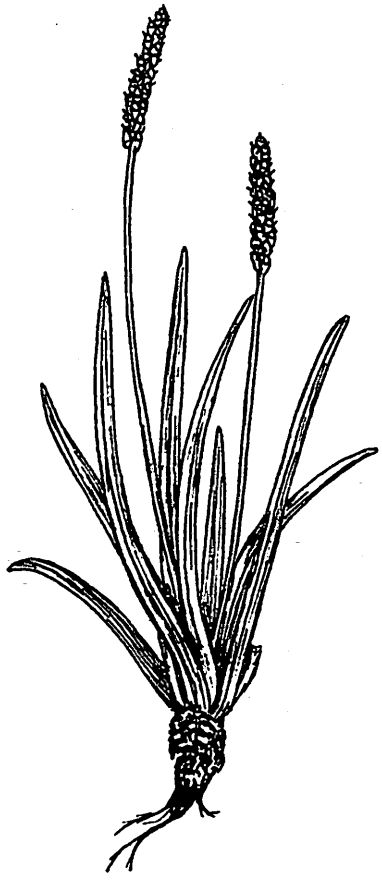
Curatorial Report Number 34

Nova Scotia Museum
1747 Summer Street
Halifax, Nova Scotia, Canada

The Estuary of the St. Mary's River Nova Scotia 1973

By Derek S. Davis
April 1976



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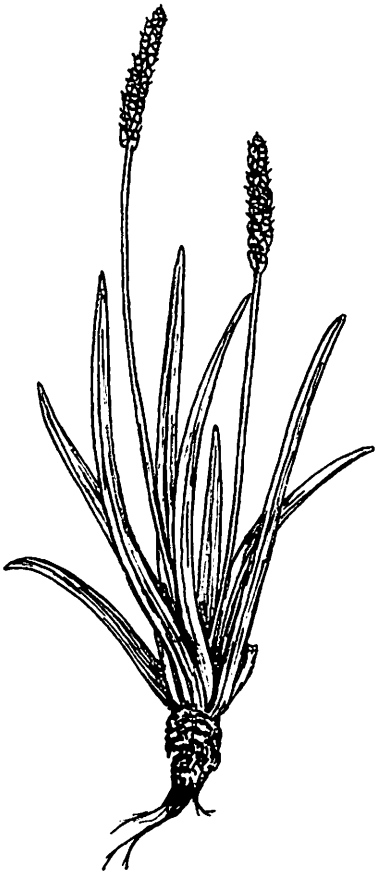

NOVA SCOTIA MUSEUM

Curatorial Reports

The *Curatorial Reports* of the Nova Scotia Museum contain information on the collections and the preliminary results of research projects carried out under the program of the museum. The reports may be cited in publications but their manuscript status should be clearly indicated.

Abstract

During the summer of 1973 a small scale biological survey was carried out on the estuary of the St. Mary's River in Guysborough Co., Nova Scotia. The purpose of the survey was to obtain information likely to be of value in interpretive programs based at Sherbrooke Village. The estuary appears to be well stratified with strong freshwater influence extending to the river mouth. Records were made of common plants and animals.

INTRODUCTION

The restoration project at Sherbrooke Village in Guysborough Co., Nova Scotia, that is being carried out under the program of the Nova Scotia Museum, has provided certain incentives for the development of environmental interpretive programs. The history of the village has been very closely tied to the natural resources of the region with prominent involvement in mining and forest industries. The dominating natural feature of the village is the St. Mary's River, which drains a basin of some 1425 km^2 and has origins in five counties. It is one of the larger watersheds in Nova Scotia. Despite decades of use for transportation and power and the effects of forestry practice, the St. Mary's River has retained much of its natural character. The high natural quality of the river and its associated wildlife, especially the migratory salmon, continue to be assets to the Sherbrooke community. It has been considered important that interpretive programs at Sherbooke Village should include the natural environment in order to demonstrate the past dependance of the community on natural resources and their increasing, though different, value in the modern world.

The Science Section of the Nova Scotia Museum maintains and develops the natural history collection and information resources that form the basis of many interpretive programs. In 1972 it was felt necessary to spend some time in the St. Mary's River watershed, to collect specimens and make notes on the natural history, in order to improve museum resources and provide some basis for environmental programs that may be required at Sherbrooke in the future. With limited resources available at the time it was felt that most studies should concentrate on the life of the river itself. The study of the estuary was a part of this program. Only limited collections were made in 1972, but this was followed in 1973 by a small scale biological survey.

METHODS

Five days were spent in the field during the summer of 1973. Four of these days were spent investigating the shores of the estuary and one day was spent with a chartered boat, studying the river channel. In addition to this, one visit was made to the estuary to make some observation and measurements of winter conditions, in January 1975.

Samples of water were taken for simple measurement of salinity and temperature on most ocassions. Salinity was generally calculated using tables of Zerbe and Taylor (1953), from specific gravity measurements made with an hydrometer. In the winter these measurements were more reliably made with a refractometer as the hydrometer was strongly influenced by ice slush in the water. Temperature was measured with a hand held thermometer.

The shore sampling stations were selected to cover most of the habitats found in the estuary. These stations were restricted to the eastern bank where there was easy access by road. At each station notes were made on the sediments and vegetation.

Representative plants were collected. Animals were either collected by hand or obtained by seiving the sediments and vegetation in the water. Bottom samples were taken with a small, hand-hauled dredge from a motor boat at nine stations. Samples were taken down the length of the estuary. The dredge worked well on soft bottoms and mussel beds but was not effective on the stony bottom. The dredge was lost off Blackhead on stony bottom, and no samples were obtained seaward of this point. Sampling stations are shown in Fig. 2.

Although the field trips of June and August allowed some comparison to be made of the general state of the plant communities, no observations were made on seasonal variation. No attempt was made to study plankton or bottom meiofauna.

