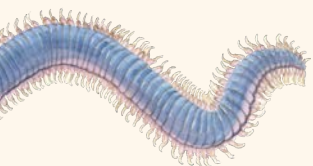




NEW YORK HARBOR ESTUARY

SPECIES IDENTIFICATION GUIDE



NEW YORK HARBOR ESTUARY

SPECIES IDENTIFICATION GUIDE



Billion Oyster Project
New York State Department of Environmental Conservation
2019 Hudson River Estuary Grants for River Education (Round 29)

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Department of
Environmental
Conservation

Hudson River
Estuary Program

Billion Oyster Project thanks the New York State Department of Environmental Conservation (NYSDEC) Hudson River Estuary Program for funding the creation and distribution of this guidebook. The opinions, results, findings and/or interpretations of data contained in this document are put forth solely by Billion Oyster Project, and do not necessarily reflect the opinions, interpretations, or policies of NYSDEC.



ABOUT THIS BOOK

Billion Oyster Project (BOP) is a 501(c)(3) nonprofit organization whose mission is to restore oyster reefs to New York Harbor through public education initiatives. Why oysters? In the process of feeding, oysters remove particles from the waters, hence they act as living water filters. Oysters naturally form three-dimensional reef structures that can help shield New York City shorelines during storm events. This book is about another important function that oysters play in NYC waters. Oyster reefs provide an essential habitat for numerous marine organisms. Many of these organisms are highlighted in this book, which is meant to help identify species and can be used when exploring the riches of New York City's aquatic habitats.

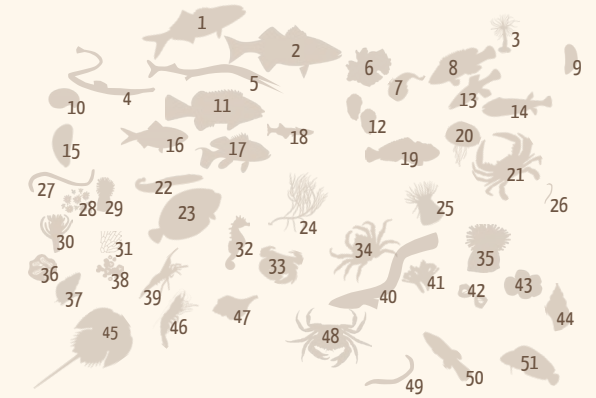
BOP believes that restoration must include education to be an effective long-term strategy. We also believe that students' learning outcomes improve when they contribute to real-life restoration projects. For those reasons, ongoing collaborations with The Urban Assembly New York Harbor School and other New York City public schools are fundamental to BOP's work. Through the lens of oyster restoration, BOP has crafted extensive science curriculum for middle school teachers, and numerous lessons and activities across Science, Technology, Engineering, Math (STEM), English Language Arts (ELA), and Social Studies available to all pre-K to P-12 students, teachers, and families. In addition, we have engaged thousands of volunteers who have contributed to the fabrication of vital restoration equipment and built an extensive network of 75+ restaurants that donate discarded oyster shells for use in our hatchery operations. As of May 2021, BOP has installed 47 million oysters across 15 reef sites, representing 12 acres of New York Harbor.

Over the last five years of working with students in the field on oyster restoration, BOP has identified a need for a compact guide to help identify marine organisms found in New York Harbor. We use and recommend many other excellent guides to neighboring ecosystems such as the Hudson River and the Atlantic Ocean. This book focuses on the unique mix of species found in New York Harbor because our students know how special our city's dynamic estuarine environment is. Our students feel a unique connection to and responsibility toward its inhabitants, and our students deserve a resource that meets their needs in the field.

BOP is excited to present the New York Harbor Estuary Species Identification Guide to educators, students, and community scientists throughout New York City and beyond. The New York Harbor Estuary, New York City's largest public space, is one of the most biologically diverse and productive estuary systems in the world, yet relatively few New Yorkers recognize its value in the context of their daily lives. Oyster restoration can connect young people to New York Harbor, and we are glad to share this guide with young scientists as they identify the biodiversity that exists just beyond their doorstep.

We welcome questions and comments about this guide: email us at educate@nyharbor.org.

To learn more about Billion Oyster Project, subscribe to our email list at bit.ly/bopnews, and follow @billionoyster on Twitter and Instagram and @billionoysterproject on Facebook.



Our New York Harbor and other parts of the Hudson - Raritan Estuary

1. Bluefish 2. Striped Bass 3. Lined Anemone 4. Northern Pipefish
5. Atlantic Needlefish 6. Sea Lettuce 7. Skilletfish 8. Cunner 9. Blue Mussels
10. Slipper Snails 11. Blackfish 12. Eastern Oysters 13. Striped Killifish 14. Northern Puffer 15. Ribbed Mussel 16. Atlantic Menhaden 17. Black Sea Bass 18. Atlantic Silverside 19. Oyster Toadfish
20. Moon Jelly 21. Blue Crab 22. Rock Gunnel 23. Flounder 24. Agardh's Red Weed 25. Orange-Striped Green Anemone 26. Carnation Worm/ Hard Tube Worm
27. Clam Worm 28. Golden Star Tunicates 29. Frilled Anemone 30. Hydroids 31. Lacy Bryozoan 32. Lined Seahorse 33. Mud Crab 34. Spider Crab 35. Dahlia Anemone 36. Chain Tunicates
37. Eastern Mudsnail 38. Boring Sponge 39. Grass Shrimp 40. American Eel 41. Red Beard Sponge 42. Barnacles 43. European Sea Squirt 44. Oyster Drill 45. Horseshoe Crab 46. Sand Shrimp 47. Whelk 48. Pacific Shore Crab 49. Blood Worm 50. Mummichog 51. Blenny

SPECIES COVERED

The New York Harbor Estuary is a remarkably abundant ecosystem with hundreds of different species of flora (plants) and fauna (animals). Many of the species in this guide thrive in brackish water, and the rest are salt water species that we find a lot at BOP restoration sites in shallow waters. Those criteria effectively exclude a number of marine creatures that are well known to New Yorkers, such as shad, sturgeon, and whales. For the species

we have been able to include, this guide aims to present detailed information about identification and morphology, life history and seasonal behavior, diet and predation, and socioeconomic and ecological significance. A few groups of species we describe (amphipods and isopods) may require specific tools (eg, microscopes) and prior training to identify.

INTERTIDAL HABITAT

Intertidal zones exist where the ocean meets the land--they are simply the terrain, sometimes covered with water and sometimes not, that lies between the high and low tide lines. It is easier to observe these zones on shorelines with a natural edge--rocky ledges, sandy beaches and mudflats. Of course much of the waterfront of New York Harbor has been modified and armored, which can make it hard to observe these natural zones. This illustration is meant to depict how intertidal zones may look in New York Harbor.



Splash or Spray Zone

This is the zone just above the water's surface. It's never completely covered in water, but water often splashes this area. Lichens, and blue and green algae can be found growing in the splash zone.

High Tide Zone

Water covers this area twice a day, during high tide. Here you can find barnacles, oysters, salt marsh plants, and other organisms that can live mostly in the open air but twice a day under water.

Middle Intertidal Zone

This area is completely exposed to the air during low tide. Some estuary animals can tolerate being out of the water for short periods of time, such as mussels, barnacles, snails, brown algae, bryozoans, and crabs. You can find these animals in the middle intertidal zone.

Low Intertidal Zone

This zone is underwater most of the time, except for a few hours at the lowest tides, just a few days each month. Crabs, mollusks, sponges, hydroids, anemones, tunicates, shrimp and some fish can be found here.

Subtidal Zone

This zone is always under water and is home to most fish and invertebrates that can't survive out of water.



FISH

- American Eel
- Atlantic Silverside
- Atlantic Needlefish
- Oyster Toadfish
- Atlantic Menhaden
- Striped Killifish
- Mummichog
- Skilletfish
- Blennies
- Gobies
- Cunner
- Blackfish
- Striped Bass
- Bluefish
- Black Sea Bass
- Scup
- Rock Gunnel
- Butterfish
- Northern Kingfish
- Sculpins
- Sea Robins
- Northern Puffer
- Flounders
- Northern Pipefish
- Lined Seahorse

ANGUILLA ROSTRATA

AMERICAN EEL

Class Actinopterygii "Ray-Finned Fishes" · Order Anguilliformes "Eels" · Family Anguillidae "Freshwater Eels"



Pictured: A slender, transparent "glass eel" (top) and an olive-green adult eel (below). American eels are snake-like fish with a single, long dorsal fin.

HABITAT

American eels spend most of their adult lives in freshwater streams, lakes, and rivers, brackish estuaries, and along the coast. During the daytime, these bottom-dwellers hide in any small space they can find, including human-made objects like pipes.

DIET

Adult eels eat many different kinds of organisms, including small fish, worms, insects, vegetation, frogs, crustaceans (like blue crabs), mollusks, and even smaller eels. Eel larvae eat tiny plankton and marine snow as they drift along in ocean currents.

COMMON PREDATORS

Striped bass, catfish, gulls, osprey, and bald eagles eat American eels.

STATUS

IUCN Population Status:
Endangered · Declining

New York State Conservation Status Rank:
Imperiled to Vulnerable · S2S3

ASFCM New York Trend Analysis:
Declining



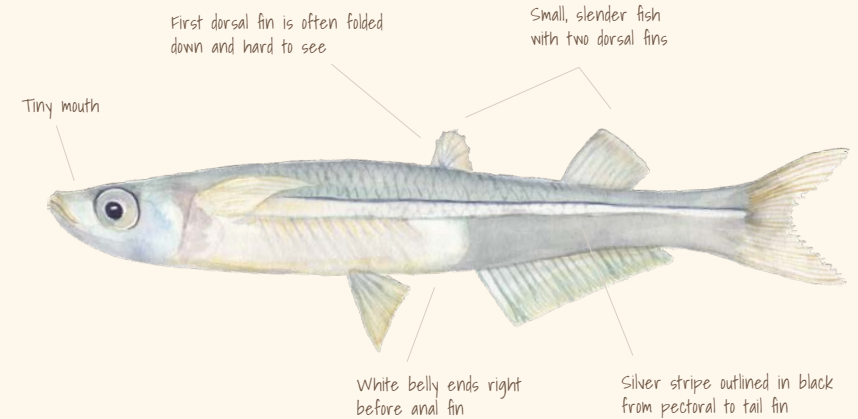
DID YOU KNOW?

Scientists have never seen American eels breed in the wild!

MENIDIA MENIDIA

ATLANTIC SILVERSIDE

Class Actinopterygii "Ray-Finned Fishes" · Order Atheriniformes "Silversides" · Family Atherinopsidae "Neotropical Silversides"



Pictured: An adult Atlantic silverside. Atlantic silversides are small, slender fish with tiny mouths and one long, silver stripe on each side.

HABITAT

In the summer, you are most likely to see Atlantic Silversides in salty, brackish, or freshwater creeks and tidal marshes, usually at a depth of less than 10 feet (around 3 meters). They often swim among seagrasses and algae.

DIET

Atlantic silversides eat amphipods, copepods, and other small crustaceans, as well as algae, bristle worms, zooplankton, young squid, barnacle larvae, and insect larvae.

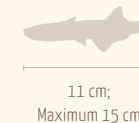
COMMON PREDATORS

Predators of Atlantic silversides include large fish such as striped bass, bluefish, and Atlantic mackerel, as well as other animals like blue crabs, egrets, herons, gulls, terns, cormorants, and raccoons. Small fish like mummichogs eat silverside eggs during the summer breeding season.

STATUS

IUCN Population Status:
Least Concern · Stable

New York State Conservation Status Rank:
Imperiled to Vulnerable · S2S3



DID YOU KNOW?

Atlantic silverside reproduction is closely tied with the lunar cycle. They usually spawn during the day right around a new or full moon.

ATLANTIC NEEDLEFISH

Class **Actinopterygii** "Ray-Finned Fishes"
Order **Beloniformes** "Needlefish & Relatives"
Family **Belonidae** "Needlefish"



Pictured: An adult Atlantic needlefish. Atlantic needlefish are long, skinny fish with pointy, needle-like jaws.

HABITAT

In the summer, you can see needlefish out at sea, in estuaries, and even in freshwater rivers. They usually skim the surface of the water, or hunt in shallow water with vegetation. Needlefish are attracted to lights and sometimes swim around docks or jetties at night.

DIET

Juvenile needlefish eat mostly shrimp and amphipods. Adults are fish-eating carnivores that hunt silversides, killifish, anchovies, juvenile river herring, and other small fish.

COMMON PREDATORS

Bottlenose dolphins, lemon sharks, seabirds (such as terns and gulls), and bald eagles eat Atlantic needlefish.

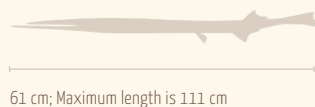
STATUS

IUCN Population Status:
Least Concern · Unknown Trend

New York State Conservation Status Rank:
Imperiled to Vulnerable · S2S3

DID YOU KNOW?

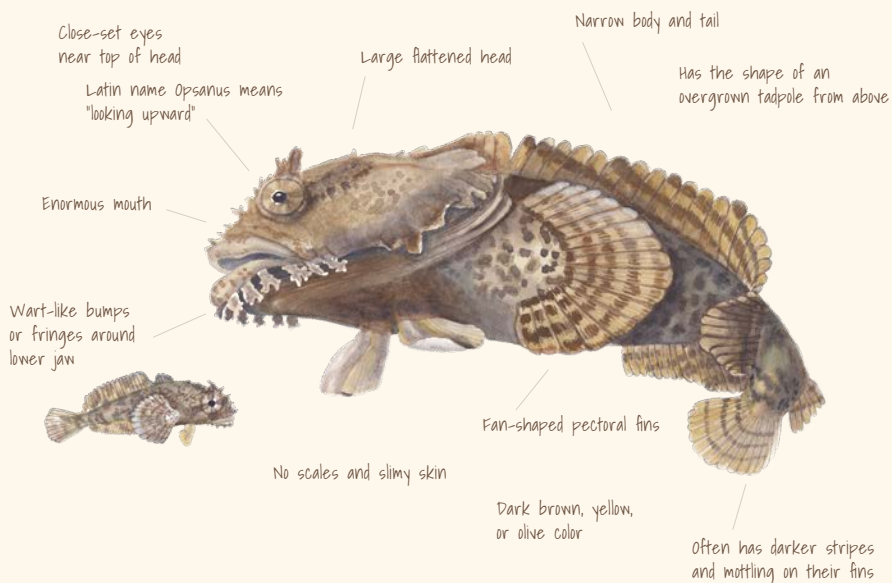
Needlefish are closely related to flying fish. Needlefish can't really fly, but they do leap and skitter out of the water while chasing their prey.



OPSANUS TAU

OYSTER TOADFISH

Class Actinopterygii "Ray-Finned Fishes" · Order Batrachoidiformes "Toadfish" · Family Batrachoididae "Toadfish"



Pictured: A juvenile oyster toadfish (left) and an adult oyster toadfish (right). Oyster toadfish are dark brown, mottled fish with large heads and mouths covered in bumps and fringes.

HABITAT

Oyster toadfish live near oyster reefs in marine or brackish water. They can also thrive near human-made structures, like jetties, and even in garbage. Toadfish prefer shallow waters at a depth of less than 16 feet (around 5 meters).

DIET

Oyster toadfish have a broad diet that includes small fish

such as blennies and gobies, as well as the larvae of black sea bass and flounder. They also eat worms, shrimp, mollusks such as snails, oysters, and squid, and crustaceans such as mud crabs.

COMMON PREDATORS

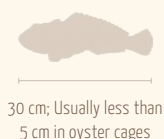
Oyster toadfish have few natural predators because of their powerful bite. Sharks are some of the only animals that can successfully capture and eat them.

STATUS

IUCN Population Status:
Least Concern · Unknown Trend

DID YOU KNOW?

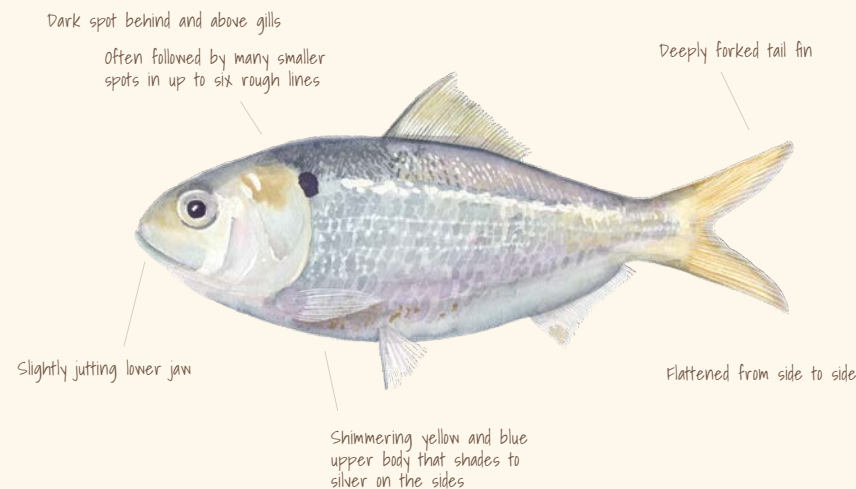
Male toadfish have the fastest-moving muscles of any vertebrate on Earth! They use these muscles to vibrate their swimbladders and make their "foghorn" call.



BREVOORTIA TYRANNUS

ATLANTIC MENHADEN

Class Actinopterygii "Ray-Finned Fishes" · Order Clupeiformes "Herrings & Anchovies" · Family Clupeidae "Herrings"



Pictured: An adult Atlantic menhaden. Atlantic menhaden are small, blue-green and silver fish with at least one large black spot behind their gills.

HABITAT

Atlantic menhaden usually school in the shallows, at less than 65 feet (around 20 meters) below the surface. Juveniles stay in bays, inlets, and brackish estuaries, while adults venture into the deeper ocean.

DIET

Juvenile menhaden filter-feed on microscopic algae, bacteria, and other phytoplankton. Adult menhaden eat

larger plankton including amphipods, mollusk larvae, fish larvae, and other zooplankton.

COMMON PREDATORS

Striped bass, bluefish, weakfish, sharks, seals, and dolphins eat Atlantic menhaden. Fish-eating birds such as osprey, bald eagles, and gulls also eat menhaden.

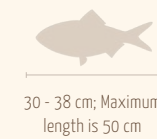
STATUS

IUCN Population Status:
Least Concern · Increasing

ASFMC Stock Assessment:
Not Currently Overfished

DID YOU KNOW?

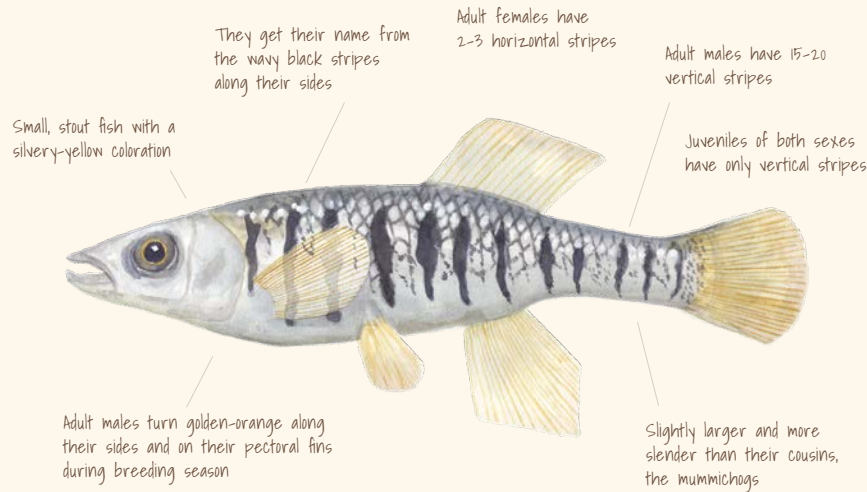
The word "menhaden" comes from the Narragansett word *munna-whatteaug*, which means "he enriches the earth." Indigenous peoples of the Atlantic coast traditionally used menhaden to fertilize their crops.



