

BY THE SEA

A GUIDE TO THE COASTAL  
ZONE OF ATLANTIC  
CANADA

MODULE 4:  
SALT MARSHES



Canada

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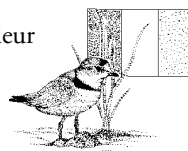
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## THE MODULES

MODULE 1	:	INTRODUCTORY MODULE
MODULE 2	:	TO THE HORIZON - THE NEARSHORE
MODULE 3	:	ESTUARIES
MODULE 4	:	SALT MARSHES
MODULE 5	:	TIDAL MUDFLATS
MODULE 6	:	SANDY BEACHES AND DUNES
MODULE 7	:	ROCKY SHORES
MODULE 8	:	COASTAL ISLANDS AND CLIFFS
MODULE 9	:	COBBLE BEACHES
MODULE 10	:	COASTAL BOGS
MODULE 11	:	FRESHWATER BARRIER PONDS
MODULE 12	:	FJORDS
MODULE 13	:	ACTIVITIES

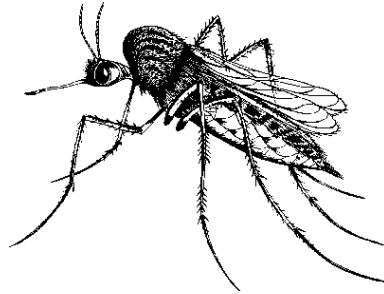
# TABLE OF CONTENTS

<b>SALT MARSHES .....</b>	<b>3</b>
What is a Salt Marsh? .....	3
The Salt Marsh within the Coastal Zone .....	4
Location .....	4
<b>THE PHYSICAL ENVIRONMENT .....</b>	<b>5</b>
Formation .....	5
Physical Characteristics .....	6
Ice .....	6
Salt .....	6
Tides .....	6
<b>BIOLOGICAL FEATURES .....</b>	<b>7</b>
Who Lives Where? .....	7
Plants .....	8
Molluscs .....	10
Insects .....	10
Crustaceans .....	11
Worms .....	11
Fish .....	12
Birds .....	13
Mammals .....	15
<b>ECOLOGY.....</b>	<b>17</b>
Stress and Survival .....	17
Productivity .....	18
Food Web .....	19
<b>SALT MARSHES AND US.....</b>	<b>21</b>
Salt Marshes - Past and Present .....	21
Problems in the Ecosystem .....	22
Protection of the Ecosystem .....	22
<b>SPECIES LISTS .....</b>	<b>23</b>
Plants .....	23
Molluscs .....	23
Insects .....	24
Crustaceans .....	24
Worms .....	24
Fish .....	25
Birds .....	25
Mammals .....	26

# SALT MARSHES

## What is a Salt Marsh?

Salt marshes are often thought of as smelly, grassy 'wastelands,' cut by numerous channels, oozing with mud, and often swarming with blood-sucking insects. This is enough to keep even the strong-willed at bay. It is not surprising that these areas are often burnt, drained, damaged and destroyed by landfill. Unfortunately, this negative view of salt marshes clouds our vision of the vital role they play in the coastal zone of Atlantic Canada.



Salt marshes are some of the most productive ecosystems along the coast. Plants play a key role in this productivity. They grow very fast, and when they die and decompose, they provide organic nutrients to the salt marsh and surrounding ecosystems. Salt marshes occur in low-lying areas. They are exposed to the daily action of tides. As the tides flow in and out of the salt marsh, the nutrients are carried with them.

A salt marsh is considered to be a community of plants that are tolerant of wet, dry, and saline (salty) conditions, generally found in low-lying, sheltered coastal areas exposed to the daily actions of tides. Plants play a key role in stabilizing the muddy sediments and in forming the salt marsh. The accumulation of organic matter often produces peat-like soils.

Salt marshes are sometimes also called tidal marshes.



## The Salt Marsh within the Coastal Zone

Salt marshes play an important role in the coastal zone of Atlantic Canada. They provide shelter for plants and animals. They also trap nutrient-rich sediments. Salt marshes are an important nursery area for some fish, and are used by many other species for feeding and resting. Some of the nutrients from the decomposed plant matter get flushed out with the tides and transported to other coastal ecosystems.

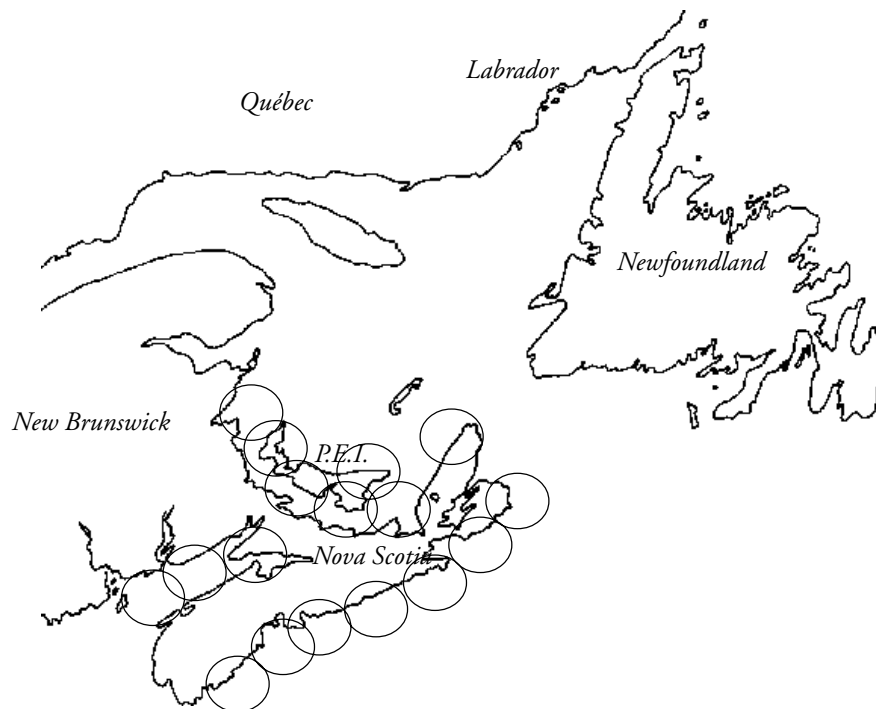
Salt marshes are found in association with other ecosystems in the coastal zone. Estuaries, barrier ponds, mudflats, sandy beaches, islands, and coastal bogs are often located close by.

