest overall in 2012 (Figure 26), with highest mean monthly temperatures in August ranging from 17.17°C to 22.76°C (Appendix 9) in all regions. The second warmest year was 2015 (Figure 29), with mean monthly temperatures in August ranging from 17.22°C to 20.94°C (Appendix 9), however, June was a cooler month in 2015 compared to 2012, possibly a reflection of a colder winter in 2015. The third warmest year was 2014 (Figure 28), with mean monthly temperatures in August ranging from 16.64°C to 20.99°C (Appendix 9) in all regions, with the exception of the southwest shore, which warmed slowly to a peak of 15.85°C in September. Finally, 2013 (Figure 27) was the coldest year, with mean monthly temperatures peaking in August ranging from 14.74°C to 21.53°C (Appendix 9) in four regions only. Waters slowly warmed to a September peak (15.85°C) along the southwest shore, and an October peak in Halifax (13.46°C) and on east shore (13.03°C).

The seasonal and year-to-year maxima (and minima) and patterns of water temperature, may influence the intra- and inter-annual size of tunicate populations

(Carver et al. 2006a, b; Dijkstra et al. 2007a; McCarthy et al. 2007; Ramsay et al. 2009; Vercaemer et al. 2011;). The average annual cover of tunicates, used as a proxy for tunicate abundance in this study, at sentinel stations in Nova Scotia between 2011 and 2015 is shown in Table 12. Larger annual populations of *C. intestinalis* occur when larval recruitment and post-settlement growth in the spring and summer are enhanced by warmer water temperatures (Ramsay et al. 2009; Vercaemer et al. 2011). This was reflected by the greatest number of sentinel stations with moderate (Category 2), high (Category 3) and very high (Category 4) cover of *C. intestinalis* in 2015 (11 stations), the second warmest year overall. This occurred in all Regions, and followed the coolest May mean monthly temperatures (Appendix 9) of any year, followed by high temperatures in August and September. Cover also increased from 2014 to 2015 at seven stations (Table 12), reflecting the warmer summer to fall period in 2015 (Appendix 9). Cover was moderate or high at seven stations, and cover increased at five stations (in all areas) in 2013, the year following the warmest water conditions of the series in 2012, supporting the findings of Vercaemer et al. (2011) and Ramsay et al. (2009) that there can be a carry-over of thermal conditions from one year in the size of large tunicate populations the following year. Despite the fact that June (or July on the east shore) temperature means were low (9 - 15°C) in 2013, which may have contributed to later, lower larval recruitment, the absolute size of the over-wintering population from the summer and fall of 2012 resulted in the high coverages seen in 2013. Several stations (Digby, Halifax BIO and Dingwall) illustrate the pattern of increasing (or decreasing) annual cover lagging thermal conditions from year-to-year. At Digby, on the southwest shore, cover by *C. intestinalis* was high, low and moderate, in 2013, 2014 and 2015, respectively, reflecting the effect of the high 2012 temperature in 2013, the colder 2013 temperature in 2014, followed by a moderate summer in 2014, and a warmer summer in 2015, when tunicate cover increased. Indian Point, a sheltered mussel aquaculture lease on the south shore, continues to be the heaviest infested site, with heavy cover in 2012 and 2013 and very heavy cover in 2014 and 2015. Year-to-year increases in the population size of *C. intestinalis* has been observed for more than a decade at this site (Vercaemer et al. 2011; K. Murphy, pers. comm).

The cover of *B. schlosseri* was highest in 2013 (seven stations), followed by 2014 and 2015, (six stations each) (Table 12), in southwest and southern Nova Scotia and Cape Breton, only. Cover increased at four stations from 2012 to 2013, at one station from 2013 to 2014, and at three stations from 2014 to 2015. The increases at Wedgeport and Clark's Harbour on the southwest shore in 2013 and at Chester, on the south shore in 2014 may reflect thermal stability from summer through fall (Appendix 9). The increase in cover at Chester in 2014 may reflect warmer waters in July on the south shore, compared with other regions, while the increases observed at three sheltered stations (Meteghan, Yarmouth Bar and Port Mouton) reflect the warmest summer

Table 12: Average annual cover of *Ciona intestinalis*, *Botryllus schlosseri* and *Botrylloides violaceus* at sentinel stations in Nova Scotia in 2011 through 2015. nm = not monitored, P = present, sw = southwest, CB = Cape Breton. Categories for percent cover were: 0: (absent), 1: <25% (low), 2: 26-50% (moderate), 3: 51-75% (heavy), and 4: 76 – 100% (very heavy). Red and green lines indicate increasing and decreasing abundance trends, respectively. Dotted lines indicate trend unclear due to limited information in previous year. 1 = Designated as Isle Madame sentinel station, 2 = Designated as a sentinel station in 2014, 3 = Sydney sentinel station.

Region	Station	Stn #	<i>Ciona intestinalis</i>					<i>Botryllus schlosseri</i>					<i>Botrylloides violaceus</i>				
			2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
sw Shore	Digby	1	1	1	3	1	2	1	1	1	1	1	1	1	1	1	1
	Meteghan	2	2	2	1	2	2	1	1	1	1	2	1	1	1	1	1
	Yarmouth Bar	4	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1
	Eel Lake	108	0	1	0	1	0	0	1	1	1	0	0	0	0	0	0
	Wedgeport	6	nm	3	1	1	2	nm	1	2	2	2	nm	1	1	2	1
	Camp Cove	7	4	nm	2	2	3	1	nm	1	1	1	1	nm	1	1	1
	Clark's Harbour	8	1	1	1	1	1	1	1	2	2	1	1	1	1	2	1
south Shore	Shelburne	12	4	3	1	1	1	1	1	1	1	1	1	1	0	0	0
	Port Mouton	82	0	0	0	1	1	1	2	1	1	3	0	1	1	1	1
	Lunenburg	18	2	1	1	1	1	1	2	2	1	1	1	1	1	1	2
	Indian Point	19	2	3	3	4	4	1	1	1	1	1	1	1	1	1	1
	Chester	21	1	P	1	1	1	2	P	1	2	1	1	P	1	1	1
	Halifax BIO	24	1	1	2	1	2	1	1	1	1	1	0	0	1	2	1
	Ship Harbour	25	0	1	1	P	2	0	1	1	P	0	0	0	0	0	0
east Shore	Port Bickerton	30	nm	1	1	1	P	nm	1	1	1	P	nm	3	2	2	P
Chedabucto Bay	Venus Cove	41	1	nm	1	1	1	1	nm	1	1	1	0	nm	1	1	1
	Petit de Grat ¹	44	3	P	nm	3	3	1	P	nm	1	1	1	P	nm	1	1
	D'Escousse ¹	45	1	1	2	nm	nm	1	1	1	nm	nm	1	1	1	nm	nm
Bras D'Or Lake	Port Hawkesbury ²	182	nm	P	P	3	2	nm	P	P	1	1	nm	P	P	1	1
	St Peters	47	1	1	1	1	0	2	3	4	3	2	0	0	0	0	0
	Eskasoni	54	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0
	Baddeck	55	0	0	0	0	0	1	2	2	1	1	0	0	1	0	0
	Ben Eoin	169	nm	nm	0	0	0	nm	nm	3	2	2	nm	nm	0	0	0
CB Coast	Sydney RCBYC ³	62	1	1	nm	nm	nm	1	0	nm	nm	nm	0	0	nm	nm	nm
	Sydney DYC ³	190	nm	nm	nm	1	2	nm	nm	nm	0	0	nm	nm	nm	0	0
	North Sydney	63	1	1	2	1	1	1	1	1	1	1	2	2	1	1	1
	St Ann's Bay	75	0	nm	0	0	0	0	nm	0	0	0	0	nm	0	0	0
	Dingwall	69	1	2	3	1	4	1	1	2	2	1	1	1	2	1	2
Presence at Sentinel Stn			16	19	19	21	20	19	21	24	24	22	12	15	18	17	17
Nb of Sentinel Stn			22	22	25	26	26	22	22	25	26	26	22	22	25	26	26

temperatures observed in these regions in any year. Cover of *B. schlosseri* was often moderate, high or even very high at three of four stations monitored in the Bras d'Or Lake, a sheltered, inland waterbody where July, August and September water temperatures were consistently higher than in other regions. Of these, increases in cover at the St. Peters station in 2012 and 2013, followed by declines in 2014 and 2015 clearly reflect temperature patterns in the Bras d'Or Lake, with very high cover in 2013, following the warmest summer in 2012. Most of the declines in cover occurred in 2014, a cooler year following lowest temperatures in 2013.

While warmer water temperatures increase recruitment and growth in cold-temperate tunicate populations in spring through fall (Vercaemer et al. 2011; Ramsay et al. 2009), winter water temperatures also influence the distribution (Therriault and Herborg 2008) and size of tunicate populations. Vercaemer et al. (2011) noted that winter temperatures were as important as summer temperatures in determining peaks of recruitment and growth leading to outbreaks of *C. intestinalis* at Indian Point on the south shore of NS. Lower winter water temperatures result in increased die-off of adult tunicates, and depress and delay gonad maturation and spawning by survivors, resulting in lower spring recruitment. If lower summer temperatures follow, recruitment may be further depressed and slower growth may result in smaller summer- fall, and overwintering, populations. Conversely, warmer summer temperatures result in larger populations, and extended recruitment periods into the winter months. If a warmer summer - fall is followed by a warmer winter, there may be increased recruitment in the following year, as was the case at Indian Point in 2008, when warm winter water temperatures, followed by higher peaks in summer temperature resulted in an "outbreak" of *C. intestinalis* (Vercaemer et al. 2011). Unfortunately, winter temperature was not recorded during the winters of 2012 to 2015 at any of the monitoring sites, however, the winter of 2014 - 2015 was colder, based on colder May temperatures in 2015, than the previous three winters. But while tunicate die-off and/or late maturation and delayed recruitment in the spring, may have occurred, warming waters to the second highest summer maxima of this series in August, followed by a warm September, allowed tunicate populations to rebound to moderate and high levels in all regions in 2015 (Table 12).

Cover of *B. violaceus* was low to moderate at most stations in most years in all areas, but increases in cover (to moderate) were noted at four station in 2014, followed by declines in 2015. Three of these stations were on the southwest shore (Yarmouth Bar, Wedgeport and Clark's Harbour), where temperatures peaked in September in 2014, and the 4th was in Halifax. The subsequent decline in cover of *B. violaceus* at three of these stations in 2015 occurred as cover by another species increased. Prevalence of *B. violaceus* was also low at most stations in 2015, and while spring through fall water temperatures were higher in 2015 compared with 2014, the harsher

winter of 2014-2015 may have delayed its recruitment. The heavy cover of *B. violaceus* observed at Port Bickerton on the east shore in 2012 may be the result of mid-summer temperatures in the range of 15°C, however summer temperatures in this region were higher in 2014 and 2015, when cover was moderate.

It is important to note that temperature alone does not determine tunicate abundance, as environmental conditions such as salinity, current, shelter and dissolved oxygen and organic matter (Bullard and Whitlatch, 2009; Carver et al. 2006a, b; Clarke and Therriault, 2007; Daniel and Therriault, 2007; Epelbaum et al., 2009;) also influence the size and dynamics of tunicate populations. Therriault and Herborg (2008) created an environmental niche model based on the documented Canadian distribution of *C. intestinalis* and found that temperature and salinity contributed 46.4% and 30.7% to the predictive nature of the model. Many of the stations monitored in Nova Scotia are located in sheltered areas, and many coastal stations experience variable or lower salinities, such as in the Bras d'Or Lake (Sephton et al. 2011, 2015, 2016). Stations in the Bay of Fundy, and on the southwest shore may experience increased water movement and higher current speeds due to vigorous tidal action (Chang et al., 2005; Brewer-Dalton et al. 2014).

The importance of consistent, year-to-year monitoring is evident in the lack of data from the east shore, Chedabucto Bay and the coast of Cape Breton. Not only is monitoring of tunicate populations important, but the collection of hourly temperature data through the monitoring period and through the winter will improve the clarification of tunicate population dynamics, as well as improve year-to-year predictions of abundance based on temperature, which may inform monitoring and management efforts. The collection of environmental data should also be focused on regions at high risk for tunicate introduction and impact, including the southwest shore of NS, Lunenburg and Halifax Harbours and Chedabucto Bay (Moore et al. 2014; Vercaemer et al. 2015).

4.2.2 New Brunswick

Hourly, spring-to-fall temperature data were only collected at two stations, in two areas in 2013, and at three stations, in three areas in 2015 (Figure 54, Appendix 10). Of these, Head Harbour (Stn 144), on Campobello Island, was monitored in 2013 and 2015. Monthly mean temperatures here ranged from 9.5 to 13.0°C in 2013 and 11.0 to 14.7°C in 2015, at this well protected location. While there are insufficient data to make year-to-year comparisons, in general, temperatures in southwest NB (fishing area 4Xs) and the southwest shore of NS (fishing area 4Xq) have similar thermal patterns and the smallest ranges of monthly temperature extremes (Brewer-Dalton et al. 2014).

Temperature data from 2012 to 2015 from the southwest shore of NS (Appendix 9) indicate that 2015 was the warmest year, followed by 2012, 2014 and 2013. Based on

May and June means, 2012 was the warmest winter, while the coldest winter occurred in 2013, with warmer winters in both 2013 and 2014.

Similar to NS waters, the influence of higher and year-to-year changes in water temperature on average annual cover of tunicates between 2011 and 2015 was evident at the 14 sentinel stations monitored in swNB (Table 13). The highest covers of *C. intestinalis* observed during this study were indeed observed in 2012 (three stations), thought to be the warmest year, and in 2015 (two stations) another warm year. The moderate (L'Etete) and high (SABS) cover observed in 2013, the year thought to have the coldest winter and summer, may reflect regional temperature differences, as sheltered, coastal locations in swNB (Appendices 5 – 8) and stations in mid-Passamaquoddy Bay have higher temperatures (Robinson et al., 1995; Martin et al. 2006). However, highest, and increasing cover of *B. schlosseri* was also noted at four stations in 2013, three outside of Passamaquoddy Bay, where water may be cooler (Robinson et al, 1995; LeGresley et al. 2008). *Botrylloides violaceus* was also detected at three new stations in 2013, in separate areas of swNB. While it is inappropriate to predict annual temperature for an entire region based on data collected at one station, evidence of a warmer year in 2013 at Head Harbour, coupled with increasing cover and new records of tunicate species may indicate that temperature played an important role in 2013. The effects of other environmental factors cannot be ignored in swNB, however, or in any region for that matter. Musquash (Stn 132) is consistently 3 - 4°C warmer than the other swNB stations at deployment and retrieval times (Appendices 5 - 8), but high variations in salinity, tidal flushing and heavy siltation preclude the establishment of tunicates there.

Tunicate cover has declined, however, in swNB since 2011; with only one station with moderate cover of *C. intestinalis* in 2014, and two in 2015, and only low cover of *B. schlosseri* in 2014 and 2015. Tunicate cover in this region was generally low and may be sporadic from year-to-year, so it is difficult to accurately describe trends in abundance. While summer water temperatures on the south shore of NS may reach 20°C or greater, temperatures in swNS and the Bay of Fundy often remain around 15°C due to vigorous tidal mixing and upwelling (Brewer-Dalton et al. 2014), conditions not conducive to the development of large tunicate populations, except in warmer, sheltered, coastal areas. Many of these locations, such as Back Bay, L'Etete and Fairhaven, are sites for salmon aquaculture, so the presence of increased nutrients (Lander et al., 2004) may result in larger tunicate populations (LeGresley et al. 2008).

Temperature data collected in 2015 (Figure 54, Appendix 10) reflect regional differences in the region. Water temperatures at Leonardville, on Deer Island, were lower than at Head Harbour, on Campobello Island, from June through September, while temperature at North Head, on Grand Manan Island, was highest of the three

Table 13: Average annual cover of *Ciona intestinalis*, *Botryllus schlosseri* and *Botrylloides violaceus* sentinel stations in southwest New Brunswick in 2011 through 2015. sw = southwest, I = Island. Categories for percent cover were: 0: (absent), 1: <25% (low), 2: 26-50% (moderate), 3: 51-75% (heavy), and 4: 76-100% (very heavy). Red and green lines indicate increasing and decreasing abundance trends, respectively.

Region	Station	Stn #	<i>Ciona intestinalis</i>					<i>Botryllus schlosseri</i>					<i>Botrylloides violaceus</i>				
			2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
sw NB	Musquash	132	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dipper Harbour	133	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1
	Beaver Harbour	135	2	1	1	2	2	1	1	2	1	1	1	1	1	1	1
	Back Bay	141	3	1	1	1	1	1	1	1	1	1	0	0	1	1	1
	L'Etete	143	1	1	2	1	1	1	1	1	1	1	0	0	0	0	0
	St. Andrews	151	2	1	1	1	1	1	1	1	1	1	0	0	0	0	0
	SABS	152	2	2	3	1	1	1	1	1	1	1	0	0	0	0	1
Deer I.	Fairhaven Dock	149	1	3	1	1	1	1	1	2	1	1	0	0	0	0	0
Campobello I.	Leonardville	146	2	2	1	1	1	1	1	1	1	1	0	0	1	1	0
	Head Harbour	144	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1
Grand Manan I.	Wilson's Beach	145	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
	North Head	136	1	1	1	1	1	1	1	2	1	1	0	1	1	0	0
	Ingalls Head	137	1	1	1	0	1	1	1	2	1	1	0	0	1	1	1
	Seal Cove	140	0	1	1	1	1	1	1	1	1	1	0	0	0	1	1
Presence at 14 Sentinel Stations			12	13	13	13	13	13	13	13	13	13	3	5	8	7	7

stations monitored. Temperature was similar at all three stations in October, possibly reflecting vigorous mixing of waters with fall storm events and fall turnover. The higher temperatures recorded at North Head do not support the contention that water temperature on Grand Manan Island, which is farthest offshore and the least sheltered, may be lower compared with coastal stations and with Passamaquoddy Bay (LeGresley et al 2008). Cover of *C. intestinalis* was moderate at Beaver Harbour, a warmer coastal location, and increased to moderate at Head Harbour in 2015. It was also found at Ingalls Head in 2015, following non-detection in 2014.

4.3 APPEARANCE OF NEW TUNICATE SPECIES

Three new AIS were first detected in NS during the summer of 2012 (Moore et al. 2014); *A. aspersa*, *S. clava*, and *D. listerianum*. All were detected in high traffic areas; all three species in Lunenburg Harbour, and *S. clava* in Halifax Harbour, and in the year that was the warmest of the four years described in this report. Lower water temperatures in 2013 may have been responsible for *D. listerianum* not surviving its first winter in Lunenburg, and this species was not found in NS in 2013, 2014 and 2015. *Styela clava* was detected for the first time in a third, high traffic area: Chedabucto Bay in 2013, although it is likely, based on its distribution, and unconfirmed reports that it was present in 2012 as well. A fourth new AIS, *D. vexillum* was also confirmed as present in NS in the upper Bay of Fundy in 2013, but again, based on its distribution, population size and unconfirmed reports, it has likely been present there as early as 2011.) Subsequent survey and monitoring efforts indicate that *A. aspersa* has not spread beyond the Lunenburg area, and that *D. vexillum* is present only in the upper Bay of Fundy, and at one location off Digby and off Yarmouth, NS (Sephton and Vercaemer 2015; Vercaemer et al. 2015). None of these new AIS have been detected in swNB up to and including 2015 (Sephton et al. 2016).

The Atlantic coast of NS and swNB remain at risk of invasion by these four species, and additional species on the “watch list” (Locke 2009), given that vectors of introduction and environmental conditions are conducive to the survival and establishment of these species, now and in the future (Lowen and DiBacco 2017). While 2013 and 2014 were cooler years, 2015 was characterized by summer water temperatures higher than, or comparable to, 2012, followed by a warm winter, conditions conducive to the establishment and spread of new AIS. Indeed, the summer of 2016 was also warm (A. Silva, pers. comm.) and *A. aspersa* was detected for the first time beyond Lunenburg Harbour at Shelburne, a high traffic port on the south shore of NS. A second species, *D. listerianum* was detected for the first time in swNB at nine of 14 stations monitored in all areas.

4.4 DISTRIBUTION OF NON-TUNICATE BIOFOULERS; *Caprella mutica* and *Membranipora membranacea*

Caprella mutica increased in presence to about 50% of monitoring stations throughout NS from 2012 to 2015, and it was present at 44 - 55% of monitoring sites in swNB. Its distribution is often sporadic in time and space, and although there are locations in both NS and swNB where it has not yet been recorded, there is potential habitat available (Turcotte and Sainte-Marie, 2009). To date, no impact of this AIS on communities and ecosystems has been identified, however (Turcotte and Sainte-Marie, 2009).

Membranipora membranacea, was present at fewer than 50% of monitoring stations recorded locations throughout NS in 2012 to 2015, but it was more prevalent in swNB, declining from being present at 94% of all stations in 2012, to 50 - 56% of stations in 2013 to 2015. Similar to *C. mutica*, its presence was sporadic from year-to-year at many sites, and in many areas in both regions. Environmental conditions in coastal Maritime waters are within the tolerance range of this species (Burridge 2012), so it may spread to new locations it has beyond its initial point of introduction on the south shore (Scheibling et al. 1999; Watanabe et al. 2010). This species threatens coastal habitats through destruction of native kelp beds and replacement of native species AIS such as *Codium fragile fragile* (Schiebling and Gagnon 2006; Schmidt and Scheibling 2007).

While the focus of DFO's AIS Monitoring program are invasive tunicates, these two species, and others, will remain on the list of species monitored annually, due to their potential or demonstrated negative effects on native communities, ecosystems and fisheries. Juveniles of the European green crab, *Carcinus maenas*, have been observed frequently on monitoring collectors, seeking refuge on heavily infested plates. Monitoring of this highly invasive crustacean is ongoing (Vercaemer and Sephton 2016) particularly in areas beyond Maritimes Region at the front of the invasion in Quebec and Newfoundland (N. Simard and C. MacKenzie, pers. comm). *Codium fragile fragile* has also been observed sporadically on collectors and on nearby structures. Another non-indigenous, algal species, *Heterosiphonia japonica*, has been included in monitoring efforts since its detection in 2012 in the Mahone Bay area (Savoie and Saunders 2013).

5.0 SUMMARY AND CONCLUDING REMARKS

5.1 NOVA SCOTIA

Biofouling monitoring conducted along the Atlantic coast of Nova Scotia between 2012 and 2015 allowed the following conclusions:

- The non-indigenous tunicates *Ciona intestinalis*, *B. schlosseri* and *B. violaceus* are well established throughout the region.
- *Ciona intestinalis* was present at many stations and in many areas of the province, and its cover was higher in general than the colonial tunicates.
- *Botryllus schlosseri* was the dominant tunicate in NS, and usually the only tunicate present in the Bras d'Or Lake, and while its cover was often low or moderate, it was found at high and very-high cover at St. Peter's.
- *Botrylloides violaceus* is increasing spatially, and although its cover was low at most locations, there were several stations in a few regions where its cover was moderate or high.
- Of the three, new species of non-indigenous tunicates detected on monitoring plates in 2012, *D. listerianum* does not appear to have established. *Asciidiella aspersa* appears to be confined in low cover to Lunenburg Harbour and its approaches, and this species was not detected on monitoring plates in 2015. *Styela clava* is also present in this area, as well as in Halifax Harbour, where it may be spreading, and in Chedabucto Bay, where it was found at three locations.
- *Didemnum vexillum*, present in the Minas Basin and at two additional locations in the Bay of Fundy, has never been detected on coastal monitoring plates in Nova Scotian waters.
- 2012 was the warmest year, followed by 2015, when temperatures were higher in summer and fall. 2013 was the coldest year of all, while 2014 was an intermediate year in terms of temperature. Cover by *C. intestinalis* was highest in 2015, when summer temperatures were highest on the southwest and south shores of NS, followed by 2013, reflecting the effects of the thermal regime in 2012. Cover by *B. schlosseri* was also highest in 2013, followed by 2014 and 2015. Cover of this species mirrors temperature trends in the Bras d'Or Lake, where it is often the only species present. Cover of *B. violaceus* was also highest in 2014, declining in 2015.
- *Caprella mutica* and *Membranipora membranacea* were present at about half of all monitoring sites in all areas of NS.

5.2 SOUTHWEST NEW BRUNSWICK

Biofouling monitoring conducted in southwest NB between 2012 and 2015 has enabled the following conclusions:

- The non-indigenous tunicates *Ciona intestinalis* and *B. schlosseri* are well established throughout the region, as are *Caprella mutica* and *Membranipora membranacea*.
- *Botrylloides violaceus* is increasing spatially, although its cover was low, and often small, single colonies only were observed on monitoring plates.
- Cover of *C. intestinalis* was higher in general than that of colonial tunicates (low cover), but it decreased from 2012 to 2015 at most stations. Moderate cover was only seen at two stations in 2015: Beaver Harbour and Head Harbour.
- Limited temperature data collected in 2013 and 2015 show that 2013 was warmer than 2015 at one station; Head Harbour. Temperature data collected in 2015 show that Leonardville was the coldest station, Head Harbour was a bit warmer, and North Head, on Grand Manan Island was warmest of the three. Cover of *C. intestinalis* was highest in 2012, 2013 and 2015. Cover of *B. schlosseri* was highest in 2013, and *B. violaceus* was detected for the first time at three new stations in that year. While temperature data to explain the rise in tunicate cover in 2013 are lacking, this region may have experienced temperature increases.
- Only the monitoring station at Musquash was free of non-indigenous tunicates, but *M. membranacea* is present here.
- *Didemnum vexillum* and *Styela clava*, present in nearby waters, have not yet been detected in the area, but there is a risk of introduction and spread for both species given the presence of suitable habitat and vectors of introduction.
- *Caprella mutica* and *Membranipora membranacea* were present at about half of all monitoring sites in all areas of swNB.

5.3 GENERAL RECOMMENDATIONS FOR FUTURE MONITORING

The following recommendations should be addressed in future work on the Atlantic coast of Nova Scotia and in southwest New Brunswick (DFO Maritimes Region):

- Given the high risk of introduction of invasive tunicates to DFO Maritimes Region waters, based on:
 - the presence of several vectors of introduction and spread,
 - the presence of established populations of *Didemnum vexillum* and other species along the US east seaboard and the Gulf of Maine, and
 - the high connectivity between these regions,
 biofouling monitoring should continue at all sentinel stations.
- High traffic ports, such as Lunenburg, Halifax and Point Tupper in Chedabucto Bay, all of which receive commercial and recreational vessels from international waters, should be targeted for the detection of new AIS. Detection efforts in these areas should employ a suite of techniques, including monitoring devices

such as collector plates and ground lines, and rapid assessment techniques (e.g. buoy surveys).

- The deployment of additional monitoring collectors during Second and Full deployment periods should be considered to facilitate the detection of small tunicate populations at many stations.
- Hourly water temperature and salinity data should be collected at all sentinel stations, where possible, or at least at one station in each area, for example at single stations on Deer, Campobello and Grand Manan Islands in swNB. These data may clarify trends in the dynamics and distribution of AIS, and inform prediction, management and mitigation.
- Due to the high likelihood of the introduction and establishment of *D. vexillum* in the abundant, suitable habitat in the Bay of Fundy and along the Atlantic coast of Nova Scotia, alternate monitoring devices, such as ground-lines, should be deployed to strengthen and expand detection efforts for this species.
- If integrated multi-trophic aquaculture and shellfish aquaculture develops in southwest NB, it will be important to expand monitoring efforts as new sites are approved, due to the risk of introduction of *S. clava* from other aquaculture areas.
- The list of NIS subject to monitoring should be updated regularly in collaboration with researchers and biologists from within DFO Maritimes, Region, other DFO Regions and US Institutions in the Gulf of Maine.
- Greater integration of monitoring and research activities, and the promotion of working partnerships with other levels of government, academia, industry and the general public should be fostered in order to improve early detection of new AIS, and better understand the biology, ecology and effects of new and established AIS.