FUNDULUS MAJALIS

STRIPED KILLIFISH

Class Actinopterygii "Ray-Finned Fishes" · Order Cyprinodontiformes "Toothcarps" · Family Fundulidae "Topminnows & Killifish"



Pictured: An adult male striped killifish. Striped killifish are stout, minnow-like fish. Male striped killifish have vertical black stripes along their sides. Female striped killifish (not pictured) have horizontal black stripes.

HABITAT

Striped killifish prefer salty or brackish habitats with tides, like estuaries, salt marshes, and sandy beaches. They are shallow-water fish that almost never swim deeper than 3 feet (around 1 meter) below the surface. Striped killifish can often be found in tide pools during low tide.

DIET

Striped killifish eat bristle worms, mosquito and other insect larvae, horseshoe crab larvae, mollusk larvae, phytoplankton, amphipods and other small crustaceans. They also scavenge dead plants and animals.

COMMON PREDATORS

Bluefish, striped bass, and blue crabs eat striped killifish. Water birds such as herons, egrets, terns, and gulls also eat killifish.

STATUS

IUCN Population Status:
Least Concern · Unknown Trend

DID YOU KNOW?

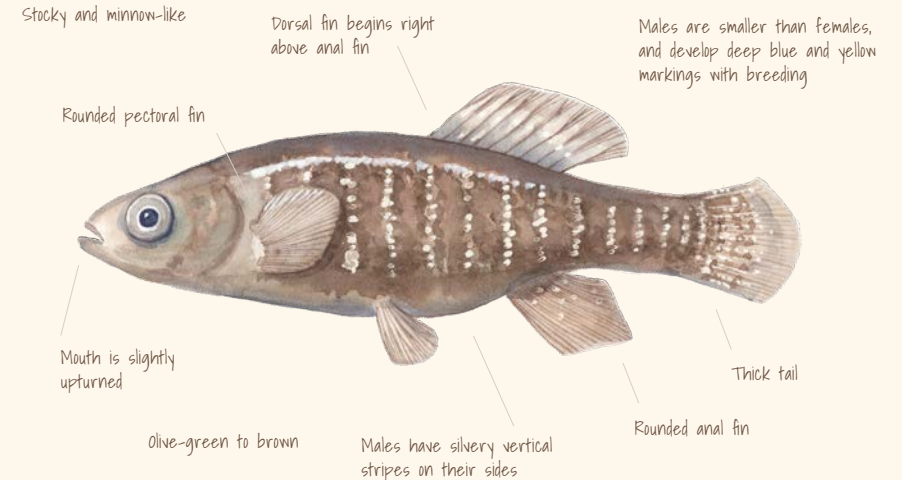
Striped killifish can flop across twelve feet of dry land to get back to the water!



FUNDULUS HETEROCLITUS

MUMMICHOG

Class Actinopterygii "Ray-Finned Fishes" · Order Cyprinodontiformes "Toothcarps" · Family Fundulidae "Topminnows & Killifish"



Pictured: An adult male mummichog. Mummichogs are small, stocky fish. Males have bright silvery stripes and mottling along their sides. Female mummichogs (not pictured) have fainter stripes and mottling.

HABITAT

Mummichogs stay close to the shore in brackish estuaries, salt marshes, muddy creeks, and eelgrass flats. They also sometimes live in freshwater lakes and rivers.

DIET

Mummichogs eat copepods, amphipods, worms, grass shrimp, eelgrass, dead animals, and fish eggs.

COMMON PREDATORS

Aquatic animals like striped bass, American eels, white perch, and blue crabs eat mummichogs. Birds such as herons, egrets, and gulls also eat mummichogs.

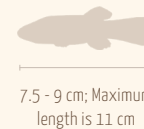
STATUS

IUCN Population Status:
Least Concern · Stable

New York State Conservation Status Rank:
Vulnerable

DID YOU KNOW?

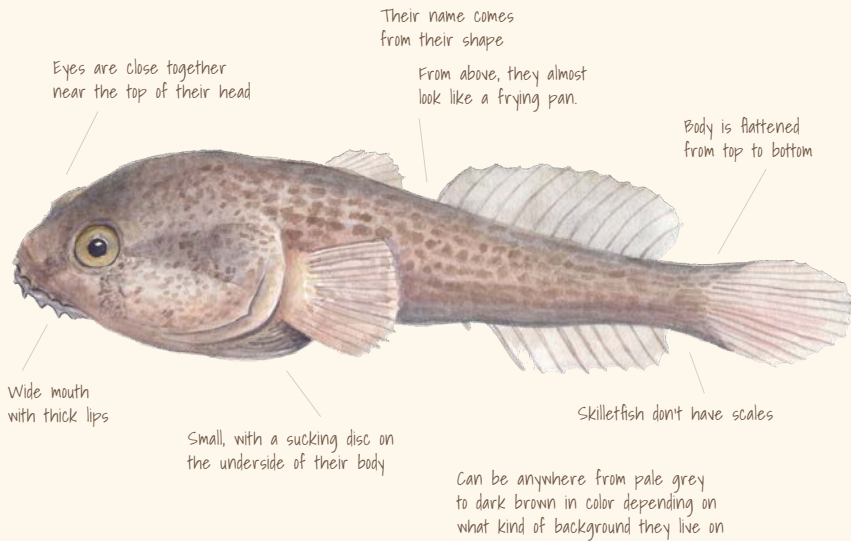
Mummichogs were the first fish to visit space! Mummichogs taught us that fish can learn to swim in low gravity.



GOBIESOX STRUMOSUS

SKILLETFISH

Class Actinopterygii "Ray-Finned Fishes" · Order Gobiesociformes "Clingfishes" · Family Gobiesocidae "Clingfishes"



Pictured: An adult skilletfish. Skilletfish are mottled brown, frying pan-shaped fish with a sucking disc underneath their body.

HABITAT

Skilletfish prefer to live among oyster reefs. But you can sometimes find them around pilings, in eelgrass meadows, or in rocky, shallow water. They usually cling to hard objects less than 3 feet (around 1 meter) below the surface. During the winter, they can descend to depths of up to 108 feet (around 33 meters).

DIET

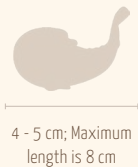
Skilletfish like to eat isopods, amphipods, and bristle worms.

COMMON PREDATORS

We don't know much about aquatic predators of skilletfish, but gulls and raccoons will pick skilletfish off of rocks during low tide.

STATUS

IUCN Population Status:
Least Concern · Unknown Trend



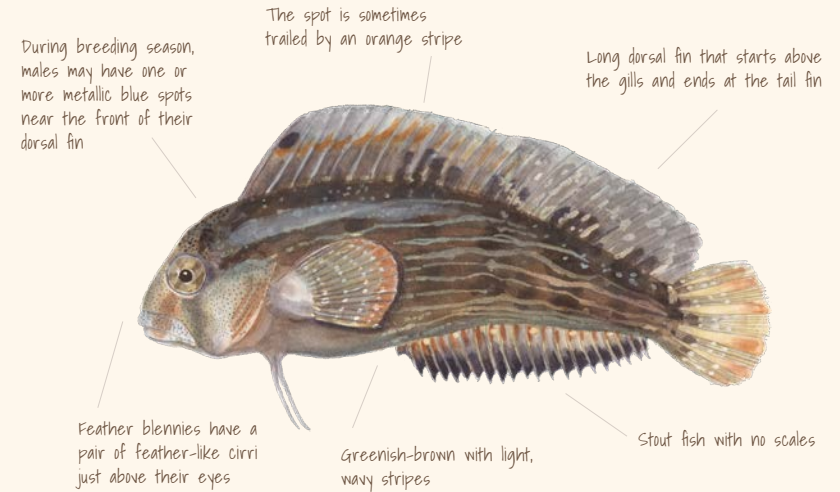
DID YOU KNOW?

The skilletfish's sucking disc evolved from two pelvic fins that fused together.

BLENNIIDAE FAMILY

BLENNIES

Class Actinopterygii "Ray-Finned Fishes" · Order Blenniiformes "True Blennies" · Family Blenniidae "Combtooth Blennies"



Pictured: An adult male striped blenny. Blennies are mid-sized, mottled brown fish with wavy stripes and a long dorsal fin. During the breeding season, male blennies have a dark blue spot trailed by an orange stripe on their dorsal fin. Feather blennies (not pictured) have two feather-like cirri above their eyes.

HABITAT

Blennies live in salty or brackish habitats, usually among oyster reefs but sometimes in sponges or eelgrass meadows. Blennies prefer habitats with a thick layer of dead and broken shells on the seafloor. You usually see them at depths of less than 100 feet (around 30 meters).

DIET

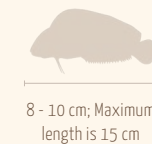
Adult blennies eat small mollusks, crustaceans such as small crabs and shrimp, and bristle worms. Juvenile blennies eat mollusk larvae.

COMMON PREDATORS

Oyster toadfish, striped bass, bluefish, and weakfish eat blennies.

STATUS

IUCN Population Status:
Least Concern · Unknown Trend



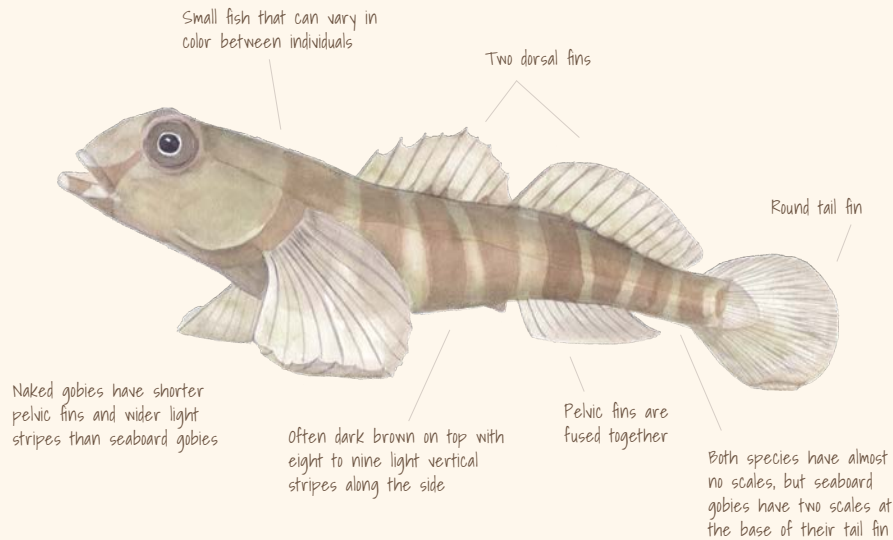
DID YOU KNOW?

As male blennies guard their eggs, they release a pheromone, or behavior-changing chemical, into water. This pheromone attracts new females to lay even more eggs in the males' nest.

GOBIOSOMA SPP.

GOBIES

Class **Actinopterygii** "Ray-Finned Fishes" · Order **Gobiiformes** "Gobies & Relatives" · Family **Gobiidae** "True Gobies"



Pictured: An adult naked goby. Gobies are tiny, but long fish with light-colored stripes along their sides. Seaboard gobies (not pictured) have longer pelvic fins and narrower stripes than naked gobies.

HABITAT

Gobies live in the shallow parts of estuaries and salt marshes. You can sometimes find them over bare sand or mud, but they prefer protected habitats like oyster reefs, tide pools, underwater plants, piles of wood, or rubble. Seaboard gobies especially like to live around limpet shells.

DIET

Gobies eat bristle worms, amphipods, copepods, and larvae of bivalves, including oysters.

COMMON PREDATORS

American eels, sand shrimp, striped bass, bluefish, and weakfish eat gobies.

STATUS

IUCN Population Status:
Least Concern · Unknown Trend

DID YOU KNOW?

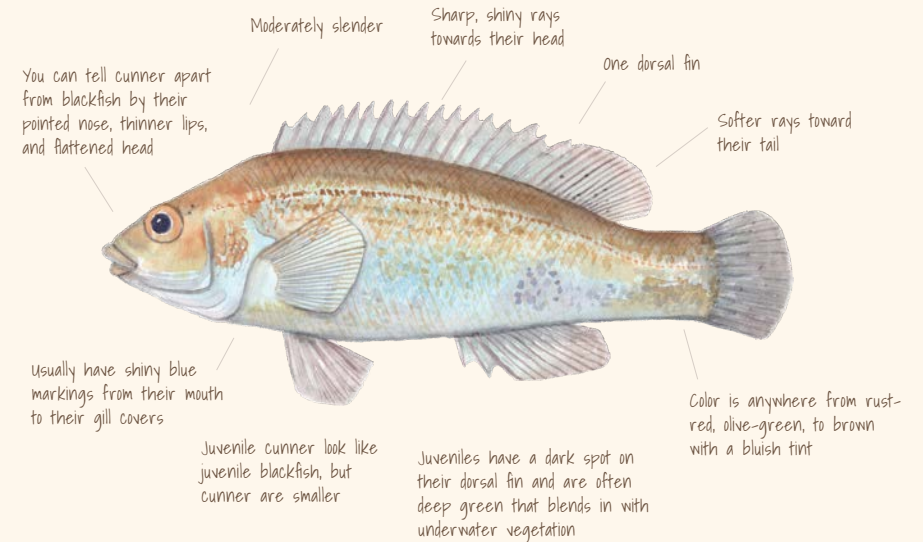
Oyster farmers can create habitat for gobies by throwing clean, blank shells back into the water after harvesting oysters.



TAUTOGOLABRUS ADSPERSUS

CUNNER

Class **Actinopterygii** "Ray-Finned Fishes" · Order **Perciformes** "Perch-like fish" · Suborder **Labroidei** "Wrasses, Cale, & Parrotfish" · Family **Labridae** "Wrasses"



Pictured: An adult cunner. Cunner are large fish with pointed noses, flattened heads, and shiny blue markings.

HABITAT

Cunner usually live no more than five or six miles from shore in salty and, rarely, brackish water. Cunner like to hide among kelp or other underwater vegetation, near rocky ledges, and around piers, jetties, pilings, and shipwrecks at depths of 33 - 420 feet (around 10 - 128 meters).

DIET

The cunner diet includes small crustaceans (isopods, amphipods, shrimp, and young lobster), young sea urchins, eelgrass, mollusks, and small fish.

COMMON PREDATORS

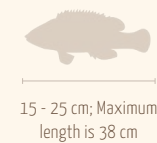
American eels, sand shrimp, striped bass, bluefish, and weakfish eat gobies.

STATUS

IUCN Population Status:
Least Concern · Unknown Trend

DID YOU KNOW?

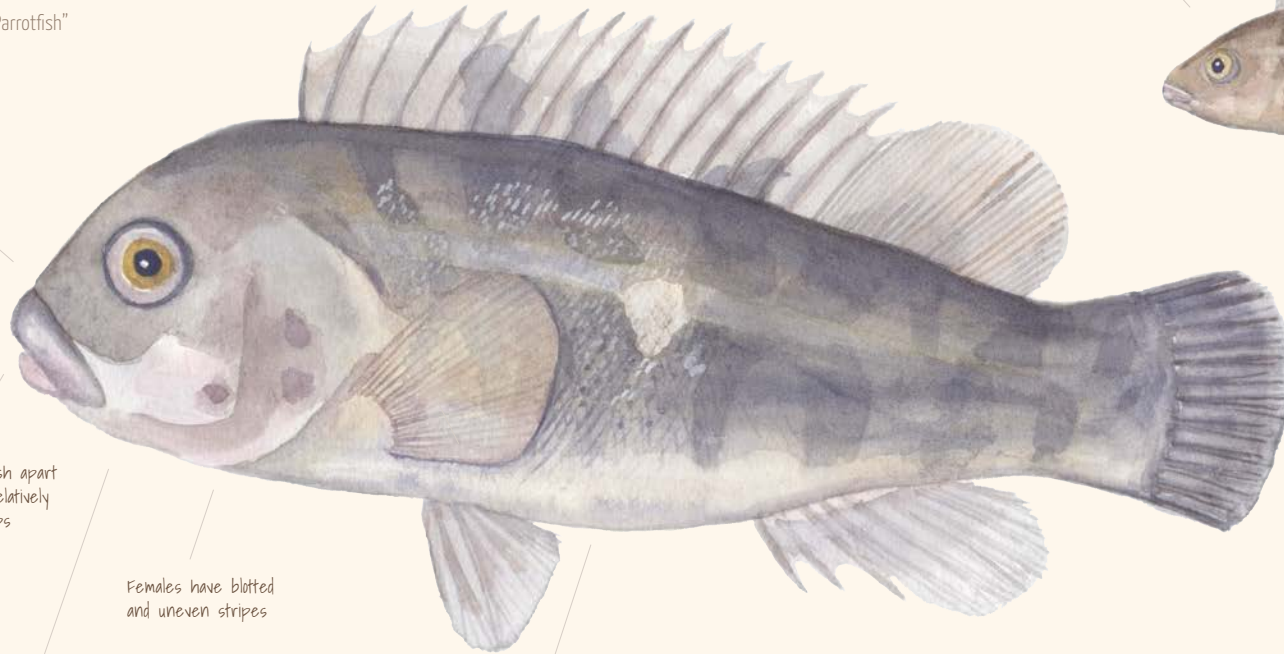
Cunner develop dark stripes at nighttime. These stripes break up the cunner's outline and confuse nocturnal predators.



TAUTOGA ONITIS

BLACKFISH

Class **Actinopterygii** "Ray-Finned Fishes"
Order **Perciformes** "Perch-like Fish"
Suborder **Labroidae** "Wrasses, Cale, & Parrotfish"
Family **Labridae** "Wrasses"



Blunt nose and arched facial profile

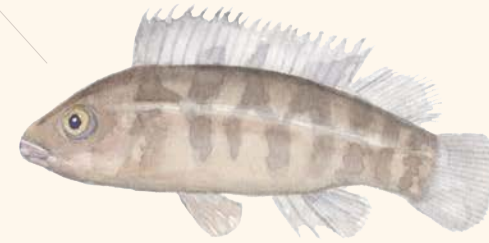
You can tell adult blackfish apart from cunner by their relatively small mouth with thick lips

Females have blotted and uneven stripes

Soft, unscaled cheeks

Plump and olive-brown, with lighter splotches across their body

Juveniles are lighter brown, and look a lot like juvenile cunner



Males are more uniform in color with a paler belly



DIET

Juvenile blackfish mostly eat copepods and amphipods. Blue mussels are a major part of the adult blackfish's diet, along with other mollusks, crabs, shrimp, and bristle worms.

COMMON PREDATORS

Diving birds (like cormorants, grebes, and loons) prey on juvenile blackfish. Predatory fish like dogfish, skate, hake, sea ravens and goosefish prey on adult and juvenile blackfish.

STATUS

IUCN Population Status:
Vulnerable · Decreasing

ASFMC Stock Status:
Overfished

DID YOU KNOW?

Blackfish can live for more than 30 years! They get darker as they get older.

Pictured: An adult female blackfish (left) and a lighter-colored juvenile blackfish (right). Blackfish are plump, olive-brown fish with thick lips and light splotches across their body. Female blackfish have blotted and uneven stripes along their side. Male blackfish (not pictured) are more uniform in color with a bright white underside.