### Location

Salt marshes are numerous throughout Atlantic Canada. They are found in sheltered locations all around the coast and are often small. They are part of a band of salt marshes that stretches from southern Labrador to the Gulf of Mexico.

The most extensive continuous salt marshes in Prince Edward Island are located on the Hillsborough River and its tributaries. In Nova Scotia, extensive salt marshes are found in the upper Bay of Fundy, Minas Basin, and Chignecto Bay. In New Brunswick, salt marshes are found along most of the coast. Salt marshes are scattered throughout Newfoundland and Labrador.

### *Location of major salt marshes in Atlantic Canada*



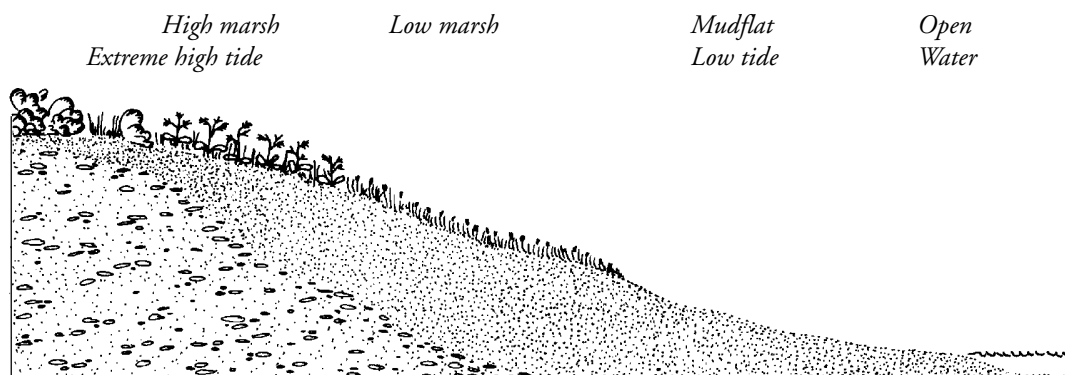
# THE PHYSICAL ENVIRONMENT

## Formation

A salt marsh is the result of the interaction between living organisms and the natural forces of wind, currents, storms, tides, and salt.

In the Maritime provinces, the main ingredients of salt marshes are a constant supply of sediment, a sheltered spot, and an astonishing grass called Salt-water Cord-grass. In Newfoundland and Labrador this grass is replaced by other salt marsh plants. Once established, the plants encourage more sediment to settle at an even faster rate. Like all good turf-forming grasses, cord-grass sends out underground stems, called rhizomes, which eventually extend and form new clumps of grasses. These clumps allow the tidal currents to slow down enough to cause sediment, brought in by the tides from the ocean and the estuary, to settle. As plants build up and decompose on top of each other, a peat-like sediment develops, building up the marsh.

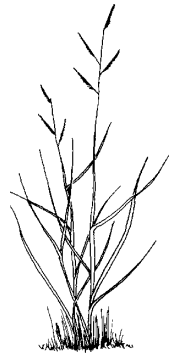
### *Salt marsh profile*



#### How are mudflats related to salt marshes?

Mudflats are the first stage in the development of salt marshes. They can be best seen when the tide is out. Mudflats are composed of very fine sediment and are located in areas where water moves very slowly. They usually extend out from the non-grassy areas of marshes or from estuaries where there is a large supply of sediments. Mudflats can also be found away from salt marshes, behind or around beaches. The Bay of Fundy is known for its extensive mudflats. Please see module 5: Tidal Mudflats.

Large numbers of shorebirds congregate on mudflats to feed.



see activity 16



see activity 23

*see activities 3, 4,  
11, 14*

## Physical Characteristics

### Ice

In winter, ice covers much of the salt marsh. It protects the marsh from changing conditions. During ice break-up in spring, chunks of salt marshes may be carried away to other coastal ecosystems. Marsh grasses are often trimmed to the ground by the action of 'ice trimming.'

### Salt

With the daily movement of the tides, salinity constantly changes. Saltwater mixes with freshwater from rivers, streams, rain-water and melting snow. When the saltwater is diluted with freshwater, it is called brackish.

### Tides

Tides can cause erosion. They bring in and carry off organic material and nutrients. Gales and storm tides also cause erosion and remove sediments and plants.

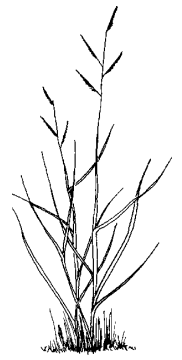
Shorebirds feed during low tide and roost during high tide.

# BIOLOGICAL FEATURES

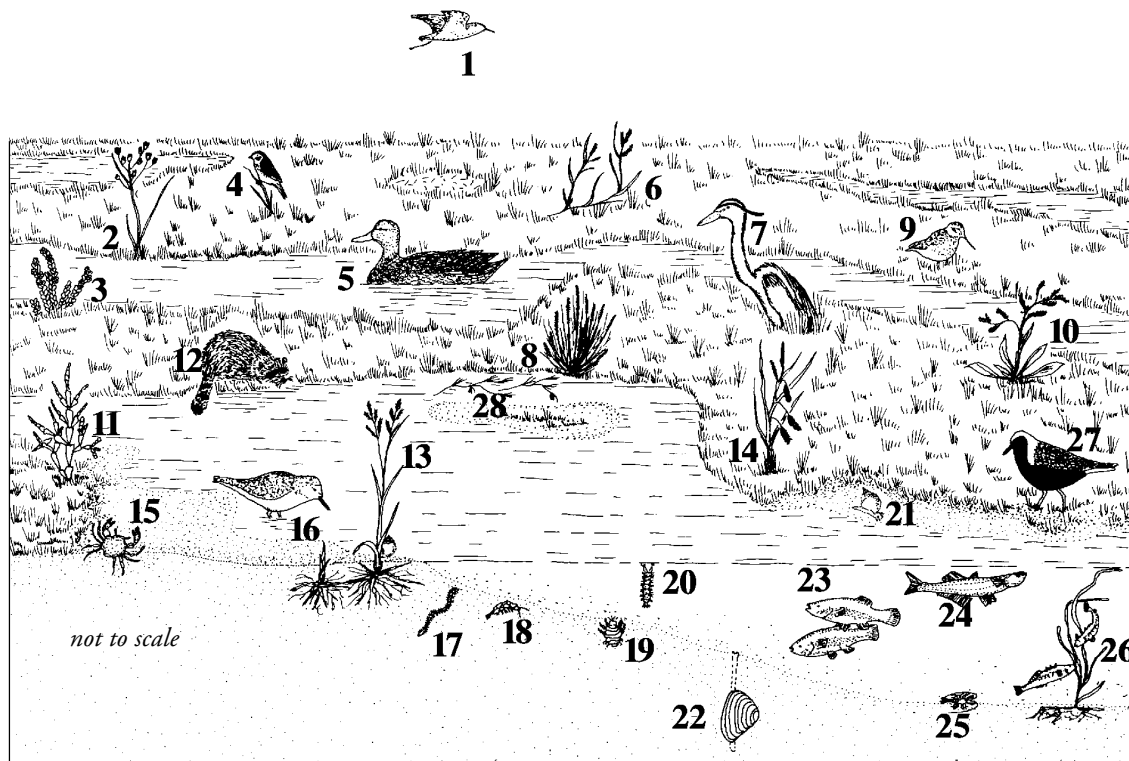
Animals and plants that live in the salt marsh reap the benefits of an ecosystem that has plenty of food to offer. They have adapted to the changing salinity, the warm water, and the tides.