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Appendix 1. Details of monitoring and tunicate cover on individual monitoring collectors at each station and as reports of presence in 2012. Stations are grouped by geographical Region or Bay. Species cover are given for top, middle and bottom plates (x, y, z), and Petri dishes (a,b,c) where 0 = no tunicate cover, 1 = <25%, 2 = 26 - 50%, 3 = 51 - 75%, and 4 = 76 - 100%. Minilog, HOBO or CT2X thermistors (purple text) were deployed at some stations. NA = not applicable, C.i. = *Ciona intestinalis*, B.s. = *Botryllus schlosseri*, B.v. = *Botrylloides violaceus*, A.a. = *Ascidella aspersa*, S.c. = *Styela clava*, D.I. = *Diplosoma listerianum*, D. v. = *Didemnum vexillum*, P = Present, A = Absent, * = tunicate present at station, but not on monitoring collector.

Region	Stn. No.	Location	Monitor. By	Deployment Dates	Deploy. Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a. cover	S.c. cover	D.I. cover
Bay of Fundy	148	Tiverton Petri Collector	DFO	First (31 May – 8 Aug.)	69	0,0,1,0,0,0	1,1,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (31 May – 8 Aug.)	69	0,0,0,0,0,0	1,0,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (8 Aug. -11 Oct.)	64	1,0,0,0,0,0	0,0,0,1,1,1	0,0,0,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (8 Aug. -11 Oct.)	64	0,0,0,0,0,0	1,0,1,1,0,1	0,1,0,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (31 May – 11 Oct.)	133	lost	lost	lost	lost	lost	lost
				Full (31 May – 11 Oct.)	133	0,0,0,0,0,0	0,1,1,1,1,3	0,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	415	Sandy Cove East	DFO	Report (Oct. 2012)	NA	P	ND	ND	ND	ND	ND
	1	Digby Reg. Collector HOBO	CARP	First (12 June - 10 Aug.)	59	1,1,1	2,2,2	0,1,1	0,0,0	0,0,0	0,0,0
				First (12 June - 10 Aug.)	59	1,1,1	1,1,4	0,1,0	0,0,0	0,0,0	0,0,0
				Second (10 Aug. - 2 Oct.)	53	0,1,1	1,2,2	1,0,1	0,0,0	0,0,0	0,0,0
				Second (10 Aug. - 2 Oct.)	53	0,1,1	1,2,1	0,1,0	0,0,0	0,0,0	0,0,0
				Full (12 June - 2 Oct.)	112	1,1,0	0,3,0	0,0,1	0,0,0	0,0,0	0,0,0
				Full (12 June - 2 Oct.)	112	4,2,4	1,1,1	2,1,0	0,0,0	0,0,0	0,0,0
Southwest shore	2	Meteghan Reg. Collector HOBO	DFO	First (23 May - 8 Aug.)	77	2,4,4	2,0,1	1,0,0	0,0,0	0,0,0	0,0,0
				First (23 May - 8 Aug.)	77	1,1,1	2,2,3	1,1,1	0,0,0	0,0,0	0,0,0
				Second (8 Aug. - 11 Oct.)	64	2,1,1	2,2,2	1,1,2	0,0,0	0,0,0	0,0,0
				Second (8 Aug. - 11 Oct.)	64	lost	lost	lost	lost	lost	lost
				Full (23 May - 11 Oct.)	141	4,4,4	1,0,0	1,0,0	0,0,0	0,0,0	0,0,0
				Full (23 May - 11 Oct.)	141	0,4,4	0,1,0	3,1,0	0,0,0	0,0,0	0,0,0
	4	Yarmouth Bar Petri Collector HOBO	DFO	First (24 May - 8 Aug.)	76	0,0,0,0,0,0	0,1,0,0,0,0	1,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (24 May - 8 Aug.)	76	0,1,1,0,0,0	1,1,0,0,0,0	1,1,1,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (8 Aug. - 11 Oct.)	64	lost	lost	lost	lost	lost	lost
				Second (8 Aug. - 11 Oct.)	64	0,0,0,0,0,0	0,0,0,0,0,0	1,1,1,2,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (24 May - 11 Oct.)	140	0,0,0,1,0,0	0,0,0,0,2,0	1,1,2,4,3,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (24 May - 11 Oct.)	140	4,3,0,4,4,4	1,1,0,0,0,0	1,1,1,3,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0

Appendix 1, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy. Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.I. cover
Southwest shore	144	Pinkney's Pt. Petri Collector HOBO	DFO	First (23 May - 8 Aug.)	76	1,1,1,3,3,2	1,3,2,1,1,1,1	1,1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (23 May - 8 Aug.)	76	4,4,1,0,0,0	0,0,1,0,0,0	1,0,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (8 Aug. - 11 Oct.)	64	1,1,1,2,1,2	2,1,0,1,1,1	1,1,4,0,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (8 Aug. - 11 Oct.)	64	1,1,0,1,1,1	3,0,2,4,3,1	1,1,1,1,1,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (23 May - 11 Oct.)	140	4,4,2,2,4,4	0,0,1,0,0,0	1,3,2,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (23 May - 11 Oct.)	140	4,4,4,4,4,4	0,1,0,0,0,0	0,0,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	108	Eel Lake Reg. Collector Minilog	DFO	Full (24 May - 7 Nov.)	167	0,0,0	1,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (24 May - 7 Nov.)	167	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (24 May - 7 Nov.)	167	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (24 May - 7 Nov.)	167	1,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
	6	Wedgeport Reg. Collector	DFO	First (24 May - 7 Aug.)	75	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (24 May - 7 Aug.)	75	4,4,4	1,0,0	0,1,0	0,0,0	0,0,0	0,0,0
				Second (7 Aug. - 11 Oct.)	65	0,0,0	2,1,1	1,0,1	0,0,0	0,0,0	0,0,0
				Second (7 Aug. - 11 Oct.)	65	0,1,0	2,1,2	1,1,1	0,0,0	0,0,0	0,0,0
				Full (24 May - 11 Oct.)	140	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (24 May - 11 Oct.)	140	4,4,4	0,0,0	0,0,1	0,0,0	0,0,0	0,0,0
	144	Dennis Point Petri Collector HOBO	DFO	First (24 May - 7 Aug.)	75	0,1,1,0,0,0	0,1,0,0,0,0	0,0,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (24 May - 7 Aug.)	75	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (7 Aug. - 10 Oct.)	65	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (7 Aug. - 10 Oct.)	65	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (24 May - 10 Oct.)	139	1,0,0,0,0,0	1,0,0,1,0,0	1,0,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (24 May - 10 Oct.)	139	lost	lost	lost	lost	lost	lost

Appendix 1, continued.

Region	Stn	Location	Monitor By	Deployment Dates	Deploy. Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.I. cover
Southwest shore	146	Fall's Point Petri Collector HOBO	DFO	First (24 May - 7 Aug.)	76	4,4,4,4,4,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (24 May - 7 Aug.)	76	4,4,4,4,4,4	0,0,0,0,0,1	0,0,0,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (7 Aug. - 11 Oct.)	64	4,4,4,4,4,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (7 Aug. - 11 Oct.)	64	4,4,4,4,4,4	0,0,0,0,0,0	0,0,0,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (24 May - 11 Oct.)	140	4,4,4,4,4,4	0,0,0,1,0,0	0,0,0,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (24 May - 11 Oct.)	140	4,4,4,4,4,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	8	Clark's Harbour Reg. Collector HOBO	DFO	First (24 May - 7 Aug.)	76	1,2,3	1,0,1	1,0,1	0,0,0	0,0,0	0,0,0
				First (24 May - 7 Aug.)	76	1,1,1	2,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Second (7 Aug. - 11 Oct.)	64	1,1,1	1,1,1	1,1,0	0,0,0	0,0,0	0,0,0
				Second (7 Aug. - 11 Oct.)	64	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				Full (24 May - 11 Oct.)	140	1,1,1	1,1,2	1,1,3	0,0,0	0,0,0	0,0,0
				Full (24 May - 11 Oct.)	140	lost	lost	lost	lost	lost	lost
South shore	9	Port La Tour Reg. Collector HOBO	DFO	First (23 May - 7 Aug.)	76	4,3,2	0,0,1	0,0,1	0,0,0	0,0,0	0,0,0
				First (23 May - 7 Aug.)	76	3,3,4	1,1,0	1,0,0	0,0,0	0,0,0	0,0,0
				Second (7 Aug. - 10 Oct.)	64	3,3,3	1,1,1	1,0,1	0,0,0	0,0,0	0,0,0
				Second (7 Aug. - 10 Oct.)	64	2,1,1	1,0,1	1,1,1	0,0,0	0,0,0	0,0,0
				Full (23 May - 10 Oct.)	140	4,4,4	0,1,1	1,2,0	0,0,0	0,0,0	0,0,0
				Full (23 May - 10 Oct.)	140	4,4,4	0,1,1	1,2,1	0,0,0	0,0,0	0,0,0
	12	Shelburne Reg. Collector HOBO	DFO	First (23 May - 7 Aug.)	76	4,4,2	0,0,2	0,0,0	0,0,0	0,0,0	0,0,0
				First (23 May - 7 Aug.)	76	4,2,1	0,2,1	0,1,0	0,0,0	0,0,0	0,0,0
				Second (7 Aug - 10 Oct)	64	4,2,4	0,1,0	0,2,0	0,0,0	0,0,0	0,0,0
				Second (7 Aug - 10 Oct)	64	1,0,0	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				Full (23 May - 10 Oct.)	140	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (23 May - 10 Oct.)	140	4,4,1	0,1,1	0,1,0	0,0,0	0,0,0	0,0,0
	13	Lockeport	DFO	Report (Oct. 2012)	NA	P	P	P	ND	ND	ND

Appendix 1, continued.

Region	Stn No.	Location	Monitor		Deploy. Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.I. cover
			By	Deployment Dates							
South shore	119	East Side Port	DFO	First (14 June - 3 Aug.)	50	0,0,0,0,0,0	4,4,4,2,4,2	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
		L'Hebert		First (14 June - 3 Aug.)	50	0,0,0,0,0,0	4,3,2,3,4,4	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
		Petri Collector		Second (3 Aug. - 9 Oct.)	67	0,0,0,0,0,0	2,2,1,1,1,2	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (3 Aug. - 9 Oct.)	67	0,0,0,0,0,0	1,1,1,1,2,0	0,1,1,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (14 June - 9 Oct.)	117	0,0,0,0,0,0	1,1,1,3,2,1	1,1,1,1,1,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (14 June - 9 Oct.)	117	0,0,0,0,0,0	1,1,1,1,1,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	82	Port Mouton	DFO	First (5 June - 3 Aug.)	59	0,0,0,0,0,0	2,3,1,4,4,4	1,1,1,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
		Petri Collector		First (5 June - 3 Aug.)	59	0,0,0,0,0,0	4,3,2,4,2,4	1,1,1,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
		HOBO		Second (3 Aug. - 9 Oct.)	67	0,0,0,0,0,0	1,1,1,1,1,1	1,0,0,0,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (3 Aug. - 9 Oct.)	67	0,0,0,0,0,0	1,1,1,3,1,1	1,2,1,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (5 June - 9 Oct.)	126	0,0,0,0,0,0	2,1,1,1,1,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (5 June - 9 Oct.)	126	0,0,0,0,0,0	0,1,1,1,1,1	0,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	100	LaHave River YC	DFO	Report (Oct. 2012)	NA	ND	P	ND	ND	ND	ND
	17	Corkum's Island	DFO	Report (Nov. 2012)	NA	P	P	P	P	ND	ND
	18	Lunenburg; Railway Reg Collector	DFO	First (5 June - 3 Aug.)	59	0,0,1	4,4,3	1,1,1	0,0,0	0,0,0	0,0,0
				First (5 June - 3 Aug.)	59	0,0,0	3,4,3	1,1,1	0,0,0	0,0,0	0,0,0
				Second (3 Aug. - 9 Oct.)	67	1,1,1	1,1,1	1,1,1	1,1,1	0,0,0	0,0,0
				Second (3 Aug. - 9 Oct.)	67	2,2,1	1,1,1	3,3,2	1,1,1	0,0,0	0,0,0
				Full (5 June - 9 Oct.)	126	lost	lost	lost	lost	lost	lost
				Full (5 June - 9 Oct.)	126	0,1,1	0,1,1	1,1,1	1,1,1	0,0,0	0,0,0
	608	Lunenburg; FM	AM	Report (Nov. 2012)	NA	P	P	P	P	P	P
	19	Indian Point Reg Collector HOBO	DFO	First (5 June - 24 July)	49	4,1,3	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				First (5 June - 24 July)	49	2,1,1	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				Second (24 July - 1 Nov.)	100	4,4,4	0,1,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (24 July - 1 Nov.)	100	4,4,4	0,0,0	0,0,1*	0,0,0	0,0,0	0,0,0

Appendix 1, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy. Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.I. cover
South shore	21	Chester	DFO	Report (Oct. 2012)	NA	P	P	P	ND	ND	ND
	412	St. Margaret's B.	DFO	Report (Sept. 2012)	NA	P	P	ND	ND	ND	ND
	424	Lower Prospect	DFO	Report (Oct. 2012)	NA	ND	ND	P	ND	ND	ND
	407	Tantallon; SWM	DFO	Report (Sept. 2012)	NA	P	ND	P	ND	ND	ND
	432	Herring Cove	DFO	Report (Nov. 2012)	NA	ND	ND	ND	ND	ND	ND
	426	Purcell's Cove	DFO	Report (Nov. 2012)	NA	P	P	ND	ND	ND	ND
	402	Halifax; RNSYS	DFO	Report (Oct. 2012)	NA	P	P	P	ND	ND	ND
	401	Halifax; AYC	DFO	Report (Oct. 2012)	NA	P	P	ND	ND	ND	ND
	431	Mill Cove Marina	DFO	Report (Nov. 2012)	NA	ND	ND	ND	ND	ND	ND
	403	Bedford Basin YC	DFO	Report (Nov. 2012)	NA	ND	ND	ND	ND	ND	ND
	428	Dartmouth YC	DFO	Report (Nov. 2012)	NA	P	P	P	ND	P	ND
	429	Wright's Cove	DFO	Report (Nov. 2012)	NA	P	P	ND	ND	P	ND
Halifax	24	Halifax; BIO	DFO	First (13 June - 28 Aug.)	76	0,0,1,0,0,0	2,1,1,0,0,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
		Petri Collector		First (13 June - 28 Aug.)	76	1,1,1,1,1,1	0,0,3,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (28 Aug. - 19 Oct.)	52	1,1,1,0,0,0	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (28 Aug. - 19 Oct.)	52	1,1,1,0,0,0	1,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (13 June - 19 Oct.)	128	0,0,1,1,0,0	2,1,0,2,2,4	0,0,0,0,0,0	0,0,0,0,0,0	0,1,0,0,0,0	0,0,0,0,0,0
				Full (13 June - 19 Oct.)	128	0,1,1,1,1,1	1,3,2,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	1,1,0,0,1,1	0,0,0,0,0,0
	427	Alderney Landing	DFO	Report (Nov. 2012)	NA	P	P	ND	ND	ND	ND
	430	Shearwater YC	DFO	Report (Nov. 2012)	NA	P	P	P	ND	ND	ND
	24	Ship Harbour	DFO	Full (19 July - 27 Nov.)	131	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
		Reg Collector		Full (19 July - 27 Nov.)	131	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
		Minilog		Full (19 July - 27 Nov.)	131	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
East shore				Full (19 July - 27 Nov.)	131	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Report (Nov. 2012)	NA	P	P	ND	ND	ND	ND

Appendix 1, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy. Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.I. cover
East shore	161	Sheet Harbour	DFO	Full (5 July - 27 Nov.)	145	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
		Reg Collector		Full (5 July - 27 Nov.)	145	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
	30	Port Bickerton	DFO	Full (5 July - 27 Nov.)	145	0,0,0,0,1,1	1,1,1,1,0,0	3,4,4,3,3,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
		Petri Collector		Full (5 July - 27 Nov.)	145	0,1,1,0,0,0	1,1,1,1,0,1	4,3,4,1,3,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
		HOB0		Full (5 July - 27 Nov.)	145	lost	lost	lost	lost	lost	lost
				Full (5 July - 27 Nov.)	145	lost	lost	lost	lost	lost	lost
	104	Country Harbour	NSDFA	Report (Dec. 2012)	NA	P	ND	ND	ND	ND	ND
	37	Whitehead	NSDFA	Report (Dec. 2012)	NA	P	ND	ND	ND	ND	ND
	147	Guysborough	DFO	First (6 June - 15 Aug.)	71	4,4,4,1,2,1	1,0,0,1,1,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
		Petri Collector		First (6 June - 15 Aug.)	71	4,4,4,4,4,4	0,0,0,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
Chedabucto Bay		HOB0		Sec (15 Aug. - 18 Oct.)	63	3,2,2,4,4,4	1,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (15 Aug. - 18 Oct.)	63	3,1,1,3,3,4	1,1,0,1,1,1	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (6 June - 18 Oct.)	134	4,4,4,4,4,4	1,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (6 June - 18 Oct.)	134	4,4,4,4,4,4	1,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	40	Eddy Point	DFO	First (6 June - 13 Aug.)	68	0,0,0	3,2,1	0,0,0	0,0,0	0,0,0	0,0,0
		Reg Collector		First (6 June - 13 Aug.)	68	4,3,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
		HOB0		Sec (13 Aug. - 15 Oct.)	63	1,1,1	1,1,2	0,0,0	0,0,0	0,0,0	0,0,0
				Sec (13 Aug. - 15 Oct.)	63	3,4,4	1,0,1	0,0,0	0,0,0	0,0,0	0,0,0
				Full (6 June - 15 Oct.)	131	4,4,4	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				Full (6 June - 15 Oct.)	131	lost	lost	lost	lost	lost	lost
				Report (Dec. 2012)	NA	ND	ND	P	ND	ND	ND
	182	Port Hawkesbury	St.FX	Report (Dec. 2012)	NA	P	ND	P	ND	ND	ND
	44	D'Escousse	DFO	First (6 June - 13 Aug.)	66	1,0,0,1,1,1	2,3,3,2,2,2	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
		Petri Collector		First (6 June - 13 Aug.)	66	1,1,1,1,1,1	2,1,0,1,1,1	3,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
		HOB0		Sec (13 Aug. - 15 Oct.)	63	0,0,0,1,0,0	1,1,1,1,1,1	2,2,2,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (13 Aug. - 15 Oct.)	63	1,1,1,0,0,0	3,2,2,1,1,3	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (6 June - 15 Oct.)	129	4,4,4,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (6 June - 15 Oct.)	129	lost	lost	lost	lost	lost	lost
	44	Petit-de-Grat	DFO	Report (Oct. 2012)	NA	P	P	P	ND	ND	ND
	46	Little Harbour	DFO	Report (Oct. 2012)	NA	P	P	P	ND	ND	ND

Appendix 1, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.I. cover
Bras d'Or Lake	47	St. Peter's Petri Collector HOBO	DFO	First (8 June - 14 Aug.)	67	1,0,0,0,0,0	2,3,1,0,1,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (8 June - 14 Aug.)	67	0,0,0,1,0,0	1,1,1,0,1,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (14 Aug. - 16 Oct.)	63	0,0,0,0,0,0	4,4,4,4,4,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (14 Aug. - 16 Oct.)	63	0,0,0,0,0,0	4,4,4,4,4,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (8 June - 16 Oct.)	130	0,0,1,0,0,0	4,3,2,4,3,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (8 June - 16 Oct.)	130	0,0,0,0,0,0	4,4,3,4,4,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	54	Eskasoni Reg Collector	EFGC	First (11 June - 4 Oct.)	115	0,0,0	1,1,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (11 June - 4 Oct.)	115	0,0,0	2,1,0	0,0,0	0,0,0	0,0,0	0,0,0
				Sec (4 Oct. - 12 Nov.)	39	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Sec (4 Oct. - 12 Nov.)	39	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (11 June - 12 Nov.)	154	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				Full (11 June - 12 Nov.)	154	0,0,0	1,0,1	0,0,0	0,0,0	0,0,0	0,0,0
	55	Baddeck Reg Collector HOBO	DFO	First (6 June - 15 Aug.)	70	0,0,0	1,4,1	0,0,0	0,0,0	0,0,0	0,0,0
				First (6 June - 15 Aug.)	70	0,0,0	1,0,1	0,0,0	0,0,0	0,0,0	0,0,0
				Sec. (15 Aug. - 16 Oct.)	62	lost	lost	lost	lost	lost	lost
				Sec. (15 Aug. - 16 Oct.)	62	0,0,0	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0
				Full (6 June - 16 Oct.)	132	0,0,0	4,4,1	0,0,0	0,0,0	0,0,0	0,0,0
				Full (6 June - 16 Oct.)	132	0,0,0	1,3,4	0,0,0	0,0,0	0,0,0	0,0,0
	51	Whycocomagh Reg Collector HOBO	DFO	First (6 June - 15 Aug.)	70	0,0,0	1,2,2	0,0,0	0,0,0	0,0,0	0,0,0
				First (6 June - 15 Aug.)	70	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				Sec (15 Aug. - 17 Oct.)	63	0,0,0	0,4,4	0,0,0	0,0,0	0,0,0	0,0,0
				Sec (15 Aug. - 17 Oct.)	63	0,0,0	0,4,4	0,0,0	0,0,0	0,0,0	0,0,0
				Full (6 June - 17 Oct.)	133	0,0,0	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0
				Full (6 June - 17 Oct.)	133	0,0,0	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0

Appendix 1, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.I. cover
Bras d'Or Lake	52	Orangedale Reg Collector	EFGC	First (11 June - 3 Oct.)	114	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (11 June - 3 Oct.)	114	lost	lost	lost	lost	lost	lost
				Sec (3 Oct. - 19 Nov.)	47	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Sec (3 Oct. - 19 Nov.)	47	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (11 June - 19 Nov.)	161	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (11 June - 19 Nov.)	161	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
Cape Breton	62	Sydney; RCBYC Reg Collector HOBO	DFO	First (7 June - 14 Aug.)	68	4,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (7 June - 14 Aug.)	68	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Sec (14 Aug. - 16 Oct.)	63	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Sec (14 Aug. - 16 Oct.)	63	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (7 June - 16 Oct.)	131	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (7 June - 16 Oct.)	131	0,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
	63	North Sydney Reg Collector HOBO	DFO	First (7 June - 14 Aug.)	68	0,0,0	3,3,4	1,1,1	0,0,0	0,0,0	0,0,0
				First (7 June - 14 Aug.)	68	0,0,0	1,1,2	1,1,1	0,0,0	0,0,0	0,0,0
				Sec (14 Aug. - 16 Oct.)	63	0,1,0	0,1,1	4,3,4	0,0,0	0,0,0	0,0,0
				Sec (14 Aug. - 16 Oct.)	63	2,0,0	1,1,1	2,3,3	0,0,0	0,0,0	0,0,0
				Full (7 June - 16 Oct.)	131	1,1,0	0,0,0	1,1,3	0,0,0	0,0,0	0,0,0
				Full (7 June - 16 Oct.)	131	1,1,0	0,0,1	3,2,2	0,0,0	0,0,0	0,0,0
	74	Little River Petri Collector	DFO	First (7 June - 15 Aug.)	69	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (7 June - 15 Aug.)	69	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (15 Aug. - 17 Oct.)	63	0,0,0,0,0,0	4,4,4,4,3,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (15 Aug. - 17 Oct.)	63	0,0,0,0,0,0	4,0,0,2,1,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (7 June - 17 Oct.)	132	lost	lost	lost	lost	lost	lost
				Full (7 June - 17 Oct.)	132	0,0,0,0,0,0	3,0,0,2,3,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0

Appendix 1, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.I. cover
Cape Breton	69	Dingwall Petri Collector HOBO	DFO	Full (8 June - 17 Oct.)	132	0,0,0,0,0,0	3,3,4,0,0,0	1,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (8 June - 17 Oct.)	132	0,0,0,0,0,0	1,1,1,0,0,0	1,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (8 June - 17 Oct.)	132	3,4,3,3,4,3	1,1,2,1,1,1	1,1,3,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (8 June - 17 Oct.)	132	4,4,4,0,0,0	1,1,1,0,0,0	2,1,2,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
North shore	214	Cribbon's Point	St.FX	Report (Dec. 2012)	NA	P	P	P	ND	ND	ND
	213	Arisaig	St. FX	Report (Dec. 2012)	NA	ND	ND	ND	ND	ND	ND
	77	Pictou	DFO	Report (Oct. 2012)	NA	ND	P	ND	ND	ND	ND

Appendix 1, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.I. cover
Southwest New Brunswick	132	Musquash Petri Collector	DFO	Sec (9 Aug. - 5 Nov.)	88	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (9 Aug. - 5 Nov.)	88	lost	lost	lost	lost	lost	lost
				Full (6 June - 5 Nov.)	152	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (6 June - 5 Nov.)	152	lost	lost	lost	lost	lost	lost
	133	Dipper Harbour Petri Collector	DFO	Sec (9 Aug. - 5 Nov.)	88	1,0,0,0,0,0	1,2,1,1,1,1	1,1,1,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (9 Aug. - 5 Nov.)	88	0,0,0,0,0,0	1,1,1,1,1,1	1,1,1,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (16 May - 5 Nov.)	173	0,1,0,0,1,0	0,1,1,1,1,1	1,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (16 May - 5 Nov.)	173	0,0,0,01,1,	1,1,1,1,1,1	0,0,0,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	134	Black's Harbour Petri Collector	NBDAAF	Sec (7 Aug. - 31 Oct.)	85	1,1,1,2,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (7 Aug. - 31 Oct.)	85	2,1,1,1,2,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (24 May - 31 Oct.)	159	1,1,0,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (24 May - 31 Oct.)	159	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	134	Beaver Harbour Petri Collector	DFO	Sec (9 Aug. - 5 Nov.)	88	0,0,0,0,1,0	1,2,2,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (9 Aug. - 5 Nov.)	88	1,1,1,1,1,1	2,1,3,1,2,1	1,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (16 May - 5 Nov.)	173	0,0,0,0,0,0	0,0,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (16 May - 5 Nov.)	173	3,3,2,1,2,1	0,0,0,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	141	Back Bay Petri Collector	NBDAAF	Sec (7 Aug. - 31 Oct.)	85	0,0,0,0,0,1	0,0,0,1,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (7 Aug. - 31 Oct.)	85	0,0,0,0,0,0	0,0,0,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (25 May - 31 Oct.)	159	0,0,0,1,0,0	0,0,0,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (25 May - 31 Oct.)	159	0,0,0,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	143	L'Etete Petri Collector	NBDAAF	Sec (7 Aug. - 31 Oct.)	85	2,2,1,2,2,2	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (7 Aug. - 31 Oct.)	85	0,0,1,1,1,0	1,1,1,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (25 May - 31 Oct.)	159	4,1,2,1,2,2	1,1,1,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (25 May - 31 Oct.)	159	2,2,1,1,1,1	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0

Appendix 1, continued.