GEOLOGICAL AND PHYSICAL CHARACTERISTICS OF THE ESTUARY

The St. Mary's River is composed of two main branches which reach their confluence at Glenelg some 15 km up river from Sherbrooke Village. These waters originate on a variety of sedimentary and igneous rocks mostly of late Palaeozoic and Mesozoic age. At Stillwater, 2.5 km north of Sherbrooke Village, the river enters a narrow valley with frequent occurrences of rapids. This valley continues southwards of Sherbrooke and is the main physical form of the estuarine or tidal section of the river. In this region the rocks are quartzite and slate of the Ordovician Meguma Series, intruded by granites of Devonian age. The fact that the river cuts through the resistant rocks of the coastal zone indicates that the drainage system is older than the present landscape. In this form the river is referred to as antecedent and the drainage pattern is certainly older than the period of postglacial uplift of the land. The estuary is a drowned river valley and the tidal section is slowly moving upstream in accordance with the general rate of coastal submergence. Along the estuary, evidence of glacial activity is found as till deposits and erratic boulders, some of which are of impressive size. The erosion of glacial till leaves residual gravel which is the dominant sediment type of the upper intertidal zone. The low intertidal zones are mostly of soft mud, often anaerobic, with some areas of sand seaward of Sonora. Quartzite bedrock outcrops in a few places.

The estuary is relatively straight and narrow. It extends some 15 km south of Sherbrooke to the open sea at Cape St. Mary and is about 250 m wide at its narrowest part. The depth is mostly less than 6 m up stream of Sonora (Fig. 1).

Climatic information and values for the seasonal volumes and quality of the freshwater run-off in the St. Mary's River are made available through the monitoring and recording services of Environment Canada. For background information during the 1972 and 1973 studies, climatic and water quality data for 1971 were summarized by staff of the Science Section (1973 a and b). Generally, the maximum river flow occurs in the spring following the thaw. During the winter, ice persists along the

whole length of the estuary although the channel may be open in some places due to river flow.

Water quality measurements indicate a pH range from about 5.25 to 6.40 and total disolved solids ranging from 13 to 20 mg/l. Turbidity, recorded in Jackson units, ranged from a maximum of 2.4 during the spring to about 0.3 in the fall.

The tidal range in the estuary is small. Canadian Hydrographic Service tables indicate smallest neap tide range at 2.0 ft and largest spring tide range at 6.7 ft at Sonora and Sherbrooke. The small tide range and narrow physical shape of the estuary do not provide for extensive intertidal areas.

Typically the tidal waters in an estuary are characterised by the degree of interaction between the seawater at the mouth and the freshwater run-off from the river. In the St. Mary's River estuary the large amount of run-off and the narrow physical form of the channel allow low salinity conditions at the surface to prevail down to the mouth, south of Sonora. The salinity measurements made at around low tide on the 14 August are shown in Table 2. The small change in salinity from 2.6‰ to 3.4‰ down the length of the estuary illustrate the dominating effect of fresh-water run-off in the system. The presence of plant and animal species requiring minimum salinities in the range 4‰ to 10‰ on the bottom as far upstream as station D3 (Table 4 and Fig. 3) indicates that the estuary is well stratified, with a bottom salt water wedge penetrating into the upper reaches. Higher salinities (up to 35‰) were recorded in shallow water along the shore and a salinity of 30.6‰ was recorded at station 12, in the mouth of the estuary. The estuary of the St. Mary's River can be described as a normal positive type of estuary, typical of temperate regions. It shows well marked two-layer flow (McLusky, 1971).

BIOLOGICAL CHARACTERISTICS OF THE ESTUARY

The vegetation of the shore is part of the extensive coastal zone that stretches from the South Shore to Cape Breton Island. The poor soils and relatively exposed condition support growths of white spruce and alder. There are small areas of coastal barren and in a few places land has been cleared for agriculture. Along the shoreline of the estuary, the white spruce and alders generally extend to within a short distance of the water's edge. Grasses and hardy plant species such as Seaside Goldenrod (*Solidago sempervirens* L.) and *Aster* spp. grow in the gravel above the tide line.

The seashore plant species typical of the Nova Scotia coast occur along the estuary but do not form extensive growths. Areas of salt marsh, dominated by *Spartina* spp., occur in some places (Fig. 3). Associated plants are filamentous algae, *Ascophyllum nodosum, Zannichelia palustris, Salicornia europea,* and *Plantago juncoides* (see Fig. 5). Along most of the lower reaches of the estuary these plants with Sea Rocket, (*Cakile edentula* (Bighel.) Hook), Orach (*Atriplex* spp.), Pigweed (*Chenopodium* spp.), Seablite (*Sueda maritima*) and Sea Lavender (*Limonium nashii*)

grow sparsely among the stones. At many places the upper shore is carpeted with dead Eel Grass (*Zostera marina*) washed up from below the tide line.

The gravel and mud shores are colonised by various filamentous algae which are conspicuous in late summer. Rockweed (*Ascophyllum nodosum*) and wrack (*Fucus* spp.) occur attached to stones as far up the estuary as Station S.1 (Table 4) although the plants here are very stunted. Intertidal rock areas are more predominant in the mouth of the estuary and provide a substrate for seaweed growth (Fig.5). Species found here are *Ectocarpus siliculosus, Chordaria flagelliformis, Petalonia fascia, Scytosiphon lomentaria, Dictyosiphon foeniculaceus, Alaria esculenta, Laminaria digitata, Laminaria saccharina, Ascophyllum nodosum, Fucus* spp., *Porphyra umbilicalis, Corallina officinalis, Lithothamnium* sp., *Chondrus crispus* and *Polysiphonia* sp. Some degree of intertidal zonation is present, although the middle shore *Fucus* and *Ascophyllum* zone is not well developed.

Dredging in the river channel provided some information on the distribution of Eel Grass (*Zostera marina*). This plant is largely restricted to the limited amount of subtidal and low tide level mud in the lower reaches of the estuary. However, it does pentrate some distance up the channel and was dredged at stations D.3 and D.5. This occurrence indicates the presence of bottom water originating from the estuary mouth, which provides the minimum 10‰ salinity required by this plant for optimum growth (Ostenfeld 1908). Several species of red and brown seaweeds, including *Laminaria saccharina*, were dredged from stony bottoms in the mouth of the estuary.

The aquatic animal life encountered during the investigation was characteristic of the cold water coastal zone of eastern Nova Scotia. The crustacean and molluscan fauna of this region has been discussed by Bousfield and Laubitz (1972). The collections made by Bousfield in this region included samples from the adjacent Wine Harbour and Liscomb Harbour, but no investigation was reported for the St. Mary's River itself. The physical form of the St. Mary's River and the dominance of fresh-water run-off prevent development of extensive shallow water mud flat areas that normally support a diverse warm water fauna within the Eel Grass community. Only the cold water species are present and the fauna becomes more impoverished with distance up the estuary due to decreasing salinity.