HABITAT

Blackfish live in estuaries and out at sea, but they rarely travel more than 4 miles (around 6 km) from the shore. In the summer, they stay in water that is less than 80 feet (around 24 m) deep. Blackfish prefer hard surfaces with lots of crevices, including oyster reefs, rocky ledges, mussel beds, and human-made structures like shipwrecks, jetties, and pilings.

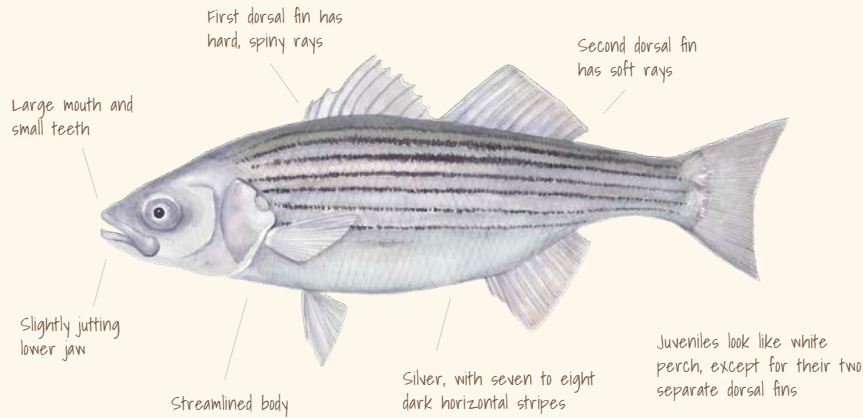


18 - 26 cm;
Maximum length is 91 cm

MORONE SAXATILIS

STRIPED BASS

Class **Actinopterygii** "Ray-Finned Fishes" · Order **Perciformes** "Perch-like Fish"
Suborder **Percoidae** "Perches, Darters, & Relatives" · Family **Moronidae** "Temperate Basses"



Pictured: An adult striped bass. Striped bass are large, streamlined, silver fish with dark horizontal stripes along their sides. Juvenile striped bass (not pictured) have bigger eyes and stripes that become fainter from top to bottom.

HABITAT

Striped bass live freshwater rivers, in estuaries, and in the ocean. They prefer deep water along rocky and sandy shores. Striped bass often live in bays, although some populations are landlocked.

DIET

Juvenile striped bass eat fish larvae, bristle worms, insects, and small crustaceans. Adult striped bass mostly

eat Atlantic menhaden, but they also prey on Atlantic silversides, anchovies, alewives, herring, smelt, eels, flounder, juvenile striped bass and yellow perch.

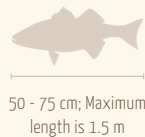
COMMON PREDATORS

Bluefish, Atlantic cod, silver hake, and adult striped bass eat juvenile striped bass. Adult striped bass have few natural predators besides seals and sharks.

STATUS

IUCN Population Status:
Least Concern · Unknown Trend

ASFCM New York Stock Status:
Overfished



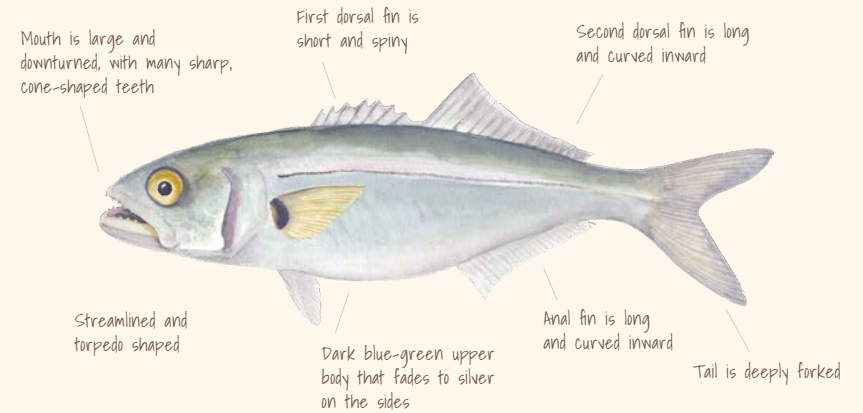
DID YOU KNOW?

Striped bass can grow to be as long as an adult human is tall!

POMATOMUS SALTATRIX

BLUEFISH

Class **Actinopterygii** "Ray-Finned Fishes" · Order **Perciformes** "Perch-like fish"
Suborder **Percoidae** "Perches, Darters, & Relatives" · Family **Poatomidae** "Bluefish"



Pictured: An adult bluefish. Bluefish are torpedo-shaped, bluish-silver fish with large, downturned mouths full of sharp teeth.

HABITAT

Young bluefish prefer sheltered habitat like sandy estuaries or salt ponds. They can also be found over mud, silt, or underwater plants. In the summer, adults typically swim at depths of less than 65 feet (around 20 meters). They prefer warmer waters along the coast at temperatures above 60° F (around 16° C).

DIET

Juvenile bluefish eat copepods, amphipods, and fish larvae. Their diet becomes increasingly fish-based as they get older. Adult bluefish are carnivores. They eat

squid, crabs, lobsters, shrimp, butterfish, alewives, Atlantic silversides, and dozens of other fish species.

COMMON PREDATORS

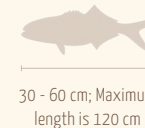
Adult bluefish have few natural predators because of their size and speed. Tuna, sharks, dolphins, seals, and billfish (like marlins) sometimes prey on bluefish.

STATUS

IUCN Population Status:
Vulnerable · Decreasing

ASFCM New York Stock Status:

Overfished



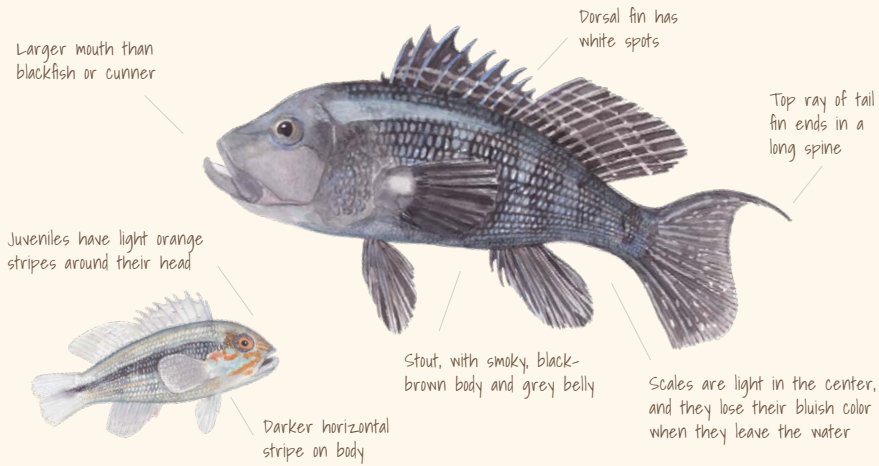
DID YOU KNOW?

Bluefish are very fast swimmers. During their migrations, they can swim up to 70 miles in a single day!

CENTROPRISTIS STRIATA

BLACK SEA BASS

Class **Actinopterygii** "Ray-Finned Fishes" · Order **Perciformes** "Perch-like Fish"
Suborder **Percoidei** "Perches, Darters, & Relatives" · Family **Serranidae** "Sea Basses & Groupers"



Pictured: An adult black sea bass (right). Adult black sea bass are stout, blackish-brown fish with light blue scales and a spine on their tail fin. A juvenile black sea bass (left). Juvenile black sea bass have light orange stripes around their head and a darker horizontal stripe on their body.

HABITAT

Adult black sea bass like to swim near large structures, including oyster reefs, mussel beds, jetties, shipwrecks, rocky ledges, and pilings. Juvenile black sea bass mature in brackish estuaries, but adults rarely leave saltwater environments.

DIET

Juvenile black sea bass eat amphipods, isopods, crabs, sand shrimp, small fish, and bristle worms. Adults eat

invertebrates like young lobster, mussels, crabs, and squid, as well as small fish.

COMMON PREDATORS

Juvenile black sea bass are prey to diving birds, as well as weakfish, summer flounder, smooth dogfish, oyster toadfish, bluefish, skate, and sea robins. Spiny dogfish, Atlantic angel sharks, skate, hake, flounder, and goosefish eat adult black sea bass.

STATUS

IUCN Population Status:
Least Concern · Stable

ASFMC New York Stock Status:

Not Overfished

DID YOU KNOW?

If there are too many females in a group of black sea bass, the largest female will change into a male to balance out the population.

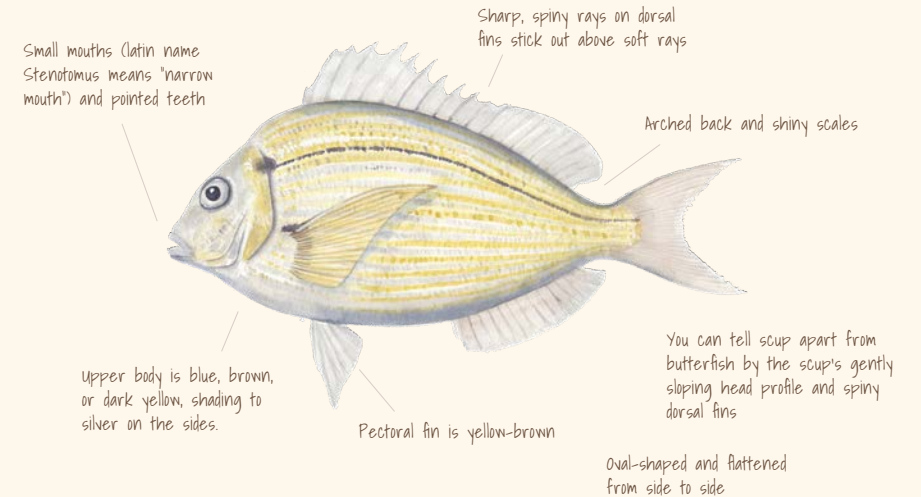


20 - 30 cm; Maximum length is 66 cm

STENOTOMUS CHRYSOPS

SCUP

Class **Actinopterygii** "Ray-Finned Fishes" · Order **Perciformes** "Perch-like fish"
Suborder **Percoidei** "Perches, Darters, & Relatives" · Family **Sparidae** "Sea Breams & Porgies"



Pictured: An adult scup. Scup are oval-shaped, golden-brown fish with arched backs and gently sloping heads.

HABITAT

Scup live in many different ecosystems, from oyster reefs, mussel beds, and rocky ledges, to open, sandy sea floors. Juvenile and young adult scup live in bays and estuaries, but schools of larger scup stick to deeper ocean waters.

DIET

Juvenile scup eat small mollusks, crustaceans, bristle worms, and fish larvae. Adult scup eat amphipods, razor clams, blue mussels, hydroids, anemones, small squid, vegetation, insect larvae, and small fish.

COMMON PREDATORS

Bluefish, Atlantic halibut, sharks, striped bass, weakfish, goosefish, hake, and other carnivorous fish eat juvenile scup. Sharks, dogfish, bluefish, stingrays, flounder, black sea bass, weakfish, mackerel, and other large carnivorous fish eat adult scup.

STATUS

IUCN Population Status:
Near Threatened · Decreasing

ASFMC New York Stock Status:

Not Overfished

DID YOU KNOW?

Most oyster reef fish spawn at night so that their eggs don't get eaten by daytime predators. But for reasons we don't understand yet, scup release their eggs in the morning.

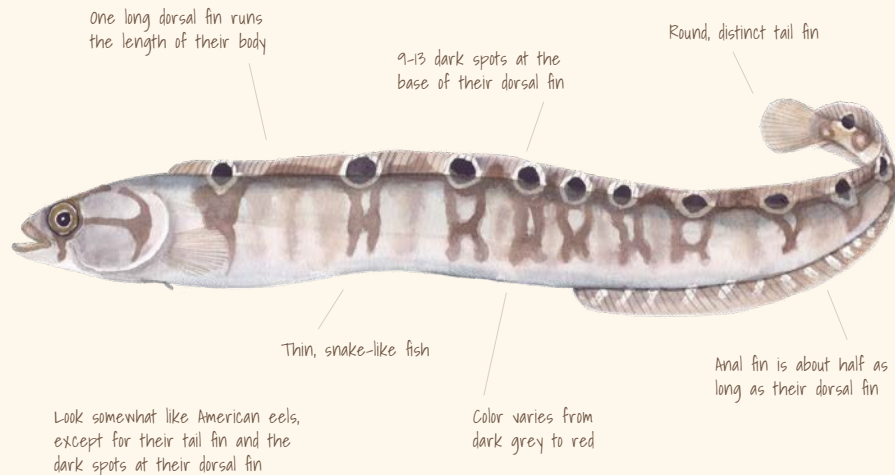


10 - 25 cm; Maximum length is 46 cm

PHOLIS GUNNELLUS

ROCK GUNNEL

Class *Actinopterygii* "Ray-Finned Fishes" · Order *Perciformes* "Perch-like Fish"
Suborder *Zoarcoidei* "Wolffishes, Gunnels, & Eelpouts" · Family *Pholidae* "Gunnels"



Pictured: An adult rock gunnel. Rock gunnels are eel-like, spotted brown fish with a long dorsal fin and a tiny, round tail fin.

HABITAT

Rock gunnels mostly live in shallow, tidal environments. But they can also descend to depths of up to 600 feet (around 180 m), especially during the winter. Rock gunnels usually hide under rocks, in crevices, or among seaweed.

DIET

Rock gunnels eat amphipods, isopods, bristle worms, and mollusks such as snails.

COMMON PREDATORS

Wading birds (like herons), shorebirds, otters, raccoons, and carnivorous fish eat rock gunnels.

DID YOU KNOW?

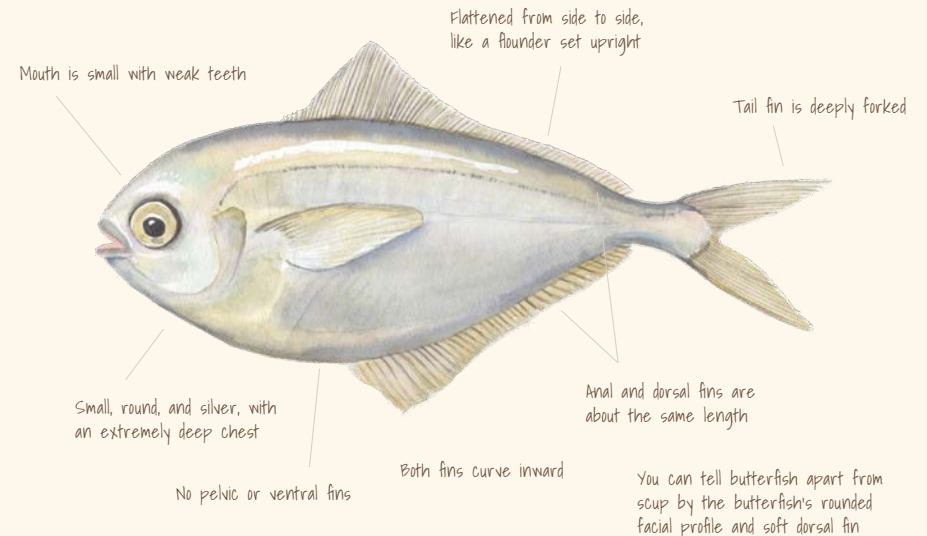
When rock gunnels are exposed to air during low tide, waste products build up in their bloodstream. After an hour or two, these waste products reach toxic levels that would kill most other fish. Scientists are still learning about how rock gunnels survive out of water for so long.



PEPRILUS TRIACANTHUS

BUTTERFISH

Class *Actinopterygii* "Ray-Finned Fishes" · Order *Perciformes* "Perch-like fish"
Suborder *Stromateoidei* "Butterfish & Relatives" · Family *Stromateidae* "Butterfish"



Pictured: An adult butterfish. Butterfish are small, round, silver fish, flattened from side to side with a deep chest.

HABITAT

During the summer, butterfish remain within 180 feet (around 55 m) of the surface. They usually school over shallow, flat areas in bays, estuaries, or the surf zone (where waves break near the beach). Juvenile and adult butterfish swim above sandy or muddy sea floors. Juveniles often group up around floating objects.

DIET

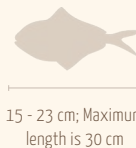
Butterfish eat fish larvae, jellyfish, squid, and small crustaceans.

COMMON PREDATORS

Butterfish have many predators, including marine mammals (seals and dolphins), weakfish, goosefish, bluefish, swordfish, hammerhead sharks, silver hake, and longfin inshore squid.

STATUS

Mid-Atlantic Fishery Management Council Stock Status: Not Overfished



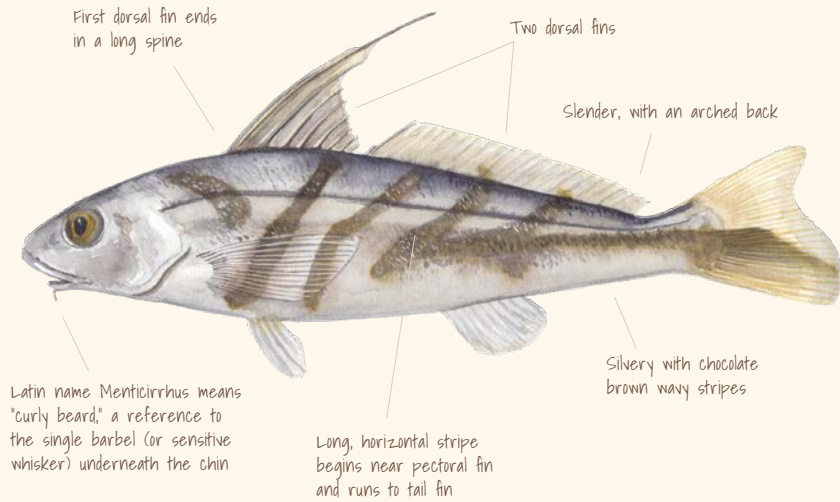
DID YOU KNOW?

Butterfish store lots of oil in their muscles and organs. This oil helps them float and makes them taste slightly buttery.

MENTICIRRHUS SAXATILIS

NORTHERN KINGFISH

Class **Actinopterygii** "Ray-Finned Fishes" · Order **Perciformes** "Perch-like Fish"
Suborder **Percoidei** "Perches, Darters, & Relatives" · Family **Sciaenidae** "Croakers"



Pictured: An adult northern kingfish. Mottled brown fish with an arched back, long dorsal fin spine, and one chin whisker.

HABITAT

Northern kingfish prefer to swim over gravel or sand along coastal beaches, inlets, and bays. Juvenile kingfish mature in the surf zone (where waves break near the shore) and in estuaries.

DIET

Kingfish are bottom-feeders that prey on shrimp, crabs,

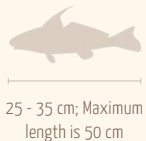
small mollusks, bristle worms, decaying carcasses, and juvenile fish.

COMMON PREDATORS

Sharks and other large, carnivorous fish eat kingfish.