Region	Stn No.	Location	Monitor		Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.I. cover
			By	Deployment Dates							
Southwest New Brunswick	149	Bliss Harbour Petri Collector	NBDAAF	Full (5 June - 25 Oct.)	142	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (5 June - 25 Oct.)	142	0,0,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
Brunswick	141	St. Andrew's Petri Collector	DFO	Sec (9 Aug. - 5 Nov.)	88	1,1,1,1,1,1	0,0,1,1,3,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (9 Aug. - 5 Nov.)	88	1,2,1,1,1,1	0,0,0,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (16 May - 5 Nov.)	173	1,1,1,1,1,0	1,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (16 May - 5 Nov.)	173	1,1,1,1,1,1	0,0,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	142	SABS Petri Collector	DFO	Sec (9 Aug.- 6 Nov.)	89	1,1,1,1,1,1	1,1,1,2,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (9 Aug. - 6 Nov.)	89	1,1,1,1,0,0	2,2,2,1,2,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (16 May - 6 Nov.)	172	3,3,4,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (16 May - 6 Nov.)	172	2,3,3,1,2,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
Grand Manan Island	136	North Head Petri Collector	NBDAAF	Sec (7 Aug. - 1 Nov.)	86	1,1,1,1,2,1	1,1,1,0,1,1	1,1,1,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (7 Aug. - 1 Nov.)	86	1,1,1,1,1,1	1,1,1,1,1,1	1,0,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 1 Nov.)	155	1,3,1,1,2,3	0,0,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 1 Nov.)	155	2,2,2,2,2,0	0,0,0,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	137	Ingall's Head Petri Collector	NBDAAF	Sec (7 Aug. - 1 Nov.)	86	0,0,0,1,0,1	1,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (7 Aug. - 1 Nov.)	86	0,0,0,1,1,1	1,1,1,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 1 Nov.)	155	0,0,1,1,1,1	0,0,0,1,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 1 Nov.)	155	1,0,0,1,0,0	0,1,1,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	140	Seal Cove Petri Collector	NBDAAF	Sec (7 Aug. - 1 Nov.)	86	0,0,0,0,1,0	0,1,2,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (7 Aug. - 1 Nov.)	86	0,0,0,0,0,0	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 1 Nov.)	155	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 1 Nov.)	155	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0

Appendix 1, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.I. cover
Campobello Island	144	Head Harbour Petri Collector	NBDAAF	Sec (7 Aug. - 6 Nov.)	91	2,2,2,1,1,1	1,1,1,1,1,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (7 Aug. - 6 Nov.)	91	1,2,3,1,1,1	1,1,1,1,1,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (24 May - 1 Nov.)	166	1,1,2,0,0,0	1,1,0,1,1,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (24 May - 1 Nov.)	166	2,3,4,1,0,0	0,0,0,0,0,0	1,1,1,1,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	144	Wilson's Beach Petri Collector	NBDAAF	Sec (7 Aug. - 6 Nov.)	91	1,1,1,1,1,1	1,2,1,2,1,1	1,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (7 Aug. - 6 Nov.)	91	2,1,1,1,1,1	1,1,1,1,1,1	0,0,1,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (24 May - 1 Nov.)	166	1,2,1,1,1,1	1,1,1,1,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (24 May - 1 Nov.)	166	2,2,2,1,1,1	0,1,1,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
Deer Island	146	Leonardville Petri Collector	NBDAAF	Sec (7 Aug. - 5 Nov.)	90	4,2,1,3,4,3	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (7 Aug. - 5 Nov.)	90	1,2,2,3,2,2	2,1,2,1,2,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (24 May - 5 Nov.)	165	3,2,1,0,0,1	0,0,0,0,0,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (24 May - 5 Nov.)	165	3,3,1,1,1,0	1,1,0,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	147	Indian Island Petri Collector	NBDAAF	Sec (7 Aug. - 6 Nov.)	91	0,0,0,0,2,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (7 Aug. - 6 Nov.)	91	1,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (24 May - 1 Nov.)	166	0,1,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (24 May - 1 Nov.)	166	lost	lost	lost	lost	lost	lost
	149	Fairhaven Petri Collector	NBDAAF	Sec (7 Aug. - 6 Nov.)	91	3,4,4,3,4,4	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (7 Aug. - 6 Nov.)	91	3,4,4,2,2,3	1,1,0,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (24 May - 1 Nov.)	166	3,3,3,4,4,4	1,1,1,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (24 May - 1 Nov.)	166	3,4,4,2,2,3	1,1,0,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	140	Fairhaven MF Petri Collector	NBDAAF	Sec (7 Aug. - 6 Nov.)	91	1,2,3,2,1,3	0,1,0,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (7 Aug. - 6 Nov.)	91	4,2,4,3,4,3	1,0,0,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (24 May - 1 Nov.)	166	1,2,2,4,3,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (24 May - 1 Nov.)	166	1,1,1,2,4,4	1,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0

Appendix 2. Details of monitoring and tunicate cover on individual monitoring collectors at each station and as reports of presence in 2013. Stations are grouped by geographical Region or Bay. Species cover are given for top, middle and bottom plates (x, y, z), and Petri dishes (a,b,c) where 0 = no tunicate cover, 1 = <25%, 2 = 26-50%, 3 = 51-75%, and 4 = 76-100%. Minilog, HOBO or CT2X thermistors (purple text) were deployed at some stations. NA = not applicable, C.i. = *Ciona intestinalis*, B.s. = *Botryllus schlosseri*, B.v. = *Botrylloides violaceus*, A.a. = *Ascidiella aspersa*, S.c. = *Styela clava*, D.l. = *Diplosoma listerianum*, D. v. = *Didemnum vexillum*, P = Present, A = Absent, * = tunicate present at station, but not on monitoring collector.

Region	Stn. No.	Location	Monitor. By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a. cover	S.c. cover	D.v. cover
Bay of Fundy	167	Westport Petri Collector	DFO	First (1 June - 8 Aug.)	68	1,1,1,1,1,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (1 June - 8 Aug.)	68	lost	lost	lost	lost	lost	lost
				Sec. (8 Aug. - 8 Oct.)	61	lost	lost	lost	lost	lost	lost
				Sec. (8 Aug. - 8 Oct.)	61	0,0,1,0,0,0	0,1,1,0,1,0	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (1 June - 8 Oct.)	129	1,1,0,1,2,1	1,0,0,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (1 June - 8 Oct.)	129	2,1,1,3,1,3	1,0,0,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	158	Tiverton Petri Collector HOBO	DFO	First (1 June - 8 Aug.)	68	0,1,0,0,0,0	1,1,1,1,1,1	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (1 June - 8 Aug.)	68	0,0,0,0,0,0	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (8 Aug. - 8 Oct.)	61	0,0,0,0,0,0	1,1,1,1,1,1	0,0,1,0,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (8 Aug. - 8 Oct.)	61	0,0,0,0,0,0	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (1 June - 8 Oct.)	129	0,0,1,0,0,1	2,1,1,3,3,1	1,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (1 June - 8 Oct.)	129	lost	lost	lost	lost	lost	lost
	171	Gulliver's Cove Petri Collector	DFO	Full (31 May - 7 Oct.)	129	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (31 May - 7 Oct.)	129	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (31 May - 7 Oct.)	129	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (31 May - 7 Oct.)	129	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	1	Digby Petri Collector HOBO	DFO	First (30 May - 8 Aug.)	70	4,2,3,1,2,3	0,0,0,1,1,1	0,0,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (30 May - 8 Aug.)	70	2,1,1,3,4,3	1,1,1,0,1,1	1,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (8 Aug. - 8 Oct.)	61	4,4,4,1,2,0	0,0,0,1,0,0	1,1,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (8 Aug. - 8 Oct.)	61	4,3,4,3,3,2	1,0,0,1,0,1	0,1,0,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 8 Oct.)	131	1,1,1,3,4,4	1,0,0,1,1,0	1,0,0,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 8 Oct.)	131	lost	lost	lost	lost	lost	lost
Southwest shore	2	Meteghan Reg. Collector HOBO	DFO	First (30 May - 7 Aug.)	69	1,1,1	1,2,0	1,1,1	0,0,0	0,0,0	0,0,0
				First (30 May - 7 Aug.)	69	0,0,0	0,1,2	1,1,1	0,0,0	0,0,0	0,0,0
				Sec. (7 Aug. - 8 Oct.)	62	2,1,1	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Sec. (7 Aug. - 8 Oct.)	62	1,2,1	1,1,1	2,2,2	0,0,0	0,0,0	0,0,0
				Full (30 May - 8 Oct.)	131	3,1,0	1,1,1	3,1,2	0,0,0	0,0,0	0,0,0
				Full (30 May - 8 Oct.)	131	1,4,2	2,1,1	2,2,2	0,0,0	0,0,0	0,0,0

Appendix 2, continued.

Region	Stn No.	Location	Monitor. By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Southwest shore	4	Yarmouth Bar Petri Collector HOBO	DFO	First (30 May- 7 Aug.)	69	1,1,0,1,1,1	0,1,0,0,0,0	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (30 May- 7 Aug.)	69	0,0,0,0,1,0	0,1,0,1,0,0	1,1,1,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (7 Aug. - 23 Sept.)	47	0,0,0,0,0,0	0,1,1,1,1,0	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (7 Aug. - 23 Sept.)	47	0,0,0,0,0,0	1,1,1,1,1,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 23 Sept.)	116	0,0,0,0,0,0	0,0,1,1,0,0	1,1,1,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 23 Sept.)	116	1,0,0,0,0,0	2,1,2,3,1,0	2,2,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	162	Yarmouth YC Petri Collector	DFO	First (30 May - 7 Aug.)	69	1,0,0,0,0,0	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (30 May- 7 Aug.)	69	0,0,0,0,0,0	2,2,1,1,1,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (7 Aug. - 23 Sept.)	47	1,1,0,1,1,1	1,1,1,1,2,1	0,1,0,1,1,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (7 Aug. - 23 Sept.)	47	1,1,1,1,1,1	1,1,1,0,1,1	0,0,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 23 Sept.)	116	1,2,1,3,2,3	4,2,0,0,1,1	0,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 23 Sept.)	116	0,1,1,2,1,0	1,2,2,2,1,1	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	155	Pinkney's Pt. Reg Collector	DFO	First (30 May.- 7 Aug.)	69	0,0,0	0,0,0	3,1,1	0,0,0	0,0,0	0,0,0
				First (30 May - 7 Aug.)	69	0,0,0	0,1,1	4,3,4	0,0,0	0,0,0	0,0,0
				Sec. (7 Aug. - 23 Sept.)	47	0,0,0	1,1,1	2,2,1	0,0,0	0,0,0	0,0,0
				Sec. (7 Aug. - 23 Sept.)	47	0,0,0	1,1,1	2,2,1	0,0,0	0,0,0	0,0,0
				Full (30 May - 23 Sept.)	116	0,3,1	0,1,1	1,2,1	0,0,0	0,0,0	0,0,0
				Full (30 May - 23 Sept.)	116	4,4,1	0,1,1	2,3,4	0,0,0	0,0,0	0,0,0
	108	Eel Lake Reg. Collector HOBO	DFO	First (26 June - 7 Aug.)	42	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (26 June - 7 Aug.)	42	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Sec. (7 Aug. - 9 Oct.)	63	0,0,0	0,1,0	0,0,0	0,0,0	0,0,0	0,0,0
				Sec. (7 Aug. - 9 Oct.)	63	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (26 June - 9 Oct.)	105	0,0,0	1,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (26 June - 9 Oct.)	105	0,0,0	1,0,1	0,0,0	0,0,0	0,0,0	0,0,0
	6	Wedgeport Reg. Collector HOBO - lost	DFO	First (29 May - 7 Aug.)	70	2,1,1	3,4,3	0,0,1	0,0,0	0,0,0	0,0,0
				First (29 May - 7 Aug.)	70	0,0,0	4,4,3	1,1,1	0,0,0	0,0,0	0,0,0
				Sec. (7 Aug. - 24 Sept.)	48	0,0,0	3,3,3	2,1,1	0,0,0	0,0,0	0,0,0
				Sec. (7 Aug. - 24 Sept.)	48	0,0,0	1,1,1	0,0,1	0,0,0	0,0,0	0,0,0
				Full (30 May - 24 Sept.)	118	lost	lost	lost	lost	lost	lost
				Full (30 May - 24 Sept.)	118	4,1,1	1,1,2	1,1,1	0,0,0	0,0,0	0,0,0

Appendix 2, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Southwest shore	97	Wedgeport; TW Petri Collector	DFO	First (29 May - 7 Aug.)	70	0,0,0,0,0,0	1,0,0,0,0,0	1,1,1,1,4,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (29 May - 7 Aug.)	70	0,0,0,0,0,0	1,0,0,2,2,1	1,1,0,3,3,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (7 Aug. - 9 Oct.)	63	0,0,0,0,0,0	1,1,0,1,1,1	1,1,0,1,2,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (7 Aug. - 9 Oct.)	63	0,0,0,0,0,0	2,0,1,1,1,0	1,0,1,1,2,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (29 May - 9 Oct.)	133	0,0,0,0,0,0	0,1,0,0,0,0	1,1,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (29 May - 9 Oct.)	133	0,0,0,0,0,0	1,0,0,1,1,0	2,2,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	154	Dennis Point Petri Collector	DFO	First (29 May - 7 Aug.)	70	0,0,0,0,0,0	0,0,1,1,1,L	1,1,1,1,1,L	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (29 May - 7 Aug.)	70	0,0,0,0,0,0	0,1,1,0,0,L	0,0,0,0,1,L	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (7 Aug. - 24 Sept.)	48	0,0,0,0,0,0	0,0,0,0,L,L	1,1,1,1,L,L	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (7 Aug. - 24 Sept.)	48	1,0,0,0,0,0	1,0,1,0,0,0	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 24 Sept.)	118	0,0,0,0,0,0	0,1,1,0,0,0	1,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 24 Sept.)	118	0,0,0,0,0,0	0,0,0,0,0,0	1,1,1,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	177	Sluice Point	DFO	Report (Sept. 2013)	NA	P	ND	P	ND	ND	ND
	178	Morris Island	DFO	Report (Sept. 2013)	NA	P	ND	P	ND	ND	ND
	7	Camp Cove Reg Collector HOBO	DFO	First (29 May - 7 Aug.)	70	1,0,0	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				First (29 May - 7 Aug.)	70	4,4,4	0,0,0	0,0,1	0,0,0	0,0,0	0,0,0
				Sec. (7 Aug. - 24 Sept.)	48	1,1,2	1,1,1	1,2,1	0,0,0	0,0,0	0,0,0
				Sec. (7 Aug. - 24 Sept.)	48	3,3,2	2,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Full (30 May - 24 Sept.)	118	0,1,0	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Full (30 May - 24 Sept.)	118	4,4,3	1,1,1	2,2,1	0,0,0	0,0,0	0,0,0
	156	Fall's Point Reg Collector	DFO	First (29 May - 6 Aug.)	69	2,4,4	1,0,0	1,0,0	0,0,0	0,0,0	0,0,0
				First (29 May - 6 Aug.)	69	1,4,4	1,1,1	1,0,1	0,0,0	0,0,0	0,0,0
				Sec. (6 Aug. - 24 Sept.)	49	3,2,1	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Sec. (6 Aug. - 24 Sept.)	49	3,3,2	0,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Full (29 May - 24 Sept.)	118	1,4,4	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Full (29 May - 24 Sept.)	118	3,4,4	1,1,0	1,1,1	0,0,0	0,0,0	0,0,0
	176	Shag Harbour	DFO	Report (Sept. 2013)	NA	P	P	P	ND	ND	ND

Appendix 2, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Southwest shore	160	West Head Reg. Collector	DFO	First (29 May - 6 Aug.)	69	0,1,0	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				First (29 May - 6 Aug.)	69	3,2,1	1,0,1	0,0,0	0,0,0	0,0,0	0,0,0
				Sec. (6 Aug. - 24 Sept.)	49	2,3,3	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Sec. (6 Aug. - 24 Sept.)	49	3,1,1	1,1,1	1,1,0	0,0,0	0,0,0	0,0,0
				Full (29 May - 24 Sept.)	118	0,1,3	0,1,1	0,1,0	0,0,0	0,0,0	0,0,0
				Full (29 May - 24 Sept.)	118	lost	lost	lost	lost	Lost	Lost
South shore	175	New elton	DFO	Report (Sept. 2013)	NA	P	ND	P	ND	ND	ND
	8	Clark's Harbour Reg. Collector HOBO	DFO	First (29 May - 6 Aug.)	69	1,1,1	1,1,1	1,1,0	0,0,0	0,0,0	0,0,0
				First (29 May - 6 Aug.)	69	1,0,1	1,1,1	1,0,0	0,0,0	0,0,0	0,0,0
				Sec. (6 Aug. - 24 Sept.)	49	1,1,1	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Sec. (6 Aug. - 24 Sept.)	49	1,1,1	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Full (29 May - 24 Sept.)	118	1,1,0	4,3,3	1,1,1	0,0,0	0,0,0	0,0,0
				Full (29 May - 24 Sept.)	118	1,1,1	2,3,2	0,0,1	0,0,0	0,0,0	0,0,0
	179	Cripple Creek	DFO	Report (Sept. 2013)	NA	ND	ND	P	ND	ND	ND
	180	South Side	DFO	Report (Sept. 2013)	NA	ND	ND	ND	ND	ND	ND
	181	Stoney Island	DFO	Report (Sept. 2013)	NA	ND	ND	ND	ND	ND	ND
	9	Port La Tour Reg. Collector	DFO	First (29 May - 6 Aug.)	69	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (29 May - 6 Aug.)	69	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Sec. (6 Aug. - 25 Sept.)	50	3,2,1	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Sec. (6 Aug. - 25 Sept.)	50	1,1,1	0,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Full (29 May - 25 Sept.)	119	2,2,3	0,3,1	1,1,0	0,0,0	0,0,0	0,0,0
				Full (29 May - 25 Sept.)	119	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
	409	Smithsville	DFO	Report (Sept. 2013)	NA	ND	ND	P	ND	ND	ND
	411	Upp. Port La Tour	DFO	Report (Sept. 2013)	NA	P	ND	P	ND	ND	ND
	10	Ingomar Reg. Collector	DFO	First (29 May - 6 Aug.)	69	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (29 May - 6 Aug.)	69	lost	lost	lost	lost	Lost	Lost
				Sec. (6 Aug. - 25 Sept.)	50	3,4,4	0,0,0	1,0,0	0,0,0	0,0,0	0,0,0
				Sec. (6 Aug. - 25 Sept.)	50	1,1,1	1,1,1	1,1,0	0,0,0	0,0,0	0,0,0
				Full (29 May - 25 Sept.)	119	1,0,0	1,2,3	1,1,1	0,0,0	0,0,0	0,0,0
				Full (29 May - 25 Sept.)	119	lost	lost	lost	lost	lost	lost

Appendix 2, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
South shore	11	Gunning Cove Reg. Collector	DFO	First (28 May - 6 Aug.)	70	1,1,1	2,2,1	0,0,0	0,0,0	0,0,0	0,0,0
				First (28 May - 6 Aug.)	70	0,0,0	2,2,1	0,0,0	0,0,0	0,0,0	0,0,0
				Sec. (6 Aug. - 25 Sept.)	50	1,1,1	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Sec. (6 Aug. - 25 Sept.)	50	1,1,1	1,1,1	1,0,1	0,0,0	0,0,0	0,0,0
				Full (29 May - 25 Sept.)	120	1,0,0	0,3,3	0,0,1	0,0,0	0,0,0	0,0,0
				Full (29 May - 25 Sept.)	120	1,1,2	2,3,3	0,0,0	0,0,0	0,0,0	0,0,0
	12	Shelburne Reg Collector HOBO	DFO	First (28 May - 6 Aug.)	70	0,0,0	0,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				First (28 May - 6 Aug.)	70	0,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Sec. (6 Aug. - 25 Sept.)	50	1,1,1	1,1,0	0,0,0	0,0,0	0,0,0	0,0,0
				Sec. (6 Aug. - 25 Sept.)	50	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (29 May - 25 Sept.)	120	0,0,1	0,0,2	0,0,0	0,0,0	0,0,0	0,0,0
				Full (29 May - 25 Sept.)	120	0,1,1	0,1,1	0,0,0	0,0,0	0,0,0	0,0,0
	14	Lower Sandy Bay Petri Collector	DFO	First (28 May - 6 Aug.)	70	3,2,2,1,2,1	1,1,1,2,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (28 May - 6 Aug.)	70	2,3,2,1,2,2	2,1,2,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (6 Aug. - 25 Sept.)	50	2,1,1,2,2,2	1,1,1,1,1,1	1,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (6 Aug. - 25 Sept.)	50	1,1,1,1,1,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (29 May - 25 Sept.)	120	4,4,4,4,4,4	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (29 May - 25 Sept.)	120	1,1,4,1,1,1	2,0,1,3,2,3	1,0,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	82	Port Mouton Petri Collector HOBO	DFO	First (28 May - 15 Aug.)	79	0,0,0,0,0,0	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (28 May - 15 Aug.)	79	0,0,0,0,0,0	1,1,1,1,1,1	1,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (15 Aug. - 9 Oct.)	55	0,0,0,0,0,0	1,1,1,1,1,1	1,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (15 Aug. - 9 Oct.)	55	0,0,0,0,0,0	1,1,1,1,1,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (28 May - 9 Oct.)	134	0,0,0,0,0,0	1,1,0,1,3,2	0,0,0,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (28 May - 9 Oct.)	134	0,0,0,0,0,0	4,4,3,3,4,4	1,1,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	119	East Side Port L'Hebert Petri Collector	DFO	First (28 May - 15 Aug.)	79	0,0,0,0,0,0	1,3,2,2,2,2	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (28 May - 15 Aug.)	79	0,0,0,0,0,0	1,1,1,2,1,1	1,1,1,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (15 Aug. - 9 Oct.)	55	1,0,0,0,0,0	1,1,1,1,1,1	0,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (15 Aug. - 9 Oct.)	55	0,0,0,0,1,0	1,1,1,1,1,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (28 May - 9 Oct.)	134	0,0,0,0,0,0	1,1,3,2,1,1	0,1,2,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (28 May - 9 Oct.)	134	1,0,0,1,0,1	2,2,0,0,1,1	1,1,1,0,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0

Appendix 2, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
South shore	17	Corkum's Island	DFO	Report (Oct. 2013)	NA	P	P	P	P	ND	ND
	18	Lunenburg; RW Reg. Collector HOBO	DFO	First (28 May - 31 July)	64	0,1,1	4,4,3	1,1,0	0,0,0	0,0,0	0,0,0
				First (28 May - 31 July)	64	0,0,0	3,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				Sec. (31 July - 10 Oct.)	71	0,1,1	1,1,1	1,1,1	1,2,1	0,0,0	0,0,0
				Sec. (31 July - 10 Oct.)	71	1,1,1	1,1,1	2,1,2	1,2,1	0,0,0	0,0,0
				Full (28 May - 10 Oct.)	135	1,1,1	1,0,0	1,2,1	1,1,1	0,0,0	0,0,0
				Full (28 May - 10 Oct.)	135	lost	lost	lost	lost	lost	lost
	587	Lunenburg; YC Petri Collector	DFO	First (13 June - 31 July)	48	0,0,0,2,2,3	3,3,3,3,3,0	1,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (13 June - 31 July)	48	3,3,3,3,3,4	2,3,2,1,2,1	1,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (31 July - 10 Oct.)	71	1,0,0,1,1,0	1,1,1,2,1,1	3,1,4,1,2,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (31 July - 10 Oct.)	71	0,0,0,0,0,1	2,1,1,2,1,1	1,1,1,1,0,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (13 June - 10 Oct.)	119	1,1,1,2,4,2	3,0,1,1,0,1	0,1,1,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (13 June - 10 Oct.)	119	3,1,2,4,4,4	0,0,0,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	608	Lunenburg; FMW Petri Collector	DFO	First (13 June- 31 July)	48	1,0,0,1,0,0	2,3,2,3,3,3	1,1,2,1,1,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (13 June- 31 July)	48	0,0,0,1,0,0	3,3,3,4,4,3	2,2,2,1,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (31 July - 10 Oct.)	71	0,0,0,0,0,0	1,1,1,1,1,1	3,1,1,2,1,2	1,1,0,1,1,2	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (31 July - 10 Oct.)	71	0,1,1,1,1,1	1,1,1,1,1,1	3,2,3,1,1,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0
				Full (13 June - 10 Oct.)	119	1,1,0,1,0,1	1,1,1,1,2,1	1,3,2,2,1,1	1,1,1,1,1,1	0,0,0,1,0,0	0,0,0,0,0,0
				Full (13 June - 10 Oct.)	119	0,0,1,0,0,0	1,1,1,1,1,1	1,2,2,1,1,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0
	19	Indian Point Reg. Collector HOBO	DFO	First (13 June - 31 July)	48	2,2,4	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				First (13 June - 31 July)	48	4,3,4	0,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				Sec. (31 July - 15 Oct.)	77	2,4,4	3,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Sec. (31 July - 15 Oct.)	77	3,2,3	2,1,2	0,0,0	0,0,0	0,0,0	0,0,0
	21	Chester Reg. Collector	DFO	First (27 May - 6 Aug.)	71	1,1,0	3,3,3	1,1,1	0,0,0	0,0,0	0,0,0
				First (27 May - 6 Aug.)	71	0,0,0	3,3,3	1,1,1	0,0,0	0,0,0	0,0,0
				Sec. (6 Aug. - 10 Oct.)	65	0,0,0	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Sec. (6 Aug. - 10 Oct.)	65	1,1,1	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Full (27 May - 10 Oct.)	136	1,1,1	1,0,0	1,1,1	0,0,0	0,0,0	0,0,0
				Full (27 May - 10 Oct.)	136	0,0,0	0,0,0	1,1,0	0,0,0	0,0,0	0,0,0

Appendix 2, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy. Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
South shore	407	Tantallon Petri Collector	DFO	First (28 May - 22 Aug.)	86	4,4,4,4,4,4	0,1,1,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (28 May - 22 Aug.)	86	3,4,4,1,1,1	1,0,0,3,0,1	1,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (22 Aug. - 15 Oct.)	54	1,0,1,1,1,1	2,1,1,1,0,1	0,0,2,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (22 Aug. - 15 Oct.)	54	0,1,1,1,1,1	1,1,1,0,3,0	1,0,1,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (28 May - 15 Oct.)	140	4,4,4,4,4,4	0,0,1,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (28 May - 15 Oct.)	140	4,4,4,4,4,4	1,0,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
Halifax	24	Halifax; BIO Petri Collector HOB0 - lost	DFO	First (18 June - 20 Aug.)	63	2,2,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (18 June - 20 Aug.)	63	4,1,0,3,3,3	3,2,2,2,2,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (20 Aug. - 4 Nov.)	78	4,4,4,4,4,4	1,1,1,1,1,1	0,0,0,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (20 Aug. - 4 Nov.)	78	0,0,0,0,0,0	1,1,1,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (18 June - 4 Nov.)	141	0,0,0,0,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,1,0,0,0,0	0,0,0,0,0,0
				Full (18 June - 4 Nov.)	141	1,3,4,1,1,4	0,0,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	401	Halifax; AYC Petri Collector	DFO	First (20 June - 22 Aug.)	63	3,4,4,4,4,4	1,1,3,0,1,0	0,0,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (20 June - 22 Aug.)	63	4,4,4,4,4,4	1,1,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (22 Aug. - 4 Nov.)	74	4,4,4,1,2,1	0,0,0,1,1,1	0,1,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (22 Aug. - 4 Nov.)	74	4,4,4,4,4,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (20 June - 4 Nov.)	137	4,4,4,4,4,4	0,1,1,0,0,0	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (20 June - 4 Nov.)	137	lost	lost	lost	lost	lost	lost
	402	Halifax; RNSYS Petri Collector	DFO	First (20 June - 22 Aug.)	63	3,3,3,2,3,3	2,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (20 June - 22 Aug.)	63	3,4,4,4,3,4	1,0,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (22 Aug. - 4 Nov.)	74	2,1,1,1,1,1	1,2,1,1,2,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (22 Aug. - 4 Nov.)	74	1,1,0,2,2,1	2,3,2,1,2,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (20 June - 4 Nov.)	137	4,1,0,4,4,4	3,3,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (20 June - 4 Nov.)	137	4,4,4,4,4,4	1,0,1,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	403	Bedford; BBYC Petri Collector	DFO	First (12 June - 21 Aug.)	70	0,4,4,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (12 June - 21 Aug.)	70	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (21 Aug. - 25 Oct.)	65	3,3,4,3,3,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (21 Aug. - 25 Oct.)	65	4,3,4,3,4,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (12 June - 25 Oct.)	135	lost	lost	lost	lost	lost	lost
				Full (12 June - 25 Oct.)	135	lost	lost	lost	lost	lost	lost