## Who Lives Where?

- |    |                              |    |                               |
|----|------------------------------|----|-------------------------------|
| 1  | <i>Lesser Yellowlegs</i>     | 2  | <i>rush</i>                   |
| 3  | <i>Sea-Milkwort</i>          | 4  | <i>Sharp-tailed Sparrow</i>   |
| 5  | <i>Black Duck</i>            | 6  | <i>Salt-meadow Grass</i>      |
| 7  | <i>Great Blue Heron</i>      | 8  | <i>Arrow-grass</i>            |
| 9  | <i>Common Snipe</i>          | 10 | <i>Sea-Lavender</i>           |
| 11 | <i>Glasswort</i>             | 12 | <i>Raccoon</i>                |
| 13 | <i>Salt-water Cord-grass</i> | 14 | <i>sedge</i>                  |
| 15 | <i>Mud Crab</i>              | 16 | <i>Semipalmated Sandpiper</i> |
| 17 | <i>worm</i>                  | 18 | <i>amphipod</i>               |
| 19 | <i>isopod</i>                | 20 | <i>mosquito larva</i>         |
| 21 | <i>Mud Dog Whelk</i>         | 22 | <i>Soft-shelled Clam</i>      |
| 23 | <i>Mummichogs</i>            | 24 | <i>Atlantic Silverside</i>    |
| 25 | <i>sand shrimp</i>           | 26 | <i>Threespine Stickleback</i> |
| 27 | <i>Black-bellied Plover</i>  | 28 | <i>Ditch-grass</i>            |



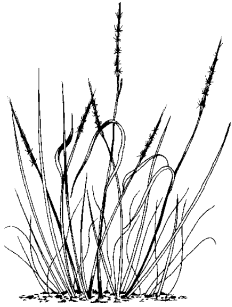
see activities 8, 16,  
17, 24, 30



## Plants

Plants are the producers of organic material, which in turn becomes food for other species, or decomposes into nutrients. Once the Salt-water Cord-grass establishes itself in a salt marsh, other salt-loving plants follow. These plants are termed halophytic and have the unique ability to excrete excess salt and/or retain water.

Larger salt marshes can be divided into two sections, the high and the low marsh. Each has a distinct plant community.

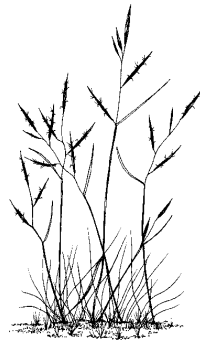


Salt-water Cord-grass

Salt-water Cord-grass is a tough grass that forms dense stands close to the water and can withstand being submerged. This cord-grass is found primarily in the low marsh.

Salt-meadow Grass

Salt-meadow Grass forms large meadows further away from the tide line in the high marsh.



## Algal mats

Late in summer when shallow waters have warmed, algae can grow into huge greenish-grey mats. Some people call this dragon-vomit. When they die these sheets of soft cardboard-like material wash up on the shoreline and on the vegetation. The algae then decompose and are recycled back into the system. Algal mats are another indication of high plant productivity in salt marshes and surrounding areas. Sea Lettuce is a main component of these algal mats. Some small businesses are actually manufacturing doormats from algal mats.

## Pannes

Pannes are shallow ponds in salt marshes that are created by poor drainage, uneven distribution of sediment, or ice scouring. Extreme salinity and high temperatures prevent colonization by grasses. Some more tolerant plants such as Sea Lettuce, Eelgrass, Ditch-grass and filamentous algae can grow there. Periwinkles can also be abundant.

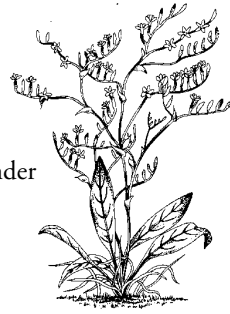


rush

Rushes are often found mixed in with the cord-grasses or alone forming stands in the mud.

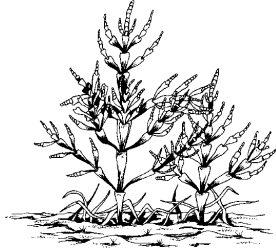
Sea-Lavender

The delicate mauve flowers of Sea-Lavender can be observed in the summer.



Glasswort

Glasswort is a small succulent plant that tastes salty. It turns a bright red in the fall.



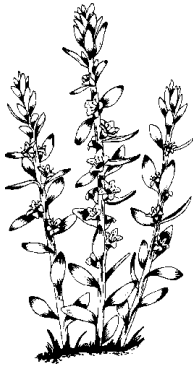
sedge

Sedges are found throughout salt marshes. Most can be identified by their three-sided stems.



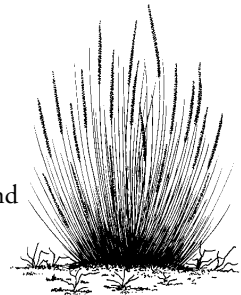
Sea-Milkwort

Sea-Milkwort is a small succulent plant with pink flowers that can form dense beds in the mud.