STATUS

IUCN Population Status:
Least Concern · Stable



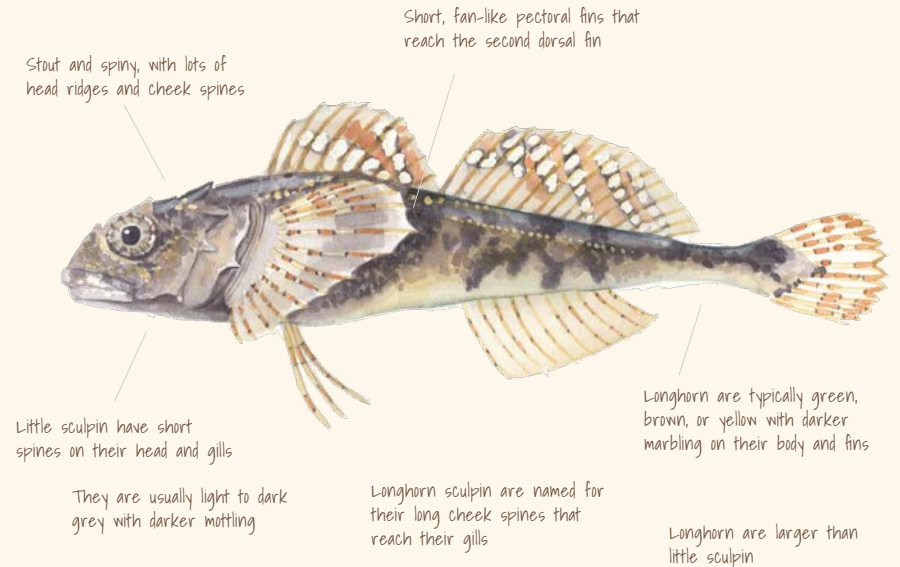
DID YOU KNOW?

As they grow and mature, northern kingfish absorb their swim-bladder, a gas-filled organ that helps fish float. Kingfish stay close to the sea floor, so they don't need to float as well as fish in the pelagic zone.

MYOXOCEPHALUS SPP.

SCULPINS

Class **Actinopterygii** "Ray-Finned Fishes" · Order **Scorpaeniformes** "Mail-Cheeked Fishes" · Family **Cottidae** "Sculpins"



Pictured: An adult little sculpin (or grubby). Sculpin are stout, spiny fish with head ridges, cheek spines, and short, fanlike pectoral fins. Longhorn sculpin (not pictured) have longer cheek spines than little sculpin.

HABITAT

Little sculpin usually live less than 90 feet (around 27 m) below the surface. You can find them among seaweed beds and swimming over sand or rocks near the shore. Longhorn sculpin often swim around human-made structures in estuaries, salt creeks, and river mouths.

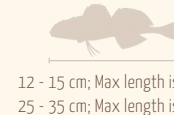
They sometimes descend up to 600 feet (around 180 m) below the surface.

DIET

Sculpin are omnivorous scavengers that eat bristle worms, small crustaceans, snails, sea slugs, mollusks, and juvenile fish.

COMMON PREDATORS

Dogfish, cod, skate, sea ravens, and summer flounder eat sculpin.



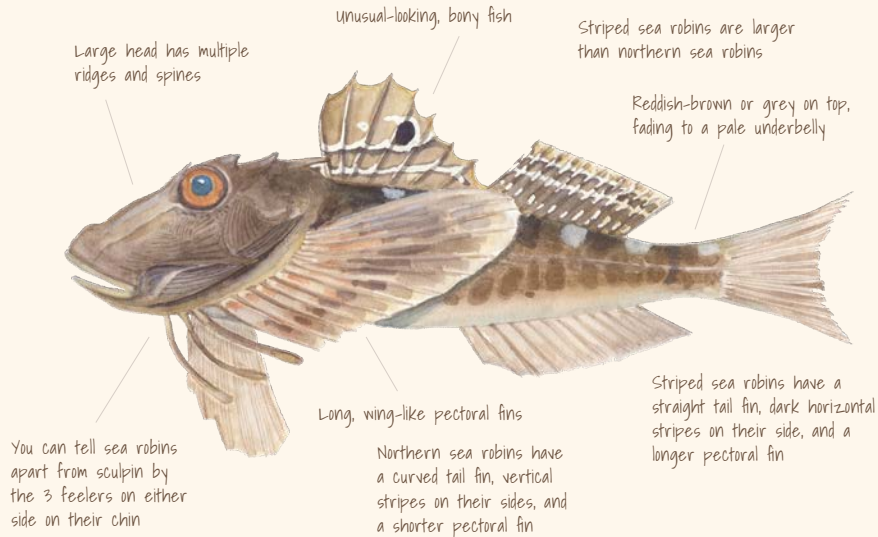
DID YOU KNOW?

In the winter, sculpin make an antifreeze protein in their cells. This amazing protein circulates in sculpin blood and keeps them warm, even if temperatures drop below freezing!

PRIONOTUS SPP.

SEA ROBINS

Class Actinopterygii "Ray-Finned Fishes" · Order Scorpaeniformes "Mail-Cheeked Fishes" · Family Triglidae "Sea Robins"



Pictured: An adult northern sea robin. Sea robins are bony, spiny-headed fish with three feelers in front of their wing-like pectoral fins. Striped sea robins (not pictured) have straighter tail fins, darker horizontal stripes on their sides, and longer pectoral fins than northern sea robins.

HABITAT

Sea robins prefer to swim over sand or gravel, but they sometimes swim around rocks or reefs. They can descend up to 600 feet (around 180 m) below the surface, and like to remain near the sea floor. During the summer, you can see sea robins in estuaries, bays, river mouths, salt flats, and other coastal areas.

DIET

Sea robins mostly eat crustaceans like sand shrimp, crabs, and amphipods. They also eat juvenile flounder, scup, Atlantic silversides, bivalves, squid, and bristle worms.

COMMON PREDATORS

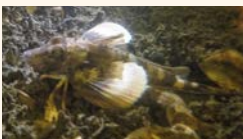
Their bony plates protect sea robins from most predators. Only large carnivorous fish like sharks can manage to eat them.

STATUS

IUCN Population Status:
Least Concern · Unknown Trend

DID YOU KNOW?

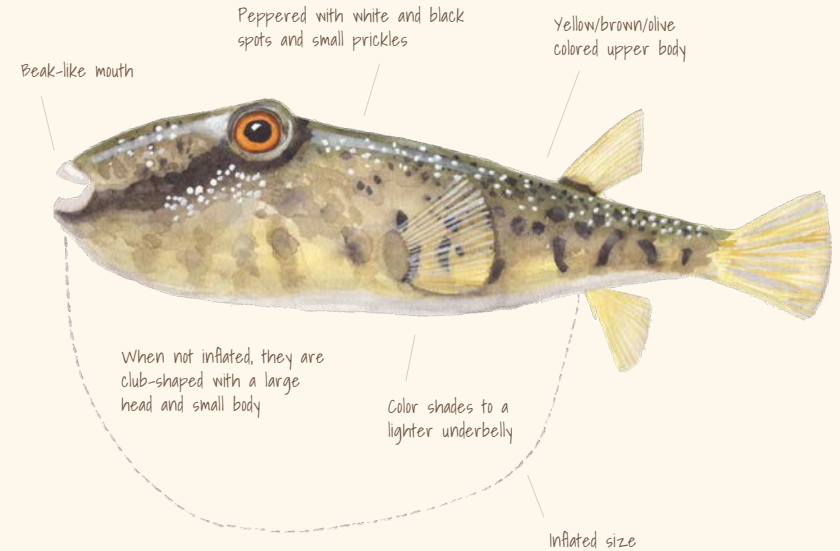
Sea robins can actually "taste" their prey with the finger-like feelers under their chins. As soon as they touch a morsel of food, they know it's something delicious and quickly snap it up.



SPHOEROIDES MACALATUS

NORTHERN PUFFER

Class Actinopterygii "Ray-Finned Fishes" · Order Tetraodintoformes "Pufferfish & Relatives" · Family Tetraodontidae "Pufferfish"



Pictured: An adult northern puffer in its normal, deflated form. The dotted line represents the size of a fully inflated northern puffer. Northern puffers are club-shaped, yellow-brown fish with large heads, beak-like mouths, and small bodies.

DIET

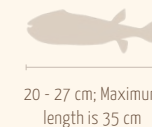
Northern puffers eat small crustaceans (like crabs, shrimp, isopods, and amphipods), bivalves (like scallops), bristle worms, barnacles, and sea urchins.

COMMON PREDATORS

Very few predators can successfully eat puffers. Cobia, sharks, and tuna can eat some species of puffer fish.

STATUS

IUCN Population Status:
Least Concern · Decreasing



DID YOU KNOW?

Northern puffers have toxic organs that can kill predators. Humans have to remove northern puffer organs before eating them.

PLEURONECTIFORMES ORDER

FLOUNDERS

Class Actinopterygii "Ray-Finned Fishes"
Order Pleuronectiformes "Flatfish"



Summer flounder usually have many eye-like spots on their body

Winter flounder bear their mouth and both eyes on the right side of their body

Winter flounder have a smaller mouth with fleshy lips

Summer flounder bear their mouth and both eyes on the left side of their body



Large, dinner plate shaped flatfish



Pictured: An adult "left-facing" summer flounder. Flounder are large, flat, dinner plate-shaped fish with both eyes on the same side of their body. Winter flounder (not pictured) have both eyes on the right side of their body.

HABITAT

Flounder are mainly ocean-dwelling fish, but both summer and winter flounder visit estuaries during the breeding season. Flounder like to burrow in sand, mud, or light gravel. When they are near the coast, you can find flounder in salt ponds, bays, tidal creeks, and seagrass beds. Flounder usually stay less than 600 feet (around 180 m) below the surface.

DIET

Adult summer flounder eat mostly fish, and prefer herring, anchovies, and sand lance, as well as squid. Winter flounder eat more invertebrates, including bristle worms, amphipods and other crustaceans, and sea anemones.

COMMON PREDATORS

Carnivorous fish such as striped bass, bluefish, goosefish, spiny dogfish, oyster toadfish, and sea ravens, as well as birds such as cormorants, herons, and osprey eat adult flounder. Jellyfish and sand shrimp eat flounder larvae.

STATUS

IUCN Population Status · Summer Flounder:
Least Concern · Decreasing

New York State Conservation Rank · Winter Flounder:
Possibly Vulnerable · S3?

ASFMC Stock Status · Summer Flounder:
Not Overfished

ASFMC Stock Status · Winter Flounder:
Unknown

DID YOU KNOW?

Flounder look like normal fish larvae for several weeks after they first hatch, but during their metamorphosis, one of their eyes slowly migrates over their head until both eyes are on the same side!

Summer flounder have relatively large mouths with sharp teeth

Color changes depending on the background, but is usually dark or mottled

SUMMER



30 - 50 cm; Maximum length is 100 cm

WINTER



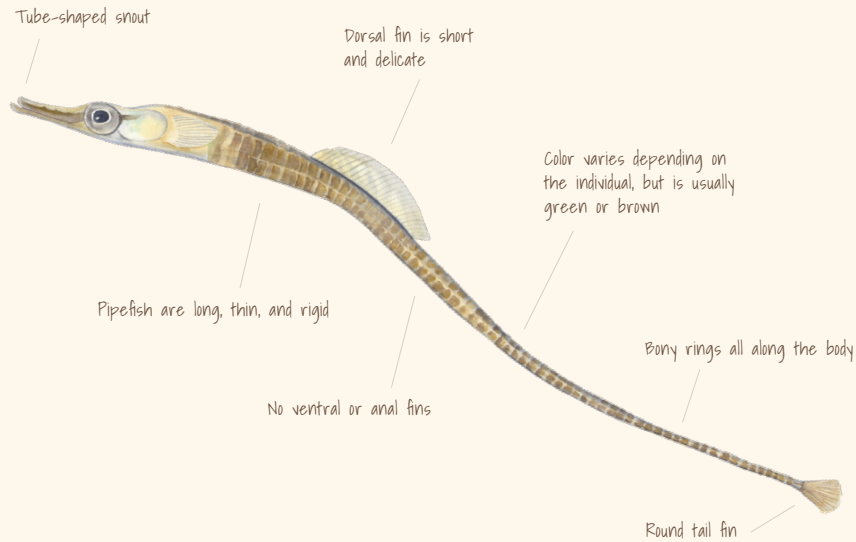
25 - 35 cm; Maximum length is 58 cm



SYNGNATHUS FUSCUS

NORTHERN PIPEFISH

Class Actinopterygii "Ray-Finned Fishes" · Order Syngnathiformes "Pipefish & Seahorses"
Family Syngnathidae "Pipefish & Seahorses"



Pictured: An adult northern pipefish. Northern pipefish are long, thin fish with bony rings all along their bodies and tube-shaped snouts.

HABITAT

Pipefish mostly live among plant and algae in brackish or saltwater habitats, including marsh creeks, estuaries, and harbors.

DIET

Pipefish eat small crustaceans, like amphipods, isopods, copepods, and shrimp.

COMMON PREDATORS

Oyster toadfish, bass, perch, drums, and weakfish eat pipefish.

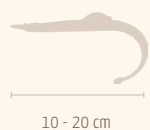
STATUS

IUCN Population Status:
Least Concern · Unknown Trend

New York State Conservation Rank:
Vulnerable · S3

DID YOU KNOW?

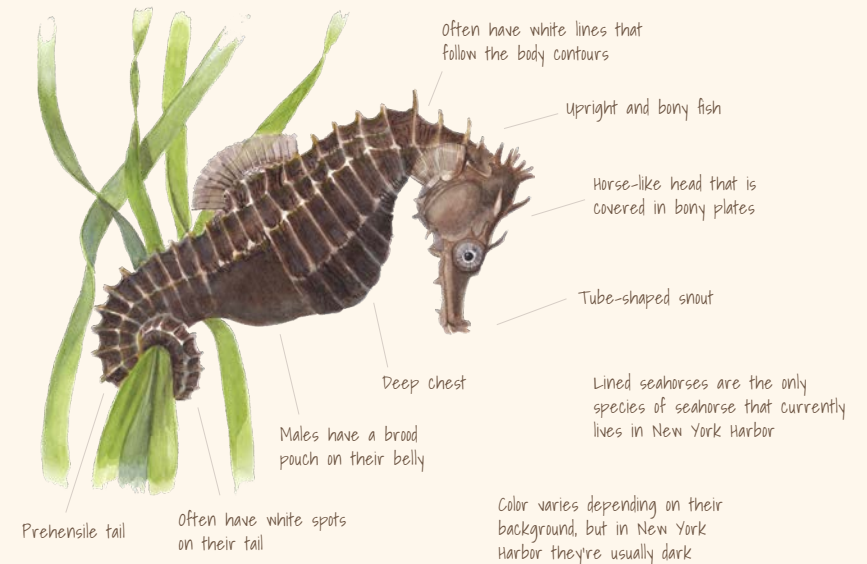
Pregnancy is dangerous for male pipefish. Many get eaten by predators or starve before they can give birth. Because of the uneven death rate, there can be as many as nine female pipefish for every one male.



HIPPOCAMPUS ERECTUS

LINED SEAHORSE

Class Actinopterygii "Ray-Finned Fishes" · Order Syngnathiformes "Pipefish & Seahorses"
Family Syngnathidae "Pipefish & Seahorses"



Pictured: An adult lined seahorse clinging to seagrass with its prehensile tail. Lined seahorses are upright, bony fish with horse-like heads, tube-shaped snouts, and deep chests.

HABITAT

During the summer, lined seahorses live in shallow areas near the shore. You can find them among underwater plants and algae, human-made structures, sponges, and oyster reefs.

DIET

Lined seahorses eat amphipods, copepods, small shrimp,

and other small crustaceans, as well as snails, and bristle worms.

COMMON PREDATORS

Black sea bass, mako sharks, stingrays, bluefish, and tuna occasionally eat lined seahorses, as do seabirds and wading birds.

STATUS

IUCN Population Status:
Vulnerable · Decreasing

DID YOU KNOW?

Lined seahorses communicate with little clicking sounds. They make these sounds by tossing their heads against a star-shaped crest on their neck called a coronet.



FISH OF NEW YORK HARBOR



AMERICAN EEL
Anguilla rostrata pg. 14



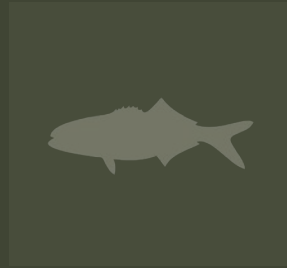
ATLANTIC SILVERSIDE
Menidia menidia pg. 15



ATLANTIC NEEDLEFISH
Strongylura marina pg. 16



OYSTER TOADFISH
Opsanus tau pg. 18



BLUEFISH
Pomatomus saltatrix pg. 29



BLACK SEA BASS
Centropristis striata pg. 30



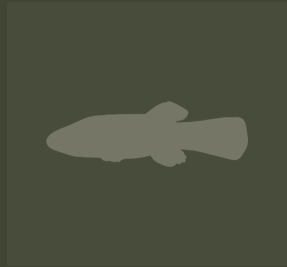
SCUP
Stenotomus chrysops pg. 31



ATLANTIC MENHADEN
Brevoortia tyrannus pg. 19



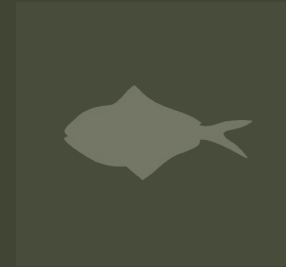
STRIPED KILLIFISH
Fundulus majalis pg. 20



MUMMICHOG
Fundulus heteroclitus pg. 21



ROCK GUNNEL
Pholis gunnellus pg. 32



BUTTERFISH
Peprilus triacanthus pg. 33



NORTHERN KINGFISH
Menticirrhus saxatilis pg. 34



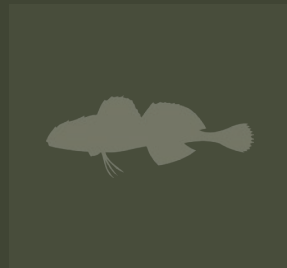
SKILLET FISH
Gobiosox strumosus pg. 22



BLENNY
Blenniidae Family pg. 23



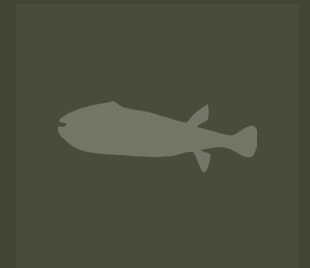
GOBY
Gobiosoma spp. pg. 24



SCULPIN
Myoxocephalus spp. pg. 35



SEA ROBIN
Prionotus spp. pg. 36



NORTHERN PUFFER
Sphaeroides maculatus pg. 37



CUNNER
Tautoglabrus adspersus pg. 25



BLACKFISH
Tautoga onitis pg. 26



STRIPED BASS
Morone saxatilis pg. 28



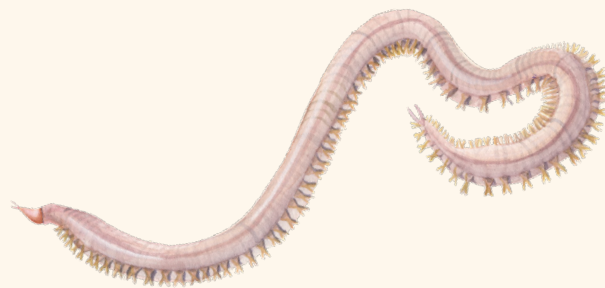
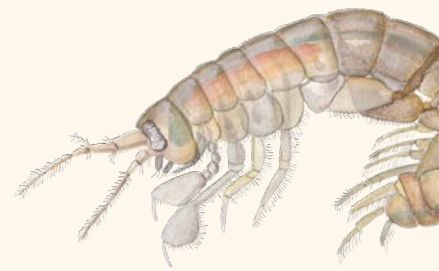
FLOUNDER
Pleuronectiformes Order pg. 38



NORTHERN PIPEFISH
Syngnathus fuscus pg. 40

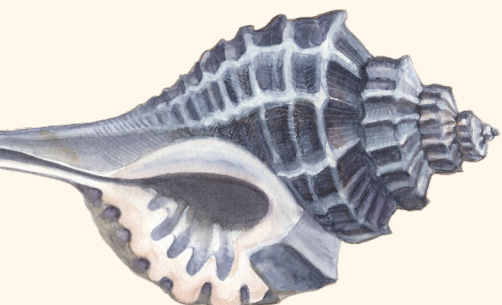
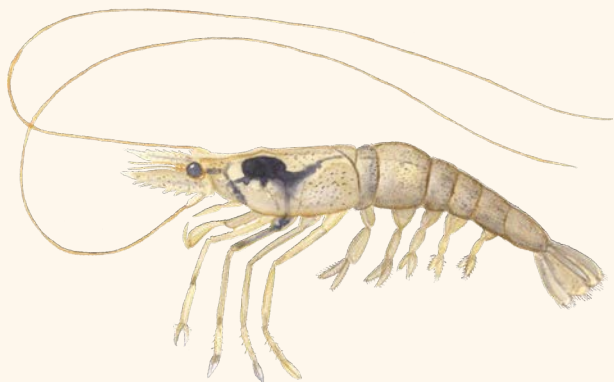


LINED SEAHORSE
Hippocampus erectus pg. 41



MOBILE INVERTEBRATES

- Green Crab
- Spider Crab
- Blue Crab
- Mud Crabs
- Mitten Crabs
- Pacific Shore Crab
- Sand Shrimp
- Grass Shrimp
- Amphipods
- Skeleton Shrimp
- Isopods
- Horseshoe Crabs
- Slipper Snails
- Whelks
- Eastern Mudsnailes
- Oyster Drills
- Bristle Worms
- Oyster Flatworm
- Comb Jelly
- Moon Jelly



CARCINUS MAENAS

GREEN CRAB

Class Malacostraca · Order Decapoda "Decapods" · Infraorder Brachyura "Crabs" · Family Portunidae "Swimming Crabs"

You can count 5 blunt spines (or "teeth") on each side of their carapace just behind the eyes

Green, but can also be mottled brown, grey, or red



Adult females have red-orange underbellies

Males and juveniles have yellow or green underbellies

Pictured: An adult green crab. Green crabs are mid-sized crabs that can be green, brown, grey, or red, with 5 blunt spines on their carapace.