The exposed rocky shore at station S.12 (Fig.5) with its zoned seaweed growth supports a typical invertebrate fauna of the region with Hydroids, Actiniarians, Nemerteans, *Lepidontus squamatus, Balanus balanoides, Jassa falcata, Acmaea testudinalis, Lucuna vincta, Littorina littorea, Littorina obtusata, Littorina rudis, Nucella lapillus* and *Mytilus edulis*. Evidence from shells washed up on shore and specimens obtained from lobster traps at Sonora wharf indicate the presence of other species, particularly *Chalina oculata, Cancer irroratus, Buccinum undatum, Asterias vulgaris, Ophiopholis aculeatus* and *Strongylocentrotus dröbachiensis*, living subtidally.

Shores within the estuary proper are mostly of stones in the upper zones and mud in the lower zones. At low water mark and below, the mud is usually stablized with growths of Eel Grass. Barnacles, *Balanus balanoides*, occur on rocks and stones of the middle shore only as far upstream as Sonora. The low salinity and lack of suitable

substrate are significant inhibiting factors, but the surface current flow would also prevent the planktonic larval stages from making much progress into the estuary. Various other crustacean species including *Jaera albifrons, Gammarellus angulosus, Gammarus mucronatus, Gammarus oceanicus, Gammarus tigrinus, Hyale nilssoni* and *Jassa falcata* occur to varying degrees but few penetrate further upstream than station S.3. Common molluscan species are *Littorina littorea, Littorina rudis, Hydrobia totteni, Mytilus edulis, Macoma bathica* and *Mya arenaria*. The apparent paucity of intertidal polychaetes is thought to be related to poor collecting technique.

Some parts of the shoreline in the upper reaches of the estuary have been affected by the activities of man. This is particularly true of the area of Mill Cove and for about 1 km south. With construction of wharves and barriers, and deposition of sawdust, the foreshore does not support any aquatic life.

The dredge sampling carried out along the length of the channel provides some interesting information on the deeper penetration of some species into the estuary within the bottom saltwater layer. Banks of blue mussels, *Mytilus edulis*, occur at stations D.8 and D.7, and the species extends to station D.4 some 3 km upstream of the last point of which it was detected in the intertidal zone (see Table 4). Several other species that show similar distribution patterns are also listed in Table 4.

The fauna list includes some 17 species of fish that were observed or collected during 1972 and 1973. The list includes the migratory anadromous or catadromous species that only use the estuary as a travel route, and several species that typically live in estuarine waters. Species of *Fundulus* and the Sticklebacks, *Apeltes quadracus* and *Pungitius pungitius*, are part of this latter group. Marine inshore species, *Pholis gunnellus* and *Myxocephalus aenaeus*, were taken in the dredge at station D.8.

During the progress of the investigation common species of birds normally associated with estuaries were observed. These included waders, Great Blue Heron, Arctic Tern, Herring Gull and cormorants.

POTENTIAL FOR ENVIRONMENTAL INTERPRETATION

The St. Mary's River estuary has scenic, geological, physical and biological features that can support worthwhile interpretive programs. The relationship of the river and geological processes, the dynamic interaction of the seawater inflow and freshwater run-off, the varied flora and fauna related to salinity, sediment and exposure and the effects of man on the system all offer interesting subject matter. Many of the features can be seen from the Sherbrooke to Sonora road without demanding hikes and without need to trespass.

A simple, self-explanatory pamphlet could be produced and made available to Sherbrooke visitors who would be induced to travel a little off the beaten track as far as Sonora and even to walk the shoreline from Sonora to Cape St. Mary. The pamphlet could draw attention to three or four stations where special features could be observed. A later development could be the provision of an interpretive display on the estuary at Sherbrooke Village.

In addition to the program for the casual visitor, there is also potential for organized field programs for groups, including residential field programs. Some programs along these lines have already been carried out by staff of the Nova Scotia Museum. Of particular note is the one week field program given to science teachers during the 1974 Nova Scotia Museum summer school. The teachers were able to study the river and estuary, not only for their own benefit but also to provide additional resource material for future use. The "Intertidal Survey of the St. Mary's Estuary" by Clyde Stanley and Jim Cleveland carried out during this program and on file at the Nova Scotia Museum provides useful additional information on the distribution of common plant and animal species. Such organized programs need sufficient logistics support which, although lacking at the present time, might become available at a future date.

ACKNOWLEDGEMENTS

The author wishes to acknowledge the field and laboratory assistance given by Paul Doleman during the course of this study. My colleagues in the Science Section provided useful comments on the manuscript.

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A LIST OF THE AQUATIC PLANTS

The species or genera listed below were all recorded in the estuary of the St. Mary's River during the survey carried out in the summer of 1973. Notes on habitat, etc., are given where appropriate, as well as the dredge (D) and shore (S) station numbers. Species marked (*) were collected and are in the herbarium of the Nova Scotia Museum. Most identifications were made by reference to Roland and Smith (1969) and Taylor (1957). Identifications of many algae were made by Marlene Davis and Carolyn Bird.

ALGAE

Unidentified filamentous algae, among *Spartina* at S.3.1 and on gravel shores at S.4 and S.5.

Chlorophyta

Enteromorpha spp. Among *Spartina* at mid-tide level (S.4), on mud (S.6) and on gravel of the middle shore and below the *Spartina* level (S.6*,S.7, S.8, S.10 and S.11). Also dredged from stony bottom (D.9*).

Cladophora spp. (Includes *C. sericea* (Huds.) Kütz). Occurring with *Rhizoclonium* and *Melosira* on mud and stones, on the shore (S.6* and S.10) and subtidally (D.9*).

Rhizoclonium implexum (Dillw.) Kütz. With *Cladophora* and *Melosira* on mud at S.6*.

Acrosiphonia arcta (Dillw.) Kütz. On stones at S.11*.

Chrysophyta

Melosira sp. A filamentous diatom occurring with *Cladophora* and *Rhizoclonium* on mud (S.6*) and on stones subtidally (D.9*).

Phaeophyta

Ectocarpus siliculosus (Dillw.) Lyngb. Epiphytic on *Chordaria flagelliformis* and *Dictyosiphon foeniculaceus* on stones at S.11* and S.12*.

Pilaiella littoralis (L.) Kjellm. Dredged at station D.9*.