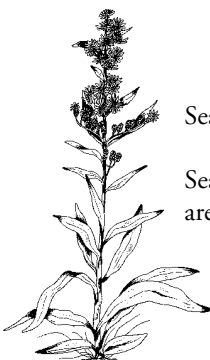
Arrow-grass

Arrow-grass is toxic to humans and can be found throughout the lower salt marsh. It grows in different sizes.



Seaside Goldenrod

Seaside Goldenrod is found most often in the drier areas of marshes, where it produces tall yellow flowers.



Sea Lettuce

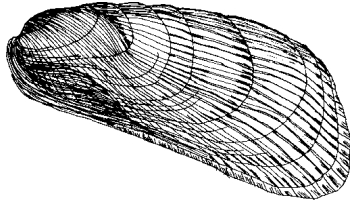
Sea Lettuce is a green algae that looks like lettuce. It can be found in tidal creeks.



## Molluscs

Molluscs inhabit the sandbars and mudflats of salt marshes. The Ribbed Mussel, the periwinkle, and the Mud Dog Whelk are found among the cord-grass.

Some molluscs feed by filtering water and others are carnivores. Some will graze on microscopic algae that live on the estuary bottom and on the vegetation. Others will feed on detritus from dead animals and plants. Molluscs are an important source of food for other species.

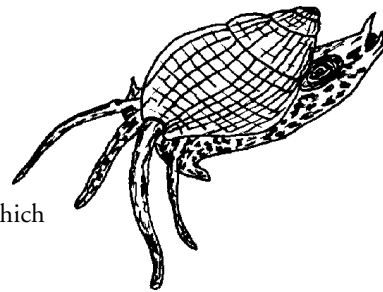


Ribbed Mussel

The Ribbed Mussel resembles the Blue Mussel but has stripes the length of its shell. To 10 cm.

Mud Dog Whelk

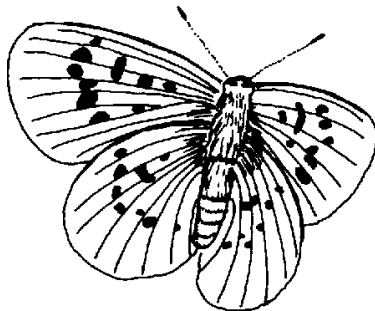
The Mud Dog Whelk is a small gastropod which can measure up to two cm.



## Insects

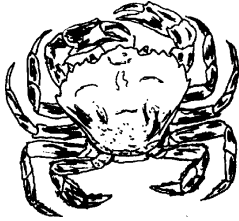
Midges, mosquitos, deer flies, blackflies, no-see-ums (black gnats), sand flies, and grasshoppers are just a few of the insects that live in salt marshes. Although some of these insects, such as mosquitos, can be very aggravating, keep in mind that they and their larvae are important food for birds and fish. Spiders often invade the cord-grasses. Salt marshes are also home to some butterflies such as the Maritime Ringlet (endangered) and the salt marsh copper (vulnerable).

*Dorcas Copper*



## Crustaceans

A number of crustaceans such as copepods and Green Crabs are at home in or on the mud of salt marshes. They in turn are food for other species, such as birds and fish. The mysis, a swimming shrimp, eats particles of salt marsh grass and is in turn eaten by fish such as the American Shad.

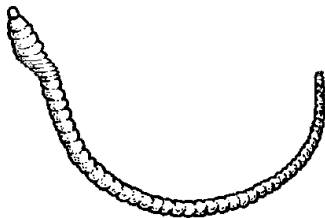


Green Crab

Green Crabs are recognized by their greenish colour and the shape of their bodies. To 7.5 cm.

## Worms

Worms such as the mud worm, thread worm, blood worm, and the terebellid thread worm are found in abundance in mudflats associated with salt marshes.

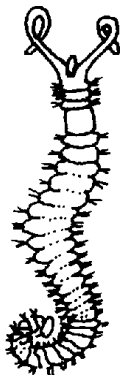
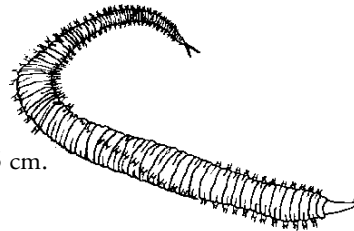


thread worm

The thread worm is a segmented worm that feeds like the earth worm. It eats mud, consumes the food in it and then releases the remaining mud back into the water. 10 cm.

blood worm

The blood worm is a segmented worm that is commonly sold for bait. It has a painful bite, similar to a bee-sting. It tolerates low concentrations of oxygen and salt. To 37.5 cm.

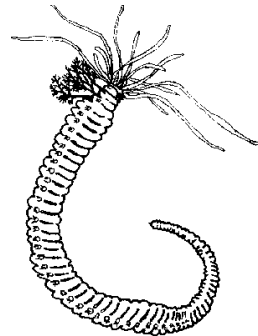


mud worm

The mud worm hides in a tube in the mud. It feeds on detritus found on the bottom's surface. Mud worms capture their food with two large, sticky tentacles. 10 cm.

terebellid worm

The terebellid worm lives in a tube that it makes out of detritus and mud. It has many white tentacles which it uses to capture detritus at the surface of the bottom. To 25 cm.

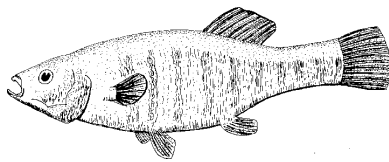


## Fish

Some fish live in salt marshes throughout their entire lives, such as small sticklebacks, killifish, Mummichogs, and Atlantic Silversides. They can be observed in the channels and in pannes. Fish such as the Striped Bass, Gaspereau, and American Eels visit occasionally during high tide. Juvenile fish like to use salt marshes for shelter and food.

Fish that inhabit salt marshes are able to tolerate the extreme conditions of temperatures above  $25\frac{1}{2}^{\circ}\text{C}$ , low concentrations of oxygen, changing salinity, and high concentrations of mud in the water. They are typically small in size and can be the prey of birds such as the yellowlegs, kingfishers, terns, and Great Blue Herons.

At low tide, when the water levels are significantly lower, fish choose the deeper water of channels to feed. At high tide they search for food, such as mosquito larvae, over a large area.