HABITAT

Green crabs can live in many types of saltwater and estuarine habitats. You can often find them among vegetation, in salt marshes, and under rocks along the banks of tidal creeks.

DIET

Green crabs eat many different kinds of plants and animals from nearly 160 different genus groups. Some of their preferred foods include snails, bivalves, (clams and mussels), juvenile fish, algae, juvenile lobsters, barnacles, and bristle worms.

COMMON PREDATORS

Sea birds (including gulls), ducks, herons, raccoons, and blue crabs eat green crabs.



6 - 10 cm · Carapace width

DID YOU KNOW?

A single green crab can eat up to 40 half-inch clams per day!

LIBINIA SPP.

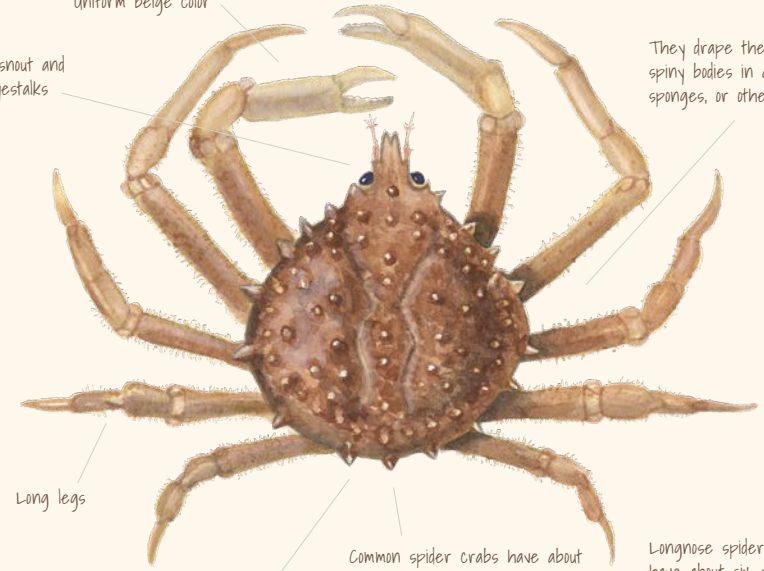
SPIDER CRAB

Class Malacostraca · Order Decapoda "Decapods" · Infraorder Brachyura "Crabs" · Family Epialtidae "Spider Crabs"

uniform beige color

Pointed snout and short eyestalks

They drape their knobby, spiny bodies in algae, sponges, or other debris



Long legs

Triangular carapace

Common spider crabs have about nine spines on their midline

Longnose spider crab have about six spines on their midline

Pictured: An adult spider crab. Spider crabs are long-legged, beige crabs with knobby, triangular carapaces and short eyestalks.

HABITAT

Spider crabs live near the sea floor on rocks, mud, and sand. You can find them in large numbers in fairly polluted bays and estuaries. Spider crabs can descend to depths of greater than 150 feet (around 45 meters) below the surface.

DIET

Spider crabs eat algae, dead and decaying fish, mollusks, barnacles, and sea stars.

COMMON PREDATORS

Octopuses, pinfish, grouper, and oyster toadfish eat spider crabs.



5 - 8 cm · Carapace; Maximum width is 10 cm

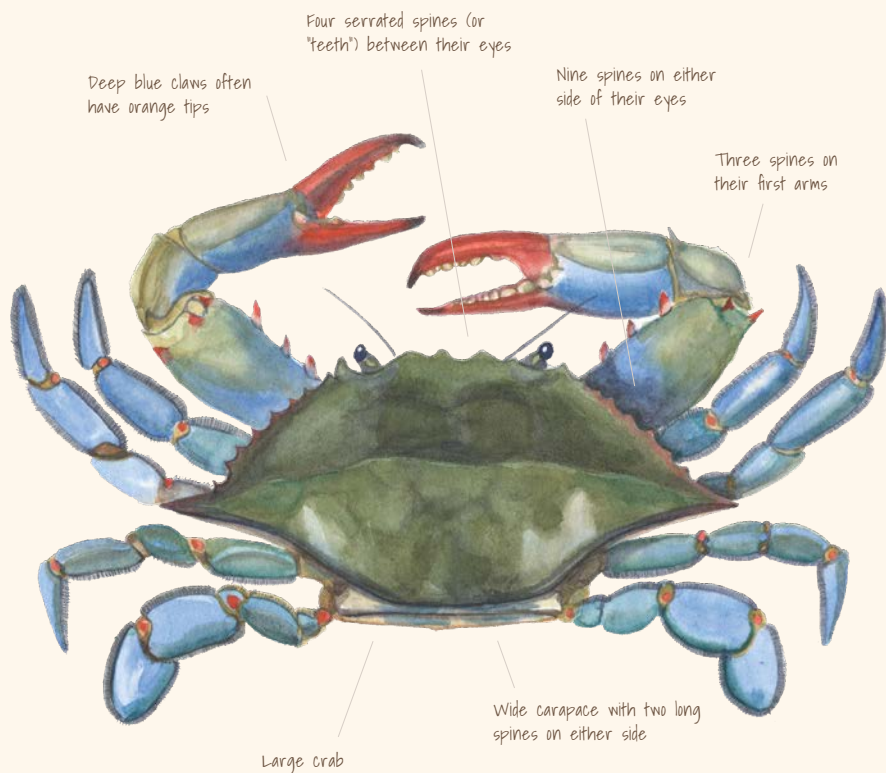
DID YOU KNOW?

To make up for their bad eyesight, spider crabs have sensory cells (like taste buds) at the end of each leg. These cells help them find tasty morsels on the sea floor.

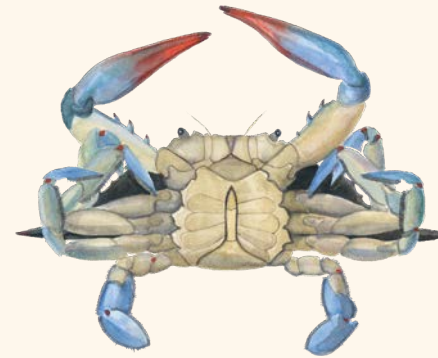
CALLINECTES SAPIDUS

BLUE CRAB

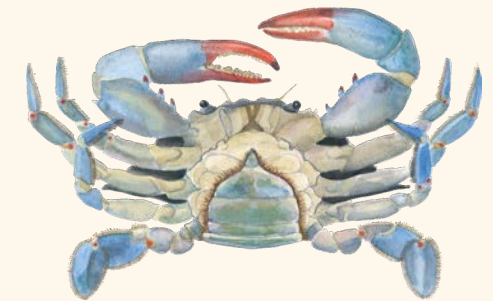
Class Malacostraca
Order Decapoda "Decapods"
Infraorder Brachyura "Crabs"
Family Portunidae "Swimming Crabs"



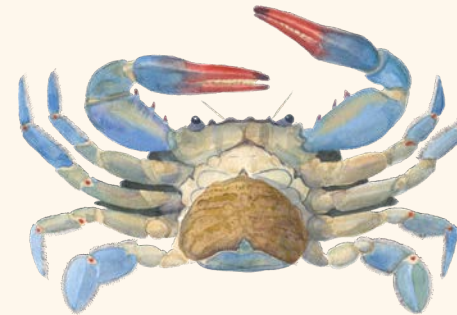
8 - 17 cm · Carapace:
Maximum width is 23 cm



Males have a narrow, tower-shaped apron on their abdomen



Female blue crabs have a wide, dome-shaped flap (or "apron") on their abdomen



Females carry their eggs in a bright orange, spongy mass on their apron

Pictured: An adult blue crab. Blue crabs are large crabs with deep blue claws and two long spines on either side of their carapace. Juvenile blue crabs (not pictured) are less brightly colored than adults.

DIET

Blue crabs eat live and dead fish, fish larvae, shrimp, bivalves (like oysters, mussels, and clams), snails, and vegetation (like eelgrass and sea lettuce).

HABITAT

Blue crabs spend most of their time underwater, on rocks, sand, or mud. During the summer, you can find them in river mouths, tidal creeks, salt marshes, and sounds. Blue crabs like to live near human-made structures, such as docks, or near underwater plants and seaweed.

COMMON PREDATORS

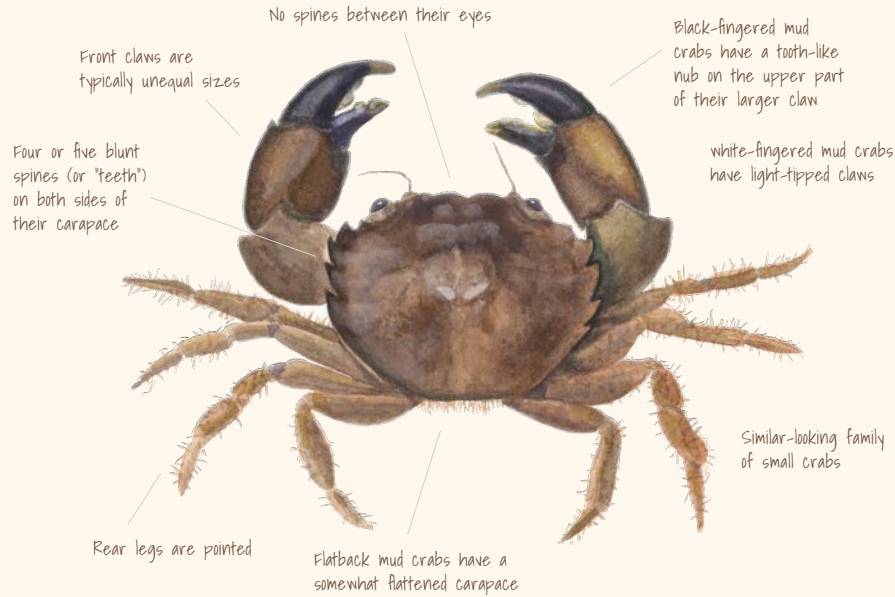
Raccoons, herons, American eels, striped bass, oyster toadfish, drums, and croakers eat blue crabs.

DID YOU KNOW?

Female blue crabs only mate once in their life, but they can store male sperm for up to two years!

MUD CRABS

Class **Malacostraca** · Order **Decapoda** "Decapods" · Infraorder **Brachyura** "Crabs" · Family **Panopeidae** "Mud Crabs"



Pictured: An adult black-fingered mud crab. Mud crabs are very small crabs with four or five blunt spines on their carapaces.

HABITAT

Mud crabs live in fresh to brackish water at up to 120 feet (around 37 meters) below the surface. They prefer sheltered estuarine habitats near pilings and jetties, sponges, bryozoans, eelgrass meadows, woody debris, rocks, or oyster reefs.

DIET

Larger species (like the black-fingered mud crab) eat oysters, quahog clams, mussels, barnacles, and snails. Smaller species (like the flatback mud crab) eat mainly algae, decaying plant and animal matter, amphipods, and bristle worms.

COMMON PREDATORS

Blue crabs, wading birds (like herons), oyster toadfish, and other carnivorous fish eat adult mud crabs. Atlantic silversides, mummichogs, grass shrimp, and other plankton-eating fish and invertebrates prey on the larvae.



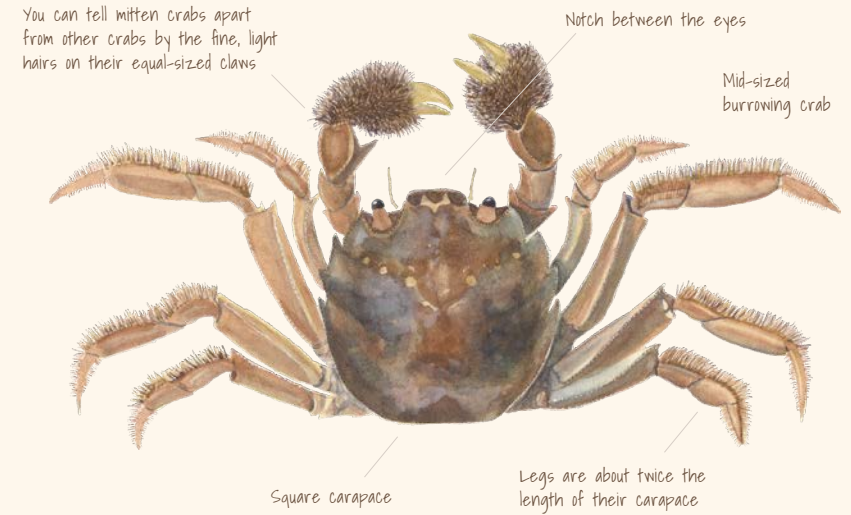
DID YOU KNOW?

Mud crab larvae have sharp spines that defend them against plankton-eating fish.

2 -4 cm · Carapace width

MITTEN CRABS

Class **Malacostraca** · Order **Decapoda** "Decapods" · Infraorder **Brachyura** "Crabs" · Family **Varunidae** "Shore Crabs"



Pictured: An adult mitten crab. Mitten crabs are mid-sized burrowing crabs with square carapaces and fine, light hairs on their claws.

HABITAT

Mitten crabs live in fresh, brackish, or salty water during different parts of their life cycle. In freshwater, they prefer shallow, slow-moving pools near algae. In brackish water, they make burrows in the sides of steep muddy or sandy banks.

DIET

Mitten crabs are flexible omnivores. They mainly eat algae, decaying matter, and dead fish. Juveniles sometimes eat amphipods and snails because they need calcium for their growing shells.

COMMON PREDATORS

We don't know for sure what animals in New York Harbor might eat mitten crabs. Some carnivorous fish like American eels, striped bass, and catfish might prey on mitten crabs. Other potential predators include raccoons, otters, wading birds (like herons), and bullfrogs.

FROM THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION: "If you collect a Chinese mitten crab, do not release it back to the water. Keep it and freeze it (preserve in alcohol if you can't freeze it). Note date and location caught (GPS coordinates preferred but pinpointed on a map is acceptable) and how you caught it. If possible, take a close-up photo. Please make a report within 48 hours of catch that includes photos and location information to isinfo@dec.ny.gov or 518-402-9425."



5 - 7 cm · Carapace;
Maximum width is 10 cm

DID YOU KNOW?

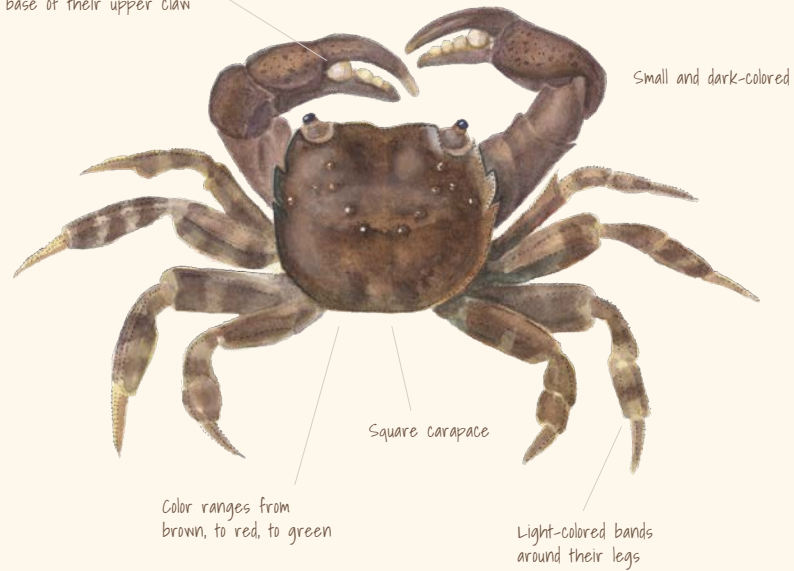
Many organisms make their home in the mitten crab's hairy claws, including bivalve and snail larvae, amphipods, bristle worms, and algae.

HEMIGRAPUS SANGUINEUS

PACIFIC SHORE CRAB

Class Malacostraca · Order Decapoda "Decapods" · Infraorder Brachyura "Crabs" · Family Varunidae "Shore Crabs"

Males have a fleshy bulb at the base of their upper claw



Pictured: An adult Pacific shore crab. Pacific shore crabs are small, dark crabs with square carapaces and light bands around their legs.

HABITAT

Pacific shore crabs usually live in the intertidal zone of rocky estuaries. They can also live in the subtidal zone, on sandy or pebbly beaches, jetties, pilings, mussel beds, and oyster reefs.

DIET

Pacific shore crabs are omnivorous. They eat many different species of plants and animals, including blue mussels, quahog clams, oysters, soft-shell clams, snails, algae, and seagrass.

COMMON PREDATORS

Tautog, cunner, oyster toadfish, striped bass, black sea bass, green crabs, and gulls eat adult Pacific shore crabs. Killifish and mummichogs eat Pacific shore crab larvae.

DID YOU KNOW?

Pacific shore crabs are immune to many toxins, including puffer fish venom!