Chordaria flagelliformis (Müll.) C. Ag. Attached to stones on the shore at S.11* and S.12* and subtidal at D.9*, some with epiphytic *Ectocarpus*.

Desmarestia aculeata (L.) Lamouroux. Dredged at station D.9*.

Petalonia fascia (O. F. Müller) Kuntze. On an exposed rocky shore at S.12*

Scytosiphon lomentaria (Lyngbye) C. Agardh. On stones and rocks at S.11* and S.12*.

Dictyosiphon foeniculaceus (Huds.) Grev. On stones and rocks at S.11* and S.12* and subtidal at D.9*.

Alaria esculenta (L.) Grev. On exposed rocks at S.12.

Laminaria digitata (L.) Lamour. On exposed rocks at S.12.

Laminaria saccharina (L.) Lamour. On exposed rocks at S.12 and dredged at D.9*.

Ascophyllum nodosum (L.) LaJol. Plants were very stunted and scarce at S.1 and S.2, but occurred more commonly on stones and rocks at S.4, S.5, S.7, S.8, S.10, S.11 and S.12. Plants occured higher up the shore nearer to the sea.

Fucus spp. (Including *F. spiralis* L. and *F. vesiculosus* L.) occurred on the shore at S.1, S.4, S.7, S.9, S.10, S.11 and S.12*, and was also dredged at D.9*.

Rhodophyta

Porphyra umbilicalis (L.) J. Ag. On exposed rocks at S.12.

Corallina officinalis L. In tide pools on exposed rocks at S.12.

Lithothamnium spp. Common in tide pools on exposed rocks at S.12.

Chondrus crispus Stackh. In tide pools at S.12.

ANGIOSPERMAE

Zostera marina L. Eel Grass. Occurred commonly on the shore at and below low water mark at S.4, S.5, S.7, S.8, S.9, S.10, and was dredged at D.3, D.5 and D.7.

Zannichelia palustris L. Horned Pondweed. Common in sheltered back waters and on shore S.3.1, S.3.2*, S.6 and dredged at D.3.

Spartina alterniflora Loisel. Cord-grass. Very common on the shore. S.1, S.2 (upper shore), S.3.1, S.4, S.6*, S.7 (patches), S.8.

Salicornia europea L. Glasswort, Samphire, S.8.

Sueda maritima (L.) Sea-blite

Limonium nashii Small. Sea Lavender. S.4.

Plantago juncoides Lam. Seaside plantain. S.3.2*, S.4, S.6, S.3.2.

A LIST OF THE AQUATIC ANIMALS

The species or genera listed below were recorded mainly during the summer survey of 1973. However, many of the fish were taken during collecting trips in 1972, by John Gilhen. Notes on habitat, etc., are given where appropriate as well as the dredge (D) and shore (S) station numbers. The accession numbers are given where specimens have been incorporated into the collection of the Nova Scotia Museum. Identifications were made using Miner (1950), Smith (1964), Gosner (1971), Bousfield (1973), Abbott (1974) and Leim and Scott (1965).

PORIFERA

Chalina oculata (Pallas) washed up on the beach at S.10 and S.11.

COELENTERATA

Hydroida , unidentified S.12.

Tubularia larynx Ellis and Solander. Subtidal on *Zostera marina* at D.3 1973-Z-353.2.

Pelagia noctiluca (Forskal). A pelagic jellyfish found close inshore at station S.4. The specimen carried commensal amphipoda, *Hyperia* sp.

Actiniaria, unidentified. In a tidepool on exposed rocks at S.12.

Nemertea

Nemertea, unidentified. In a tidepool on exposed rocks at S.12.

ANNELIDA

Lepidonotus squamatus (Linnaeus). In a tidepool on exposed rocks at S.12 and taken in the dredge at D.8 1973-Z-358.3.

Nereis sp. Taken in the dredge at D.7 1973-Z-357.5(1).

Nereis virens Sars. Dredged at station D.4 1973-Z-354.3(4).

Sabellaria sp.? Living in sand at S.11.

ARTHOPODA

CRUSTACEA

Balanus balanoides (Linnaeus). Common on stones and rocks in the middle shore from Sonora wharf to the open sea. Recorded at stations S.9, S.10, S.11 and S.12.

Balanus crenatus Bruguiére. On mussel shells dredged at D.7 1973-Z-357.3.

Chiridotea caeca (Say). Taken in the dredge at station D.9 1973-Z-359.4(1).

Jaera albifrons (Leach). Found under stones on the middle shore at S.7 and S.10.

Amphipoda, unidentified. A variety of amphipods was recorded at S.1, S.2 and S.9 but no identifications were made of material from these stations. Identified species from other stations are listed below.

Corophium sp. Found among mussels dredged at D.7 1973-Z-357.2(1).

Gammarellus angulosus (Rathke), on the shore at S.3 1973-Z-350.4 (Part) (4).

Gammarus sp. Collected at S.11 on sand and stony shore 1973-Z-352.2(Part) (7).

Gammarus mucronatus Say. Collected in the backwater at S.3, among algae and *Spartina* 1973-Z-350.4(Part) (1).

Gammarus oceanicus Segerstråle. Taken on the shore at S.4 1973-Z-351.2(12) and dredged at several locations, D.4, 1973-Z-354.2(8), D.6, 1973-Z-356.1(11), D.7, 1973-Z-357.1(30), D.8, 1973-Z-358.2(20), D.9, 1973-Z-359.1(1).

Gammarus tigrinus Sexton. Collected on the shore at stations S.3.2, 1973-Z-350.4 (Part) (10), and S.4, 1973-Z-351.3(9) and dredged at D.3, 1973-Z-353.1(1), D.5, 1973-Z-355.1(4), and D.9, 1973-Z-359.2(1) and 359.3(2).

Hyale nilssoni (Rathke). Found under stones on sand at S.11, 1973-Z-352.2 (Part) (11), and 1973-Z-352.4(Part) (1).

Jassa falcata (Montagu). Among algae in brackish water at S.3, 1973-Z-350.4 (Part) (21), and also recorded at S.12 in tidepools on exposed rocks.

Hyperia sp. Found commensal with the jelly fish, *Pelagia noctiluca*, at S.4, 1973-Z-351.4(5).

Crangon vulgaris Fabricus. S.11, D.4, D.6, D.7, D.8.