Appendix 2, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy. Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Halifax	426	Purcell's Cove Petri Collector	DFO	First (20 June - 22 Aug.)	63	3,3,2,3,4,3	2,1,1,1,1,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (20 June - 22 Aug.)	63	3,3,2,3,3,3	1,1,1,1,2,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (22 Aug. - 4 Nov.)	74	3,1,2,4,3,4	1,0,0,0,0,0	0,0,0,0,0,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (22 Aug. - 4 Nov.)	74	2,0,3,1,1,1	1,0,3,1,0,1	1,0,2,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (20 June - 4 Nov.)	137	4,4,4,4,4,4	1,1,1,1,1,1	1,1,0,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (20 June - 4 Nov.)	137	lost	lost	lost	lost	lost	lost
	427	Alderney Landing Petri Collector	DFO	First (12 June - 21 Aug.)	70	0,0,0,0,0,0	1,1,0,2,2,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (12 June - 21 Aug.)	70	0,1,0,1,0,0	1,0,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (21 Aug. - 31 Oct.)	71	0,0,0,1,0,1	4,3,2,3,2,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (21 Aug. - 31 Oct.)	71	0,0,0,0,0,0	2,1,1,3,2,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (12 June - 31 Oct.)	141	lost	lost	lost	lost	lost	lost
				Full (12 June - 31 Oct.)	141	lost	lost	lost	lost	lost	lost
	428	Dartmouth YC Petri Collector	DFO	First (12 June - 21 Aug.)	70	4,4,4,3,3,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (12 June - 21 Aug.)	70	4,4,4,3,4,3	0,0,0,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (21 Aug. - 31 Oct.)	71	4,4,3,3,4,4	2,2,2,1,2,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (21 Aug. - 31 Oct.)	71	4,4,3,3,4,4	2,2,3,1,2,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (12 June - 31 Oct.)	141	2,3,4,4,3,4	1,1,0,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (12 June - 31 Oct.)	141	2,2,4,4,3,3	0,0,2,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	430	Shearwater YC Petri Collector	DFO	First (12 June - 21 Aug.)	70	4,4,4,4,4,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (12 June - 21 Aug.)	70	4,4,4,4,4,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (21 Aug. - 31 Oct.)	71	4,2,1,4,4,4	0,0,1,0,0,1	0,2,2,0,2,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (21 Aug. - 31 Oct.)	71	lost	lost	lost	lost	lost	lost
				Full (12 June - 31 Oct.)	141	lost	lost	lost	lost	lost	lost
				Full (12 June - 31 Oct.)	141	lost	lost	lost	lost	lost	lost
	431	Bedford; Mill Cove Petri Collector		First (12 June - 21 Aug.)	70	1,3,3,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (12 June - 21 Aug.)	70	2,4,4,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (21 Aug. - 25 Oct.)	65	2,2,2,2,2,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (21 Aug. - 25 Oct.)	65	3,2,3,3,3,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (12 June - 25 Oct.)	135	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (12 June - 25 Oct.)	135	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0

Appendix 2, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy. Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Halifax	432	Herring Cove Petri Collector	DFO	First (20 June - 22 Aug.)	63	0,1,1,0,0,0	0,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (20 June - 22 Aug.)	63	0,0,0,1,0,0	1,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (22 Aug. - 4 Nov.)	74	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (22 Aug. - 4 Nov.)	74	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (20 June - 4 Nov.)	137	0,0,0,0,0,0	0,0,2,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (20 June - 4 Nov.)	137	lost	lost	lost	lost	lost	lost
East shore	166	East Petpeswick Petri Collector	DFO	First (3 June - 12 Aug.)	70	0,0,0,0,0,0	2,1,2,4,0,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (3 June - 12 Aug.)	70	0,0,0,0,0,0	4,3,3,4,3,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (12 Aug. - 15 Oct.)	64	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (12 Aug. - 15 Oct.)	64	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (3 June - 15 Oct.)	134	0,0,0,0,0,0	3,2,1,1,1,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (3 June - 15 Oct.)	134	0,0,0,0,0,0	2,1,3,2,2,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	25	Ship Harbour Reg. Collector HOBO	DFO	Full (18 July - 8 Nov.)	113	1*, 0,0	1*, 0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (18 July - 8 Nov.)	113	lost	lost	lost	lost	lost	lost
				Full (18 Jul - 8 Nov.)	113	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (18 July - 8 Nov.)	113	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
	26	Cooper's Point Petri Collector	DFO	First (3 June - 12 Aug.)	70	0,0,0,1,0,0	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (3 June - 12 Aug.)	70	0,0,0,0,0,0	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (12 Aug. - 15 Oct.)	64	0,0,0,0,0,0	4,4,4,4,4,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (12 Aug. - 15 Oct.)	64	0,0,0,0,0,0	4,4,3,4,3,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (3 June - 15 Oct.)	134	0,0,0,0,0,0	2,1,3,3,3,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (3 June - 15 Oct.)	134	0,0,0,0,0,0	4,4,3,4,4,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	30	Port Bickerton Reg. Collector HOBO	DFO	First (3 June - 12 Aug.)	70	3,2,3	0,1,0	1,1,0	0,0,0	0,0,0	0,0,0
				First (3 June - 12 Aug.)	70	0,1,1	0,0,1	1,1,1	0,0,0	0,0,0	0,0,0
				Sec. (12 Aug. - 15 Oct.)	64	0,0,0	1,1,1	2,2,1	0,0,0	0,0,0	0,0,0
				Sec. (12 Aug. - 15 Oct.)	64	3,4,4	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Full (3 June - 15 Oct.)	134	1,1,1	1,1,1	3,1,3	0,0,0	0,0,0	0,0,0
				Full (3 June - 15 Oct.)	134	1,1,0	0,0,1	2,2,3	0,0,0	0,0,0	0,0,0

Appendix 2, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy. Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Chedabucto Bay	39	Cape Canso Reg. Collector HOBO	DFO	First (3 June - 12 Aug.)	70	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (3 June - 12 Aug.)	70	1,1,1	0,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				Sec. (12 Aug. - 14 Oct.)	63	2,1,1	1,1,2	1,1,1	0,0,0	0,0,0	0,0,0
				Sec. (12 Aug. - 14 Oct.)	63	1,1,1	1,1,2	0,1,0	0,0,0	0,0,0	0,0,0
				Full (3 June - 14 Oct.)	133	3,2,1	0,1,2	0,0,0	0,0,0	0,0,0	0,0,0
				Full (3 June - 14 Oct.)	133	lost	lost	lost	lost	lost	lost
	41	Venus Cove Reg. Collector HOBO - lost	DFO	First (4 June - 12 Aug.)	69	1,0,0	1,1,1,	0,0,0	0,0,0	1*,0,0	0,0,0
				First (4 June - 12 Aug.)	69	lost	lost	lost	lost	lost	lost
				Sec. (12 Aug. - 16 Oct.)	65	1,1,1	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0
				Sec. (12 Aug. - 16 Oct.)	65	1,1,1	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Full (4 June - 16 Oct.)	134	lost	lost	lost	lost	lost	lost
				Full (4 June - 16 Oct.)	134	lost	lost	lost	lost	lost	lost
	182	Port Haw kesbury	StFX	Report (Oct. 2013)	NA	P	P	P	ND	P	ND
	173	Pirate Harbour	DFO	Report (Aug. 2013)	N/A	P	P	P	ND	ND	ND
	45	D'Escousse Reg. Collector	DFO	First (3 June - 13 Aug.)	71	lost	lost	lost	lost	lost	lost
				First (3 June - 13 Aug.)	71	lost	lost	lost	lost	lost	lost
				Sec. (13 Aug. - 16 Oct.)	64	lost	lost	lost	lost	lost	lost
				Sec. (13 Aug. - 16 Oct.)	64	4,4,2	0,1,1	0,0,3	0,0,0	0,0,0	0,0,0
				Full (3 June - 16 Oct.)	135	2,4,4	0,0,0	1,0,0	0,0,0	0,0,0	0,0,0
				Full (3 June - 16 Oct.)	135	2,1,1	1,1,1	1,1,2	0,0,0	0,0,0	0,0,0
Bras d'Or Lake	47	St. Peter's Reg. Collector HOBO	DFO	First (4 June - 13 Aug.)	70	0,0,0	1,1,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (4 June - 13 Aug.)	70	0,0,0	3,3,1	0,0,0	0,0,0	0,0,0	0,0,0
				Sec. (13 Aug. - 16 Oct.)	64	0,0,1	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0
				Sec. (13 Aug. - 16 Oct.)	64	0,0,0	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0
				Full (4 June - 16 Oct.)	134	0,0,0	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0
				Full (4 June - 16 Oct.)	134	0,0,0	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0

Appendix 2, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Bras d'Or Lake	169	Ben Eoin Petri Collector HOBO	DFO	First (4 June - 13 Aug.)	70	0,0,0,0,0,0	4,4,4,1,3,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (4 June - 13 Aug.)	70	0,0,0,0,0,0	4,4,4,4,3,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (13 Aug. - 15 Oct.)	63	0,0,0,0,0,0	4,4,4,4,4,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (13 Aug. - 15 Oct.)	63	0,0,0,0,0,0	4,4,4,4,4,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (4 June - 15 Oct.)	133	0,0,0,0,0,0	1,0,0,1,1,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (4 June - 15 Oct.)	133	0,0,0,0,0,0	1,1,1,1,0,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	51	Whycocomagh Reg. Collector	DFO	First (6 June - 14 Aug.)	69	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (6 June - 14 Aug.)	69	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Sec. (14 Aug. - 17 Oct.)	64	0,0,0	1,2,1	0,0,0	0,0,0	0,0,0	0,0,0
				Sec. (14 Aug. - 17 Oct.)	64	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				Full (6 June - 17 Oct.)	133	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (6 June - 17 Oct.)	133	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
	55	Baddeck Reg Collector HOBO	DFO	First (5 June - 14 Aug.)	70	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (5 June - 14 Aug.)	70	0,0,0	0,0,1	0,0,0	0,0,0	0,0,0	0,0,0
				Sec. (14 Aug. - 16 Oct.)	63	0,0,0	3,4,4	0,0,1	0,0,0	0,0,0	0,0,0
				Sec. (14 Aug. - 16 Oct.)	63	0,0,0	4,4,2	0,0,0	0,0,0	0,0,0	0,0,0
				Full (5 June - 16 Oct.)	133	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				Full (5 June - 16 Oct.)	133	0,0,0	3,2,1	0,0,0	0,0,0	0,0,0	0,0,0
	54	Eskasoni	EFWC	Report	NA	ND	P	ND	ND	ND	ND
Cape Breton	69	Dingwall Reg Collector	DFO	Full (5 June - 17 Oct.)	134	3,4,4	2,2,1	2,3,4	0,0,0	0,0,0	0,0,0
				Full (5 June - 17 Oct.)	134	3,4,4	2,2,3	2,3,3	0,0,0	0,0,0	0,0,0
				Full (5 June - 17 Oct.)	134	3,4,4	2,1,3	1,3,1	0,0,0	0,0,0	0,0,0
				Full (5 June - 17 Oct.)	134	0,0,0	3,3,3	1,2,2	0,0,0	0,0,0	0,0,0
	94	Aspy Bay North Reg Collector Minilog	DFO	Full (5 June - 17 Oct.)	134	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (5 June - 17 Oct.)	134	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (5 June - 17 Oct.)	134	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (5 June - 17 Oct.)	134	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
	209	Parrsboro	DFO	Full (4 June - 4 Oct.)	122	ND	ND	ND	ND	ND	P

Appendix 2, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Cape Breton	74	Little River	DFO	First (5 June - 13 Aug.)	69	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				Reg Collector	First (5 June - 13 Aug.)	69	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0
				HOB0	Sec. (13 Aug. - 17 Oct.)	65	0,0,0	4,3,3	0,0,0	0,0,0	0,0,0
					Sec. (13 Aug. - 17 Oct.)	65	0,0,0	3,2,1	0,0,0	0,0,0	0,0,0
					Full (5 June - 17 Oct.)	134	0,0,0	4,4,4	0,0,0	0,0,0	0,0,0
					Full (5 June - 17 Oct.)	134	lost	lost	lost	lost	lost
	75	St Ann's Bay	DFO	Full (6 June - 19 Nov.)	166	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Reg Collector	Full (6 June - 19 Nov.)	166	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				HOB0	Full (6 June - 19 Nov.)	166	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
					Full (6 June - 19 Nov.)	166	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
	63	North Sydney	DFO	First (4 June - 13 Aug.)	70	3,3,1	0,0,3	0,1,1	0,0,0	0,0,0	0,0,0
				Reg Collector	First (4 June - 13 Aug.)	70	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0
				HOB0	Sec. (13 Aug. - 16 Oct.)	64	4,4,4	0,1,1	1,0,1	0,0,0	0,0,0
					Sec. (13 Aug. - 16 Oct.)	64	1,0,1	1,1,1	3,3,4	0,0,0	0,0,0
					Full (4 June - 16 Oct.)	134	4,0,0	1,1,1	2,1,2	0,0,0	0,0,0
					Full (4 June - 16 Oct.)	134	1,0,0	1,1,0	1,2,2	0,0,0	0,0,0
	58	Louisbourg	DFO	First (4 June - 13 Aug.)	70	1,0,0	1,1,2	0,0,0	0,0,0	0,0,0	0,0,0
				Reg Collector	First (4 June - 13 Aug.)	70	lost	lost	lost	0,0,0	0,0,0
				HOB0	Sec. (13 Aug. - 16 Oct.)	64	4,0,0	0,1,2	1,1,1	0,0,0	0,0,0
					Sec. (13 Aug. - 16 Oct.)	64	2,1,4	1,1,0	1,1,1	0,0,0	0,0,0
					Full (4 June - 16 Oct.)	134	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0
					Full (4 June - 16 Oct.)	134	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0
North shore	172	Big Island	DFO	Full (11 June - 29 Nov.)	171	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Reg Collector	Full (11 June - 29 Nov.)	171	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				HOB0	Full (11 June - 29 Nov.)	171	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
					Full (11 June - 29 Nov.)	171	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0

Appendix 2, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Southwest New Brunswick	132	Musquash Petri Collector	DFO	Sec. (9 Aug. - 28 Oct.)	80	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (9 Aug. - 28 Oct.)	80	lost	lost	lost	lost	lost	lost
				Full (31 May - 28 Oct.)	150	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (31 May - 28 Oct.)	150	lost	lost	lost	lost	lost	lost
	133	Dipper Harbour Petri Collector	DFO	Sec. (9 Aug. - 28 Oct.)	80	0,1,0,1,0,0	2,2,1,1,1,2	0,1,1,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (9 Aug. - 28 Oct.)	80	1,1,0,1,1,0	1,1,1,1,1,1	1,1,0,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (31 May - 28 Oct.)	150	1,1,0,0,0,0	0,1,2,1,2,1	1,0,0,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (31 May - 28 Oct.)	150	lost	lost	lost	lost	lost	lost
	134	Blacks Harbour Petri Collector	NBDAAF	Sec. (1 Aug. - 28 Oct.)	83	0,0,0,1,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (1 Aug. - 28 Oct.)	83	0,0,0,1,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (10 May - 28 Oct.)	171	0,0,0,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (10 May - 28 Oct.)	171	0,0,0,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	135	Beaver Harbour Petri Collector	DFO	Sec. (9 Aug. - 28 Oct.)	80	1,0,0,0,0,0	4,3,3,4,3,3	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (9 Aug. - 28 Oct.)	80	3,3,3,2,1,2	3,3,2,3,4,3	0,0,1,0,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (31 May - 28 Oct.)	150	2,1,0,0,0,0	1,1,1,1,1,1	1,0,0,1,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (31 May - 28 Oct.)	150	0,0,1,0,1,0	3,3,2,2,1,0	0,0,0,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	141	Back Bay Petri Collector	NBDAAF	Sec. (1 Aug. - 28 Oct.)	83	0,0,0,1,0,0	3,0,1,1,0,0	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (1 Aug. - 28 Oct.)	83	0,0,0,0,0,0	1,3,1,1,1,0	0,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (10 May - 28 Oct.)	171	0,1,0,0,0,0	1,0,1,0,0,0	1,0,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (10 May - 28 Oct.)	171	0,0,0,1,1,1	4,2,0,2,2,0	0,1,1,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	143	L'Etete Petri Collector	NBDAAF	Sec. (1 Aug. - 28 Oct.)	83	3,1,1,2,3,2	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (1 Aug. - 28 Oct.)	83	0,1,1,3,3,1	1,1,1,1,1,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (10 May - 28 Oct.)	171	2,1,1,2,2,3	1,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (10 May - 28 Oct.)	171	1,1,1,3,0,0	1,0,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0

Appendix 2, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Southwest New Brunswick Grand Manan Island	159	Bliss Harbour Petri Collector	NBDAAF	Sec. (1 Aug. - 28 Oct.)	83	0,0,0,4,1,2	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (1 Aug. - 28 Oct.)	83	1,1,0,2,2,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (13 May - 28 Oct.)	168	1,3,2,2,3,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (13 May - 28 Oct.)	168	3,4,4,1,3,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	151	St. Andrew's Petri Collector	DFO	Sec. (9 Aug. - 28 Oct.)	80	1,1,1,1,1,1	1,0,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (9 Aug. - 28 Oct.)	80	3,2,1,0,0,0	1,1,1,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (31 May - 28 Oct.)	150	1,2,1,1,2,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (31 May - 28 Oct.)	150	1,1,0,1,1,1	0,1,0,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	152	SABS Petri Collector HOBO	DFO	Sec. (1 Aug. - 29 Oct.)	84	4,4,4,3,4,3	1,0,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (1 Aug. - 29 Oct.)	84	2,2,2,1,3,0	1,2,1,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (13 May - 29 Oct.)	169	2,2,4,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (13 May - 29 Oct.)	169	1,3,2,3,2,1	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	136	North Head Petri Collector HOBO	NBDAAF	Sec. (1 Aug. - 29 Oct.)	84	1,1,0,1,1,1	2,1,1,2,2,3	1,0,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (1 Aug. - 29 Oct.)	84	1,0,0,1,1,1	1,3,2,3,2,3	1,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (15 May - 29 Oct.)	167	1,2,3,1,2,2	3,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (15 May - 29 Oct.)	167	0,1,0,0,0,0	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	137	Ingall's Head Petri Collector	NBDAAF	Sec. (1 Aug. - 29 Oct.)	84	0,0,1,0,0,1	3,2,2,3,4,3	0,0,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (1 Aug. - 29 Oct.)	84	0,0,0,0,0,1	4,4,1,2,2,2	1,1,0,1,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (15 May - 29 Oct.)	167	0,0,0,0,0,0	1,2,1,1,2,1	0,0,1,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (15 May - 29 Oct.)	167	0,0,0,0,0,0	2,2,4,0,0,0	1,0,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	140	Seal Cove Petri Collector	NBDAAF	Sec. (1 Aug. - 29 Oct.)	84	1,0,1,0,1,0	1,4,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (1 Aug. - 29 Oct.)	84	0,0,0,0,0,0	2,1,1,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (15 May - 29 Oct.)	167	3,1,1,1,2,1	1,1,1,1,1,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (15 May - 29 Oct.)	167	1,2,1,1,1,2	1,2,3,2,2,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0

Appendix 2, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Campobello Island	144	Head Harbour Petri Collector HOBO	NBDAAF	Sec. (1 Aug. - 29 Oct.)	84	1,1,1,2,1,1	2,1,2,2,4,3	1,1,1,1,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (1 Aug. - 29 Oct.)	84	2,2,2,1,0,0	1,1,2,2,1,1	1,0,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (10 May - 29 Oct.)	172	0,1,0,0,1,0	1,1,0,1,1,0	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (10 May - 29 Oct.)	172	3,2,2,3,3,2	1,1,1,1,1,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	145	Wilson's Beach Petri Collector	NBDAAF	Sec. (1 Aug. - 29 Oct.)	84	3,3,3,1,1,1	1,1,1,1,2,1	1,1,1,1,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (1 Aug. - 29 Oct.)	84	3,3,3,1,2,1	1,1,1,2,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (10 May - 29 Oct.)	172	4,4,4,2,2,2	0,0,1,1,1,1	0,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (10 May - 29 Oct.)	172	3,4,2,2,1,2	1,0,1,0,2,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
Deer Island	146	Leonardville Petri Collector	NBDAAF	Sec. (1 Aug. - 29 Oct.)	84	2,0,1,2,2,3	1,2,0,1,2,0	1,1,1,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (1 Aug. - 29 Oct.)	84	3,0,1,2,2,2	1,1,0,1,0,1	0,1,0,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (10 May - 29 Oct.)	172	1,2,0,1,1,1	0,1,0,1,1,1	1,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (10 May - 29 Oct.)	172	2,2,0,1,2,1	0,0,1,1,2,0	1,1,1,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	147	Indian Island Petri Collector	NBDAAF	Sec. (1 Aug. - 29 Oct.)	84	0,0,0,1,1,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (1 Aug. - 29 Oct.)	84	0,0,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (10 May - 29 Oct.)	172	lost	lost	lost	lost	lost	lost
				Full (10 May - 29 Oct.)	172	lost	lost	lost	lost	lost	lost
	149	Fairhaven Petri Collector	NBDAAF	Sec. (1 Aug. - 29 Oct.)	84	1,1,1,1,1,1	3,1,2,2,2,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (1 Aug. - 29 Oct.)	84	1,1,1,2,1,1	2,2,2,2,2,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (10 May - 29 Oct.)	172	lost	lost	lost	lost	lost	lost
				Full (10 May - 29 Oct.)	172	lost	lost	lost	lost	lost	lost

Appendix 3. Details of monitoring and tunicate cover on individual monitoring collectors at each station and as reports of presence in 2014. Stations are grouped by geographical Region or Bay. Species cover are given for top, middle and bottom plates (x, y, z), and Petri dishes (a,b,c) where 0 = no tunicate cover, 1 = <25%, 2 = 26 - 50%, 3 = 51 - 75%, and 4 = 76 - 100%. Minilog, HOBO or CT2X thermistors (purple text) were deployed at some stations. NA = not applicable, C.i. = *Ciona intestinalis*, B.s. = *Botryllus schlosseri*, B.v. = *Botrylloides violaceus*, A.a. = *Asciidiella aspersa*, S.c. = *Styela clava*, D.l. = *Diplosoma listerianum*, D. v. = *Didemnum vexillum*, P = Present, A = Absent, * = tunicate present at station, but not on monitoring collector.