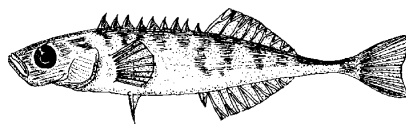
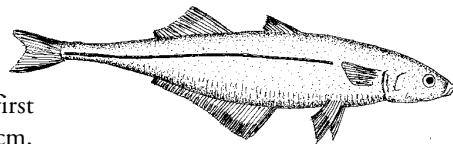


Mummichog

Mummichogs are found in abundance in salt marshes and estuaries. They have a rounded tail and dark vertical bands the length of their body. 13 cm.

Atlantic Silverside

The Atlantic Silverside resembles a small smelt. It feeds frequently in salt marshes at high tide. It has a silvery line along its sides. There are two fins on its back; the first is very small with only 4 spines. To 13.7 cm.

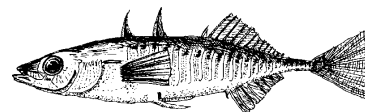


Ninespine Stickleback

The Ninespine Stickleback has nine small spines on its back. It is the smallest of the sticklebacks. To 7.6 cm.

Threespine Stickleback

The Threespine Stickleback has three spines on its back. It lives in salt marshes but can be found in other coastal ecosystems. To 10 cm.



## Birds

Shorebirds are often seen in salt marshes feeding on the mudflats. They are most numerous during migration in summer and fall. They can be seen by the thousands at low tide, feeding on invertebrate organisms in the mud.

It is also very common to see Great Blue Herons and other birds searching for food in the creeks, channels, and pannes in salt marshes. Some birds such as Black Ducks nest in salt marshes and can be seen dipping into the water for their food. Other waterfowl feed here in the fall and winter.

### Some birds' habitat and food

Bird	Habitat	Food
Black Duck	salt marsh, estuary	Eelgrass, insects, snails, mussels, periwinkles, molluscs, crustaceans
Sharp-tailed Sparrow	salt marsh	insects, flies, sand fleas, spiders, snails, seeds of grasses, weeds
Great Blue Heron	estuary, salt marsh, beach	small fish, clams, mussels, crabs, mice, shrimp, young birds
Lesser Yellowlegs	salt marsh, estuary	killifish, minnows, insects, snails, crabs
Least Sandpiper	salt marsh	mosquitos, insect larvae, marine worms, molluscs
Ring-billed Gull	all	opportunistic; especially dead animals, garbage

### Migration

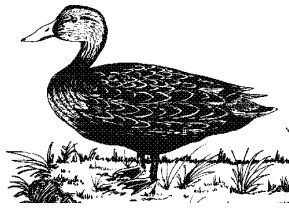
Birds have a very high metabolic rate. They eat often and in large quantities compared to their body weight. Flying is an energy-intensive activity, so their metabolic rate is high, especially during migration when they fly thousands of kilometres. Despite this high metabolic rate, birds use energy far more efficiently than any plane or machine.

Birds use salt marshes for staging, feeding, and resting during migration or during the summer. Before shorebirds fly thousands of kilometres to South America and the southern United States, they will double the amount of fat in their body tissues: necessary fuel for the flight.

Shorebirds gather in large numbers in certain salt marshes of the Atlantic region (for example, Bathurst, Pokemouche, Tabusintac, Richibucto, Summerside, Malpeque Bay, Wallace Brook, Tatamagouche, Mabou Harbour), but the greatest numbers are found in the upper Bay of Fundy, where they can be observed in flocks of tens of thousands.



*see activity 37*



Black Duck

The Black Duck is a sooty, brown dabbling duck that calls with a typical duck quack. Its ducklings can tolerate high salt concentrations. 58 cm.

Blue-winged Teal

The Blue-winged Teal is a small duck, slightly larger than a pigeon, with a bluish wing stripe. Its cousin, the Green-winged Teal, has a green wing stripe. Listen for the whistling noise it makes with its wings. 39 cm.

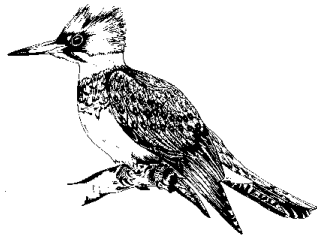
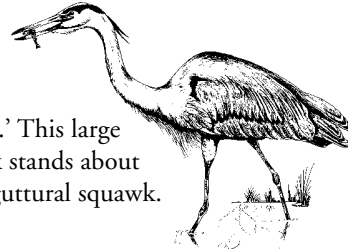


Sharp-tailed Sparrow

The Sharp-tailed Sparrow is a typical salt marsh inhabitant. It is identified by its orange buff face on an otherwise brown body and its kip-kip-zeee or pshaw call. 13 cm.

Great Blue Heron

The Great Blue Heron is locally called a 'crane.' This large bluish-grey bird with long legs and a long beak stands about a metre high. When startled, it gives a hoarse guttural squawk.

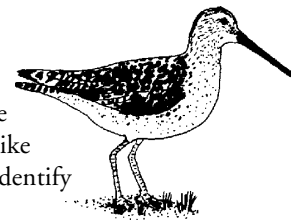


Kingfisher

Watch for the bluish Kingfisher dashing over the water uttering a loud rattling noise, stopping, hovering, and suddenly diving into the water for fish. 33 cm.

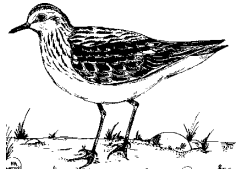
Short-billed Dowitcher

The Short-billed Dowitcher is bigger than a robin. This long-billed bird occurs in large flocks over mudflats. The sewing-machine-like action of the bill is one of the best ways to identify it. 28 cm.



Black-bellied Plover

The Black-bellied Plover is a plump, quail-sized bird. Listen for the clear, whistled pee-a-wee call. Check for young birds without the black belly. 29 cm.

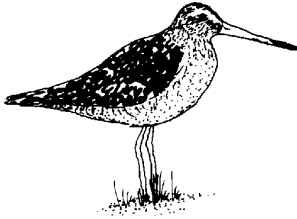


Least Sandpiper

The Least Sandpiper is sometimes called mud peep. This is the smallest and tamest of all the shorebirds. Listen for its kreeeet call. 15 cm.

Lesser Yellowlegs

The Lesser Yellowlegs is a noisy, big, yellow-legged bird that calls yewyew. 27 cm.