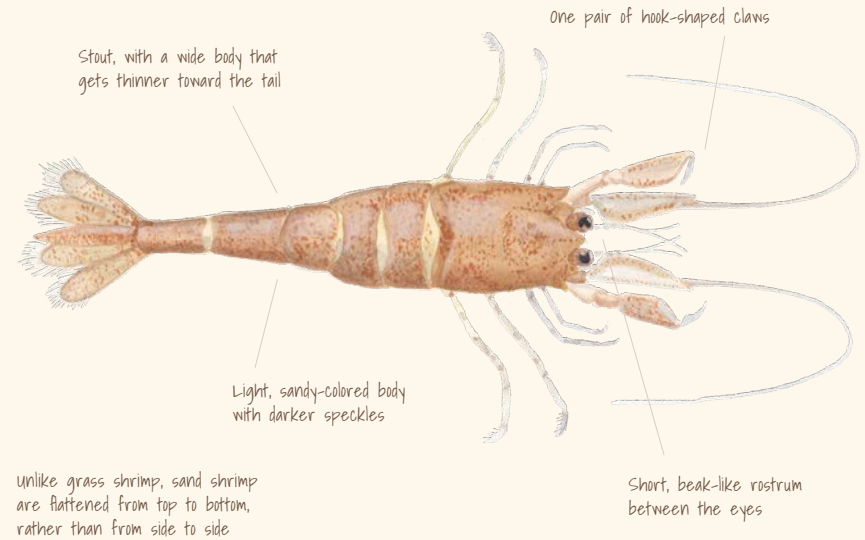


1 - 3 cm · Carapace; ;
Maximum width is 4 cm

CRANGON SEPTEMPINOSA

SAND SHRIMP

Class Malacostraca · Order Decapoda "Decapods" · Infraorder Caridea "Caridean Shrimp" · Family Crangonidae



Pictured: An adult sand shrimp. Sand shrimp are stout, sandy-colored shrimp with dark speckles and hook-shaped claws.

HABITAT

Sand shrimp live on sand or mud in the shallow bottoms of estuaries and salt marshes.

DIET

Sand shrimp eat decaying plants and animals, small crustaceans (like amphipods), fish larvae, insects, and invertebrate eggs.

COMMON PREDATORS

Flounder, striped bass, black sea bass, sea robins, skates, and other bottom-dwelling fish eat adult sand shrimp. Comb jellies and other plankton-eating species eat sand shrimp larvae.

DID YOU KNOW?

Sand shrimp eat lots of sand on purpose. It helps them grind up the hard shells of insects and amphipods. In fact, sand shrimp poop is mostly made of sand!

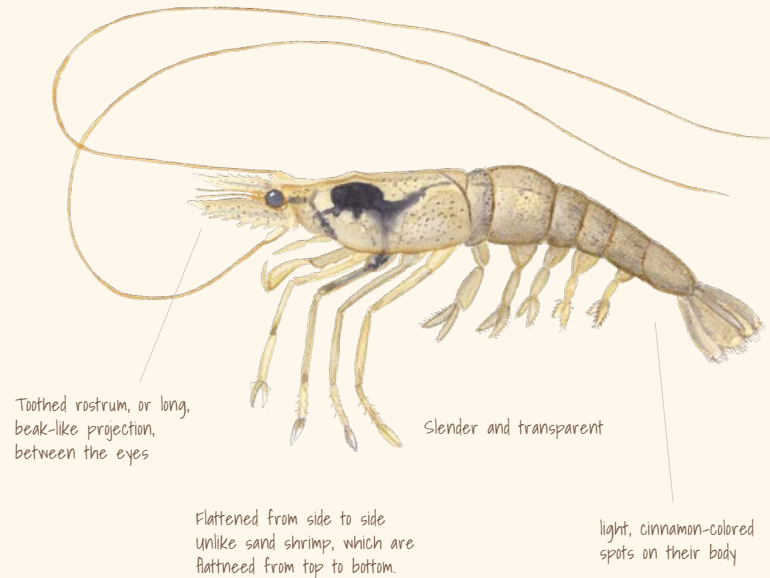


1 - 4 cm; Maximum
length is 7 cm

PALAEEMON SPP. (FORMERLY PALAEMONETES)

GRASS SHRIMP

Class Malacostraca · Order Decapoda "Decapods" · Infraorder Caridea "Caridean Shrimp" · Family Palaemonidae



Pictured: An adult grass shrimp. Grass shrimp are slender, transparent shrimp with cinnamon spots and two pairs of claws on their front legs.

HABITAT

Grass shrimp live in many shallow coastal habitats, including salt marshes and estuaries. They spend a lot of time around eelgrass meadows and other underwater plants and algae.

DIET

Grass shrimp eat tiny algae, rotting vegetation, phytoplankton, and small invertebrates.

COMMON PREDATORS

Mummichogs, killifish, and other small fish eat grass shrimp.

DID YOU KNOW?

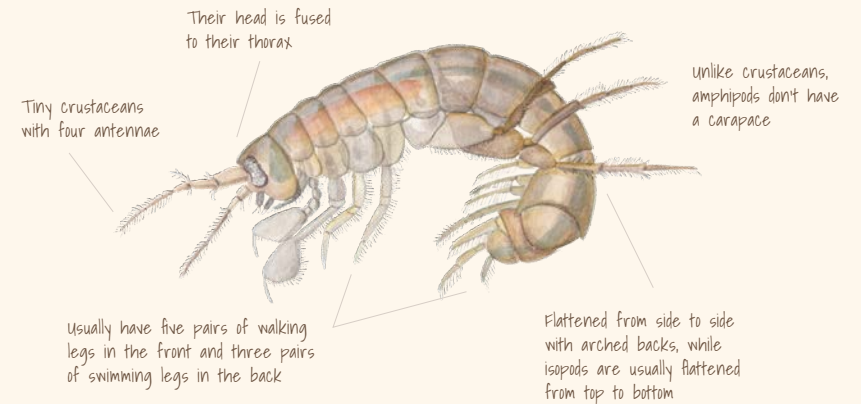
Some grass shrimp have a parasite that looks like a purplish-brown lump on their gills. This parasite is actually an isopod called *Probopyrus pandalicola*.



ORDER AMPHIPODA

AMPHIPODS

Class Malacostraca · Order Amphipoda "Amphipods"



A mixture of amphipods, skeleton shrimp, and isopods in an ordinary plastic spoon. These organisms are visible to the naked eye, but it's difficult to observe them in detail without a microscope or magnifying glass.

Pictured: An adult scud (a type of amphipod). Amphipods are tiny crustaceans with four antennae and no carapace. Their head is fused to their thorax.

DIET

Most amphipods are scavengers. They eat rotting algae, seaweed, dead fish, other amphipods, isopods, zooplankton, phytoplankton, and insect eggs.

HABITAT

Amphipods live in all kinds of saltwater, brackish, and freshwater communities. People commonly see them among underwater vegetation (like eelgrass meadows), salt marshes, tide pools, sandy beaches, and rotting seaweed.

COMMON PREDATORS

Most of the fish species in New York Harbor eat amphipods during some part of their life cycle. Shorebirds, crabs, and shrimp also eat amphipods.

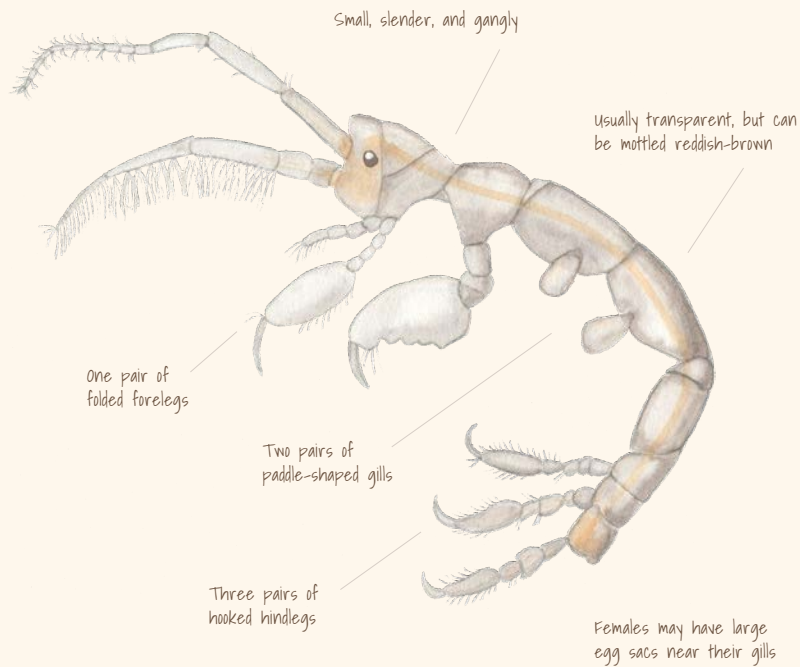
DID YOU KNOW?

Some amphipods will eat almost anything, including human garbage. One study found that a group of amphipods can chew a single plastic bag into 175 million pieces!



SKELETON SHRIMP

Class Malacostraca · Order Amphipoda “Amphipods” · Family Caprellidae “Skeleton Shrimp”



Pictured: An adult skeleton shrimp. Skeleton shrimp are transparent, gangly amphipods with folded forelegs and paddle-shaped gills.

HABITAT

Skeleton shrimp live in shallow estuaries and saltwater environments. They are usually attached to hydroids, sponges, sea stars, bryozoans, kelp, seaweed, algae, or eelgrass. Some species live freely on soft mud.

DIET

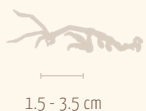
Skeleton shrimp are omnivores. They feed on zooplankton, phytoplankton, crustacean larvae, and rotting bits of plants and animals.

COMMON PREDATORS

Black sea bass, pipefish, seahorses, blennies, gobies, and ribbon worms eat skeleton shrimp.

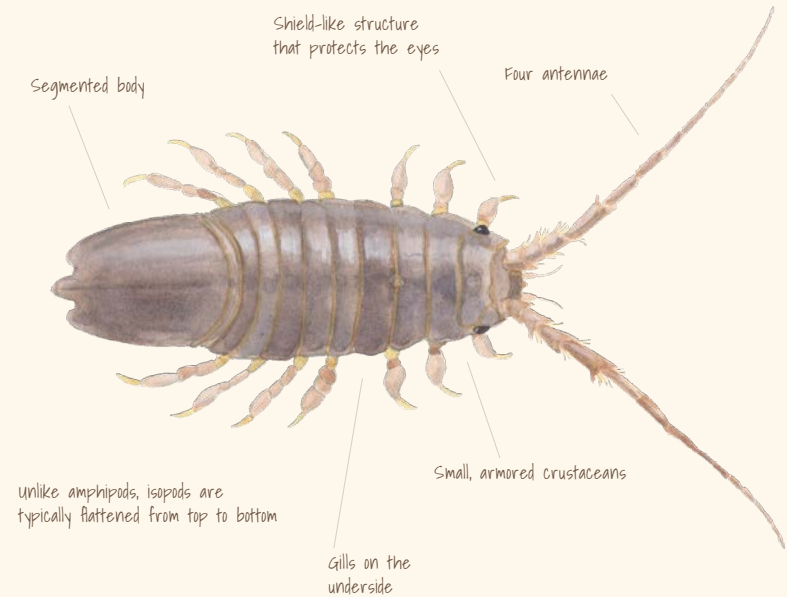
DID YOU KNOW?

Sixty-two new species of skeleton shrimp have been discovered in the last fifteen years. Scientists think that many more species haven't been discovered yet.



ISOPODS

Class Malacostraca · Order Isopoda “Isopods”



Pictured: A generic adult isopod (based on Idotea spp.). Isopods are small, armored crustaceans with segmented bodies and four antennae. There are many isopod species in New York Harbor, but most look similar to the example in this illustration.

DIET

Isopods eat dead animals, decaying algae and seaweed, wood, and other rotting matter. Parasitic isopods eat the blood of live fish.

COMMON PREDATORS

Many juvenile fish eat isopods, as do other small fish, shorebirds, and crabs.

HABITAT

In marine environments, isopods often crawl around underwater algae and plants (like eelgrass), over rocks, sand, or mud, on exposed rocks or pilings near the water, and in tide pools.

DID YOU KNOW?

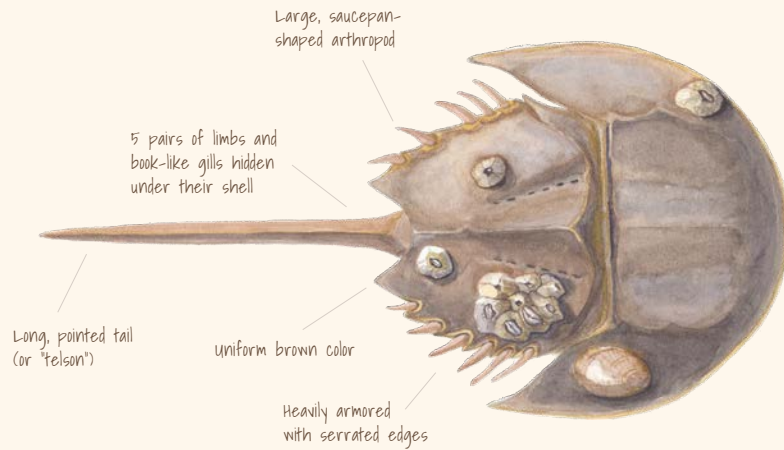
Some parasitic isopods bite off a fish's tongue and replace it with their own body!



LIMULUS POLYPHEMUS

HORSESHOE CRABS

Subphylum **Chelicerata** "Arachnids, Sea Spiders, & Horseshoe Crabs" · Class **Merostomata** "Sea Scorpions & Horseshoe Crabs"
Order **Xiphosurida** "Horseshoe Crabs" · Family **Limulidae**



Pictured: An adult horseshoe crab with barnacles and a slipper snail hitchhiking on its shell. Horseshoe crabs are large, brown, saucepan-shaped arthropods, heavily armored with a long, pointed tail.

HABITAT

Horseshoe crabs breed on sandy beaches. Outside of the breeding season, horseshoe crabs live in shallow and deeper water over almost any type of sea floor.

DIET

Horseshoe crabs prefer to eat mollusks (including blue mussels, soft-shell clams, and surf clams). But horseshoe crabs also eat plant matter, bristle worms, algae, small crabs and other crustaceans.

COMMON PREDATORS

Shorebirds and raccoons eat horseshoe crab eggs. Sand shrimp, blue crabs, striped bass, killifish, Atlantic silver-sides, and other surf zone fish eat juvenile horseshoe crabs. Adults are well-defended and have few natural predators. Sea turtles sometimes eat adults at sea, and gulls eat stranded adults on the beach.

STATUS

IUCN Population Status:
Vulnerable · Decreasing

ASFCM New York Stock Status:
Poor

DID YOU KNOW?

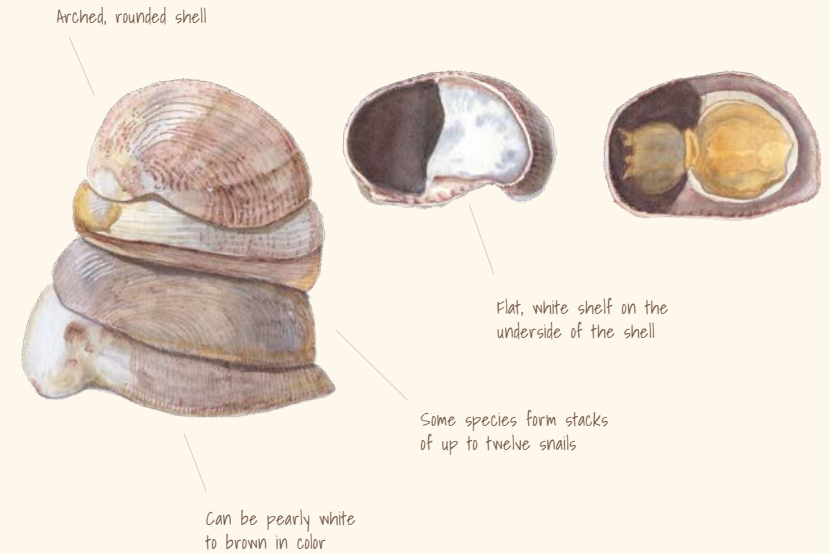
Ten percent of horseshoe crabs die every year when they become stranded on the beach upside down. If you see one on its back, you can help by flipping it over – they don't bite!



CREPIDULA SPP. (C. FORNICATA; C. PLANA; C. CONVEXA)

SLIPPER SNAILS

Class **Gastropoda** "Snails & Slugs" · Order **Littorinimorpha** "Sea Snails" · Family **Calyptreaidae**



Pictured: A stack of slipper snails as they might appear on an oyster reef (left). Slipper snails have rounded, mottled, light brown shells. On their undersides, slipper snails have a white "shelf" that protects the snail's body (middle). You would be able to see the soft, pale mollusk inside if the "shelf" were transparent (right).

HABITAT

Slipper snails live in the subtidal or intertidal zones of coastal marshes, tide pools, and beaches. They are often attached to hard surfaces (like rocks, oyster reefs, and shells), other animals (like horseshoe crabs and hermit

crabs) or blades of eelgrass. Slipper shells can live up to 50 feet (around 15 meters) below the surface of the water.

DIET

Slipper snails are filter feeders. They eat phytoplankton and other particles in the water.

COMMON PREDATORS

Whelks, hermit crabs, boring sponges, oyster drills, flounders, and sea stars eat slipper snails.

DID YOU KNOW?

As slipper snails grow larger, they gradually change their sex from male to female.



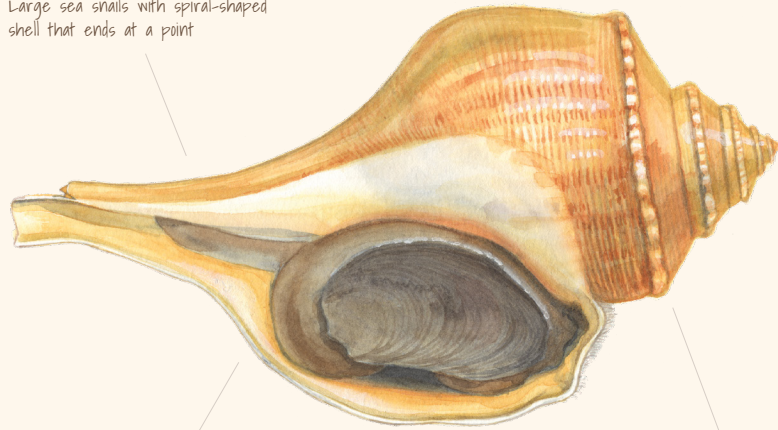
WHELKS

Category **Snails, Worms, & Jellies** · Class **Gastropoda** "Snails & Slugs" · Order **Neogastropoda** · Family **Busyconidae** "Whelks"

EASTERN MUDSNAILS

Category **Snails, Worms, & Jellies** · Class **Gastropoda** "Snails & Slugs"
Order **Neogastropoda** · Family **Nassariidae** "Nassa Mud Snails"

Large sea snails with spiral-shaped shell that ends at a point



Knobbed whelks have pointed knobs near the top of their shells

Both knobbed whelks and channeled whelks have right-handed shells

Channeled whelks have deep grooves, or channels, at the seam that separates each whorl of their shell

Pictured: A channeled whelk. Whelks are large sea snails with spiral-shaped shells that taper to a point. Knobbed whelks (not pictured) have pointed knobs on their shells.

HABITAT

Whelks live in the intertidal and subtidal zones of estuaries and out at sea. They live on the sea floor at up to 165 feet (around 50 meters) below the surface. Empty shells often wash ashore on sandy beaches, but you're

more likely to find live whelks around oyster reefs and mussel beds.

DIET

Whelks eat bivalves, including quahog clams, oysters, and blue mussels.

COMMON PREDATORS

Crabs, sea stars, and sea urchins eat whelks.



13 - 23 cm

DID YOU KNOW?

Like people, most whelks are "right-handed." That means that the opening of their shell is on their right side. But every now and then, a whelk is born "left-handed."

Shell is covered in a dark brown, nearly black "skin" (called periostracum)



Small, oval shaped shell that gradually tapers toward the pointed end

Eastern mudsnail shells are right-handed, meaning that the opening is on the right side

White shell often peeks through where the dark skin has started to wear away

Shell has six to seven whorls

Pictured: An eastern mudsnail. Eastern mudsnails are small, mottled brown snails with an oval-shaped shell that ends in a point.