Region	Stn. No.	Location	Monitor. By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a. cover	S.c. cover	D.v. cover
Bay of Fundy	209	Parrsboro	DFO	Full (27 June - 6 Oct..)	93	ND	ND	ND	ND	ND	P
	1	Digby Reg. Collector HOBO	DFO	First (28 May - 13 Aug)	77	0,0,0	1,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (28 May - 13 Aug)	77	0,0,0	1,1,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (13 Aug - 28 Oct)	76	1,1,1	2,3,2	1,2,0	0,0,0	0,0,0	0,0,0
				Second (13 Aug - 28 Oct)	76	0,0,1	0,0,1	1,2,1	0,0,0	0,0,0	0,0,0
				First (28 May - 13 Aug)	153	1,0,1	1,2,1	1,0,1	0,0,0	0,0,0	0,0,0
				First (28 May - 13 Aug)	153	4,3,3	0,1,2	1,0,0	0,0,0	0,0,0	0,0,0
Southwest shore	2	Meteghan Reg. Collector HOBO	DFO	First (28 May - 13 Aug)	77	1,1,1	3,2,2	0,0,0	0,0,0	0,0,0	0,0,0
				First (28 May - 13 Aug)	77	1,0,0	2,1,2	0,0,0	0,0,0	0,0,0	0,0,0
				Second (13 Aug - 28 Oct)	76	0,0,4	2,1,1	3,1,1	0,0,0	0,0,0	0,0,0
				Second (13 Aug - 28 Oct)	76	lost	lost	lost	lost	lost	lost
				Full (28 May - 28 Oct)	153	0,1,0	1,1,1	1,3,3	0,0,0	0,0,0	0,0,0
				Full (28 May - 28 Oct)	153	3,4,4	1,0,0	1,1,1	0,0,0	0,0,0	0,0,0
	4	Yarmouth Bar Reg. Collector HOBO	DFO	First (27 May - 12 Aug)	77	0,1,0	1,1,0	1,1,1	0,0,0	0,0,0	0,0,0
				First (27 May - 12 Aug)	77	1,1,1	0,1,0	1,1,1	0,0,0	0,0,0	0,0,0
				Second (12 Aug - 28 Oct)	77	0,0,0	1,2,1	3,2,3	0,0,0	0,0,0	0,0,0
				Second (12 Aug - 28 Oct)	77	0,0,0	1,2,0	2,3,4	0,0,0	0,0,0	0,0,0
				Full (27 May - 28 Oct)	154	0,0,0	1,1,1	2,2,2	0,0,0	0,0,0	0,0,0
				Full (27 May - 28 Oct)	154	lost	lost	lost	lost	lost	lost
	6	Wedgeport Reg. Collector HOBO	DFO	First (28 May - 13 Aug)	77	1,0,0	1,1,1	1,2,1	0,0,0	0,0,0	0,0,0
				First (28 May - 13 Aug)	77	0,0,0	3,4,4	1,3,1	0,0,0	0,0,0	0,0,0
				Second (13 Aug - 29 Oct)	77	2,0,0	1,2,3	3,4,3	0,0,0	0,0,0	0,0,0
				Second (13 Aug - 29 Oct)	77	1,0,0	3,3,3	2,1,3	0,0,0	0,0,0	0,0,0
				Full (28 May - 29 Oct)	154	1,2,1	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0
				Full (28 May - 29 Oct)	154	0,0,0	0,0,0	1,3,1	0,0,0	0,0,0	0,0,0
	7	Camp Cove Reg Collector HOBO	DFO	First (28 May - 13 Aug)	77	0,0,0	1,2,2	3,1,1	0,0,0	0,0,0	0,0,0
				First (28 May - 13 Aug)	77	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (Aug 13 - Oct 29)	77	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (Aug 13 - Oct 29)	77	0,0,0	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0
				Full (28 May - 29 Oct)	154	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (28 May - 29 Oct)	154	0,0,0	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0

Appendix 3, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Southwest shore	108	Eel Lake Reg. Collector Hobo lost	DFO	First (28 May - 13 Aug)	78	lost	lost	lost	lost	lost	lost
				First (28 May - 13 Aug)	78	lost	lost	lost	lost	lost	lost
				Second (13 Aug-29 Oct)	76	0,1,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (13 Aug-29 Oct)	76	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (28 May - 29 Oct)	154	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (28 May - 29 Oct)	154	0,0,0	0,0,3	0,0,0	0,0,0	0,0,0	0,0,0
	156	Falls Point Reg. Collector HOBO	DFO	First (27 May - 12 Aug)	77	3,4,4	0,0,0	1,1,0	0,0,0	0,0,0	0,0,0
				First (27 May - 12 Aug)	77	2,4,4	2,0,0	1,0,0	0,0,0	0,0,0	0,0,0
				Second (12 Aug-29 Oct)	78	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (12 Aug-29 Oct)	78	3,4,4	2,0,0	1,0,0	0,0,0	0,0,0	0,0,0
				Full (27 May - 29 Oct)	155	4,4,4	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0
				Full (27 May - 29 Oct)	155	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
South shore	8	Clark's Harbour Reg. Collector HOBO	DFO	First (27 May - 12 Aug)	77	0,0,0	1,2,1	1,1,1	0,0,0	0,0,0	0,0,0
				First (27 May - 12 Aug)	77	0,0,1	0,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Second (12 Aug - 29 Oct)	78	0,0,0	4,3,2	2,4,3	0,0,0	0,0,0	0,0,0
				Second (12 Aug - 29 Oct)	78	0,0,0	3,2,3	2,2,1	0,0,0	0,0,0	0,0,0
				Full (27 May - 29 Oct)	155	0,0,0	2,1,3	1,2,1	0,0,0	0,0,0	0,0,0
				Full (27 May - 29 Oct)	155	0,0,0	2,3,0	1,1,1	0,0,0	0,0,0	0,0,0
	12	Shelburne Reg Collector HOBO	DFO	First (27 May - 12 Aug)	77	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (27 May - 12 Aug)	77	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (12 Aug - 29 Oct)	78	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (12 Aug - 29 Oct)	78	lost	lost	lost	0,0,0	0,0,0	0,0,0
				Full (27 May - 29 Oct)	155	1,0,0	1,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (27 May - 29 Oct)	155	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
	82	Port Mouton Petri Collector	DFO	First (27 May - 12 Aug)	77	0,0,0,0,0,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (27 May - 12 Aug)	77	0,0,0,0,0,0	2,1,1,2,1,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (12 Aug-29 Oct)	78	1,0,0,1,0,0	2,1,1,1,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (12 Aug-29 Oct)	78	0,0,0,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (27 May - 29 Oct)	155	0,0,0,0,0,0	4,4,4,4,4,4	0,0,1,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (27 May - 29 Oct)	155	0,0,0,0,0,0	4,2,3,2,2,2	0,0,0,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0

Appendix 3, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
South shore	18	Lunenburg; RW Reg. Collector HOBO	DFO	First (27 May - 21 Aug)	86	0,0,0	1,1,1	3,2,3	0,0,0	0,0,0	0,0,0
				First (27 May - 21 Aug)	86	0,0,0	1,1,1	1,3,3	0,0,0	0,0,0	0,0,0
				Second (21 Aug - 29 Oct)	69	lost	lost	lost	lost	lost	lost
				Second (21 Aug - 29 Oct)	69	lost	lost	lost	lost	lost	lost
				Full (27 May - 29 Oct)	155	0,0,0	0,0,0	2,1,1	1,2,2	2,3,1	0,0,0
				Full (27 May - 29 Oct)	155	0,0,1	0,3,3	2,1,1	1,1,1	0,0,0	0,0,0
	19	Indian Point Reg. Collector HOBO	DFO	First (31 May - 31 July)	61	0,4,4	1,1,0	1,0,0	0,0,0	0,0,0	0,0,0
				First (31 May - 31 July)	61	0,4,4	1,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Sec (31 July - 30 Sept.)	61	4,4,4	1,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Sec (31 July - 30 Sept.)	61	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
	21	Chester Reg. Collector	DFO	First (27 May - 21 Aug)	86	0,0,0	4,4,4	1,2,1	0,0,0	0,0,0	0,0,0
				First (27 May - 21 Aug)	86	0,0,0	3,4,4	1,1,1	0,0,0	0,0,0	0,0,0
				Second (21 Aug - 29 Oct)	69	lost	lost	lost	lost	lost	lost
				Second (21 Aug - 29 Oct)	69	0,0,0	1,1,0	1,0,0	0,0,0	0,0,0	0,0,0
				Full (27 May - 29 Oct)	155	1*,0,0	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0
				Full (27 May - 29 Oct)	155	0,0,0	1,1,1	1,0,0	0,0,0	0,0,0	0,0,0
Halifax	24	Halifax; BIO Petri Collector HOBO	DFO	First (11 June - 21 Aug)	71	0,1,1,0,1,0	1,1,1,2,1,2	0,1,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (11 June - 21 Aug)	71	0,0,0,0,1,	4,4,4,2,2,1	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (21 Aug- 12 Nov)	83	0,0,0,1,1,1	1,2,4,1,1,2	0,1,0,0,1,0	0,0,0,0,0,0	0,0,0,1,1,0	0,0,0,0,0,0
				Second (21 Aug- 12 Nov)	83	0,0,0,0,1,1	2,2,2,1,1,2	3,2,1,1,2,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (11 June - 12 Nov)	154	2,0,0,2,3,4	0,1,1,0,0,1	0,1,0,0,0,2	0,0,0,0,0,0	1,0,0,0,1,0	0,0,0,0,0,0
				Full (11 June - 12 Nov)	154	0,0,1,0,1,1	0,0,0,1,0,2	1,?,0,4,0,1	0,0,0,0,0,0	1,1,0,3,1,1	0,0,0,0,0,0
	401	Halifax; AYC Petri Collector	DFO	First (12 June - 19 Aug)	68	4,4,4,4,4,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (12 June - 19 Aug)	68	4,4,4,4,4,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (19 Aug-28 Oct)	70	4,2,1,4,4,4	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (19 Aug-28 Oct)	70	4,4,4,4,4,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (12 June - 28 Oct)	138	4,4,4,4,4,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (12 June - 28 Oct)	138	4,4,4,4,4,4	2,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0

Appendix 3, continued.

Region	Stn No.	Location	Monitor		Deploy. Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover	
			By	Deployment Dates								
Halifax	402	Halifax; RNSYS Petri Collector HOBO - lost	DFO	First (12 June - 19 Aug)	68	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	
				First (12 June - 19 Aug)	68	1,2,2,4,4,4	1,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	
				Second (19 Aug-28 Oct)	70	1,1,0,1,1,1	0,1,0,0,2,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	
				Second (19 Aug-28 Oct)	70	lost	lost	lost	lost	lost	lost	lost
				Full (12 June - 28 Oct)	138	lost	lost	lost	lost	lost	lost	lost
				Full (12 June - 28 Oct)	138	lost	lost	lost	lost	lost	lost	lost
	428	Dartmouth YC Petri Collector	DFO	First (11 June - 21 Aug)	71	1,2,2,1,2,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	
				First (11 June - 21 Aug)	71	0,0,1,1,1,1	2,3,3,2,2,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (21 Aug-12 Nov)	83	4,4,4,4,4,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (21 Aug-12 Nov)	83	4,4,4,4,4,4	1,0,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (11 June - 12 Nov)	154	1,1,1,2,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (11 June - 12 Nov)	154	1,1,1,0,2,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	210	Skull Cove	DFO	Anecdotal (Nov. 2014)	NA	P	P	P	ND	P	ND	
	East shore	25	Ship Harbour	DFO	Anecdotal (Nov. 2014)	NA	P	P	ND	ND	ND	ND
		30	Port Bickerton Reg. Collector HOBO	DFO	First (5 June - 27 Aug)	83	1,1,1	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
					First (5 June - 27 Aug)	83	1,1,2	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
					Second (27 Aug - 21 Oct)	55	3,2,3	2,1,1	2,3,1	0,0,0	0,0,0	0,0,0
					Second (27 Aug - 21 Oct)	55	0,0,0	1,1,1	4,3,4	0,0,0	0,0,0	0,0,0
Full (5 June - 21 Oct)					138	0,0,0	0,0,0	1,2,2	0,0,0	0,0,0	0,0,0	
Full (5 June - 21 Oct)					138	0,0,0	0,0,1	1,2,2	0,0,0	0,0,0	0,0,0	
Chedabucto Bay		39	Cape Canso Reg. Collector HOBO	DFO	First (3 June - 25 Aug)	83	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
	First (3 June - 25 Aug)				83	1,1,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
	Second (25 Aug - 21 Oct)				57	0,0,0	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
	Second (25 Aug - 21 Oct)				57	2,3,1	1,0,1	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
	Full (3 June - 21 Oct)				140	3,3,2	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
	Full (3 June - 21 Oct)				140	1,2,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0

Appendix 3, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy. Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Chedabucto Bay	41	Venus Cove Petri+Reg. Collectors HOBO	DFO	First (3 June - 25 Aug)	83	0,1,1	1,2,1	0,0,0	0,0,0	1,1,0	0,0,0
				First (3 June - 25 Aug)	83	0,1,1	1,1,1	0,0,0	0,0,0	1,1,1	0,0,0
				Second (25 Aug - 23 Oct)	59	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (25 Aug - 23 Oct)	59	1,1,1,1,1,1	0,1,0,0,0,0	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (3 June - 23 Oct)	142	1,2,2	1,0,1	1,0,0	0,0,0	2,3,4	0,0,0
				Full (3 June - 23 Oct)	142	3,3,3	0,0,0	0,0,0	0,0,0	3,2,4	0,0,0
	182	Port Hawkesbury Petri+Reg. Collectors	DFO	First (3 June - 25 Aug)	83	1,1,1	1,1,1	2,2,1	0,0,0	0,0,0	0,0,0
				First (3 June - 25 Aug)	83	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (25 Aug - 23 Oct)	59	3,1,1,1,3,2	0,0,1,0,0,0	1,1,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (25 Aug - 23 Oct)	59	1,1,1,4,3,2	0,0,0,0,0,0	1,1,2,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (3 June - 23 Oct)	142	4,3,4	0,0,0	1,1,2	0,0,0	1,2,1	0,0,0
				Full (3 June - 23 Oct)	142	2,4,4	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0
	44	Petit-de-Grat Reg. Collector HOBO	DFO	First (3 June - 25 Aug)	83	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (3 June - 25 Aug)	83	4,2,0	0,0,0	1,1,2	0,0,0	0,0,0	0,0,0
				Second (25 Aug-22 Oct)	58	3,2,2	0,0,2	2,2,0	0,0,0	0,0,0	0,0,0
				Second (25 Aug-22 Oct)	58	4,4,4	0,0,0	0,0,1	0,0,0	0,0,0	0,0,0
				Full (3 June - 22 Oct)	141	lost	lost	lost	lost	lost	lost
				Full (3 June - 22 Oct)	141	4,4,4	0,1,1	1,1,1	0,0,0	0,0,0	0,0,0
Bras d'Or Lake	47	St. Peter's Reg. Collector	DFO	First (3 June - 25 Aug)	83	1,0,0	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				First (3 June - 25 Aug)	83	0,0,0	0,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				Second (25 Aug-22 Oct)	58	0,0,0	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0
				Second (25 Aug-22 Oct)	58	0,0,0	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0
				Full (3 June - 22 Oct)	141	0,0,0	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0
				Full (3 June - 22 Oct)	141	0,0,0	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0
	169	Ben Eoin Reg. Collector	DFO	First (4 June - 26 Aug)	83	0,0,0	0,1,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (4 June - 26 Aug)	83	0,0,0	0,1,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (26 Aug-22 Oct)	57	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (26 Aug-22 Oct)	57	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (4 June - 22 Oct)	140	0,0,0	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0
				Full (4 June - 22 Oct)	140	0,0,0	4,0,4	0,0,0	0,0,0	0,0,0	0,0,0

Appendix 3, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Bras d'Or Lake	54	Eskasoni Reg. Collector	EFGC	First (9 June - 18 Sept)	101	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				First (9 June - 18 Sept)	101	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (18 Sep - 28 Nov)	71	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (18 Sep - 28 Nov)	71	lost	lost	lost	lost	lost	lost
				Full (9 June - 28 Nov)	172	0,0,0	0,0,1	0,0,0	0,0,0	0,0,0	0,0,0
				Full (9 June - 28 Nov)	172	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
	76	Big Bras D'Or	DFO	Anecdotal (Dec 2014)	NA	ND	ND	P	ND	ND	ND
	211	Bras D'Or	DFO	Anecdotal (Oct 2014)	NA	P	P	P	ND	ND	ND
	212	New Harris	DFO	Anecdotal (Dec 2014)	NA	ND	ND	P	ND	ND	ND
	55	Baddeck Reg. Collector HOBO	DFO	First (4 June - 26 Aug)	83	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (4 June - 26 Aug)	83	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (26 Aug-23 Oct)	58	0,0,0	1,1,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (26 Aug-23 Oct)	58	0,0,0	0,0,1	0,0,0	0,0,0	0,0,0	0,0,0
				Full (4 June - 23 Oct)	141	0,0,0	0,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				Full (4 June - 23 Oct)	141	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
	51	Whycocomagh Reg. Collector	DFO	First (5 June - 27 Aug)	83	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (5 June - 27 Aug)	83	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (27 Aug-23 Oct)	40	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (27 Aug-23 Oct)	40	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (5 June - 23 Oct)	123	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (5 June - 23 Oct)	123	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
	48	Gillis Cove Reg. Collector HOBO	EFGC	First (9 June - 18 Sept)	101	0,0,0	4,1,3	1,1,1	0,0,0	0,0,0	0,0,0
				First (9 June - 18 Sept)	101	0,0,0	4,2,1	0,0,0	0,0,0	0,0,0	0,0,0
				Second (9 June - 11 Nov)	53	0,0,0	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0
				Second (9 June - 11 Nov)	53	0,0,0	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0
				Full (9 June - 11 Nov)	154	0,0,0	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0
				Full (9 June - 11 Nov)	154	0,0,0	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0

Appendix 3, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Cape Breton	69	Dingwall Reg. Collector	DFO	Full (4 June - 22 Oct)	140	0,0,0	1,1,3	1,3,1	0,0,0	0,0,0	0,0,0
				Full (4 June - 22 Oct)	140	1,1,2	2,3,1	1,1,1	0,0,0	0,0,0	0,0,0
				Full (4 June - 22 Oct)	140	0,0,0	1,1,2	1,1,1	0,0,0	0,0,0	0,0,0
				Full (4 June - 22 Oct)	140	0,1,1	2,1,1	1,1,1	0,0,0	0,0,0	0,0,0
	74	Little River Reg Collector HOBO	DFO	First (4 June - 25 Aug)	82	0,0,0	1,1,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (4 June - 25 Aug)	82	0,0,0	1,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (25 Aug-22 Oct)	58	0,0,0	3,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (4 June - 22 Oct)	140	0,0,0	2,1,2	0,0,0	0,0,0	0,0,0	0,0,0
	75	St Ann's Bay Reg Collector HOBO	St.FX	Full (2 June - 3 Oct)	123	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (2 June - 3 Oct)	123	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (2 June - 3 Oct)	123	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (2 June - 3 Oct)	123	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
	63	North Sydney Reg Collector HOBO	DFO	First (4 June - 26 Aug)	83	1,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (4 June - 26 Aug)	83	1,0,0	1,0,1	1,0,0	0,0,0	0,0,0	0,0,0
				Second (26 Aug-22 Oct)	57	0,0,0	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0
				Second (26 Aug-22 Oct)	57	0,0,0	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0
				Full (4 June - 22 Oct)	140	1,0,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (4 June - 22 Oct)	140	lost	lost	lost	lost	lost	lost
	190	Sydney: Dobson YC Reg. Collector	DFO	First (4 June - 26 Aug)	83	4,2,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (4 June - 26 Aug)	83	3,2,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (26 Aug-22 Oct)	57	0,0,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (26 Aug-22 Oct)	57	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (4 June - 22 Oct)	140	1,3,2	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (4 June - 22 Oct)	140	1,1,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0

Appendix 3, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Southwest New Brunswick	132	Musquash Petri Collector	DFO	Sec (13 Aug - 14 Oct)	62	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (13 Aug - 14 Oct)	63	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (28 May - 14 Oct)	139	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (28 May - 14 Oct)	139	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	133	Dipper Harbour Petri Collector	DFO	Sec (14 Aug - 14 Oct)	61	0,0,0,0,0,0	1,1,2,2,2,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (14 Aug - 14 Oct)	61	0,0,0,0,0,0	1,1,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (29 May - 14 Oct)	138	0,0,0,0,0,0	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (29 May - 14 Oct)	138	0,0,0,0,0,0	2,1,1,0,1,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	134	Blacks Harbour Petri Collector	NBDAAF	Sec (13 Aug - 15 Oct)	63	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (13 Aug - 15 Oct)	63	0,0,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 15 Oct)	138	1,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 15 Oct)	138	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	135	Beaver Harbour Petri Collector	DFO	Sec (14 Aug - 14 Oct)	61	1,0,0,0,0,1	2,2,2,2,1,2	1,2,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (14 Aug - 14 Oct)	61	2,3,2,4,4,3	1,1,2,1,0,1	1,1,1,1,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (29 May - 14 Oct)	138	4,4,4,3,2,3	0,1,1,1,1,1	0,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (29 May - 14 Oct)	138	1,0,0,1,1,1	1,1,2,1,0,1	1,1,1,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	141	Back Bay Petri Collector	NBDAAF	Sec (13 Aug - 15 Oct)	63	0,0,0,0,0,0	1,1,0,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (13 Aug - 15 Oct)	63	0,0,0,0,0,0	0,0,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 15 Oct)	138	0,0,0,0,0,0	0,1,1,1,0,1	0,1,0,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 15 Oct)	138	lost	lost	lost	lost	lost	lost
	143	L'Etete Petri Collector	NBDAAF	Sec (13 Aug - 15 Oct)	63	1,1,1,1,1,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (13 Aug - 15 Oct)	63	0,0,1,1,1,1	1,1,1,1,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 15 Oct)	138	1,1,1,1,1,1	1,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 15 Oct)	138	1,1,1,1,1,1	1,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	159	Bliss Harbour Petri Collector	NBDAAF	Sec (13 Aug - 15 Oct)	63	lost	lost	lost	lost	lost	lost
				Sec (13 Aug - 15 Oct)	63	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 15 Oct)	138	lost	lost	lost	lost	lost	lost
				Full (30 May - 15 Oct)	138	lost	lost	lost	lost	lost	lost

Appendix 3, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Southwest New Brunswick	151	St. Andrew's Petri Collector	DFO	Sec (14 Aug - 15 Oct)	62	0,0,1,0,1,1	1,1,3,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (14 Aug - 15 Oct)	62	0,0,1,0,0,0	0,1,3,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (29 May -15 Oct)	139	1,1,1,1,1,1	1,1,1,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (29 May -15 Oct)	139	0,1,0,1,1,1	0,0,0,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	152	SABS Petri Collector HOBO	DFO	Sec (14 Aug - 15 Oct)	62	1,1,1,1,1,1	2,2,3,1,2,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (14 Aug - 15 Oct)	62	1,1,1,1,0,0	2,3,2,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (29 May -15 Oct)	139	1,2,2,2,2,1	0,0,0,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (29 May -15 Oct)	139	2,2,2,1,2,1	0,0,0,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	136	North Head Petri Collector	NBDAAF	Sec (21 Aug - 14 Oct)	54	1,0,0,0,0,1	1,1,1,1,1,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (21 Aug - 14 Oct)	54	0,0,0,1,0,1	1,1,1,1,1,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (2 June - 14 Oct)	134	2,2,2,1,2,1	1,1,1,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (2 June - 14 Oct)	134	2,1,1,1,1,1	1,1,1,0,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	137	Ingall's Head Petri Collector	NBDAAF	Sec (21 Aug - 14 Oct)	54	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (21 Aug - 14 Oct)	54	0,0,0,0,0,0	0,0,0,0,0,0	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (2 June - 14 Oct)	134	0,0,0,L,L,L	1,0,0,L,L,L	0,0,0,L,L,L	0,0,0,L,L,L	0,0,0,L,L,L	0,0,0,L,L,L
				Full (2 June - 14 Oct)	134	0,0,0,L,0,L	1,0,1,L,0,L	0,0,0,L,0,L	0,0,0,L,0,L	0,0,0,L,0,L	0,0,0,L,0,L
	140	Seal Cove Petri Collector	NBDAAF	Sec (21 Aug - 14 Oct)	54	0,0,0,1,0,0	0,0,0,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (21 Aug - 14 Oct)	54	0,0,0,0,0,0	1,1,1,0,0,1	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (2 June - 14 Oct)	134	0,0,0,1,0,0	0,0,0,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (2 June - 14 Oct)	134	0,0,0,0,0,0	0,0,0,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
Campobello Island	144	Head Harbour Petri Collector	NBDAAF	Sec (13 Aug - 15 Oct)	61	0,0,0,1,1,1	2,1,1,1,2,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (13 Aug - 15 Oct)	61	1,1,1,1,0,1	1,1,1,1,1,1	1,1,1,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 15 Oct)	138	2,0,0,1,3,3	0,1,0,1,0,0	1,1,0,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 15 Oct)	138	2,2,1,1,3,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	145	Wilson's Beach Petri Collector	NBDAAF	Sec (13 Aug. - 15 Oct)	61	1,1,0,1,1,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec (13 Aug. - 15 Oct)	61	1,1,1,1,1,1	1,0,1,1,1,0	1,0,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 15 Oct)	138	2,2,1,1,2,1	1,0,0,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 15 Oct)	138	1,2,3,1,1,1	0,0,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0

Appendix 3, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Deer Island	146	Leonardville Petri Collector	NBDAAF	Sec. (13 Aug -15 Oct)	61	1,0,0,1,1,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (13 Aug -15 Oct)	61	0,1,0,1,0,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 15 Oct)	138	0,0,0,1,1,1	0,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 15 Oct)	138	0,0,0,0,1,0	0,0,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	149	Fairhaven Petri Collector	NBDAAF	Sec. (13 Aug -15 Oct)	61	0,1,0,1,1,1	0,0,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Sec. (13 Aug -15 Oct)	61	1,1,1,1,1,2	1,1,1,1,2,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 15 Oct)	138	0,0,0,0,0,1	1,0,1,1,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (30 May - 15 Oct)	138	damaged	damaged	damaged	damaged	damaged	damaged

Appendix 4. Details of monitoring and tunicate cover on individual monitoring collectors at each station and as reports of presence in 2015. Stations are grouped by geographical Region or Bay. Species cover are given for top, middle and bottom plates (x, y, z), and Petri dishes (a,b,c) where 0 = no tunicate cover, 1 = <25%, 2 = 26 - 50%, 3 = 51 - 75%, and 4 = 76 - 100%. Minilog, HOBO or CT2X thermistors (purple text) were deployed at some stations. NA = not applicable, C.i. = *Ciona intestinalis*, B.s. = *Botryllus schlosseri*, B.v. = *Botrylloides violaceus*, A.a. = *Ascidiella aspersa*, S.c. = *Styela clava*, D.l. = *Diplosoma listerianum*, D. v. = *Didemnum vexillum*, P = Present, A = Absent, * = tunicate present at station, but not on monitoring collector.

Region	Stn. No.	Location	Monitor. By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a. cover	S.c. cover	D.v. cover
Bay of Fundy	209	Parrsboro	DFO	Report (Dec. 2015)	NA	ND	ND	ND	ND	ND	P
	158	Tiverton	DFO	Full (28 May - 29 Sept.)	71	1,0,1	1,1,0	0,1,0	0,0,0	0,0,0	0,0,0
		CT2X		Full (28 May - 29 Sept.)	71	1,0,0	1,1,0	0,0,0	0,0,0	0,0,0	0,0,0
		Reg. Collector		Full (28 May - 29 Sept.)	71	1,0,1	0,0,1	0,1,0	0,0,0	0,0,0	0,0,0
				Full (28 May - 29 Sept.)	71	Lost	Lost	Lost	Lost	Lost	Lost
	1	Digby	DFO	First (28 May - 6 Aug.)	70	1,1,1,	1,0,0,	0,0,0	0,0,0	0,0,0	0,0,0
		Reg. Collector		First (28 May - 6 Aug.)	70	1,1,0	1,0,1	0,0,0	0,0,0	0,0,0	0,0,0
		HOBO		Second (6 Aug. - 29 Sept.)	54	0,0,0	0,1,3	1,1,1	0,0,0	0,0,0	0,0,0
				Second (6 Aug. - 29 Sept.)	54	2,2,2	3,3,2	1,0,0	0,0,0	0,0,0	0,0,0
				Full (28 May - 29 Sept.)	124	4,4,4	1,0,0	0,0,0	0,0,0	0,0,0	0,0,0
Southwest shore				Full (28 May - 29 Sept.)	124	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
	2	Meteghan	DFO	First (28 May - 6 Aug.)	70	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
		Reg. Collector		First (28 May - 6 Aug.)	70	0,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
		HOBO		Second (6 Aug. - 29 Sept.)	54	1,1,1	4,4,4	1,1,1	0,0,0	0,0,0	0,0,0
				Second (6 Aug. - 29 Sept.)	54	1,2,2	4,4,2	1,1,1	0,0,0	0,0,0	0,0,0
				Full (28 May - 29 Sept.)	124	4,3,2	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Full (28 May - 29 Sept.)	124	3,1,1	2,2,2	1,1,1	0,0,0	0,0,0	0,0,0
	4	Yarmouth Bar	DFO	First (28 May - 6 Aug.)	70	0,0,0	1,0,0,	0,0,0	0,0,0	0,0,0	0,0,0
		Reg. Collector		First (28 May - 6 Aug.)	70	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
		CT2X - St. FX		Second (6 Aug. - 30 Sept.)	55	0,0,0	1,0,0,	0,0,0	0,0,0	0,0,0	0,0,0
		* present on site		Second (6 Aug. - 30 Sept.)	55	0,0,0	0,1,0	1,0,0	0,0,0	0,0,0	0,0,0
				Full (28 May - 30 Sept.)	125	1*,0,0	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				Full (28 May - 30 Sept.)	125	0,0,0	1,2,1	1,1,1	0,0,0	0,0,0	0,0,0
		Yarmouth YC	DFO	First (28 May - 6 Aug.)	70	1,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
		Reg. Collector		First (28 May - 6 Aug.)	70	1,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (6 Aug. - 30 Sept.)	55	0,1,0	4,2,3	0,2,0	0,0,0	0,0,0	0,0,0
				Second (6 Aug. - 30 Sept.)	55	0,0,0	3,4,2	1,1,1	0,0,0	0,0,0	0,0,0
				Full (28 May - 30 Sept.)	125	2,2,1	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Full (28 May - 30 Sept.)	125	4,1,1	1,1,1	0,0,1	0,0,0	0,0,0	0,0,0

Appendix 4, continued.