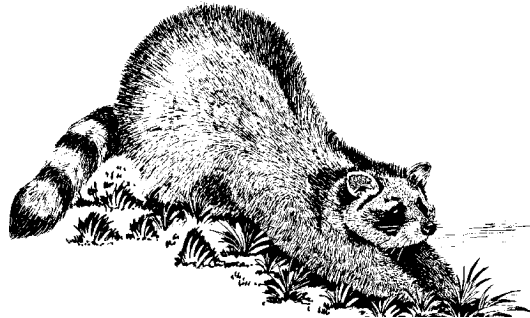


Hudsonian Godwit

The Hudsonian Godwit is a big shorebird with an upturned bill. 39 cm.

## Mammals

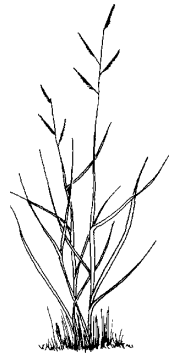
There are a variety of mammals that visit salt marshes to look for food and shelter. In the upper sections of the marsh Meadow Voles and Masked Shrews forage for insects and seeds. Raccoons visit the tidal creeks and pannes in search of fish and molluscs. Muskrats live in tidal creeks, where they burrow into the banks and raise ten to fifteen young per season. In the tidal waters in salt marshes in Newfoundland and Yarmouth County, Nova Scotia, otters can also be seen. Occasionally deer and Moose visit the marshes to look for salt and seaweed.



# ECOLOGY

## Stress and Survival

A salt marsh is a place of extremes. Variations in salt, oxygen, and temperature levels as well as ice trimming require animals and plants to adapt. Organisms that live in salt marshes have some amazing adaptations to deal with these challenges. These adaptations include excretion of excess salt, storing of water, and burrowing.



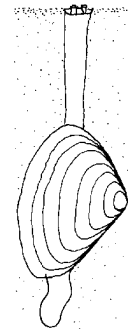
### What are some of the adaptations?

Cord-grass has glands that excrete salt. It also possesses air passages in the stem that permit the transportation of oxygen to the roots. Since it is perennial, it can tolerate the trimming by ice in the winter.

Glasswort is a succulent plant, storing water in its cells, and excreting excess salt.

Clams have evolved siphons that extend to the surface to get access to oxygen and food.

*Baltic Macoma*



Worms build tubes through which they create currents that carry oxygenated water and food.

Birds have differently shaped beaks with different lengths for finding creatures buried at different levels in the mud. Plovers stab at their food, such as marine worms, with their short stubby bills. The beaks of mud-probing birds, such as the Least Sandpiper, are equipped with special sensory organs so that they feel their prey beneath the mud. Sensory receptors on the beak can detect vibrations in the mud made by worms or other creatures.

Many animals have amazing ways to deal with salt. Crustaceans that live on or in the bottom substrate excrete salt as rapidly as it is absorbed (many estuarine organisms do this as well). Some birds also have salt glands that excrete salt. Other organisms (especially marine worms) contract their bodies to reduce the surface area in contact with the water (i.e. compress themselves) and thus decrease the absorption of salt. The last option is to have an impermeable surface to prevent salt from being absorbed through the skin-but only birds, reptiles, and mammals are so adapted. A clam or mussel can only make itself temporarily watertight. Organisms without these features are absent from salt marshes. Frogs, for example, are not found in salt marshes.



see activities 35, 36

## Productivity

While salt marshes may appear to be inhospitable, many of them are among the most productive ecosystems on the planet, similar to prairie grasslands and Eelgrass beds. However, the salt marshes of Atlantic Canada are not as productive as those found on the east coast of the United States.

Many species of fish, molluscs, crustaceans, and birds inhabit or visit salt marshes for the abundance of high quality food.

Most of the organic matter found in salt marshes is due to the fast growing salt marsh grasses. An average hectare of salt marsh may produce more than six times the organic material of a hectare of wheat, about 22, 000 kg of food per hectare.

From many salt marshes, a large portion of organic material and nutrients gets flushed into bays and estuaries, making coastal areas extremely productive for fish. As much as 50% of the commercial catch of fish and shellfish use these organic materials directly or indirectly. The remainder is stored within the salt marshes along with other organic matter such as Eelgrass from estuaries. Plants store carbon, which accumulates in the peaty sediment of the salt marshes. As a result, salt marshes are often called ‘carbon sinks.’

*see activity 1*



### **If a salt marsh smells like rotten eggs does it mean it's polluted?**

No! The smell is due to the high rate of decomposition (the breaking down of matter by anaerobic bacteria and other small organisms). The rotten egg smell is actually sulphur, a byproduct of rotting organic material (detritus). This material provides enormous amounts of food to organisms in and around the salt marsh. The regular inundation of tides transports nutrients (food) and organic material out to estuaries and other coastal ecosystems.