Homarus americanus Milne-Edwards. Taken by Sonora fishermen off the mouth of the river.

Cancer irroratus Say. Washed up on the beach at S.11.

INSECTA

Trichocorixa spp. Among algae and eelgrass at S.3, 1973-Z-350.2(2), S.4, 1973-Z-351.1(1).

MOLLUSCA

GASTROPODA

Acmaea testudinalis (Linnaeus). On exposed rocks at S.12.

Lacuna vincta (Montagu). On seaweeds in tidepools, with spawn at S.12, 1973-Z-360.1(12) and dredged at D.4, D.7, D.9 on eelgrass and *Laminaria*.

Littorina littorea L. Common on the shore at S.4, S.7, S.9, S.10, S.11, S.12 and dredged at D.4 and D.7.

Littorina obtusata L. On *Fucus* spp. at S.10 and S.12.

Littorina rudis (Maton) (=L. *saxatilis* (Olivi). S.4, S.5, S.7, S.8, S.9, S.10, S.11, 1973-Z-352.1(4), S12, D.4, D.5, D.6, D.7 on *Zostera marina*.

Hydrobia totteni Morrison. S.3, 1973-Z-359.1(9), S.4, S.8.

Lunatia heros Say. S.7 (shell only), D.6 (egg collar), D.8 (live specimens and egg collars on mussel bed).

Buccinum undatum L. Shells only, from lobster traps at Sonora.

Nucella lapillus L. Imbricate form, S.10, S.12, D.7, D.8, 1973-Z-358.1(1).

PELECYPODA

Mytilus edulis L. S.6, S.7, S.9, S.10, S.11, S.12, D.4 (thin shelled specimens), D.5, D.6 (dead and alive, some bored by *Lunatia heros)*, D.7, 1973-Z-357.3(4) (mussel bed), D.8 (mussel bed).

Tellina agilis Stimpson. Shells only at S.11.

Macoma balthica L. S.1 (shells), S.4, S.6, S.7, S.10, S.11, D.4, D.7 (shell).

Mya arenaria L. Very common at S.2, S.4 (shells and live juveniles), S.5, S.7, S.8, S.9, S.10, S.11, D.3, D.4, 1973-Z0354.1(2), D.7 and D.8.

ECHINODERMATA

Asterias vulgaris Verrill. Found in lobster traps at Sonora.

Ophiopholis aculeatus (Linnaeus). Found in lobster traps at Sonora.

Strongylocentrotus dröbachiensis (O. F. Müller). Found in lobster traps at Sonora.

PISCES

Petromyzon marinus Linnaeus. Sea lamprey. Common. 1972-Z-626-1(3).

Anguilla rostrata (LeSueur). American eel. Common. 1972-Z-83-1(2) and S.3.1. in 1973 (juvenile).

Alosa pseudoharengus (Wilson). Gaspereau. Common. 1972-Z-60-1(5).

Alosa sapidissima (Wilson). American shad. Common. 1972-Z-642-1(4).

Brevoortia tyrannus (Latrobe). Atlantic menhaden. Unusual. 1972-Z-642-2(1).

Salmo solar Linnaeus. Atlantic salmon. Common. 1972-Z-80-1(2).

Salvelinus fontinalis Mitchill. Brook trout. Common. Observed.

Osmerus mordox Mitchill. Rainbow smelt. Common. Observed.

Microgadus tomcod (Walbaum). Atlantic tomcod. Common. Observed.

Fundulus diaphanus (Lesueur). Banded killifish. Common. 1972-Z-80-5(1).

Fundulus heteroclitus (Linnaeus). Mummichog. Common. 1972-Z-83-1(1).

Fundulus hybrid. Common. 1972-Z83-3(4).

Menidia menidia (Linnaeus). Atlantic silverside. One observed dead on shore.

Apeltes quadracus (Mitchill). Four spine stickleback. Common. 1972-Z-634-6(10).

Pungitius pungitius (Linnaeus). Ninespine stickleback. Common. 1972-Z-87-4(1).

Pholis gunnellus (L.). Rock gunnel. Common. 1973-Z-357-4(3) and D.8.

Myxocephalus aenaeus (Mitchill). Grubby. Dredged at D.8, 1973-Z-358-4(1).

Table 1. Shore stations sampled in the estuary of the St. Mary's River, Guysborough County, in 1973. Collections were made by hand at low tide.

Station No.	Distance from Sherbrooke Bridge (km)	Date Sampled	Type of Bottom	Water Surface Salinity °/₀₀	Water Surface Temp.°C	Air Temp.°C	Remarks
S1	4.0	4 June	mud and stones	6.6	16.5	16.5	
S2	6.5	4 June	mud and rocks	7.6	15.5	16.7	
S3.1	7.5	5 June	*Spartina* marsh	-	-	-	Backwater
S3.2	7.5	13 Aug.	*Spartina* marsh	-	-	-	Backwater
S4	9.0	13 Aug.	gravel	-	-	-	
S5	9.5	5 June	gravel	-	-	-	
S6	10.0	13 Aug.	mud	-	-	-	Backwater
S7	10.0	4 June	gravel and stones	35.0	15.4	17.2	
S8	10.0	13 Aug.	gravel and stones	-	-	-	
S9	12.0	5 June	gravel and stones	-	-	-	
S10	12.5	4 June	stones	29.5	11.9	-	
S11	13.3	15 Aug.	sand and stones	-	-	-	
S12	14.0	15 Aug.	rock	30.6	17.2	-	

Table 2. Bottom stations sampled in the estuary of the St. Mary's River, Guysborough County, on 14 August 1973. Samples were taken with a hand-hauled dredge at about the time of low tide. Water surface temperature and salinity were measured at each station.