Region	Stn No.	Location	Monitor		Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
			By	Deployment Dates							
Southwest shore	6	Wedgeport Reg. Collector CT2X - St. FX	DFO	First (27 May - 6 Aug.)	71	1,0,1	2,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				First (27 May - 6 Aug.)	71	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				Second (6 Aug. - 30 Sept.)	55	3,4,3	4,2,4	1,1,1	0,0,0	0,0,0	0,0,0
				Second (6 Aug. - 30 Sept.)	55	Lost	Lost	Lost	Lost	Lost	Lost
				Full (27 May - 30 Sept.)	126	4,4,4	3,1,2	3,3,2	0,0,0	0,0,0	0,0,0
				Full (27 May - 30 Sept.)	126	Lost	Lost	Lost	Lost	Lost	Lost
	108	Eel Lake Reg. Collector CT2X	DFO	Full (1 Aug. - 22 Dec.)	144	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (1 Aug. - 22 Dec.)	144	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (1 Aug. - 22 Dec.)	144	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (1 Aug. - 22 Dec.)	144	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
South shore	7	Camp Cove Reg Collector CT2X - St. FX	DFO	First (27 May - 6 Aug.)	71	4,4,3	1,0,1	1,0,1	0,0,0	0,0,0	0,0,0
				First (27 May - 6 Aug.)	71	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (6 Aug. - 30 Sept.)	55	1,1,0	0,0,1	1,1,4	0,0,0	0,0,0	0,0,0
				Second (6 Aug. - 30 Sept.)	55	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (27 May - 30 Sept.)	126	4,4,3	0,0,0	0,1,1	0,0,0	0,0,0	0,0,0
				Full (27 May - 30 Sept.)	126	Lost	Lost	Lost	Lost	Lost	Lost
	8	Clark's Harbour Reg. Collector HOBO	DFO	First (27 May - 6 Aug.)	71	1,1,1	1,0,1	0,0,0	0,0,0	0,0,0	0,0,0
				First (27 May - 6 Aug.)	71	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (6 Aug. - 30 Sept.)	55	1,1,0	0,0,0	1,1,0	0,0,0	0,0,0	0,0,0
				Second (6 Aug. - 30 Sept.)	55	1,3,1	0,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Full (27 May - 30 Sept.)	126	1,1,1	2,1,2	1,1,0	0,0,0	0,0,0	0,0,0
				Full (27 May - 30 Sept.)	126	1,1,1	2,1,0	1,1,1	0,0,0	0,0,0	0,0,0
	9	Port La Tour Reg. Collector HOBO	DFO	First (27 May - 6 Aug.)	71	2,1,1	1,0,1	1,1,0	0,0,0	0,0,0	0,0,0
				First (27 May - 6 Aug.)	71	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (6 Aug. - 30 Sept.)	55	4,4,4	1,2,1	1,1,1	0,0,0	0,0,0	0,0,0
				Second (6 Aug. - 30 Sept.)	55	4,3,1	1,1,1	2,2,3	0,0,0	0,0,0	0,0,0
				Full (27 May - 30 Sept.)	126	4,3,2	0,1,1	1,2,3	0,0,0	0,0,0	0,0,0
				Full (27 May - 30 Sept.)	126	Lost	Lost	Lost	Lost	Lost	Lost
	11	Gunning Cove Reg Collector	DFO	First (27 May - 5 Aug.)	70	1,1,1	1,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (27 May - 5 Aug.)	70	1,1,1	0,0,1	0,0,0	0,0,0	0,0,0	0,0,0
				Second (5 Aug. - 30 Sept.)	56	1,1,1	4,3,3	1,1,1	0,0,0	0,0,0	0,0,0
				Second (5 Aug. - 30 Sept.)	56	1,1,1	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0
				Full (27 May - 30 Sept.)	126	1,1,1	3,4,3	1,1,1	0,0,0	0,0,0	0,0,0
				Full (27 May - 30 Sept.)	126	1,0,0	2,4,4	1,1,1	0,0,0	0,0,0	0,0,0

Appendix 4, continued.

Region	Stn No.	Location	Monitor		Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
			By	Deployment Dates							
South shore	12	Shelburne Reg Collector HOBO	DFO	First (27 May - 5 Aug.)	70	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (27 May - 5 Aug.)	70	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (5 Aug. - 5 Oct.)	61	1,1,1	4,4,3	0,0,0	0,0,0	0,0,0	0,0,0
				Second (5 Aug. - 5 Oct.)	61	1,2,3	1,2,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (27 May - 5 Oct.)	131	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (27 May - 5 Oct.)	131	Lost	Lost	Lost	lost	Lost	Lost
	14	Lower Sandy Point Reg Collector	DFO	First (27 May - 5 Aug.)	70	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (27 May - 5 Aug.)	70	3,2,2	0,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				Second (5 Aug. - 5 Oct.)	61	1,1,2	2,1,2	1,1,1	0,0,0	0,0,0	0,0,0
				Second (5 Aug. - 5 Oct.)	61	1,3,4	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Full (27 May - 5 Oct.)	131	4,4,4	0,0,0	1,0,0	0,0,0	0,0,0	0,0,0
				Full (27 May - 5 Oct.)	131	4,4,4	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0
	82	Port Mouton Petri Collector HOBO	DFO	First (27 May - 5 Aug.)	70	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				First (27 May - 5 Aug.)	70	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				Second (5 Aug. -15 Oct.)	71	0,0,0	4,4,3	1,1,0	0,0,0	0,0,0	0,0,0
				Second (5 Aug. - 15 Oct.)	71	1,1,1	2,4,4	1,1,2	0,0,0	0,0,0	0,0,0
				Full (27 May - 15 Oct.)	141	0,0,0	4,4,4	1,1,1	0,0,0	0,0,0	0,0,0
				Full (27 May - 15 Oct.)	141	0,0,0	2,4,4	1,1,1	0,0,0	0,0,0	0,0,0
	18	Lunenburg; RW Reg. Collector HOBO	DFO	First (26 May - 5 Aug.)	71	0,0,0	0,1,2	4,3,2	0,0,0	0,0,0	0,0,0
				First (26 May - 5 Aug.)	71	Lost	Lost	Lost	Lost	Lost	Lost
				Second (5 Aug. -15 Oct.)	71	Lost	Lost	Lost	Lost	Lost	Lost
				Second (5 Aug. - 15 Oct.)	71	Lost	Lost	Lost	Lost	Lost	Lost
				Full (26 May - 15 Oct.)	142	1,1,1	0,0,0	1,1,2	0,0,0	1,1,0	0,0,0
				Full (26 May - 15 Oct.)	142	2,1,1	1,1,1	3,3,2	0,0,0	1,1,1	0,0,0
	608	Lunenburg; FMW Reg. Collector	DFO	First (26 May - 5 Aug.)	71	0,0,0	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				First (26 May - 5 Aug.)	71	0,0,0	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0
				Second (5 Aug. -15 Oct.)	71	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (5 Aug. - 15 Oct.)	71	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (26 May - 15 Oct.)	142	0,0,0	1,1,1	3,3,3	0,0,0	0,0,0	0,0,0
				Full (26 May - 15 Oct.)	142	0,0,0	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0
	587	Lunenburg YC Reg. Collector	DFO	First (26 May - 5 Aug.)	71	1,2,2	1,1,1	0,1,0	0,0,0	0,0,0	0,0,0
				First (26 May - 5 Aug.)	71	1,1,0	2,2,2	0,0,0	0,0,0	0,0,0	0,0,0
				Second (5 Aug. -15 Oct.)	71	Lost	Lost	Lost	Lost	Lost	Lost
				Second (5 Aug. - 15 Oct.)	71	Lost	Lost	Lost	Lost	Lost	Lost
				Full (26 May - 15 Oct.)	142	Lost	Lost	Lost	Lost	Lost	Lost
				Full (26 May - 15 Oct.)	142	Lost	Lost	Lost	Lost	Lost	Lost

Appendix 4, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
South shore	19	Indian Point Reg. Collector CT2X - St. FX	St. FX	Full (8 May - 5 Oct.)	150	4,4,4	1,1,1	1,1,0	0,0,0	0,0,0	0,0,0
				Full (8 May - 5 Oct.)	150	3,4,4	1,0,0	0,0,0	0,0,0	0,0,0	0,0,0
	20	Mahone Bay Reg. Collector	DFO	First (26 May - 5 Aug.)	71	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (26 May - 5 Aug.)	71	0,0,0	1,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (5 Aug. -15 Oct.)	71	0,0,0	1,1,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (5 Aug. - 15 Oct.)	71	0,0,1	1,2,3	0,0,0	0,0,0	0,0,0	0,0,0
				Full (26 May - 15 Oct.)	142	0,0,0	4,0,1	0,0,0	0,0,0	0,0,0	0,0,0
				Full (26 May - 15 Oct.)	142	0,0,0	4,0,1	0,0,0	0,0,0	0,0,0	0,0,0
	21	Chester Reg. Collector	DFO	First (26 May - 5 Aug.)	71	0,0,0	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				First (26 May - 5 Aug.)	71	0,0,0	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Second (5 Aug. -15 Oct.)	71	0,1,0	1,1,2	2,2,2	0,0,0	0,0,0	0,0,0
				Second (5 Aug. - 15 Oct.)	71	1,1,1	1,1,1	3,1,1	0,0,0	0,0,0	0,0,0
				Full (26 May - 15 Oct.)	142	1,0,0	0,0,0	1,0,0	0,0,0	0,0,0	0,0,0
				Full (26 May - 15 Oct.)	142	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
Halifax	24	Halifax; BIO Petri Collector Seabird ** Reg. Collector	DFO	First (25 May - 17 Aug.)	84	0,0,0,1,0,0	1,1,0,1,1,1	0,0,0,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (25 May - 17 Aug.)	84	1,0,0,1,0,0	1,1,1,2,3,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (17 Aug. - 30 Oct.)**	74	1,1,0	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0
				Second (17 Aug. - 30 Oct.)**	74	1,1,1	1,1,1	2,2,1	0,0,0	0,0,0	0,0,0
				Full (25 May - 30 Oct.)	158	4,2,0,3,4,4	0,1,1,0,0,0	1,0,0,0,1,0	0,0,0,0,0,0	1,0,0,0,0,0	0,0,0,0,0,0
				Full (25 May - 30 Oct.)	158	4,3,0,4,4,4	0,0,0,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	401	Halifax; AYC Petri Collector ** Reg. Collector	DFO	First (5 June - 13 Aug.)	69	0,0,0,0,0,0	4,4,3,2,3,4	1,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (5 June - 13 Aug.)	69	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (13 Aug. -13 Oct.)**	61	0,0,0	3,2,1	3,2,2	0,0,0	0,0,0	0,0,0
				Second (13 Aug. -13 Oct.)**	61	1,1,0	4,4,4	1,0,0	0,0,0	0,0,0	0,0,0
				Full (5 June - 13 Oct.)	130	0,0,0,0,0,0	2,1,2,2,1,1	1,1,2,1,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (5 June - 13 Oct.)	130	0,0,0,0,0,0	0,1,0,1,0,0	0,0,1,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0

Appendix 4, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy. Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a. cover	S.c. cover	D.v. cover
Halifax	430	Halifax; Shearwater <i>Petri Collector</i> ** Reg. Collector	DFO	First (5 June - 13 Aug.)	69	4,4,3,4,4,4	1,1,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (5 June - 13 Aug.)	69	0,0,0,0,0,0	0,1,1,2,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (13 Aug. - 14 Oct.)**	62	1,0,0	1,3,2	3,3,3	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (13 Aug. - 14 Oct.)**	62	2,3,2	1,1,1	1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (13 Aug. - 14 Oct.)	131	Lost	Lost	Lost	Lost	Lost	Lost
				Full (13 Aug. - 14 Oct.)	131	1,1,0,1,2,0	0,0,0,0,0,0	1,1,1,0,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	428	Dartmouth YC <i>Petri Collector</i> ** Reg. Collector	DFO	First (5 June - 13 Aug.)	69	4,4,4,4,4,4	0,0,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				First (5 June - 13 Aug.)	69	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (13 Aug. - 14 Oct.)**	62	4,4,4	1,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (13 Aug. - 14 Oct.)**	62	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (13 Aug. - 14 Oct.)	131	4,4,4,4,4,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (13 Aug. - 14 Oct.)	131	4,4,4,4,4,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
East shore	25	Ship Harbour <i>CT2X - St. FX</i>	St. FX	Full (12 May - 5 Oct.)	146	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (12 May - 5 Oct.)	146	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
	30	Port Bickerton	St. FX	Report (Nov. 2015)	NA	P	P	P	ND	ND	ND
Chedabucto Bay	39	Cape Canso	St FX	Report (Nov. 2015)	NA	P	P	ND	ND	ND	ND
	40	Eddy Point <i>Reg. Collector</i> <i>HOB0 lost</i>	DFO	First (1 June - 11 Aug.)	71	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (1 June - 11 Aug.)	71	Lost	Lost	Lost	Lost	Lost	Lost
				Second (11 Aug. - 8 Oct.)	58	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (11 Aug. - 8 Oct.)	58	Lost	Lost	Lost	Lost	Lost	Lost
				Full (1 June - 8 Oct.)	129	Lost	Lost	Lost	Lost	Lost	Lost
				Full (1 June - 8 Oct.)	129	Lost	Lost	Lost	Lost	Lost	Lost

Appendix 4, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy. Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Chedabucto Bay	41	Venus Cove Reg. Collectors HOBO	DFO	First (1 June - 11 Aug.)	71	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (1 June - 11 Aug.)	71	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (11 Aug. - 8 Oct.)	58	1,1,1	1,1,0	1,0,0	0,0,0	0,0,0	0,0,0
				Second (11 Aug. - 8 Oct.)	58	Lost	Lost	Lost	Lost	Lost	Lost
				Full (1 June - 8 Oct.)	129	2,2,2	0,0,0	1,1,1	0,0,0	1,1,1	0,0,0
				Full (1 June - 8 Oct.)	129	Lost	Lost	Lost	Lost	Lost	Lost
	182	Port Hawkesbury Reg. Collector	DFO	First (1 June - 11 Aug.)	71	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (1 June - 11 Aug.)	71	0,0,1	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0
				Second (11 Aug. - 8 Oct.)	58	1,2,1	0,0,1	1,2,1	0,0,0	0,0,0	0,0,0
				Second (11 Aug. - 8 Oct.)	58	2,1,2	0,1,1	2,1,1	0,0,0	0,0,0	0,0,0
				Full (1 June - 8 Oct.)	129	4,1,1	0,0,0	0,0,0	0,0,0	1*,0,0	0,0,0
				Full (1 June - 8 Oct.)	129	4,3,3	0,0,0	1,0,0	0,0,0	0,0,0	0,0,0
	44	Petit-de-Grat Reg. Collector HOBO	DFO	First (1 June - 11 Aug.)	71	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (1 June - 11 Aug.)	71	0,0,0	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0
				Second (11 Aug. - 7 Oct.)	57	2,2,4	1,1,1	3,2,2	0,0,0	0,0,0	0,0,0
				Second (11 Aug. - 7 Oct.)	57	1,2,2	1,1,1	3,2,3	0,0,0	0,0,0	0,0,0
				Full (1 June - 7 Oct.)	128	4,4,3	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0
				Full (1 June - 7 Oct.)	128	4,4,4	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0
Bras d'Or Lake	47	St. Peter's Reg. Collector	DFO	First (1 June - 11 Aug.)	71	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (1 June - 11 Aug.)	71	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (11 Aug. - 7 Oct.)	57	0,0,0	1,4,2	0,0,0	0,0,0	0,0,0	0,0,0
				Second (11 Aug. - 7 Oct.)	57	0,0,0	4,2,3	0,0,0	0,0,0	0,0,0	0,0,0
				Full (1 June - 7 Oct.)	128	0,0,0	1,4,3	0,0,0	0,0,0	0,0,0	0,0,0
				Full (1 June - 7 Oct.)	128	0,0,0	2,4,4	0,0,0	0,0,0	0,0,0	0,0,0
	169	Ben Eoin Reg. Collector	DFO	First (2 June - 11 Aug.)	70	0,0,0	0,1,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (2 June - 11 Aug.)	70	0,0,0	0,0,1	0,0,0	0,0,0	0,0,0	0,0,0
				Second (11 Aug. - 7 Oct.)	57	0,0,0	2,4,4	0,0,0	0,0,0	0,0,0	0,0,0
				Second (11 Aug. - 7 Oct.)	57	0,0,0	1,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (1 June - 7 Oct.)	128	0,0,0	4,3,1	0,0,0	0,0,0	0,0,0	0,0,0
				Full (1 June - 7 Oct.)	128	0,0,0	1,1,0	0,0,0	0,0,0	0,0,0	0,0,0

Appendix 4, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Bras d'Or Lake	54	Eskasoni	EFGC	Report (Dec., 2015)	N/A	ND	P	ND	ND	ND	ND
	55	Baddeck Reg Collector	DFO	First (3 June - 12 Aug.)	70	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (3 June - 12 Aug.)	70	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (12 Aug. - 7 Oct.)	56	0,0,0	0,1,1	0,0,0	0,0,0	0,0,0	0,0,0
				Second (12 Aug. - 7 Oct.)	56	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (2 June - 7 Oct.)	126	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (2 June - 7 Oct.)	127	0,0,0	1,3,4	0,0,0	0,0,0	0,0,0	0,0,0
	51	Whycocomagh Reg. Collector	DFO	Full (12 Aug. - 6 Oct.)	55	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (12 Aug. - 6 Oct.)	55	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (12 Aug. - 6 Oct.)	55	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (12 Aug. - 6 Oct.)	55	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
Cape Breton	63	North Sydney Reg Collector HOBO		First (2 June - 12 Aug.)	71	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (2 June - 12 Aug.)	71	1,1,1	0,0,1	0,0,0	0,0,0	0,0,0	0,0,0
				Second (12 Aug. - 7 Oct.)	56	1,1,1	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0
				Second (12 Aug. - 7 Oct.)	56	0,0,0	0,0,0	1,1,1	0,0,0	0,0,0	0,0,0
				Full (2 June - 7 Oct.)	127	1,1,1	0,0,0	1,2,2	0,0,0	0,0,0	0,0,0
				Full (2 June - 7 Oct.)	127	0,0,0	0,0,0	1,1,2	0,0,0	0,0,0	0,0,0
	190	Sydney: Dobson Yacht Club Reg. Collector		First (2 June - 11 Aug.)	70	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (2 June - 11 Aug.)	70	2,2,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (11 Aug. - 7 Oct.)	57	1,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (11 Aug. - 7 Oct.)	57	2,2,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (1 June - 7 Oct.)	128	4,4,2	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (1 June - 7 Oct.)	128	2,1,1	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
	69	Dingwall Reg. Collector CT2X - St. FX	DFO	Full (6 June - 6 Oct.)	126	4,4,4	1,1,1	2,1,1	0,0,0	0,0,0	0,0,0
				Full (6 June - 6 Oct.)	126	4,4,4	1,1,1	2,2,2	0,0,0	0,0,0	0,0,0
				Full (6 June - 6 Oct.)	126	4,4,4	1,1,1	1,1,1	0,0,0	0,0,0	0,0,0
				Full (6 June - 6 Oct.)	126	4,4,4	1,1,1	2,2,1	0,0,0	0,0,0	0,0,0

Appendix 4, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Cape Breton	74	Little River Reg Collector HOBO	DFO	First (2 June - 12 Aug.)	71	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				First (2 June - 12 Aug.)	71	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Second (12 Aug. - 6 Oct.)	55	0,0,0	4,2,1	0,0,0	0,0,0	0,0,0	0,0,0
				Second (12 Aug. - 6 Oct.)	55	Lost	Lost	Lost	Lost	Lost	Lost
				Full (2 June - 6 Oct.)	126	0,0,0	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0
				Full (2 June - 6 Oct.)	126	0,0,0	4,4,4	0,0,0	0,0,0	0,0,0	0,0,0
	75	St Ann's Bay Reg. Collector CT2X - St. FX	St. FX	Full (13 May - 26 Oct.)	166	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
				Full (13 May - 26 Oct.)	166	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0

Appendix 4, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Southwest New Brunswick	132	Musquash Petri Collector	DFO	Full (11 June - 19 Oct.)	130	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (11 June - 19 Oct.)	130	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (11 June - 19 Oct.)	130	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (11 June - 19 Oct.)	130	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	133	Dipper Harbour Petri Collector	DFO	Full (11 June - 19 Oct.)	130	0,0,0,0,0,0	1,1,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (11 June - 19 Oct.)	130	Lost	Lost	Lost	Lost	Lost	Lost
				Full (11 June - 19 Oct.)	130	0,0,0,0,0,0	1,0,1,0,0,1	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (11 June - 19 Oct.)	130	0,0,1,0,0,0	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	135	Beaver Harbour Petri Collector	DFO	Full (11 June - 19 Oct.)	130	2,2,1,1,2,1	2,2,3,2,1,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (11 June - 19 Oct.)	130	1,1,0,0,0,0	1,2,2,1,2,0	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (11 June - 19 Oct.)	130	2,4,2,4,4,4	2,2,2,1,1,0	2,1,1,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (11 June - 19 Oct.)	130	4,4,4,4,4,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	141	Back Bay Petri Collector	NBDAAF	Second (25 May - 13. Aug)	67	0,0,0,0,0,0	1,1,1,0,1,1	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (25 May - 13. Aug)	67	1,0,0,1,1,1	1,0,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (25 May - 19 Oct.)	147	0,0,0,L,,L	1,1,0,L,L,L	0,0,0,L,L,L	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (25 May - 19 Oct.)	147	0,0,0,0,0,L	2,1,0,0,1,L	0,0,0,0,0,L	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	143	L'Etete Petri Collector	NBDAAF	Second (25 May - 13. Aug)	67	0,0,0,0,1,1	1,1,0,0,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (25 May - 13. Aug)	67	0,0,0,0,1,1	0,0,0,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (25 May - 19 Oct.)	147	1,0,0,1,1,1	1,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (25 May - 19 Oct.)	147	1,0,0,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	151	St. Andrew's Petri Collector	DFO	Full (10 June - 21 Oct.)	133	0,0,0,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (10 June - 21 Oct.)	133	0,0,0,0,0,0	0,0,0,2,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (10 June - 21 Oct.)	133	0,1,1,1,1,0	2,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (10 June - 21 Oct.)	133	1,1,2,1,2,2	1,1,1,2,2,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	152	SABS Petri Collector HOB0	DFO	Full (10 June - 20 Oct.)	13	1,0,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (10 June - 20 Oct.)	132	1,0,1,1,1,0	1,1,1,2,1,1	1,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (10 June - 20 Oct.)	132	1,1,1,0,1,1	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (10 June - 20 Oct.)	132	1,0,1,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0

Appendix 4, continued.

Region	Stn No.	Location	Monitor By	Deployment Dates	Deploy Period (days)	C.i. cover	B.s. cover	B.v. cover	A.a cover	S.c. cover	D.v. cover
Grand Manan Island	136	North Head Petri Collector	NBDAAF	Second (13 Aug. - 20 Oct.)	68	1,1,1,1,1,1	2,3,3,2,2,2	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (13 Aug. - 20 Oct.)	68	0,0,0,0,0,0	2,2,2,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (13 May - 20 Oct.)	160	1,0,1,1,1,L	2,1,1,2,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (13 May - 20 Oct.)	160	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	137	Ingall's Head Petri Collector	NBDAAF	Second (13 Aug. - 20 Oct.)	68	0,0,0,1,0,0	3,2,1,3,3,3	0,0,0,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (13 Aug. - 20 Oct.)	68	0,0,0,0,0,0	3,2,1,3,2,2	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (13 May - 20 Oct.)	160	0,0,1,1,1,0	1,2,1,1,0,0	1,1,0,1,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (13 May - 20 Oct.)	160	0,1,0,0,1,0	1,1,1,0,0,0	1,0,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	140	Seal Cove Petri Collector	NBDAAF	Second (13 Aug. - 20 Oct.)	68	1,4,1,0,0,0	2,1,2,3,2,2	0,1,1,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (13 Aug. - 20 Oct.)	68	1,1,1,1,1,1	2,2,2,2,2,2	0,0,0,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (13 May - 20 Oct.)	160	0,1,0,0,0,0	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (13 May - 20 Oct.)	160	1,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
Campobello Island	144	Head Harbour Petri Collector	NBDAAF	Second (13 Aug. - 20 Oct.)	68	1,1,1,2,1,2	2,0,1,1,1,1	1,0,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (13 Aug. - 20 Oct.)	68	1,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (25 May - 20 Oct.)	148	4,3,3,4,4,4	0,0,0,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (25 May - 20 Oct.)	148	3,3,3,3,3,3	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	145	Wilson's Beach Petri Collector	NBDAAF	Second (13 Aug. - 20 Oct.)	68	1,1,1,1,1,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (13 Aug. - 20 Oct.)	68	1,1,1,1,1,1	1,1,1,0,1,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (25 May - 20 Oct.)	148	1,1,0,1,1,1	0,1,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (25 May - 20 Oct.)	148	1,1,1,1,1,1	0,0,1,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
Deer Island	146	Leonardville Petri Collector HOB0	NBDAAF	Second (13 Aug. - 20 Oct.)	68	0,0,0,0,0,0	0,0,0,1,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (13 Aug. - 20 Oct.)	68	1,1,1,1,0,0	2,2,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (25 May - 20 Oct.)	148	0,1,0,1,0,1	1,1,1,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (25 May - 20 Oct.)	148	0,0,1,0,0,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
	149	Fairhaven Petri Collector	NBDAAF	Second (13 Aug. - 20 Oct.)	68	0,0,0,1,1,1	2,2,1,4,3,4	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Second (13 Aug. - 20 Oct.)	68	0,0,0,L,L,L	0,0,0,L,L,L	0,0,0,L,L,L	0,0,0,L,L,L	0,0,0,L,L,L	0,0,0,L,L,L
				Full (25 May - 20 Oct.)	148	1,1,0,1,1,1	1,1,0,1,1,1	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0	0,0,0,0,0,0
				Full (25 May - 20 Oct.)	148	0,0,0,L,L,L	0,0,0,L,L,L	0,0,0,L,L,L	0,0,0,L,L,L	0,0,0,L,L,L	0,0,0,L,L,L

Appendix 5: Environmental variables measured using YSI probes at monitoring stations in 2012. ChlA = chlorophyll a, BIO = Bedford Institute of Oceanography, SABS = St. Andrew's Biological Station, MF = Marine Fish.