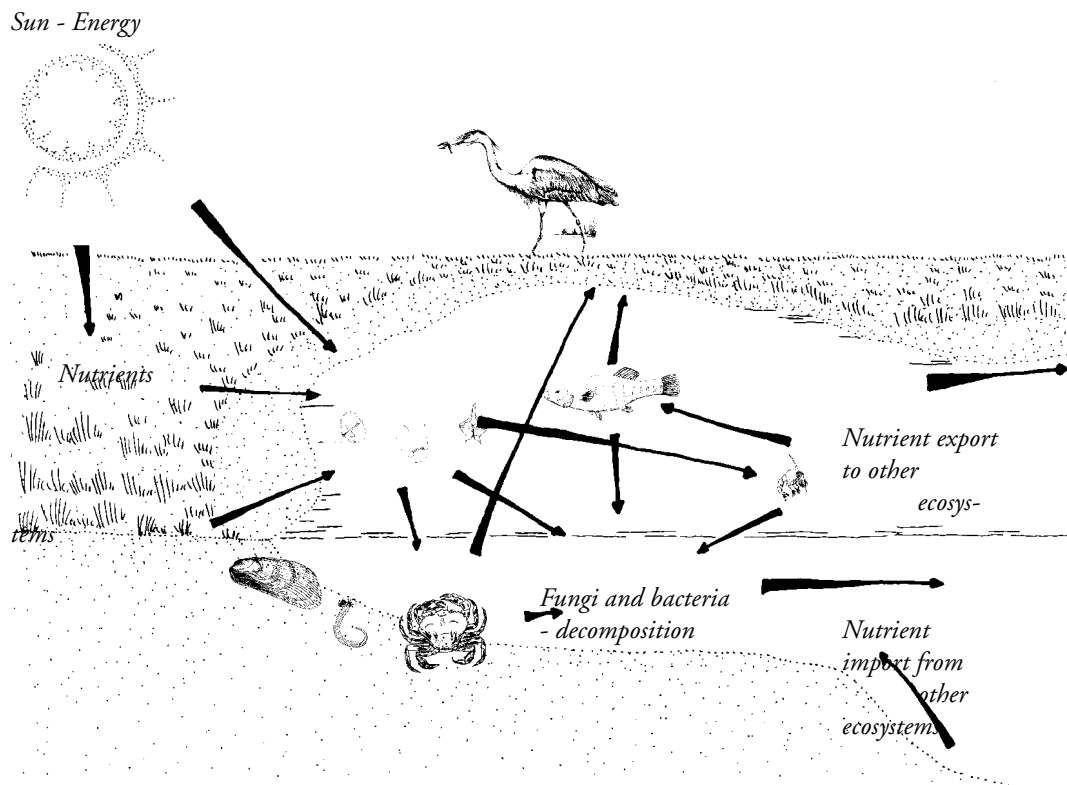
The sulphur may take the form of  $H_2S$  (hydrogen sulphide, a colourless gas), or  $SO_2$  (sulphur dioxide).

## Food Web

Food webs in salt marshes are fairly complex and difficult to determine. In salt marshes, as in other ecosystems, plants are at the base of the food web. Cord-grasses are the main producers. A portion of the organic material from the plants and the nutrients created through the breakdown of this material is carried out of the marshes to other coastal ecosystems. Nutrients are also brought in with the tides. In salt marshes, fungi and bacteria break down the organic material. In turn they are eaten by filter feeders such as worms and molluscs. Fish eat zooplankton, insect larvae, worms, and molluscs, and are in turn food for birds and mammals.

### *Food web*

*Arrow: indicates direction of food/energy*

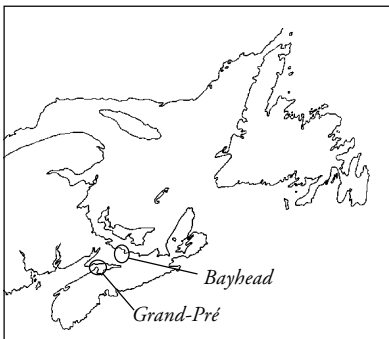


# SALT MARSHES AND US

## Salt Marshes - Past and Present

People have been using salt marshes for hundreds of years. Before the arrival of Europeans, First Nations, especially the Mi'kmaq, gathered shellfish. In areas where they camped thousands of years ago, piles of shellfish remains, such as periwinkles, have been found.

The Acadians diked many of the salt marshes in Atlantic Canada. Channels were cut in the marshes to reduce the amount of water at high tide. Dikes were built around the perimeters of the drained lands to keep saltwater out. The diked marshes were then used to grow fodder. Farmers used the areas for cattle grazing.



In Bayhead and the Grand-Pré region of Nova Scotia there are remnants of old Acadian dikes, indicating use of salt marshes going far into the past. Most salt marshes in Prince Edward Island were also farmed, some even as late as the 1970s.

Today people visit salt marshes and adjacent mudflats for recreational purposes such as nature study, clam digging, hunting, and fishing.

Many plants of the salt marshes are still used today. The Acadians collect the Seaside-Plantain. Sweet Grass or Indian Grass, a vanilla-scented grass found in salt marshes, is used by the Mi'kmaq for spiritual ceremonies and to make baskets.



## Problems in the Ecosystem

Of all coastal ecosystems, salt marshes are the ones most in danger of disappearing.

Sixty-five per cent of all the salt marshes in Atlantic Canada have been altered or destroyed for housing development, and road construction or diked for farming. In Nova Scotia, 16,000 hectares remain, representing 1/3 of the original acreage. In New Brunswick 13,000 hectares have been lost to agriculture. Eighty-five per cent of salt marshes in the Bay of Fundy are gone forever.

In some areas of Atlantic Canada the burning of salt marshes in the spring is still practiced. Garbage is a problem in all coastal ecosystems. Some people drive through the marsh with their ATVs, which damages the vegetation cover and promotes erosion.

The discussion about the benefits of salt marshes as a natural ecosystem versus the benefits of filling them in for development continues to this day.

## Protection of the Ecosystem

Salt marshes are some of the most productive ecosystems in Atlantic Canada. If we alter or destroy them, the effects can ripple throughout the other ecosystems of the coastal zone.

Fortunately, people are now acting to protect this vital ecosystem. Fewer salt marshes are filled in and built upon. Sewage in many areas is now treated, which reduces the excess amount of nutrients that enters these ecosystems.

Salt marshes are not just smelly wastelands. Their health is important for the integrity of the coastal zone. We all can do our part.



## SPECIES LISTS

The following lists are by no means a complete account of the organisms living in this ecosystem. They were chosen as representative species, ones that would most likely be observed when visiting the salt marsh. There are also great regional and local variations, and we realize the difficulty in accommodating all of these.



### Plants

Salt-water Cord-grass	<i>Spartina alterniflora</i>
Salt-meadow Grass	<i>Spartina patens</i>
rush	<i>Juncus spp.</i>
Salt-marsh Bulrush	<i>Scirpus maritimus</i>
sedges	<i>Carex paleacea + others</i>
Sea-Lavender	<i>Limonium carolinianum</i>
Glasswort	<i>Salicornia europaea</i>
Sea-Milkwort	<i>Glaux maritima</i>
Seaside Goldenrod	<i>Solidago sempervirens</i>
Silverweed	<i>Potentilla anserina</i>
Sea-Blite	<i>Suaeda maritima</i>
Arrow-grass	<i>Triglochin maritima</i>
Seaside-Plantain/Goose-tongue	<i>Plantago maritima</i>
Canada Sand-Spurrey	<i>Spergularia canadensis</i>
Seaside Crowfoot	<i>Ranunculus cymbalaria</i>
Orach	<i>Atriplex sp.</i>
Eelgrass	<i>Zostera marina</i>
Ditch-grass/Widgeon-grass	<i>Ruppia maritima</i>
Bayberry	<i>Myrica pensylvanica</i>
Sea Lettuce	<i>Ulva lactuca</i>
hollow green weed	<i>Enteromorpha sp.</i>