HABITAT

Eastern mudsnails live in the intertidal zone in mudflats and salt marshes. You can also find them in eelgrass meadows, oyster reefs, and mussel beds.

DIET

Eastern mudsnails eat bacteria, phytoplankton, decomposing algae, and animal carcasses.

COMMON PREDATORS

Turtles, crabs, shorebirds, wading birds (like herons), and fish eat eastern mudsnails.



2.5 - 3 cm

DID YOU KNOW?

In New York Harbor, diamondback terrapins (a type of turtle) love to eat eastern mudsnails. Some parasites have evolved to live in both terrapins and mudsnails.

MURICIDAE (UROSALPINX CINEREA, EUPLEURA CAUDATA)

OYSTER DRILLS

Category Snails, Worms, & Jellies
Class Gastropoda "Snails & Slugs"
Order Neogastropoda
Family Muricidae "Rock Snails"



Vase-shaped oyster drill egg cases attached to vegetation, with bright yellow eggs inside each case

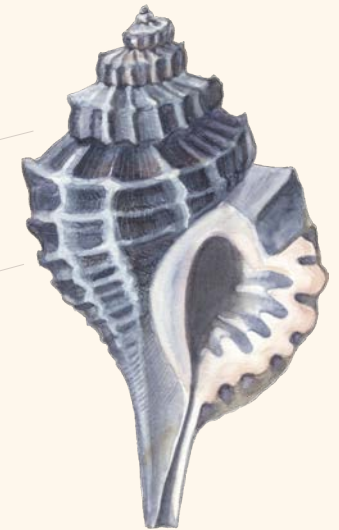


Small snails with spiral-shaped shells that end in a point

Shells are reddish-brown and have smooth edges

Thick-lipped drill shells are grey and have slightly jagged edges

As their name suggests, thick-lipped drills have a thicker lip near the opening of their shells



Pictured: An Atlantic oyster drill (top). Atlantic oyster drills have reddish-brown, spiral-shaped shells with smooth edges. A thick-lipped oyster drill (bottom). Thick-lipped oyster drills have grey shells with slightly jagged edges and a thicker lip near the opening of their shell.

HABITAT

Oyster drills live in the intertidal zone and shallow parts of the subtidal zone, in estuaries and near the shore. You can find them among seagrass meadows, mud flats, oyster reefs, pilings with barnacles, and rocks up to 120 feet (around 36 meters) below the surface of the water.

DIET

Oyster drills eat oysters, slipper shells, mussels, barnacles, bristle worms, and bryozoans.

COMMON PREDATORS

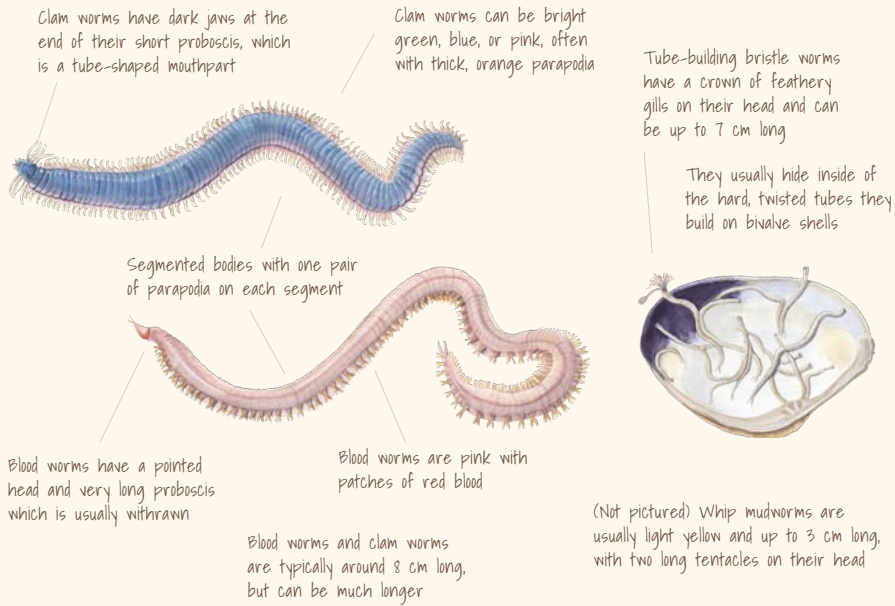
Sea stars, blue crabs, flatworms, and other carnivorous snails eat oyster drills.

DID YOU KNOW?

A single oyster drill can eat up to 200 juvenile oysters in one season!

BRISTLE WORMS

Category Snails, Worms, & Jellies · Phylum Annelida "Worms" · Class Polychaeta "Polychaete Worms"



Pictured: A common clam worm (top), which is another type of bristle worm. Clam worms are brightly colored with thick, orange legs and dark jaws. A blood worm (bottom), which is a type of bristle worm. Blood worms are pink with red patches, and they have a pointed head. A group of tube-building worms attached to a clam shell (right). These worms build brittle, coiled tubes all over shells. Tube-building worms feed by poking their heads out of their tubes and trapping phytoplankton in their feathery gills.

HABITAT

Bristle worms live in all kinds of saltwater and estuarine

habitats. You can find bristle worms in mud and sand, seaweed, oyster reefs, mussel beds, rocky cliffs, sea-grass meadows, and human-made structures.

DIET

Different bristle worm species have different diets. Many bristle worms eat animal carcasses, algae, phytoplankton, small amphipods, fish larvae, and other bristle worms.

COMMON PREDATORS

Many species of fish, crustaceans, and birds eat bristle worms.

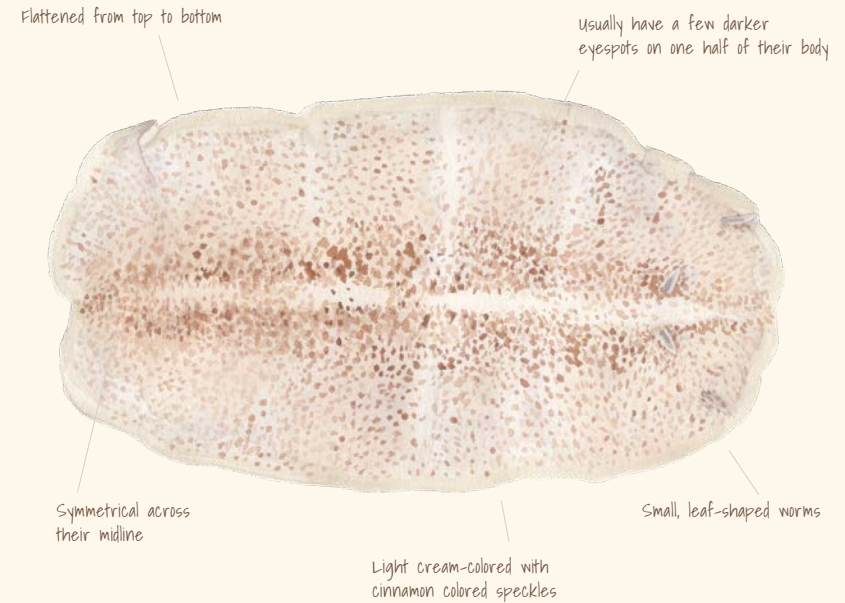
DID YOU KNOW?

Blood worm jaws are made with metal! These worms produce a copper-containing mineral that helps them pierce through their prey and inject their venom.



OYSTER FLATWORM

Category Snails, Worms, & Jellies · Phylum Platyhelminthes "Flatworms"
Order Polycladida "Free-Living Marine Flatworms" · Family Stylochidae



Pictured: An oyster flatworm. Oyster flatworms are small, leaf-shaped, flattened worms, light cream-colored with dark eyespots.

DIET

Juvenile oyster flatworms eat red algae. Adult flatworms eat oysters and barnacles

HABITAT

Oyster flatworms live on oyster reefs and among barnacles. They prefer brackish or salty water. Flatworms usually remain near the surface of the water. You can sometimes find them inside empty oyster shells, or underneath rocks in shallow water.

COMMON PREDATORS

Plankton-eating fish like Atlantic menhaden eat oyster flatworm larvae. We don't know much about predators of adult flatworms, but omnivorous fish and crustaceans probably eat them.



DID YOU KNOW?

If there is not enough food around, oyster flatworms can temporarily shrink in size by up to 50%. That way, flatworms don't have to eat as much to sustain themselves.

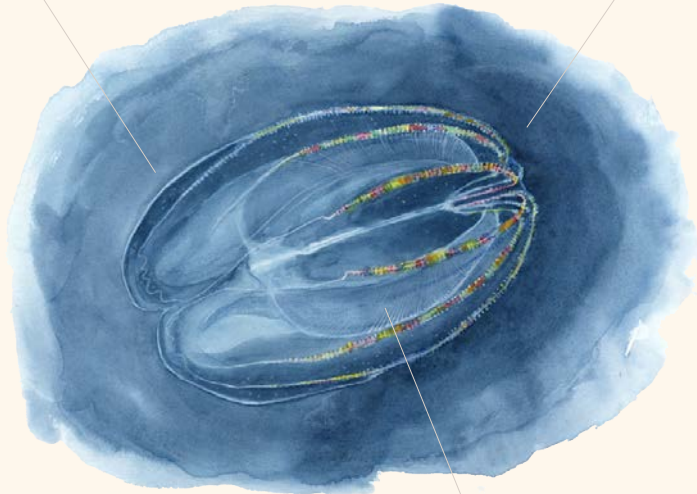
MNEMIOPSIS IEIDYI

COMB JELLY

Category Snails, Worms, & Jellies · Phylum Ctenophora "Comb Jellies" · Class Tentaculata · Order Lobata · Family Bolinopsidae

Common southern comb jellies are transparent, jellyfish-like animals

Eight rows of glittering, comb-like plates along their body



Two long lobes, like bunny ears, that begin near the top of their body and droop down over their mouth

Pictured: A comb jelly. Comb jellies are transparent, oval-shaped animals with eight rows of sparkling combs around the outside of their body.

DIET

Common southern comb jellies eat any type of zooplankton, including fish, crustacean, and mollusk larvae. They also eat phytoplankton, floating fish eggs, and copepods.

HABITAT

Common southern comb jellies usually live near the shore, in bays and estuaries. But people sometimes see comb jellies several hundred miles away from the shore, in open ocean. Comb jellies prefer murky, brackish water, but they can live in salty and almost fresh water as well.



3 - 12 cm

DID YOU KNOW?

Some comb jellies have a parasite that looks like a thin, pink worm living inside their transparent bodies. This parasite is actually a type of sea anemone called the lined anemone.

AURELIA AURITA

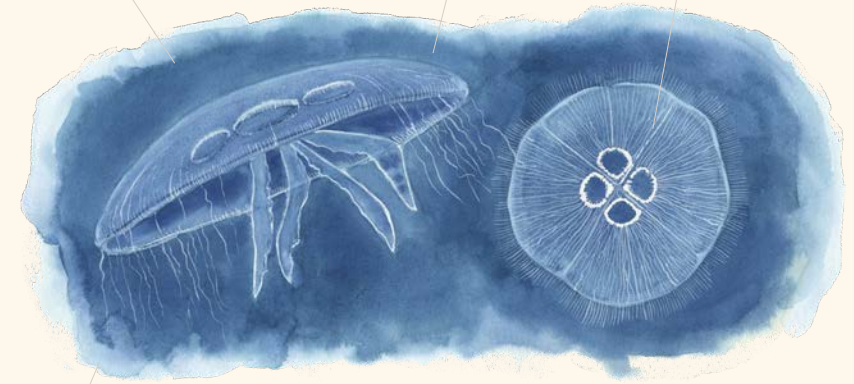
MOON JELLY

Category Snails, Worms, & Jellies · Phylum Cnidaria "Jellyfish" · Class Scyphozoa "True Jellyfish" · Order Semaestomeae · Family Ulmaridae

Can be anywhere from pink to orange, to white in color

As medusas, moon jellies are large, round jellyfish

Transparent with four C-shaped reproductive organs (gonads) that are visible from above



Fringe of many short tentacles and four longer tentacles, called oral arms

As polyps, moon jellies are almost microscopically small

Polyps live in colonies and look like tiny sea anemones

Polyps have a narrow stem that broadens into a cup with 10-15 slender tentacles arranged around the edge

Pictured: A side-view of a moon jelly (left) and a top-down view of a moon jelly (right). Moon jellies are transparent, round jellyfish with a fringe of short tentacles and four longer tentacles. They have four horseshoe-shaped reproductive organs (gonads) that you can see from above.

DIET

Moon jellies eat phytoplankton (like algae) and zooplankton (like the larvae of mollusks, bristle worms, fish, and crustaceans).

COMMON PREDATORS

Other jellyfish (like lion's mane jellyfish), sea turtles, and ocean sunfish eat moon jelly medusas. Sea slugs eat moon jelly polyps.

HABITAT

Moon jellies are found around the world in open water. They drift into bays, estuaries, and other shallow, protected waters during the summer.



Medusas: 5 - 40 cm in diameter.
Polyps: < 1 cm and difficult to see with the naked eye.

DID YOU KNOW?

If moon jelly medusas get sick or injured, they can heal themselves by reversing their life cycle and transforming back into polyps.

MOBILE INVERTEBRATES OF NEW YORK HARBOR



GREEN CRAB
Carcinus maenas pg. 46



SPIDER CRAB
Libinia spp. pg. 47



BLUE CRAB
Callinectes sapidus pg. 48



SLIPPER SNAILS
Crepidula spp. pg. 59



WHELKS
Busyconidae Family pg. 60



EASTERN MUDSNAILS
Tritia obsoleta pg. 61



MUD CRAB
Panopeidae Family pg. 50



MITTEN CRAB
Eriocheir sinensis pg. 51



PACIFIC SHORE CRAB
Hemigrapsus sanguineus pg. 52



OYSTER DRILL EGG CAPSULES
Muricidae Family pg. 62



OYSTER DRILLS
Muricidae Family pg. 63



CLAM WORM
Polychaeta Class pg. 64



SAND SHRIMP
Crangon septemspinosa pg. 53



GRASS SHRIMP
Palaemon spp. pg. 54



AMPHIPODS
Order Amphipoda pg. 55



CARNATION WORM
Polychaeta Class pg. 64



OYSTER FLATWORM
Stylochus ellipticus pg. 65



COMB JELLY
Mnemiopsis leidyi pg. 66



SKELETON SHRIMP
Caprellidae Family pg. 56



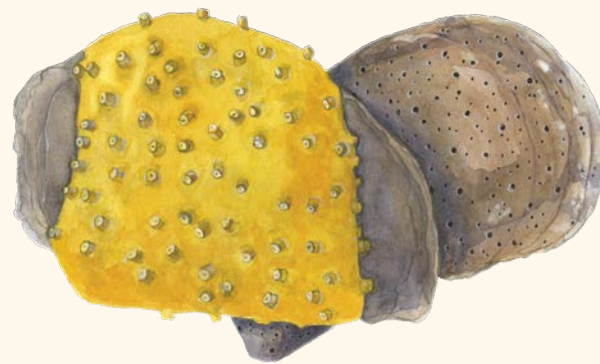
ISOPODS
Order Isopoda pg. 57



HORSESHOE CRAB
Limulus polyphemus pg. 58

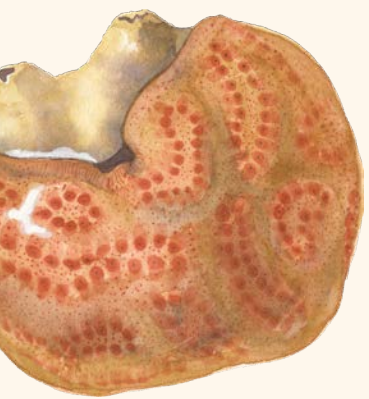
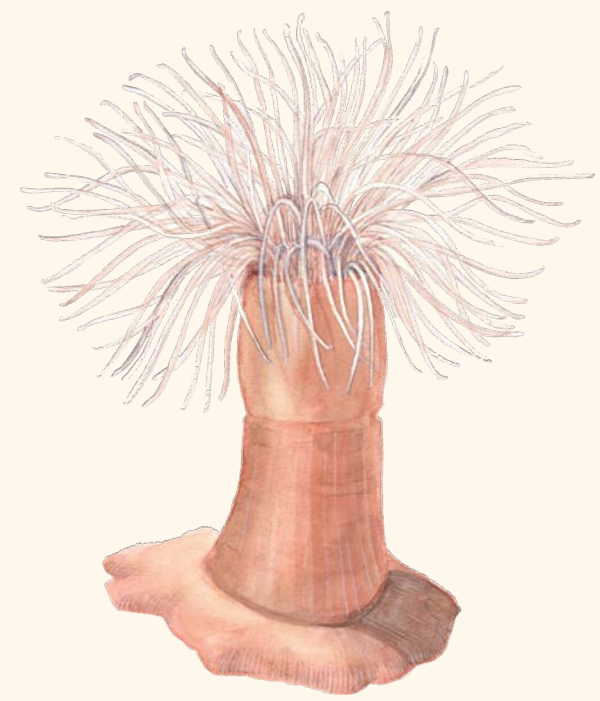


MOON JELLY
Aurelia aurita pg. 67



SESSILE ORGANISMS

- Barnacles
- Ribbed Mussels
- Blue Mussels
- Jingle Shells
- Eastern Oysters
- Northern Quahog
- European Sea Squirt
- Sea Vases
- Sea Grapes
- Chain Tunicates
- Golden Star Tunicates
- Boring Sponges
- Red Beard Sponge
- Hydroids
- Orange-Striped Green Anemone
- Frilled Anemones
- Dahlia Anemones
- Lined Anemones
- Bushy Bryozoan
- Lacy Bryozoan
- Sea Lettuce
- Agardh's Red Weed



BARNACLES

Class Hexanauplia · Order Sessilia “Acorn Barnacles” · Family Balanidae

Adult barnacles are sessile crustaceans that attach themselves to hard substrates

It is difficult to tell northern rock barnacles and ivory barnacles apart without detaching them

Both species are pale whitish-yellow color 51



Beak-like gill cover in the center of their plates

Protected by a ring of strong, overlapping plates

Pictured: A group of barnacles attached to an oyster shell. Barnacles are sessile, armored crustaceans that are protected by a ring of bony plates and a beak-like gill cover.

HABITAT

Barnacles live in the intertidal zone, in salty or brackish water. They can attach themselves to any rough, hard surface, including oysters, rocks in tide pools, pilings, jetties, and ships. Barnacles can tolerate fairly fresh

water, which means that they can live in far upstream in estuaries.

DIET

Barnacles are filter-feeders that eat phytoplankton and other particles in the water.

COMMON PREDATORS

Oyster flatworms, oyster drills, blennies, sea stars, sea slugs, and bryozoans eat barnacles.

DID YOU KNOW?

Like all crustaceans, barnacles have to molt their skin as they grow. When they're finished molting, they push the empty husk out of their shell.



RIBBED MUSSELS

Phylum Mollusca “Mollusks” · Class Bivalvia “Bivalves” · Order Mytilida “True Mussels” · Family Mytilidae “Sea Mussels”

Glossy, bean-shaped mussels

Inside of their shell is iridescent pink, blue, or purple



Lined, corduroy-textured shell

Vary in color from olive green to dark brown

Pictured: An Atlantic ribbed mussel. Atlantic ribbed mussels are glossy, bean-shaped bivalves with corduroy-textured shells.

DIET

Atlantic ribbed mussels eat phytoplankton, bits of decaying animals, algae, zooplankton, and other particles.

HABITAT

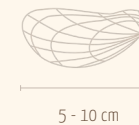
Atlantic ribbed mussels live below the high tide line in salt marshes, oyster reefs, cordgrass, and soft mud.