Region	Stn. No.	Location	Sample Date	Probe Depth, m	YSI Probe Type	Temp, °C	Salinity	Oxygen %	Oxygen mg L ⁻¹	Conductivity, mS cm ⁻¹	ChlA, µg L ⁻¹	pH
Southwest shore	158	Tiverton	31-May	0.95	6600	8.88	32.48	102.90	9.67	34.62	1.10	7.93
			8-Aug	1.05	6600	14.97	32.61	99.00	8.18	40.20		7.97
			11-Oct	1.08	6600	13.37	33.24	95.60	8.12	39.44		7.94
	1	Digby	12-Jun	0.50	6600	11.00	32.34	81.00	7.30			8.11
			10-Aug	0.50	6600	16.10		92.00	7.20			8.25
			2-Oct	1.50	6600	13.85	32.10	91.30	7.70			8.07
	2	Meteghan	23-May	0.95	6600	11.68	31.35	116.10	10.35	35.95	2.06	8.14
			8-Aug	1.18	6600	15.83	32.38	108.70	8.85	40.79		7.98
			11-Oct	0.89	6600	14.22	32.79	94.30	7.89	39.76		7.85
	4	Yarmouth Bar	24-May	0.95	6600	10.78	31.10	110.60	10.06	34.92	2.13	8.18
			8-Aug	1.08	6600	16.34	32.46	105.50	8.49	41.36	17.23	7.96
			11-Oct	0.71	6600	13.33	31.97	92.50	7.93	38.03		7.86
	155	Pinkney's Point	24-May	0.92	6600	12.66	30.58	104.80	9.19	35.99	1.25	8.16
			8-Aug	1.02	6600	18.08	32.02	103.30	8.06	42.47	5.21	7.94
			11-Oct	0.85	6600	13.69	31.50	100.50	8.58	37.87	12.10	7.83
	6	Wedgeport	24-May	1.00	6600	14.16	24.48	100.30	8.85	30.50	1.84	8.32
			7-Aug	1.02	6600	20.36	30.89	106.50	8.02	43.18	2.86	7.98
			11-Oct	0.74	6600	14.42	30.18	92.70	7.86	37.08	12.53	7.76
	154	Dennis Point	24-May	1.24	6600	12.60	30.59	105.50	9.26	35.95	0.66	8.31
			7-Aug	1.00	6600	18.12	31.85	103.00	8.04	42.30	5.06	7.96
			10-Oct	0.78	6600	13.76	30.83	95.30	8.15	37.22	5.43	7.81
	156	Falls Point	23-May	0.99	6600	11.68	31.19	108.20	9.65	35.78	0.81	8.32
			7-Aug	0.99	6600	17.72	31.82	101.10	7.95	41.89	2.42	7.91
			10-Oct	0.86	6600	13.42	31.53	93.50	8.02	37.68	10.26	7.82
South shore	8	Clark's Harbour	23-May	0.78	6600	9.95	31.76	100.80	9.30	34.85	1.47	8.26
			7-Aug	1.10	6600	15.41	31.73	91.00	7.50	39.67		7.86
			10-Oct	1.13	6600	12.73	31.62	88.00	7.66	37.16	11.80	7.80
	9	Port La Tour	23-May	0.97	6600	13.37	29.95	98.40	8.54	35.92	1.84	8.29
			7-Aug	1.16	6600	18.64	31.10	100.70	7.81	41.99		7.91
			10-Oct	0.80	6600	12.22	28.84	86.20	7.71	33.78	21.33	7.69
	12	Shelburne	23-May	0.85	6600	14.74	27.41	109.70	9.40	34.25	4.83	8.30
			7-Aug	0.91	6600	19.14	29.94	96.50	7.47	40.91	7.77	7.61
			10-Oct	0.99	6600	12.24	29.51	89.80	8.00	34.51	12.32	7.74
	119	East Side Port L'Hebert	14-Jun	1.00	6600	16.70	29.87	117.60	9.55	38.69	2.99	8.05
			3-Aug	0.83	6600	13.96	30.98	117.00	9.51	37.56		7.88
			9-Oct	0.97	6600	12.02	30.77	97.70	8.67	35.64	11.80	7.89
	82	Port Mouton	5-Jun	1.14	6600	12.64	27.66	93.10	8.32	32.86	1.76	8.15
			3-Aug	1.19	6600	15.00	30.40	99.70	8.35	37.81		8.08
			9-Oct	0.98	6600	12.16	29.40	96.50	8.62	34.33	3.37	7.78
	18	Lunenburg Railway Wharf	5-Jun	0.71	6600	12.70	30.55	89.20	7.82	35.99	1.10	8.05
			3-Aug	0.99	6600	18.85	30.33	108.70	8.45	41.11		8.01
			9-Oct	1.00	6600	13.13	30.76	94.60	8.21	36.60	6.31	7.82
	19	Indian Point	5-Jun	0.84	6600	13.17	29.55	102.00	8.91	35.33	1.25	8.08
			24-Jul	1.27	6600	14.60	30.34	0.00	0.00	37.41	5.94	8.07
			1-Nov	0.95	6600	11.33	30.36	96.30	8.69	34.63	2.71	7.93
Halifax	24	BIO	28-Aug	0.93	6600	18.04	30.29	105.20	8.30	40.36	2.71	8.14
			19-Oct	0.55	6600	10.89	29.31	89.00	8.17	33.19	15.91	7.79
East shore	25	Ship Harbour	19-Jul	0.88	6600	19.15	26.46			36.61		8.09
			27-Nov	0.61	6600	8.17	28.02	93.70	9.21	29.75	3.52	7.93
	161	Sheet Harbour	5-Jul	1.06	6600	20.68	14.70	0.00	0.00	22.17	5.79	7.86
			27-Sep	0.86	6600	17.77	2.19	99.50	9.34	3.54	5.28	7.10
	30	Port Bickerton	5-Jul	0.72	6600	17.90	30.07	0.00	0.00	39.98	11.00	7.95
			27-Nov	1.40	6600	5.36	29.79	93.40	9.70	29.20	1.69	8.00

Appendix 5, continued.

Region	Stn. No.	Location	Sample Date	Probe Depth, m	YSI Probe Type	Temp, °C	Salinity	Oxygen %	Oxygen mg L ⁻¹	Conductivity, mS cm ⁻¹	ChlA, µg L ⁻¹	pH
Chedabucto Bay	157	Guysborough	6-Jun	1.00	6600	10.14	29.83	101.80	9.47	33.09	0.74	7.41
			16-Aug	0.90	6600	20.54	29.79	109.20	8.24	41.95	4.40	8.01
			18-Oct	0.92	6600	11.10	28.68	94.00	8.62	32.72	25.43	7.91
	40	Eddy Point	6-Jun	0.82	6600	9.17	29.90	96.00	9.12	32.37	0.30	8.08
			13-Aug	1.00	6600	21.04	29.99	105.70	7.90	42.65	5.87	8.01
			15-Oct	0.95	6600	10.31	29.35	93.90	8.72	32.76	4.18	7.75
Bras d'Or Lake	45	D'Escousse	8-Jun	1.00	6600	10.70	30.04	103.00	9.45	33.77	1.18	8.30
			13-Aug	0.93	6600	22.10	29.95	101.30	7.43	43.55	6.38	7.99
			15-Oct	0.84	6600	9.28	29.71	91.30	8.66	32.27	9.09	7.81
	47	St. Peter's	7-Jun	0.98	6600	12.04	25.87	107.90	9.88	30.49	3.29	8.40
			14-Aug	0.98	6600	23.57	21.09	109.70	8.25	32.72	3.52	7.98
			16-Oct	0.97	6600	12.68	20.28	91.30	8.54	24.82	16.05	7.76
Bras d'Or Lake	54	Eskasoni	11-Jun	1.00	6600	15.40	18.58	122.40	10.64			
			4-Oct	1.00	6600	17.60	13.38					
			6-Jun	0.87	6600	12.03	21.52	104.00	9.79	25.79	0.59	7.94
	55	Baddeck	15-Aug	0.89	6600	23.56	22.14	109.30	8.17	34.18	0.37	8.08
			16-Oct	0.80	6600	14.03	20.93	95.30	8.62	26.38	22.87	7.94
			6-Jun	1.02	6600	12.88	18.75	95.50	8.99	23.21		
Cape Breton coast	62	Sydney	15-Aug	1.04	6600	24.10	19.89	110.20	8.27	31.36	4.18	8.07
			17-Oct	1.02	6600	14.32	19.81	80.60	7.30	25.26	13.78	7.69
			11-Jun	1.00	6600	17.60	13.14	105.30	9.44			
	52	Orangedale	3-Oct	1.00	6600	17.50						
			19-Nov	1.00	6600	17.40	17.90					
			7-Jun	0.98	6600	12.04	25.87	107.90	9.88	30.49	3.29	8.40
Southwest New Brunswick	63	North Sydney	14-Aug	1.01	6600	21.20	28.92	90.80	6.81	41.43	3.74	7.94
			16-Oct	0.70	6600	14.31	26.76	87.50	7.60	33.18	10.55	7.81
			7-Jun	1.01	6600	10.41	29.23	91.10	8.45	32.72	1.32	8.04
	74	Little River	14-Aug	1.00	6600	20.75	29.15	80.00	6.04	41.34	4.47	7.88
			16-Oct	0.86	6600	13.95	26.97	92.00	8.03	33.13	8.43	7.82
			7-Jun	0.82	6600	9.31	29.45	64.00	6.08	32.04	0.22	8.08
Campobello Island	69	Dingwall	15-Aug	1.03	6600	21.61	28.18	88.50	6.61	40.82	11.07	7.97
			17-Oct	1.00	6600	12.05	28.96	80.40	7.20	33.76		7.78
			7-Jun	0.85	6600	9.81	29.61	97.20	9.12	32.61	1.69	8.24
	132	Musquash	17-Oct	1.00	6600	11.29	28.33	92.40	8.46	32.51	16.30	7.93
			9-Aug	0.96	6600	15.77	31.20	111.40	9.13	39.41	1.84	7.95
			5-Nov	0.90	6600	11.53	21.61	94.90	9.02	25.57	2.64	7.93
Deer Island	133	Dipper Harbour	9-Aug	1.08	6600	15.62	31.98	105.20	8.61	40.15	7.40	7.91
			5-Nov	0.90	6600	12.10	32.40	96.50	8.47	37.41	2.64	7.88
			9-Aug	1.04	6600	15.01	31.80	105.40	8.74	39.40	4.33	7.83
	135	Beaver Harbour	5-Nov	0.95	6600	11.87	32.38	85.60	7.54	37.18	6.67	7.86
			9-Aug	1.00	6600	16.67	31.49	113.00	9.08	40.55	2.13	7.97
			5-Nov	0.91	6600	11.36	30.80	88.70	7.99	35.11	11.88	7.89
Deer Island	152	SABS	9-Aug	1.05	6600	15.32	30.85	101.50	8.42	38.60	7.84	7.84
			6-Nov	1.40	6600	9.99	26.15	100.50	9.60	29.28	5.79	7.88
			6-Nov	1.54	650	11.07	32.28	88.30	7.92	36.37		7.89
	144	Head Harbour	6-Nov	1.08	650	11.10	31.60	88.60	7.98	35.70		7.87
			6-Nov	1.63	650	11.54	32.37	87.20	7.74	36.88		7.91
			6-Nov	0.50	650	11.64	31.35	87.30	7.79	35.92		7.90
Deer Island	149	Fairhaven	6-Nov	0.53	6600	10.63	30.86	99.80	9.13	34.54	0.22	7.88
			6-Nov	0.53	6600	11.35	31.16	101.10	9.08	35.47	3.30	7.89

Appendix 6: Environmental variables measured using YSI probes at monitoring stations in 2013. ChlA = chlorophyll a, BIO = Bedford Institute of Oceanography, SABS = St. Andrew's Biological Station.

	Stn.		Sample	Probe	YSI Probe	Temp,		Oxygen,	Oxygen,	Conductivity,	
Region	No.	Location	Date	Depth, m	Type	°C	Salinity	%	mg L ⁻¹	mS cm ⁻¹	pH
Bay of Fundy	167	Westport	8-Aug	1.05	6600	11.77	30.71	97.10	8.67	35.36	7.74
			8-Oct	1.14	6600	11.82	28.74	94.20	8.51	33.36	7.90
	158	Tiverton	8-Aug	0.99	6600	14.06	30.61	106.60	9.08	37.23	7.84
			8-Oct	1.02	6600	12.06	28.87	100.70	9.04	33.68	7.90
	1	Digby	31-May	1.08	6600	9.91	31.29	100.50	9.31	34.35	7.95
			8-Aug	1.03	6600	14.46	30.68	104.40	8.81	37.66	7.81
8-Oct			1.07	6600	12.27	25.78	92.70	8.45	30.56	7.98	
Southwest shore	2	Meteghan	31-May	1.18	6600	9.63	31.36	102.30	9.53	34.19	7.99
			7-Aug	0.85	6600	15.35	30.92	101.50	8.41	38.71	7.83
			8-Oct	1.01	6600	13.40	28.98	97.10	8.47	34.89	7.92
	4	Yarmouth Bar	31-May	0.97	6600	9.28	30.96	95.00	8.94	33.50	7.94
			7-Aug	1.28	6600	13.00	29.99	107.60	9.40	35.65	7.80
			23-Sep	1.26	6600	12.41	25.97	98.70	8.95	30.88	8.00
Southwest shore	162	Yarmouth Yacht Club	31-May	1.29	6600	10.91	27.57	93.80	8.70	31.42	7.93
			7-Aug	1.29	6600	16.95	28.21	96.90	7.91	36.96	7.79
			23-Sep	1.19	6600	12.95	28.45	98.60	8.72	33.96	7.83
	155	Pinkney's Point	31-May	1.31	6600	10.41	30.44	98.90	9.11	33.93	7.95
			7-Aug	0.92	6600	15.47	30.49	100.10	8.30	38.33	7.82
			23-Sep	0.91	6600	13.21	28.36	98.70	8.68	34.07	7.81
Southwest shore	108	Eel Lake	26-Jun	1.02	6600	21.09	17.90	96.50	7.74	26.78	7.54
			7-Aug	0.72	6600	21.99	15.30	110.30	8.82	23.64	8.21
			9-Oct	1.13	6600	16.11	19.65	109.70	9.59	26.13	7.66
	6	Wedgeport	29-May	1.09	6600	11.54	26.86	98.30	9.04	31.16	7.97
			7-Aug	0.99	6600	16.72	27.70	102.40	8.42	36.17	7.83
			24-Sep	0.96	6600	14.15	24.32	95.50	8.45	36.18	
Southwest shore	97	Wedgeport; Tuna Wharf	29-May	1.07	6600	12.49	28.71	108.70	9.68	33.87	8.08
			7-Aug	1.03	6600	17.17	29.21	107.90	8.71	38.33	7.94
			9-Oct	0.90	6600	12.95	27.27	95.70	8.51	32.68	
	154	Dennis Point	29-May	0.84	6600	11.02	30.22	103.80	9.44	34.23	8.02
			7-Aug	1.10	6600	14.70	29.50	101.90	8.63	36.56	7.81
			24-Sep	1.48	6600	13.21	27.81	97.80	8.61	33.49	7.67
Southwest shore	7	Camp Cove	29-May	1.41	6600	12.10	29.84	100.10	8.92	34.74	7.98
			7-Aug	0.77	6600	17.01	29.61	106.60	8.61	38.66	7.87
			9-Oct	0.89	6600	13.23	28.01	99.10	8.73	33.70	7.87
	156	Fall's Point	29-May	1.15	6600	11.24	30.60	105.60	9.54	34.80	8.05
			6-Aug	0.94	6600	13.98	29.43	98.6	9.48	35.78	7.92
			9-Oct	1.48	6600	13.47	27.96	98.50	8.64	33.85	7.71
Southwest shore	160	West Head	29-May	0.97	6600	10.84	30.80	97.30	8.86	34.67	8.01
			6-Aug	1.41	6600	13.00	29.26	109.80	9.66	34.83	7.89
			24-Sep	1.00	85	11.70	31.50	70.30	6.30	35.59	
	8	Clark's Harbour	29-May	1.00	6600	10.54	30.61	100.00	9.17	34.21	8.05
			6-Aug	1.10	6600	13.90	29.21	116.40	10.03	35.57	7.93
			24-Sep	1.00	85	11.40	31.60	78.50	6.98	36.02	
Southwest shore	9	Port La Tour	29-May	1.15	6600	8.10	30.35	100.20	9.72	31.93	8.02
			6-Aug	0.61	6600	9.14	30.72	107.00	10.11	33.15	7.69
			25-Sep	1.00	85	10.00	32.70	55.40	5.43	35.36	
	10	Ingomar	29-May	0.94	6600	9.56	29.91	98.20	9.24	32.70	7.98
			6-Aug	0.99	6600	16.09	27.64	104.10	8.67	35.59	7.81
			25-Sep	1.00	6600	11.00	33.40	69.80	6.04	37.34	

Appendix 6, continued.

Region	Stn. No.	Location	Sample Date	Probe Depth, m	YSI Probe Type	Temp, °C	Salinity	Oxygen, %	Oxygen, mg L ⁻¹	Conductivity, mS cm ⁻¹	pH
South shore	11	Gunning Cove	28-May	1.06	6600	10.48	25.7	98.4	9.33	29.17	7.92
			6-Aug	1.00	6600	11.31	27.72	96.90	8.91	31.88	7.73
			25-Sep	0.69	6600	10.00	25.60	94.30	9.04	28.72	7.93
	12	Shelburne	28-May	0.96	6600	10.63	27.04	99.50	9.32	30.66	7.97
			6-Aug	0.91	6600	15.35	28.01	75.10	7.12	31.00	7.61
			25-Sep	0.70	6600	10.28	25.66	95.00	9.04	28.98	7.79
	14	Lower Sandy Point	28-May	3.02	6600	7.25	30.59	102.20	10.09	31.46	8.01
			6-Aug	1.06	6600	8.50	28.27	102.20	9.96	30.25	7.81
			25-Sep	1.07	6600	9.66	26.78	93.00	8.91	29.66	7.87
	17	Corkum's Island	25-Nov	4.27	Pro+	3.70	29.64	107.10	11.45	27.89	
	82	Port Mouton	28-May	0.94	6600	6.83	29.48	101.30	10.17	30.08	8.01
			15-Aug	1.00	6600	7.97	28.99	89.00	8.74	30.52	7.81
			9-Oct	0.77	6600	14.36	26.80	84.30	7.31	33.27	
South shore	119	East Side Port L'Hebert	28-May	0.76	6600	7.82	30.05	97.50	9.53	31.42	8.02
			15-Aug	1.02	6600	12.69	27.80	97.20	8.67	33.06	7.84
			9-Oct	0.95	6600	14.31	27.27	98.50	8.52	33.74	
	18	Lunenburg Railway Wharf	28-May	1.14	6600	7.29	30.51	103.00	10.17	31.41	8.04
			31-Jul	1.00	6600	18.91	29.01	113.90	8.91	39.57	7.96
			10-Oct	0.97	6600	14.53	27.37	90.30	7.77	34.03	7.81
	608	Lunenburg; Fisheries Museum Wharf	13-Jun	0.99	6600	10.67	30.26	99.70	9.14	33.97	8.01
			31-Jul	1.05	6600	17.54	29.50	104.20	8.34	38.99	7.92
			10-Oct	0.78	650	14.64	27.52	86.60	7.43	34.30	
	587	Lunenburg Yacht Club	13-Jun	0.95	6600	12.41	24.82	97.70	8.93	29.63	8.01
			31-Jul	0.93	6600	19.83	27.65	111.40	8.64	38.65	7.91
			10-Oct	0.85	6600	13.36	27.44	103.21	9.10	33.19	
	19	Indian Point	13-Jun	1.00	6600	12.03	28.89	101.90	9.16	33.69	7.95
			30-Jul	0.85	6600	19.37	28.36	112.00	8.72	39.16	7.87
			15-Oct	1.00	Pro+	13.50	26.26	110.00	9.40		
Halifax	21	Chester	28-May	1.01	6600	8.84	29.97	100.60	9.62	32.17	8.02
			6-Aug	1.23	6600	11.94	28.20	104.10	9.41	32.88	7.86
			10-Oct	0.72	6600	14.15	27.81	109.80	9.50	34.23	
	407	Tantallon	28-May	1.05	6600	9.32	26.55	102.00	9.86	29.18	8.06
			22-Aug	1.08	6600	18.00	24.82	105.00	8.56	33.73	7.88
	24	BIO	18-Jun	1.04	6600	11.74	27.37	108.50	9.90	31.86	8.04
			20-Aug	1.05	6600	15.00	28.64	112.80	9.54	35.85	7.91
			6-Nov	1	Pro+	8.7	28.4	139.8	13.99	30.5	
	401	Halifax; Armdale Yacht Club	20-Jun	1.02	6600	13.52	28.87	112.10	9.76	34.88	7.99
			22-Aug	0.95	6600	13.50	29.64	108.80	9.44	35.69	7.68
			4-Nov	1.00	Pro+	8.80	26.23	89.40	8.71	28.45	
	402	Halifax; Royal Nova Scotia Yacht Squadron	20-Jun	1.13	6600	14.25	28.52	98.20	8.44	35.10	8.04
			22-Aug	1.02	6600	12.75	29.58	114.00	10.06	34.98	7.81
			4-Nov	1.00	Pro+	8.40	26.51	96.50	9.62	28.48	
	403	Bedford Basin Yacht Club	12-Jun	0.88	6600	14.70	9.28	107.50	10.30	11.60	8.14
			21-Aug	0.94	6600	16.43	27.85	140.50	11.61	36.12	8.08
			25-Oct	1.00	Pro+	13.50	25.28	112.00	9.96		
	426	Purcell's Cove	20-Jun	1.00	6600	14.39	28.06	110.50	9.50	34.69	8.03
			22-Aug	1.05	6600	9.78	29.77	115.30	10.84	32.69	7.86
			4-Nov	1.00	Pro+	9.00	26.40	108.70	10.45	28.77	

Appendix 6, continued.

Region	Stn.	Location	Sample	Probe	YSI Probe	Temp,	Oxygen,	Oxygen,	Conductivity,		
	No.		Date	Depth,	Type	°C		Salinity			%
Halifax	427	Alderney Landing	12-Jun	0.78	6600	8.22	29.48	104.90	10.21	31.20	8.00
			21-Aug	0.50	6600	13.85	29.09	105.00	9.16	35.22	7.73
			31-Oct	1.00	Pro+	9.40	26.44	108.60	10.37	29.12	
	428	Dartmouth Yacht Club	12-Jun	0.89	6600	9.54	28.05	108.00	10.31	30.81	8.10
			21-Aug	0.82	6600	17.95	27.77	116.80	9.40	37.38	7.95
			31-Oct	1.00	Pro	11.90	24.70	98.70	9.14	29.15	
	430	Shearwater Yacht Club	12-Jun	0.91	6600	7.42	30.52	98.40	9.68	31.53	8.04
			21-Aug	0.79	6600	12.28	29.03	125.60	11.11	34.17	7.84
			31-Oct	1.00	Pro+	8.80	26.08	106.80	10.27	28.45	
	431	Bedford; Mill Cove	12-Jun	1.03	6600	14.93	3.43	112.50	11.12	5.05	8.33
			21-Aug	1.01	6600	13.55	27.47	123.80	10.87	33.29	7.88
			25-Oct	1.00	Pro+	13.50	25.08	101.30	8.99		
East shore	432	Herring Cove	20-Jun	1.05	6600	12.31	28.18	106.00	9.55	33.02	8.09
			22-Aug	0.78	6600	8.98	29.74	111.20	10.62	32.07	7.86
			4-Nov	1.00	Pro+	8.90	26.29	103.80	10.25	28.69	
	166	East Petpeswick	3-Jun	0.93	6600	16.98	24.75	113.20	9.43	32.86	8.15
			12-Aug	1.09	6600	21.81	26.07	105.20	7.93	38.21	7.90
			15-Oct	1.12	6600	13.79	22.12			27.58	7.97
	25	Ship Harbour	18-Jul	1.31	6600	17.17	24.86	108.00	8.96	33.13	7.89
			8-Nov	1.00	Pro +	9.60	24.80	125.60			
			3-Jun	0.92	6600	13.03	24.28	99.40	8.99	29.48	7.97
	26	Cooper's Point	12-Aug	1.03	6600	13.29	28.67	106.00	9.28	34.48	7.84
			15-Oct	1.60	6600	13.74	25.01			30.79	7.95
			3-Jun	1.17	6600	13.47	29.95	107.20	9.28	36.01	8.09
Chedabucto Bay	30	Port Bickerton	12-Aug	1.13	6600	15.48	29.15	97.00	8.10	36.83	7.87
			3-Jun	0.88	6600	7.90	30.43	95.60	9.32	31.83	8.00
			12-Aug	1.21	6600	16.11	28.93	98.60	8.14	37.10	7.81
	41	Venus Cove	4-Jun	0.81	6600	10.59	29.76	109.40	10.08	33.40	8.01
			12-Aug	1.06	6600	16.49	28.93	94.40	7.74	37.41	7.85
			13-Aug	1.05	6600	18.98	28.35	102.90	8.07	38.81	8.01
Bras d'Or Lake	47	St. Peter's	4-Jun	1.02	6600	11.92	20.38	106.00	10.07	24.48	8.00
			13-Aug	1.16	6600	19.76	19.45	99.10	8.07	28.07	7.98
			4-Jun	1.19	6600	12.60	20.35	102.00	9.55	24.84	7.94
	169	Ben Eoin	13-Aug	0.92	6600	21.80	19.42	94.90	7.44	29.27	7.87
			5-Jun	1.01	6600	13.84	16.72	100.70	9.39	21.38	8.01
			14-Aug	0.93	6600	20.85	19.36	99.50	7.95	28.61	7.97
Cape Breton	55	Baddeck	5-Jun	1.04	6600	10.64	21.75	98.30	9.52	25.17	8.00
			14-Aug	1.25	6600	20.92	20.94	101.40	8.01	30.77	7.93
			4-Jun	0.52	6600	10.02	28.66	100.40	9.43	7.97	7.97
	63	North Sydney	13-Aug	1.08	6600	20.32	28.01	117.60	9.01	39.51	8.05
			4-Jun	1.11	6600	9.85	28.66	91.30	8.61	31.69	7.96
			13-Aug	1.07	6600	17.49	28.23	92.50	7.47	37.43	7.83
	75	St. Ann's Bay	6-Jun	0.61	6600	8.71	28.21	104.30	10.12	30.36	7.96
			5-Jun	1.08	6600	7.80	30.06	95.40	9.33	31.41	7.99
			13-Aug	0.99	6600	20.27	27.77	102.50	7.87	39.16	7.94
	74	Little River	5-Jun	0.82	6600	9.70	29.34	97.30	9.16	32.26	7.82
North shore			11-Jun	0.94	6600	15.02	21.57	105.30	9.30	27.74	8.11

Appendix 6, continued.

Region	Stn. No.	Location	Sample Date	Probe Depth, m	YSI Probe Type	Temp, °C	Salinity	Oxygen, %	Oxygen, mg L ⁻¹	Conductivity, mS cm ⁻¹	pH
Southwest New Brunswick	132	Musquash	31-May	0.88	6600	13.09	8.08	97.20	9.72	10.75	7.80
			9-Aug	1.12	6600	14.74	23.02	97.30	8.57	29.25	7.85
			28-Oct	1.00	85	10.70	22.05	127.40	11.04		
	133	Dipper Harbour	31-May	0.85	6600	7.15	29.64	98.60	9.81	30.49	7.93
			9-Aug	1.04	6600	12.85	29.06	105.20	9.28	34.54	7.89
			28-Oct	1.00	Pro+	11.10	28.58	100.60	9.26	32.59	
	135	Beaver Harbour	31-May	0.93	6600	8.86	29.47	98.00	9.40	31.70	7.89
			9-Aug	0.68	6600	14.49	27.69	97.00	8.34	34.37	7.86
			28-Oct	1.00	Pro+	11.20	28.92	101.60	9.34	32.87	
	151	St. Andrew's	31-May	0.65	650	9.20	27.71	105.20	10.13	30.25	8.02
			9-Aug	0.88	650	13.60	27.64	91.20	7.99	33.61	7.76
	152	SABS	31-May	0.93	6600	9.74	24.43	105.50	10.24	27.35	8.02
			9-Aug	1.13	6600	13.77	25.34	94.40	8.36	31.18	7.82
			29-Oct	1.00	Pro+	11.20	26.78	109.10	10.10		
Grand Manan Island	136	North Head	29-Oct	1.00	6600	10.70	32.60			36.38	
	137	Ingalls Head	29-Oct	1.00	6600	10.00	32.80			35.95	
	140	Seal Cove	29-Oct	1.00	6600	10.30	32.80			36.25	
Campobello Island	144	Head Harbour	29-Oct	1.00	Pro+	10.50	28.74	102.30	9.40		
	145	Wilson Beach	29-Oct	1.00	Pro+	11.10	28.68	101.60	9.36		
	146	Leonardville	29-Oct	1.00	Pro+	11.00	28.49	113.30	10.25		
Deer Island	147	Indian Island	29-Oct	1.00	Pro+	11.30	28.70	114.40	10.59		
	149	Fairhaven	29-Oct	1.00	Pro+	10.50	28.20	103.30	9.85		

Appendix 7: Environmental variables measured using YSI probes at monitoring stations in 2014. ChlA = chlorophyll a, BIO = Bedford Institute of Oceanography, SABS = St. Andrew's Biological Station.