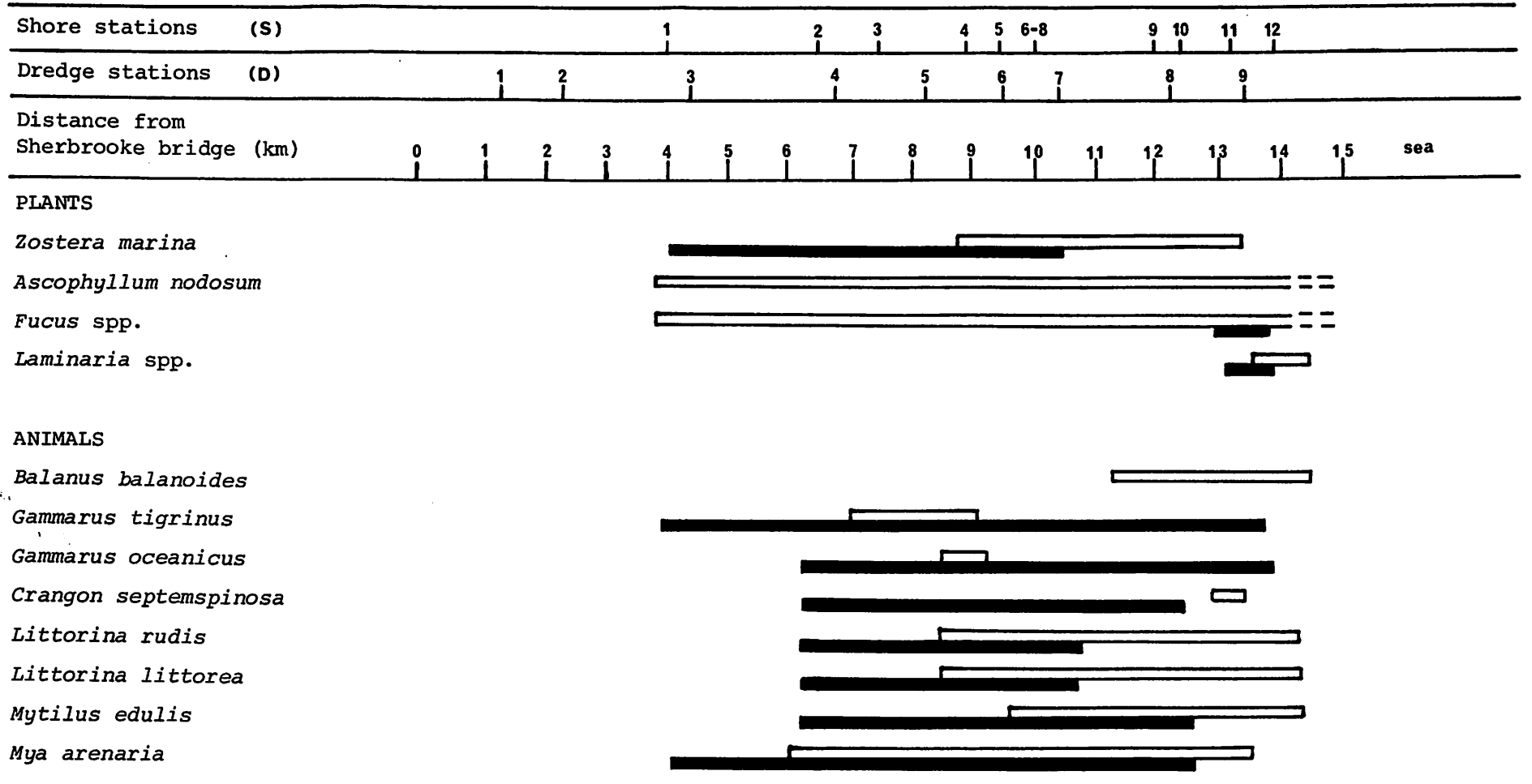
Station No.	Distance from Sherbrooke Bridge (km)	Depth (ft.)	Type of Bottom	Surface Salinity (°/₀₀)	Surface Temperature (°C)
D1	1.25	12	stone and twigs	2.6	21.8
D2	2.30	22	stones and mud	2.2	20.8
D3	4.50	9-13	sandy mud	2.6	19.6
D4	6.75	13-14	stones,mud/sand, organic debris	2.5	19.3
D5	8.25	14-15	sand and organic debris	2.9	18.4
D6	9.50	15-16.5	sand,mussels	2.9	18.4
D7	10.50	7	mussel bank, sand and *Zostera*	3.3	18.0
D8	12.25	22	mussel bank	3.3	17.6
D9	13.50	11	stones with *Laminaria*	3.4	16.4

Table 3. Temperature and salinity measurements made at Sherbrooke Village and Sonora Wharf on 16th and 17th January 1975. The St. Mary's River was completely frozen over for some six km below Sherbrooke. At Sonora there was fixed ice in the bays and free-ice in the river. Current flow was rapid.

	Sherbrooke Village		Sonora Wharf	
	Low tide	High tide	Low tide	High tide
Date	16 Jan.	17 Jan.	16 Jan.	17 Jan.
Time AST.	17.15	12.00	17.00	12.15
Air temp °C	-	0.4	-3.7	0.8
Water temp (surface) °C	1.0	1.0	0.0	0.3
Salinity 1(°/$_{oo}$)	4.1	5.0	13.2	15.4
Salinity 2(°/$_{oo}$)	0.0	0.0	3.0	8.0

Note Salinity 1 was obtained by conversion of specific gravity measured with a hydrometer. Salinity 2 was measured with a refractometer. The high values obtained with the hydrometer are due to ice slush in the sample. The refractometer values are a little more realistic.

Table 4. The intertidal and subtidal distributions of some common aquatic plant and animal species in the estuary of the St. Mary's River, based upon shore and dredge collections made during the 1973 study. Intertidal records are shown ═══, and subtidal records ▬▬▬.