### Molluscs

Soft-shelled Clam	<i>Mya arenaria</i>
Ribbed Mussel	<i>Modiolus demissus</i>
Baltic Macoma	<i>Macoma baltica</i>
Atlantic Nut Clam	<i>Nucula proxima</i>
Mud Dog Whelk	<i>Nassarius obsoletus</i>
Hydrobia	<i>Hydrobia minuta</i>
Bay Quahaug	<i>Mercenaria mercenaria</i>

## Insects

black gnats/no-see-ums	<i>Leptoconops sp.</i>
deer flies	<i>Chrysops sp.</i>
blackflies	<i>Simulium sp.</i>
mosquitos	<i>Aedes sp.</i>
horseflies	<i>Tabanus sp.</i>
Maritime Ringlet	<i>Coenonympha inornata nipisquit</i>
salt marsh copper	<i>Lycaena sp.</i>

## Crustaceans

Mud Crab	<i>Neopanopeus sayi</i>
Green Crab	<i>Carcinus maenas</i>
Sand Shrimp	<i>Crangon septemspinosa</i>
four-eyed amphipod	<i>Ampelisca macrocephala</i>
four-eyed amphipod	<i>Ampelisca addita</i>
Tube-making Amphipod	<i>Corophium volutator</i>
	<i>Leptocheirus pinguis</i>
	<i>Unciola irrorata</i>
isopod	<i>Tanais canolinii</i>
Little Shore Isopod	<i>Jaera marina</i>
	<i>Idotea balthica</i>

## Worms

blood worm	<i>Glycera dibranchiata</i>
blood worm	<i>Glycera robusta</i>
red-lined worm	<i>Nephtys incisa</i>
red-lined worm	<i>Nephtys bucera</i>
red-lined worm	<i>Nephtys caeca</i>
paddle worm	<i>Ptyllodoce mucosa</i>
paddle worm	<i>Eteone lacta</i>
paddle worm	<i>Eteone heteropoda</i>
syllid worm	<i>Autolytus prolifera</i>
clam worm	<i>Nereis virens</i>
Dumeril's Clam Worm	<i>Platynereis dumerilii</i>
Lumbrinerid Thread Worm	<i>Ninoe nigripes</i>
orbiniid worm	<i>Naineris quadricuspida</i>
capitellid thread worm	<i>Capitella capitata</i>
bamboo worm	<i>Clymenella torquata</i>
mud worm	<i>Polydora quadrilobata</i>
mud worm	<i>Prionospio steenstrupi</i>

mud worm	<i>Scolecopides viridis</i>
ampharetid worm	<i>Ampharete artica</i>
ampharetid worm	<i>Melinna cristata</i>
terebellid worm	<i>Amphitrite cirrata</i>
terebellid worm	<i>Enoplobranchus sanguineus</i>
terebellid worm	<i>Neoamphitrite figulus</i>

## Fish

Threespine Stickleback	<i>Gasterosteus aculeatus</i>
Fourspine Stickleback	<i>Apeltes quadracus</i>
Ninespine Stickleback	<i>Pungitius pungitius</i>
Mummichog	<i>Fundulus heteroclitus</i>
Atlantic Silverside	<i>Menidia menidia</i>
Atlantic Tomcod	<i>Microgadus tomcod</i>
Striped Bass	<i>Roccus saxatilis</i>
Gaspereau/Alewife	<i>Alosa pseudoharengus</i>
Atlantic Salmon	<i>Salmo salar</i>
Brook Trout	<i>Salvelinus fontinalis</i>
American Eel	<i>Anguilla rostrata</i>

## Birds

Black Duck	<i>Anas rubripes</i>
Mallard	<i>Anas platyrhynchos</i>
American Wigeon	<i>Anas americana</i>
Blue-winged Teal	<i>Anas discors</i>
Green-winged Teal	<i>Anas crecca</i>
Sharp-tailed Sparrow	<i>Ammodramus caudacutus</i>
Savannah Sparrow	<i>Passerculus sandwichensis</i>
Short-eared Owl	<i>Asio flammeus</i>
Northern Harrier	<i>Circus cyaneus</i>
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>
Great Blue Heron	<i>Ardea herodias</i>
Kingfisher	<i>Ceryle alcyon</i>
Tree Swallow	<i>Tachycineta bicolor</i>
Bank Swallow	<i>Riparia riparia</i>
Osprey	<i>Pandion haliaetus</i>
Common Tern	<i>Sterna hirundo</i>
Ring-billed Gull	<i>Larus delawarensis</i>
Short-billed Dowitcher	<i>Limnodromus griseus</i>
White-rumped Sandpiper	<i>Calidris fuscicollis</i>
Semipalmated Plover	<i>Charadrius semipalmatus</i>
Black-bellied Plover	<i>Pluvialis squatarola</i>

Willet	<i>Catoptrophorus semipalmatus</i>
Whimbrel	<i>Numenius phaeopus</i>
Red Knot	<i>Calidris canutus</i>
Pectoral Sandpiper	<i>Calidris melanotos</i>
Semipalmated Sandpiper	<i>Calidris pusilla</i>
Least Sandpiper	<i>Calidris minutilla</i>
Dunlin	<i>Calidris alpina</i>
Hudsonian Godwit	<i>Limosa haemastica</i>
Greater Yellowlegs	<i>Tringa melanoleuca</i>
Lesser Yellowlegs	<i>Tringa flavipes</i>
Canada Goose	<i>Branta canadensis</i>
Brant	<i>Branta bernicla</i>
Northern Shoveler	<i>Anas clypeata</i>
Common Snipe	<i>Gallinago gallinago</i>
Common Pintail	<i>Anas acuta</i>
Merlin	<i>Falco columbarius</i>

## **Mammals**

Raccoon	<i>Procyon lotor</i>
Mink	<i>Mustela vison</i>
White-tailed Deer	<i>Odocoileus virginianus</i>
Moose	<i>Alces alces</i>
Masked Shrew	<i>Sorex cinereus</i>
Meadow Vole	<i>Microtus pennsylvanicus</i>
Muskrat	<i>Ondatra zibethicus</i>