Region	Stn. No.	Location	Sample Date	Probe Depth, m	YSI Probe Type	Temp, °C	Salinity	Oxygen %	Oxygen mg L ⁻¹	Conductivity, mS cm ⁻¹	ChlA, µg L ⁻¹	pH
Bay of Fundy	1	Digby	28-May	0.83	6600	8.34	31.62	109.50	10.48	33.33		7.94
			3-Jul	0.79	6600	12.54	31.98	113.00	9.85	37.37		7.90
			13-Aug	1.02	6600	13.41	32.54	109.60	9.35	38.75		7.73
			28-Oct	1.12	6600	12.06	33.73	95.10	8.28	38.75		8.03
Southwest shore	2	Meteghan	28-May	1.13	6600	9.59	31.51	106.30	9.89	34.31		7.92
			13-Aug	1.11	6600	14.61	33.01	107.70	8.94	40.37		7.84
			28-Oct	1.16	6600	11.57	32.71	90.20	7.99	37.26		7.97
	4	Yarmouth Bar	27-May	1.10	6600	9.05	31.40	100.70	9.49	33.74		7.87
			12-Aug	0.83	6600	14.57	33.15	103.20	8.57	40.49		7.91
	108	Eel Lake	28-Oct	0.94	6600	12.80	33.05	91.70	7.90	38.72		8.04
			28-May	1.05	6600	15.66	17.78	99.00	8.84	23.61		7.72
			29-Oct	1.23	6600	12.29	23.31	87.00	8.05	27.91		7.74
	6	Wedgeport	28-May	0.98	6600	11.90	28.08	100.60	9.11	32.73		7.83
			13-Aug	1.04	6600	18.41	29.14	106.40	8.39	39.31		7.75
			29-Oct	0.73	6600	12.37	28.32	93.30	8.35	33.35		7.93
	7	Camp Cove	28-May	0.89	6600	11.10	30.51	99.80	9.05	34.60		7.81
			13-Aug	0.91	6600	17.31	31.81	106.90	8.48	41.51		7.78
			29-Oct	0.97	6600	13.09	32.21	90.40	7.77	38.11		7.97
South shore	156	Fall's Point	27-May	0.88	6600	10.36	31.18	104.10	9.55	34.64		7.92
			12-Aug	1.10	6600	15.34	32.39	120.40	9.89	40.36		7.94
			29-Oct	1.01	6600	12.24	32.21	88.90	7.79	37.35		7.91
	8	Clark's Harbour	27-May	0.97	6600	9.79	31.03	107.70	10.01	34.00		7.95
			12-Aug	1.00	6600	14.77	32.82	116.10	9.61	40.31		7.93
			29-Oct	1.27	6600	11.76	32.23	81.90	7.24	36.94		7.82
	12	Shelburne	27-May	0.89	6600	9.16	29.28	103.60	9.88	31.76		7.87
			12-Aug	1.06	6600	15.40	30.63	116.50	9.66	38.44		7.89
			27-May	0.85	6600	9.38	28.55	99.80	9.51	31.22		7.84
	82	Port Mouton	12-Aug	1.17	6600	15.56	31.02	112.80	9.30	39.02		7.93
			29-Oct	0.98	6600	13.63	32.07	72.50	6.17	38.44		7.88
	18	Lunenburg Railway Wharf	27-May	1.06	6600	9.05	30.81	105.40	9.98	33.15		7.93
			21-Aug	1.05	6600	19.26	31.32	109.70	8.40	42.70		8.00
			29-Oct	0.86	6600	13.17	31.76	94.00	8.10	37.69		7.97
Halifax	19	Indian Point	12-Jun	1.08	6600	11.92	29.15	101.90	9.16	33.88		7.97
			31-Jul	0.85	6600	18.01	28.92	113.30	9.02	38.69		7.86
			15-Oct	1.00	Pro+	13.50	26.26	110.00	9.40			
	21	Chester	27-May	0.85	6600	7.65	30.71	112.00	10.95	31.90		7.77
			21-Aug	1.04	6600	19.31	31.19	125.10	9.52	42.60		8.02
			29-Oct	0.70	6600	13.09	13.76	96.20	8.30	37.63		8.04
	24	BIO	11-Jun	1.00	6600	13.20	29.88	136.10	11.86	35.71		8.15
			21-Aug	2.60	6600	18.04	30.48	113.60	8.98	40.59		8.01
			12-Nov	0.51	6600	10.53	29.36	103.50	9.57	32.95		8.06
	401	Halifax; Armdale Yach Club	12-Jun	0.95	6600	13.56	30.13	118.70	10.25	36.29		7.92
			19-Aug	0.75	6600	18.76	30.78	100.40	7.79	41.60		7.84
			28-Oct	0.83	6600	12.20	31.41	89.50	7.88	36.48		7.91
	402	Halifax; Royal Nova Scotia Yacht Squadron	12-Jun	0.90	6600	12.31	30.17	128.00	11.34	35.27		7.98
			19-Aug	0.92	6600	18.75	30.81	113.90	8.84	41.63		7.89
			28-Oct	1.07	6600	12.88	31.75	90.60	7.85	37.43		8.03

Appendix 7, continued.

Region	Stn. No.	Location	Sample Date	Probe Depth, m	YSI Probe Type	Temp, °C	Salinity	Oxygen %	Oxygen mg L ⁻¹	Conductivity, mS cm ⁻¹	ChlA, µg L ⁻¹	pH
Halifax	428	Dartmouth Yacht Club	12-Jun	0.85	6600	13.68	29.57	151.30	13.08	35.77		8.08
			21-Aug	1.02	6600	18.36	30.32	114.40	8.97	40.69		8.03
			12-Nov	0.76	6600	11.10	29.79	99.30	9.05	33.85		8.08
East shore	30	Port Bickerton	5-Jun	0.90	6600	12.57	30.81	108.10	9.48	36.16		8.06
			27-Aug	1.32	6600	20.19	30.53	102.80	7.78	42.58		7.88
			21-Oct	1.07	6600	13.85	31.46	97.40	8.29	37.98		7.91
Chedabucto Bay	39	Cape Canso	3-Jun	1.14	6600	6.76	30.75	100.20	10.00	31.20		7.85
			25-Aug	1.06	6600	19.16	30.37	67.20	5.19	41.46		7.69
			21-Oct	1.00	6600	13.46	30.66	91.40	7.88	36.77		8.00
	41	Venus Cove	3-Jun	0.97	6600	10.88	29.93	117.50	10.75	33.82		7.99
			25-Aug	0.92	6600	18.15	30.28	115.50	9.09	40.45		7.95
			23-Oct	0.79	6600	11.46	29.25	97.10	8.81	33.59		8.06
	182	Port Hawkesbury	3-Jun	1.03	6600	10.32	30.23	115.20	10.64	33.65		7.95
			25-Aug	0.83	6600	18.63	30.29	114.80	8.96	40.89		7.93
			3-Jun	0.77	6600	10.04	30.68	120.40	11.16	33.87		8.03
	44	Petit-de-Grat	25-Aug	0.86	6600	20.21	29.48	112.10	8.53	41.28		7.93
			22-Oct	0.79	6600	10.65	31.56	85.20	7.75	35.27		7.96
			4-Jun	0.94	6600	10.29	20.51	105.90	10.42	23.65		7.75
Bras d'Or Lake	169	Ben Eoin	26-Aug	0.78	6600	20.17	20.62	106.50	8.55	29.87		7.92
			22-Oct	0.64	6600	12.52	21.87	94.50	8.78	26.49		8.03
			4-Jun	0.96	6600	11.21	20.19	109.00	10.52	23.85		7.79
	55	Baddeck	26-Aug	0.89	6600	22.32	21.82	116.70	8.94	32.88		7.99
			23-Oct	1.04	6600	13.19	23.81	96.00	8.68	29.07		8.06
			5-Jun	0.94	6600	16.77	11.75	105.40	9.54	16.56		7.90
	51	Whycocomagh	27-Aug	0.87	6600	19.76	28.22	108.60	8.40	39.31		7.97
			23-Oct	0.93	6600	12.82	22.33	89.40	8.23	27.19		7.89
			9-Jun	1.00	6600	16.40	16.61	110.70	9.69			
	48	Gillis Cove	18-Sep	1.00	6600	18.20	20.52	99.70	8.18			
			10-Nov	1.00	6600	8.70	15.48	98.80	10.37			
			3-Jun	0.98	6600	15.23	19.43	114.20	10.18	25.35		7.94
	47	St. Peter's	25-Aug	1.00	6600	21.26	20.68	115.40	9.07	30.65		7.96
			22-Oct	1.14	6600	13.20	21.68	99.80	9.15	26.70		7.91
			9-Jun	1.00	6600	16.90	20.17	121.60	10.69			
	54	Eskasoni	28-Nov	1.00	6600	5.60	19.99	104.40	11.49			
			4-Jun	0.87	6600	10.08	28.32	105.70	9.94	31.54		7.86
			26-Aug	1.18	6600	19.28	28.32	98.70	7.70	39.03		7.87
Cape Breton	63	North Sydney	22-Oct	1.04	6600	12.53	30.37	90.50	7.97	35.67		7.96
			4-Jun	0.78	6600	11.04	27.24	107.70	9.99	31.18		7.90
			26-Aug	0.87	6600	19.76	28.22	108.60	8.40	39.31		7.97
	190	Sydney; Dobson Yacht Club	22-Oct	0.93	6600	11.64	28.95	82.70	7.48	33.44		7.91
			4-Jun	0.96	6600	9.07	28.13	97.90	9.43	30.55		7.80
			26-Aug	0.99	6600	20.72	28.20	92.40	7.02	40.09		7.73
	74	Little River	22-Oct	0.86	6600	11.89	30.43	80.40	7.17	35.18		7.90
			4-Jun	0.86	6600	11.17	28.91	114.80	10.50	33.01		7.84
			22-Oct	1.03	6600	12.19	30.14	94.90	8.43	35.12		8.08
	69	Dingwall	4-Jun	0.86	6600	11.17	28.91	114.80	10.50	33.01		7.84
			22-Oct	1.03	6600	12.19	30.14	94.90	8.43	35.12		8.08

Appendix 7, continued.

Region	Stn. No.	Location	Sample Date	Probe Depth, m	YSI Probe Type	Temp, °C	Salinity	Oxygen , %	Oxygen , mg L ⁻¹	Conductivity, mS cm ⁻¹	ChlA, µg L ⁻¹	pH
Southwest New Brunswick	132	Musquash	28-May	1.21	6600	10.78	12.48	98.80	10.12	15.18		7.73
			13-Aug	1.09	6600	17.16	20.90	91.10	7.75	28.35		7.38
			14-Oct	1.50	6600	12.60	33.17	93.20	7.96			7.96
	133	Dipper Harbour	29-May	0.74	6600	6.75	28.23	104.40	10.59	28.87		7.85
			14-Aug	0.92	6600	12.78	31.77	97.70	8.48	37.36		7.66
			14-Oct	7.40	850	12.61	33.65	91.00	7.75			7.99
	135	Beaver Harbour	29-May	0.95	6600	7.71	28.41	101.90	10.10	29.78		7.83
			14-Aug	0.99	6600	14.60	31.16	102.10	8.57	38.32		7.65
			14-Oct	1.00	6600	12.63	33.65	80.40	6.83			7.88
	151	St. Andrew's	29-May	1.11	6600	7.43	29.35	107.00	10.61	30.44		7.91
			14-Aug	0.55	6600	13.32	31.10	100.70	8.68	37.13		7.61
			15-Oct	0.71	650	13.47	33.16	90.30	7.58			7.93
	152	SABS	29-May	1.11	6600	7.43	29.35	107.00	10.61	30.44		7.91
			14-Oct	0.84	6600	12.78	31.47	102.50	8.92	37.05		7.65
			15-Oct	0.45	650	13.02	32.48	90.40	7.69			7.93

Appendix 8: Environmental variables measured using YSI probes at monitoring stations in 2015. BIO = Bedford Institute of Oceanography, SABS = St. Andrew's Biological Station.

Region	Stn. No.	Location	Sample Date	Probe Depth, m	YSI Probe Type	Temp, °C	Salinity	Oxygen, %	Oxygen, mg L ⁻¹
Bay of Fundy shore	158	Tiverton	28-May	1.00	Pro+	7.2	32.97		
			29-Sep	1.00	Pro+	14.3	33.28		
			28-May	1.00	Pro+	9.60	30.84		
Southwest shore	1	Digby	6-Aug	1.00	Pro+	14.20	33.77		
			29-Sep	1.00	Pro+	13.10	33.83		
			28-May	1.00	Pro+	8.70	32.55		
Southwest shore	2	Meteghan	6-Aug	1.00	Pro+	15.10	33.34		
			29-Sep	1.00	Pro+	15.10	33.89		
			28-May	1.00	Pro+	9.30	32.10		
Southwest shore	4	Yarmouth Bar	6-Aug	1.00	Pro+	14.60	33.58		
			30-Sep	1.00	Pro+	15.40	33.90		
			28-May	1.00	Pro+	12.00	31.49		
Southwest shore	162	Yarmouth Yacht Club	6-Aug	1.00	Pro+	16.30	33.01		
			30-Sep	1.00	Pro+	16.50	33.30		
			27-May	1.00	Pro+	13.00	29.37		
Southwest shore	6	Wedgeport	6-Aug	1.00	Pro+	19.20	30.99		
			30-Sep	1.00	Pro+	17.00	31.36		
			27-May	1.00	Pro+	13.40	30.73		
South shore	7	Camp Cove	6-Aug	1.00	Pro+	17.80	32.50		
			30-Sep	1.00	Pro+	16.90	33.38		
			27-May	1.00	Pro+	10.60	31.00	82.40	7.19
South shore	8	Clark's Harbour	6-Aug	1.00	Pro+	14.00	32.33		
			30-Sep	1.00	Pro+	16.80	33.22		
			27-May	1.00	Pro+	7.40	31.60	94.00	10.32
South shore	9	Port La Tour	6-Aug	1.00	Pro+	14.60	32.24		
			30-Sep	1.00	Pro+	16.50	32.70		
			27-May	1.00	Pro+	7.00	30.70	83.10	8.23
South shore	11	Gunning Cove	6-Aug	1.00	Pro+	20.70	30.50		
			30-Sep	1.00	Pro+	15.10	32.43		
			27-May	1.00	Pro+	15.70		78.20	7.96
South shore	12	Shelburne	6-Aug	1.00	Pro+	25.80			
			5-Oct	1.00	Pro+	14.90	31.55		
			27-May	1.00	Pro+	7.6	30.8	95.6	9.45
South shore	14	Lower Sandy Point	5-Aug	1.00	Pro+	17.7	31.59		
			5-Oct	1.00	Pro+	13.7	31.3		
			27-May	1.00	Pro+	3.80	31.20		
South shore	82	Port Mouton	5-Aug	1.00	Pro+	11.60	32.61		
			5-Oct	1.00	Pro+	13.30	27.28		
			26-May	1.00	Pro+	10.30	30.40	111.20	10.47
South shore	18	Lunenburg, Railway Wharf	5-Aug	1.00	Pro+	20.50	31.11		
			15-Oct	1.00	Pro+	14.50	31.59		
			26-May	1.00	Pro+	9.50	30.20	104.90	10.31
South shore	608	Lunenburg; Fisheries Museum Wharf	5-Aug	1.00	Pro+	20.40	30.72		
			15-Oct	1.00	Pro+	14.50	31.47		
			26-May	1.00	Pro+	6.90	30.00	118.10	11.63
South shore	587	Lunenburg Yacht Club	5-Aug	1.00	Pro+	17.80	31.23		
			15-Oct	1.00	Pro+	13.80	31.61		

Appendix 8, continued.

Region	Stn. No.	Location	Sample Date	Probe Depth, m	YSI Probe Type	Temp, °C	Salinity	Oxygen, %	Oxygen, mg L ⁻¹
Halifax	20	Mahone Bay	26-May	1.00	Pro+	11.80	28.50	94.40	9.63
			5-Aug	1.00	Pro+	19.10	30.76		
			15-Oct	1.00	Pro+	14.10	31.41		
	21	Chester	26-May	1.00	Pro+	8.30	29.60	118.80	11.50
			5-Aug	1.00	Pro+	21.00	30.57		
			15-Oct	1.00	Pro+	14.00	31.89		
	24	Halifax; BIO	25-May	1.00	Pro+	7.3	29.9	89	9.37
			17-Aug	1.00	Pro+	18.9	29.6		
			30-Oct	1.00	Pro+	10.7	30.2		
	401	Halifax; Armdale Yacht Club	8-Jun	1.00	Pro+	8.50	30.89		
			13-Aug	1.00	Pro+	16.70	30.04		
			13-Oct	1.00	Pro+	14.80	30.07		
	428	Dartmouth Yacht Club	5-Jun	1.00	Pro+	10.00	28.62		
			13-Aug	1.00	Pro+	17.30	29.61		
			14-Oct	1.00	Pro+	14.90	28.83		
	430	Shearwater Yacht Club	5-Jun	1.00	Pro+	5.50	31.62		
			13-Aug	1.00	Pro+	17.20	31.07		
			14-Oct	1.00	Pro+	14.80	30.41		
Chedabucto Bay	40	Eddy Point	1-Jun	1.00	Pro+	9.30	30.22		
			11-Aug	1.00	Pro+	16.50	28.54		
			8-Oct	1.00	Pro+	14.60	29.55		
	41	Venus Cove	1-Jun	1.00	Pro+	8.90	31.16		
			11-Aug	1.00	Pro+	15.90	29.25		
			8-Oct	1.00	Pro+	15.80	30.82		
	44	Petit-de-Grat	1-Jun	1.00	Pro+	6.90	31.75		
			11-Aug	1.00	Pro+	19.00	29.33		
			7-Oct	1.00	Pro+	16.20	31.30		
	182	Port Hawkesbury	1-Jun	1.00	Pro+	8.50	31.35		
			11-Aug	1.00	Pro+	17.60	28.95		
			8-Oct	1.00	Pro+	15.90	30.78		
Bras d'Or Lake	169	Ben Eoin	2-Jun	1.00	Pro+	11.50	19.82		
			11-Aug	1.00	Pro+	12.90	20.60		
			7-Oct	1.00	Pro+	14.50	21.54		
	55	Baddeck	3-Jun	1.00	Pro+	10.00	20.30		
			12-Aug	1.00	Pro+	19.60	14.34		
			7-Oct	1.00	Pro+	16.20	23.24		
	51	Whycocomagh	12-Aug	1.00	Pro+	19.70	14.25		
			6-Oct	1.00	Pro+	16.70	20.80		
	47	St. Peter's	1-Jun	1.00	Pro+	11.80	20.04		
			11-Aug	1.00	Pro+	20.60	18.24		
			7-Oct	1.00	Pro+	16.30	21.99		
Cape Breton	63	North Sydney	2-Jun	1.00	Pro+	8.30	29.47		
			12-Aug	1.00	Pro+	18.10	27.42		
			7-Oct	1.00	Pro+	15.20	29.77		
	190	Sydney; Dobson Yacht Club	2-Jun	1.00	Pro+	8.10	28.41		
			12-Aug	1.00	Pro+	18.70	29.60		
			7-Oct	1.00	Pro+	16.50	29.87		

Appendix 8, continued.

Region	Stn. No.	Location	Sample Date	Probe Depth, m	YSI Probe Type	Temp, °C	Salinity	Oxygen, %	Oxygen, mg L ⁻¹
Cape Breton	74	Little River	2-Jun	1.00	Pro+	6.00	29.51		
			12-Aug	1.00	Pro+	18.70	30.43		
			6-Oct	1.00	Pro+	16.20	30.03		
	69	Dingwall	2-Jun	1.00	Pro+	8.00	29.83		
			6-Oct	1.00	Pro+	14.60	30.22		
Southwest New Brunswick	132	Musquash	11-Jun	1.00	Pro+	19.40	13.50		
			19-Oct	1.00	Pro+	11.40	29.20		
	133	Dipper Harbour	11-Jun	1.00	Pro+	7.00	32.06		
			19-Oct	1.00	Pro+	11.00	33.40		
	135	Beaver Harbour	11-Jun	1.00	Pro+	8.40	28.34		
			19-Oct	1.00	Pro+	10.50	33.56		
	151	St. Andrew's	10-Jun	1.00	Pro+	9.60	31.98		
			21-Oct	1.00	Pro+	10.90	32.84		
	152	SABS	10-Jun	1.00	Pro+	9.00	30.81		
			20-Oct	1.00	Pro+	10.70	31.87		

Appendix 9. Monthly mean water temperatures ($\bar{X} \pm \text{SD}$) for seven areas of Nova Scotia between May and November in 2012 through 2015. Warmest temperatures for each region in each year are shaded in red, while coolest temperatures are shaded in blue.

2012		May	June	July	August	September	October	November
Area	n							
southwest shore	7	12.43	14.08 \pm 1.96	16.91 \pm 1.88	17.76 \pm 1.71	16.29 \pm 1.26	14.90 \pm 0.78	
south shore	6	12.44	15.08 \pm 2.20	16.16 \pm 2.42	17.17 \pm 2.70	14.47 \pm 1.45	13.53 \pm 1.57	
Halifax	1		14.23 \pm 1.55	16.34 \pm 1.90	18.68 \pm 1.71	15.02 \pm 1.11	13.37 \pm 1.80	
east shore	2			15.77 \pm 2.76	16.62 \pm 3.75	14.04 \pm 3.35	11.65 \pm 2.06	
Chedabucto Bay	3		13.66 \pm 1.99	17.42 \pm 1.46	20.54 \pm 1.74	17.14 \pm 1.31	13.97 \pm 1.39	
Cape Breton	3		12.29 \pm 2.00	17.11 \pm 2.54	20.41 \pm 1.86	16.93 \pm 1.96	13.48 \pm 2.14	
Bras d'Or Lake	3		16.02 \pm 1.82	19.86 \pm 1.32	22.76 \pm 1.06	19.15 \pm 1.03	15.69 \pm 1.42	
2013		May	June	July	August	September	October	November
Area	n							
southwest shore	5	9.96	10.63 \pm 2.46	13.79 \pm 3.36	14.74 \pm 3.67	13.89 \pm 3.36	13.23 \pm 3.17	
south shore	6	11.9	14.11 \pm 3.14	16.27 \pm 3.61	14.13 \pm 3.94	13.95 \pm 2.71	13.73 \pm 1.52	7.51
Halifax	1	6.78	9.14 \pm 1.36	12.56 \pm 3.13	11.33 \pm 2.12	13.45 \pm 3.00	13.46 \pm 1.70	8.26
east shore	1			8.39 \pm 1.53	10.28 \pm 2.54	11.92 \pm 4.54	13.03 \pm 1.58	
Chedabucto Bay	1		10.00 \pm 1.51	16.01 \pm 2.43	17.38 \pm 0.96	15.81 \pm 1.93	14.49 \pm 0.68	
Cape Breton	5		11.27 \pm 2.23	17.5 \pm 2.62	19.64 \pm 1.13	16.52 \pm 1.24	13.54 \pm 1.60	10.18
Bras d'Or Lake	4		15.51 \pm 2.89	21.11 \pm 1.95	21.53 \pm 1.71	17.95 \pm 1.23	14.54 \pm 1.57	
2014		May	June	July	August	September	October	November
Area	n							
southwest shore	6	10.22	12.72 \pm 2.04	15.03 \pm 2.06	15.80 \pm 1.65	15.85 \pm 1.53	14.46 \pm 1.08	
south shore	3	9.98	13.61 \pm 1.93	13.22 \pm 3.80	16.64 \pm 2.19	15.3 \pm 1.87	14.34 \pm 1.15	
Halifax	1		13.26 \pm 2.08	15.91 \pm 2.10	17.71 \pm 1.50	15.83 \pm 1.50	13.30 \pm 0.79	10.90
east shore	2		11.81 \pm 2.18	13.47 \pm 2.78	17.87 \pm 2.05	15.81 \pm 1.93	13.82 \pm 1.02	9.53
Chedabucto Bay	3		10.47 \pm 2.03	14.86 \pm 3.22	19.42 \pm 1.72	16.54 \pm 1.86	14.11 \pm 0.78	
Cape Breton	4		11.68 \pm 1.79	17.04 \pm 2.33	20.04 \pm 1.49	17.03 \pm 1.51	14.00 \pm 0.89	
Bras d'Or Lake	2	9.42	13.90 \pm 1.67	18.00 \pm 2.75	20.99 \pm 2.17	18.14 \pm 2.12	14.13 \pm 1.46	6.04
2015		May	June	July	August	September	October	November
Area	n							
Southwest Shore	3	11.3	13.77 \pm 3.59	16.99 \pm 4.13	17.97 \pm 4.22	17.53 \pm 3.13	14.54 \pm 2.32	9.37
South Shore	9		14.68 \pm 2.07	17.19 \pm 2.95	19.74 \pm 3.16	16.79 \pm 2.17	14.73 \pm 0.73	
Halifax	1	5.5	9.06 \pm 2.22	14.37 \pm 1.87	17.22 \pm 2.65	15.74 \pm 1.49	12.63 \pm 1.36	
East shore	1	8.36	11.24 \pm 3.17	17.10 \pm 2.03	19.11 \pm 2.80	16.73 \pm 1.04	16.07 \pm 1.23	
Chedabucto Bay	2	7.45	9.03 \pm 1.84	14.23 \pm 1.55	18.85 \pm 2.25	16.55 \pm 1.88	15.84 \pm 0.83	
Cape Breton	5	5.93	9.09 \pm 2.06	15.24 \pm 1.80	19.1 \pm 1.65	17.89 \pm 0.90	15.46 \pm 0.94	
Bras d'Or Lake	1	9.95	12.12 \pm 1.26	18.12 \pm 1.36	20.94 \pm 1.44	19.64 \pm 0.89	16.68 \pm 0.44	
Minimum			9.03	8.39	10.28	11.92	11.65	
Maximum			16.02	21.11	22.76	19.64	16.68	

Appendix 10. Monthly mean water temperatures ($X \pm SD$) for four stations in southwest New Brunswick, between June and October in 2013 and 2015. Warmest temperatures for each region in each year are shaded in red, while coolest temperatures are shaded in blue.

2013	June	July	August	September	October
Station					
SABS	11.04 \pm 1.20	13.65 \pm 1.59	14.71 \pm 1.11	13.84 \pm 0.77	12.57 \pm 0.68
Head Harbour	9.51 \pm 0.76	11.98 \pm 0.95	13.12 \pm 0.66	13.13 \pm 0.69	12.25 \pm 0.57
2015	June	July	August	September	October
Station					
Leonardville	7.75 \pm 1.17	10.30 \pm 0.95	12.11 \pm 0.78	12.70 \pm 0.42	11.79 \pm 0.38
Head Harbour	8.35 \pm 1.14	11.03 \pm 0.95	12.76 \pm 0.78	13.16 \pm 0.44	11.78 \pm 0.54
North head	9.84 \pm 1.29	11.95 \pm 1.42	13.72 \pm 1.10	13.83 \pm 1.02	12.09 \pm 0.44
Minimum	7.75	10.30	12.11	12.7	11.78
Maximum	11.04	13.65	14.74	13.84	12.57