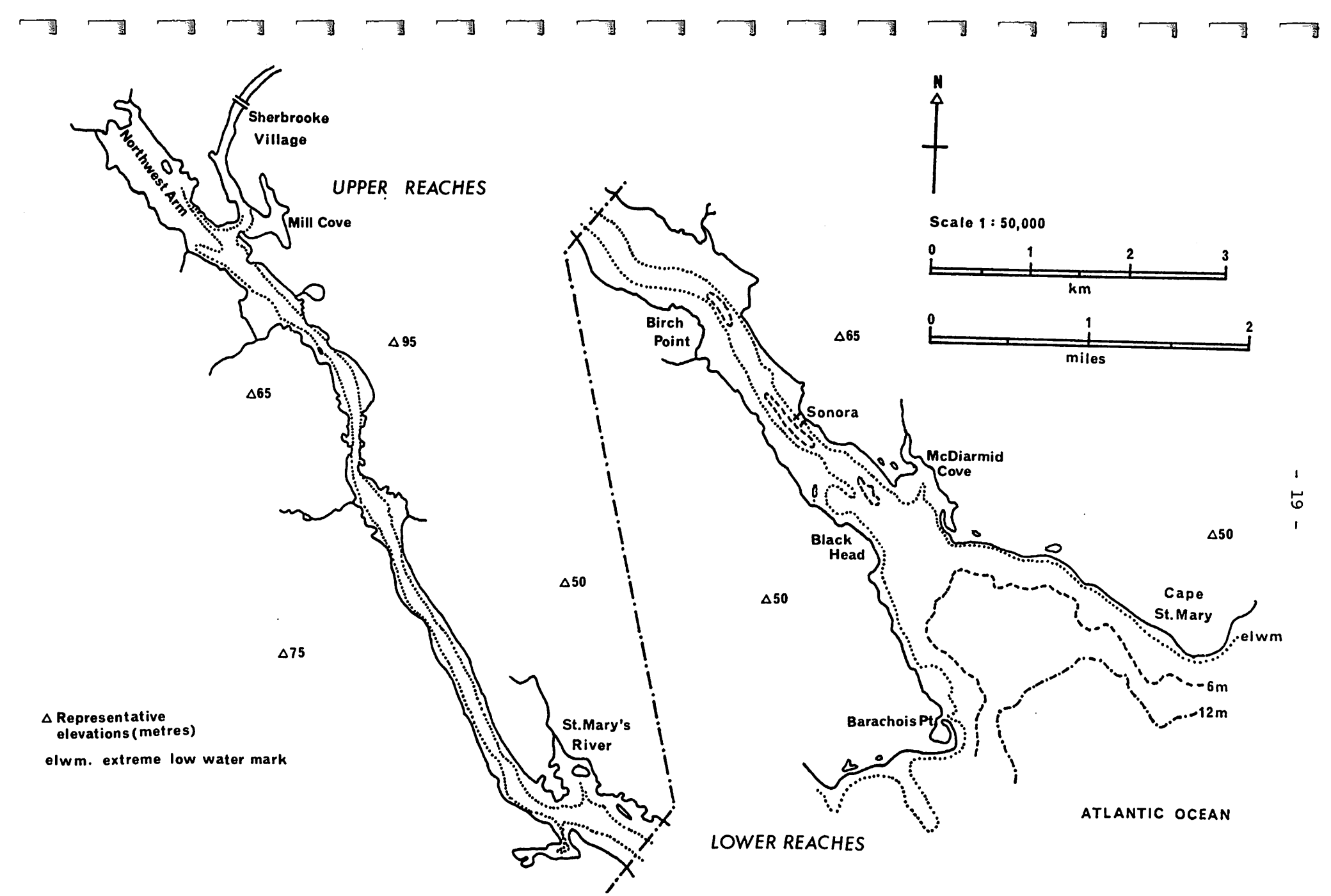


Fig. 1. The estuary of the St. Mary's River. Localities and physical features. Based upon National Topographic Series sheet 11F/4 and Canadian Hydrographic chart No. 4285.

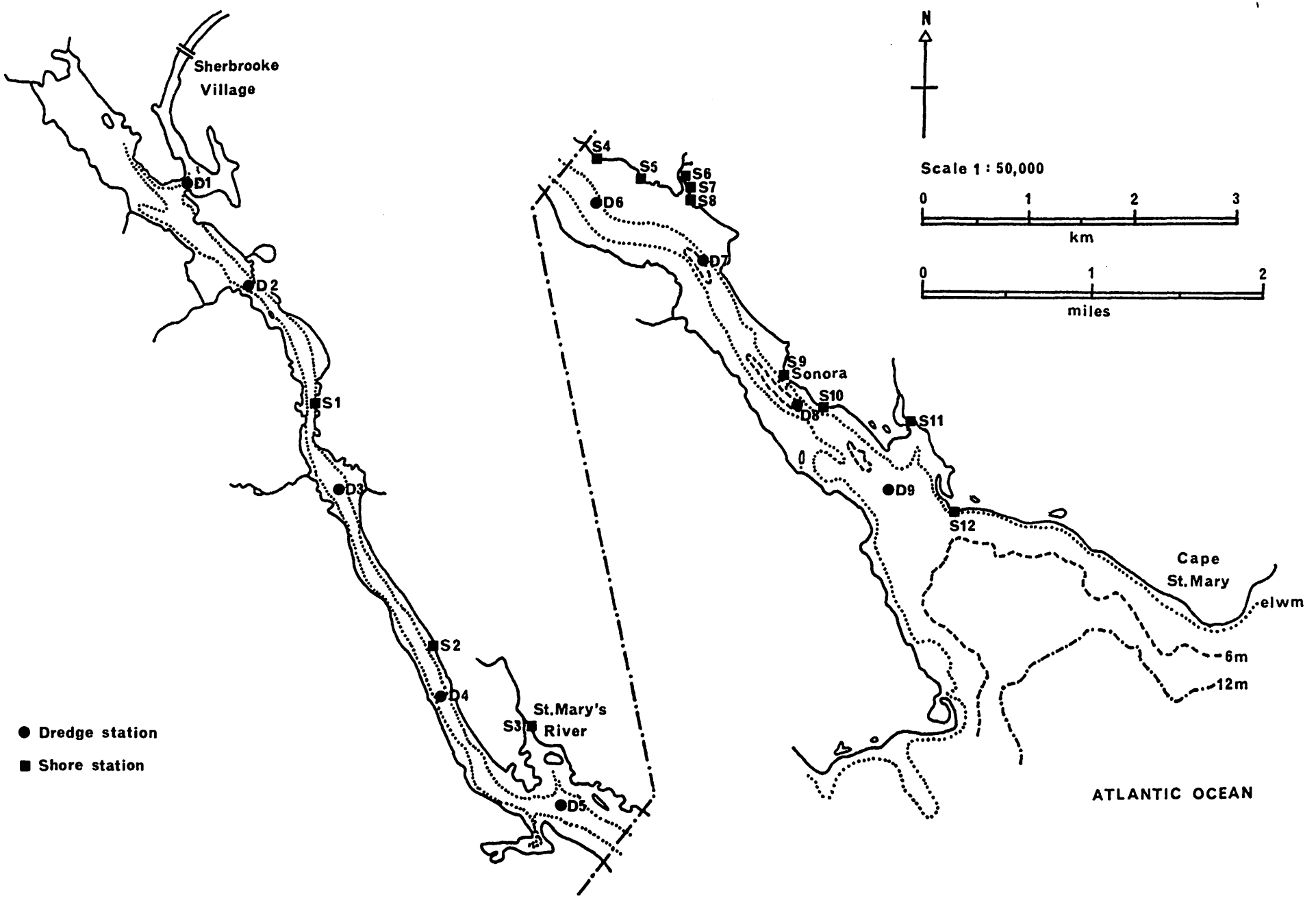


Fig. 2. The estuary of the St. Mary's River. Sampling stations used in the 1973 study. Shore stations were restricted to the east bank as most of the west bank was inaccessible.

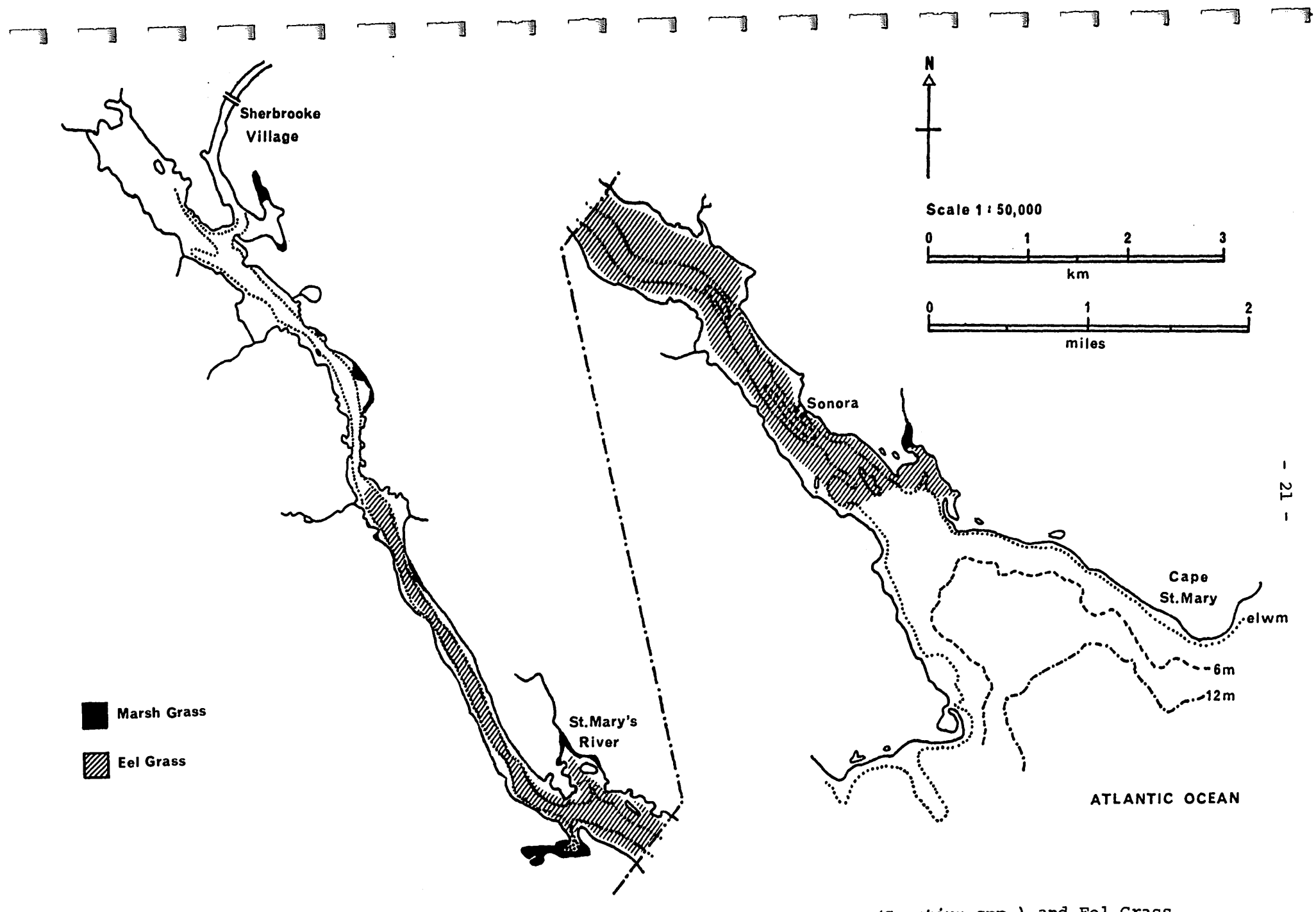


Fig. 3. The estuary of the St. Mary's River. Distribution of Marsh Grass (*Spartina* spp.) and Eel Grass (*Zostera marina*) based upon the 1973 study and air survey photographs (1964).

Fig. 4 Station S.3, a backwater of the St. Mary's River estuary at St Mary's Bay. The shore vegetation is dominated by cord grass (*Spartina alterniflora*), rock weed (*Ascophyllum nodosum*) and various filamentous algae. Horned Pondweed, *Zannichelia palustris*, occurs in the water. Sweeping the pondweed with a seive produced four species of amphipod crustacean, *Gammarellus angulosus, Gammarus mucronatus, Gammarus tigrinus* and *Jassa falcata*, one species of insect, *Trichocorixa* sp., one specimen of mollusc, *Hydrobia totteni*, and juvenile eels, *Anguilla rostrata*.

Fig. 5 Station S.12, an area of exposed rocks on the headland south of McDiarmid Cove. The quartzite rocks provide a good substrate for seaweeds. There are some large tidepools at various tide levels. Seaweeds recorded here were *Ectocarpus siliculosus, Chordaria flagelliformis, Petalonia fascia, Scytosiphon lomentaria, Dictyosiphon foeniculaceus, Alaria esculenta, Laminaria digitata, Laminaria saccharina, Ascophyllum nodosum, Fucus* spp., *Porphyra umbilicalis, Corallina officinalis, Lithothamnium* sp., *Chondrus crispus* and *Polysiphonia* sp. Animals recorded among the seaweeds and in tidepools were Hydroids, one actiniarian, one nemertean, one polychaete worm, *Lepidonotus squamatus* ; two species of crustacea, *Balanus balanoides* and *Jassa falcata;* and seven species of mollusc, *Acmaea testudinalis, Lacuna vincta, Littorina littorea, Littorina obtusata, Littorina rudis, Nucella lapillus* and *Mytilus edulis*.