COMMON PREDATORS

Blue crabs, mud crabs, and shore birds eat Atlantic ribbed mussels.

DID YOU KNOW?

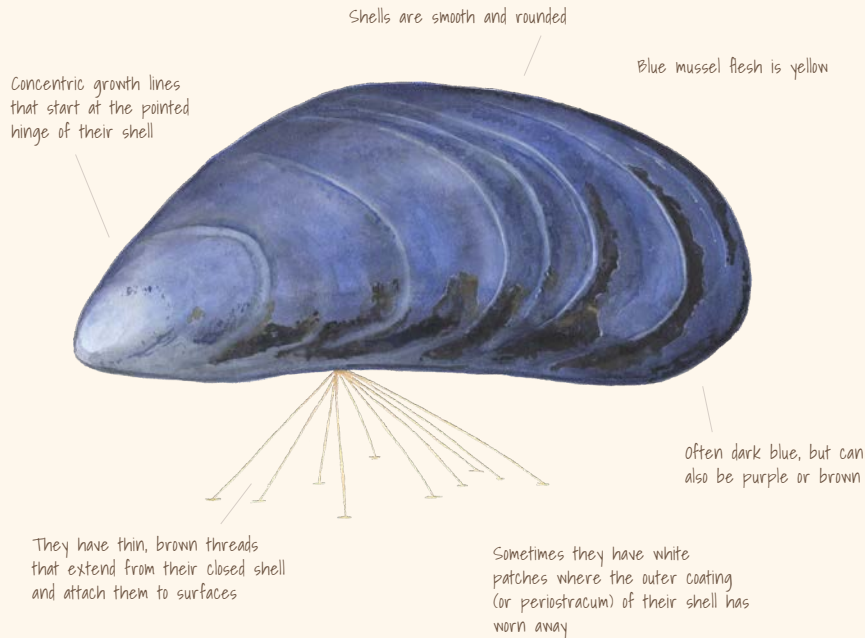
Atlantic ribbed mussels can re-attach themselves to cordgrass if they get knocked out of place.



MYTILUS EDULIS

BLUE MUSSELS

Phylum Mollusca "Mollusks" · Class Bivalvia "Bivalves" · Order Mytilida "True Mussels" · Family Mytilidae "Sea Mussels"



Pictured: A blue mussel with yellow byssal threads, which they use to attach themselves to surfaces. Blue mussels are smooth, rounded bivalves with concentric growth lines. They can be dark blue, purple, or brown.

HABITAT

Blue mussels live in dense beds in the subtidal and intertidal zones. You can find them on rocky shores, pilings, and empty shells, usually less than 32 feet (around 10 meters) below the surface. Blue mussels prefer salty water and do not grow well in brackish water. They usually settle closer to the mouth of estuaries.

DIET

Blue mussels eat phytoplankton, including algae, and bits of rotting vegetation.

COMMON PREDATORS

Jellyfish and young fish eat mussel larvae. Sea stars, crustaceans, tautog, cunner, and some seabirds eat adult blue mussels.



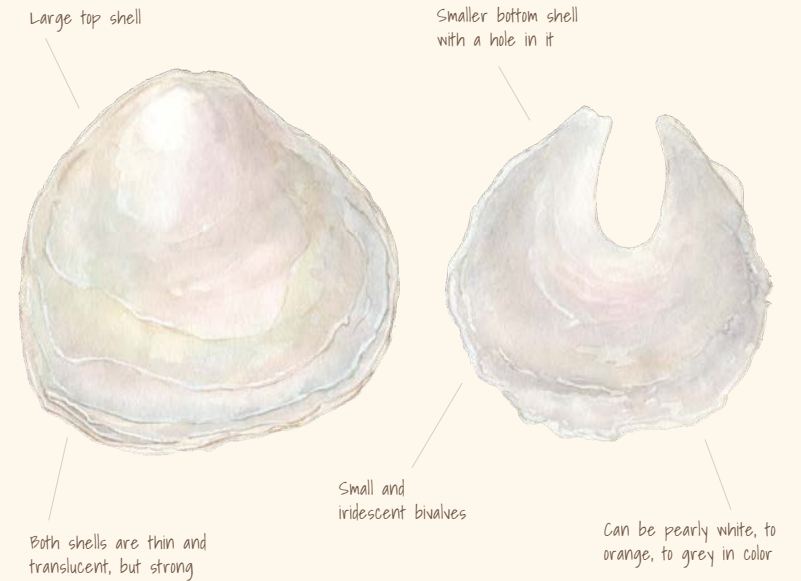
DID YOU KNOW?

Scientists have studied blue mussels' byssal threads to learn how to make stronger, stretchier materials.

ANOMIA SIMPLEX

JINGLE SHELLS

Phylum Mollusca "Mollusks" · Class Bivalvia "Bivalves" · Order Pectinida "Scallops & Relatives" · Family Anomiidae "Jingle Shells"



Pictured: The upper shell (left) and lower shell (right) of a common jingle shell. Jingle shells are small, iridescent bivalves with thin, translucent shells that are pearly white to orange. Their lower shell has a hole in it to allow byssal threads to pass through.

them in the intertidal and subtidal zones of beaches, bays, and estuaries.

DIET

Jingle shells filter-feed on phytoplankton, algae, small bits of rotting plants, and other particles.

HABITAT

Jingle shells live on hard surfaces, including oyster reefs, mussel beds, and on rocks among eelgrass. You can find

COMMON PREDATORS

Predatory snails, crabs, and fish eat jingle shells.



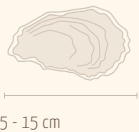
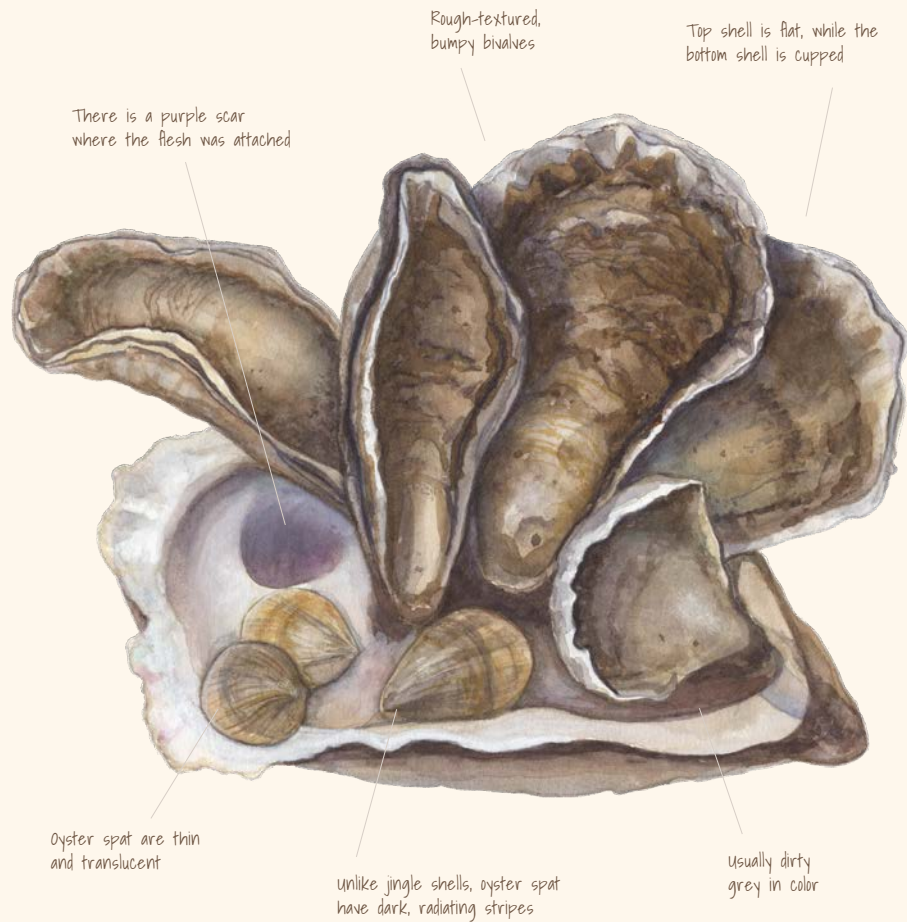
DID YOU KNOW?

Although jingle shells look fragile, they are actually surprisingly strong. Jingle shells cling very tightly to adult oyster shells and are difficult for predators to remove.

CRASSOSTREA VIRGINICA

EASTERN OYSTERS

Phylum **Mollusca** "Mollusks"
Class **Bivalvia** "Bivalves"
Order **Ostreida** "Oysters"
Family **Ostreidae** "True Oysters"



Oyster Reproductive Cycle

Pictured: A group of living adult oysters and oyster spat growing on an empty oyster shell. Oysters are rough-textured, bumpy bivalves that are greyish-brown in color. Empty oyster shells have a purple scar where the flesh was attached.

HABITAT

Oysters live in estuaries, bays, and coastal ponds in the intertidal and subtidal zones. They usually live in dense reefs attached to hard surfaces, including rocks, pilings, other human-made objects, and mollusk shells.

DIET

Oysters eat phytoplankton and suspended particles.

COMMON PREDATORS

Shorebirds (including oystercatchers and gulls), flatworms, oyster drills, whelks, and oyster toadfish eat oysters.

REPRODUCTIVE CYCLE

When water conditions are just right, adult oysters release eggs and sperm. The sperm enter the eggs in the water and fertilize them. Oyster larvae swim freely for several weeks, and then sink down to the sea floor. They use their foot to crawl around and search for an adult oyster to settle on. When they find a good spot, the larvae absorb their foot, cement themselves to the surface, and transform into spat. Two to three years later, the oyster is fully grown and ready to breed.

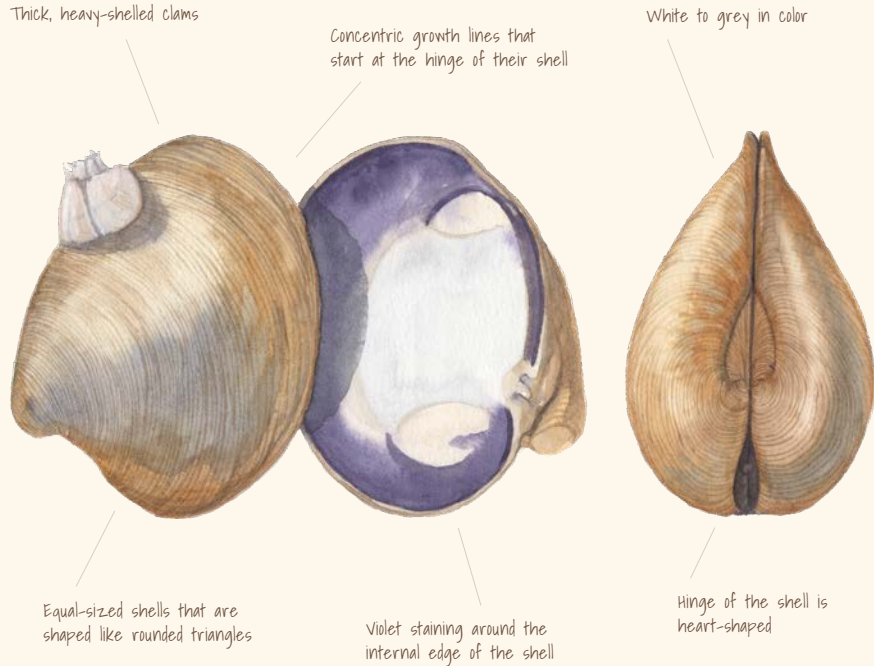
DID YOU KNOW?

People traditionally only ate oysters during months that contained the letter "R." That's because oysters become thin and watery after they reproduce in the summer.

MERCENARIA MERCENARIA

NORTHERN QUAHOG

Phylum Mollusca "Mollusks" · Class Bivalvia "Bivalves" · Order Venerida · Family Veneridae "Venus Clams"



Pictured: A northern quahog with an attached barnacle (left). Northern quahogs are thick, heavy-shelled clams with concentric growth lines on their shells. They are greyish-yellow with purple staining around the inner edge of their shell (middle). If you look at a quahog from the side, the hinge of their shell looks like a heart (right).

HABITAT

Quahogs live in sand and mud flats in the intertidal and subtidal zones. You can find them in estuaries, bays, and on sandy shores.

DIET

Quahogs eat phytoplankton, algae, bacteria, bits of rotting plants, and other small particles.

COMMON PREDATORS

Gulls, oystercatchers, tautog, pufferfish, rays, blue crabs, green crabs, oyster drills, and whelks eat quahogs.



2.5 - 10 cm

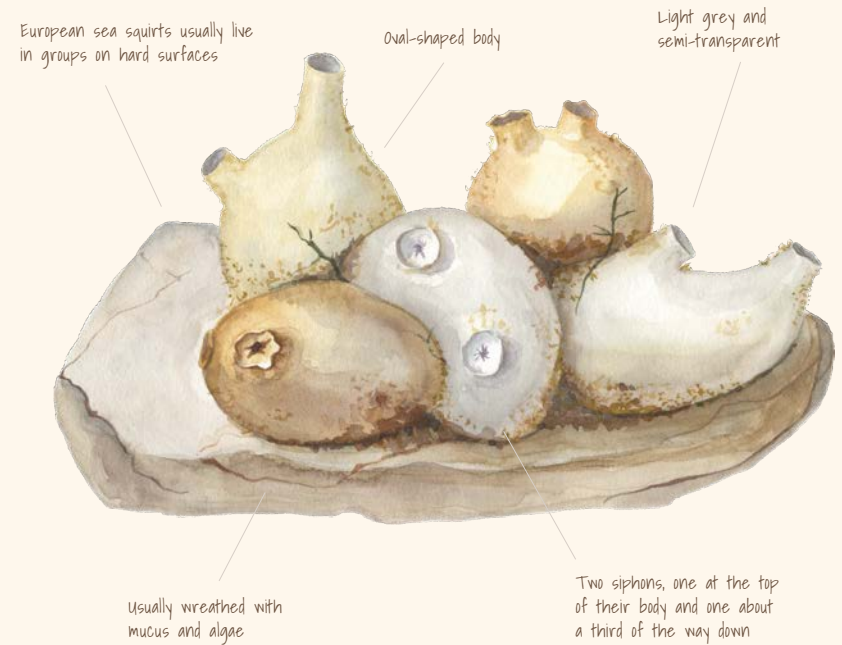
DID YOU KNOW?

Quahogs can live as long as 40 years – unless something eats them first!

ASCIDIELLA ASPERSA

EUROPEAN SEA SQUIRT

Phylum Chordata "Chordates" · Subphylum Tunicata "Tunicates" · Class Ascidiacea "Sea Squirts" · Order Phlebobranchia · Family Ascidiidae



Pictured: A group of algae-covered European sea squirts growing on a rock. European sea squirts are oval-shaped, light grey, semi-transparent tunicates with two siphons.

HABITAT

European sea squirts can live on any type of hard surface, including rocks, oyster reefs, and human-made objects. You can find them in the subtidal zone at up to 300 feet (around 91 meters) below the surface. European sea squirts prefer protected habitat such as estuaries, bays, and harbors.

DIET

European sea squirts eat phytoplankton, algae, bits of rotting organisms, and other particles in the water.

COMMON PREDATORS

Adult European sea squirts have few predators in New York Harbor, but some carnivorous snails eat them.



5 - 13 cm

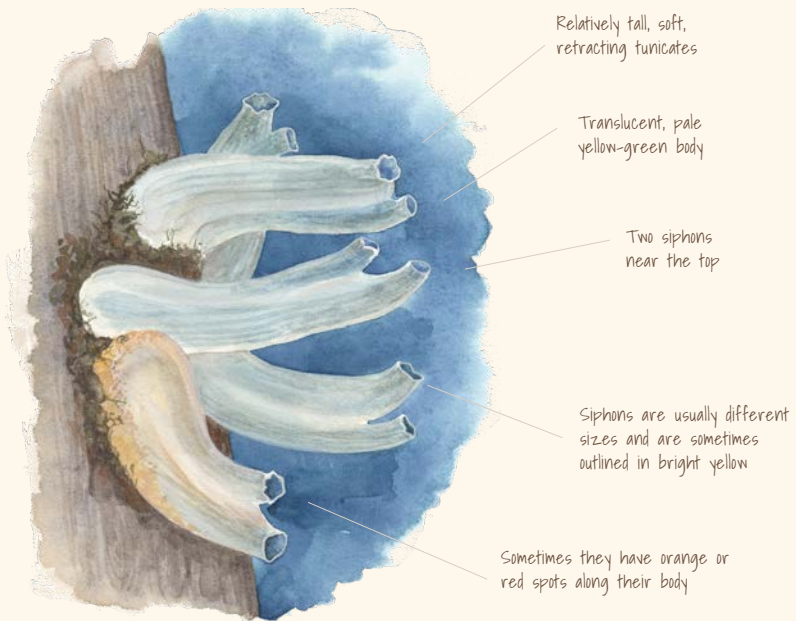
DID YOU KNOW?

Like all tunicates, European sea squirt larvae have a primitive backbone that they lose in adulthood. This means that sea squirts are chordates, and they're more closely related to humans than they are to jellyfish, coral, or any other invertebrates.

CIONA INTESTINALIS

SEA VASES

Phylum **Chordata** "Chordates" · Subphylum **Tunicata** "Tunicates" · Class **Ascidiacea** "Sea Squirts"
Order **Phlebobranchia** · Family **Cionidae**



Pictured: A group of sea vases growing on a wooden dock. Sea vases are tall, semi-transparent tunicates, pale yellow-green in color with two siphons near the top of their body.

HABITAT

Sea vases often grow in shallow water on hard and soft surfaces, including eelgrass, bivalve shells, and rocks. They can also live on human-made items like docks, pilings, aquaculture gear, and metal. Sea vases prefer

protected waters like estuaries, harbors, and bays. They can grow at depths of up to 325 feet (around 100 meters).

DIET

Sea vases eat phytoplankton and bacteria.

COMMON PREDATORS

Fish, crabs, sea stars, and carnivorous snails eat adult sea vases. Moon jellies eat sea vase larvae.



4 - 14 cm

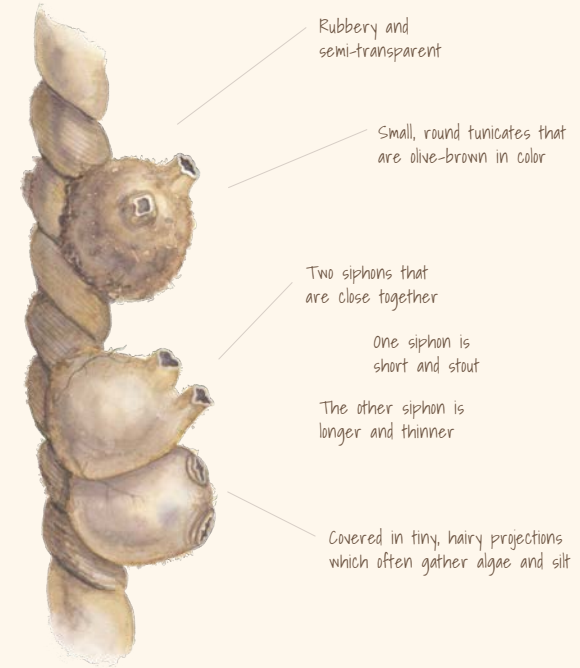
DID YOU KNOW?

Sea vases have pale orange organs, which you can see through their body.

MOLGULA MANHATTENSIS

SEA GRAPES

Phylum **Chordata** "Chordates" · Subphylum **Tunicata** "Tunicates" · Class **Ascidiacea** "Sea Squirts"
Order **Stolidobranchia** · Family **Molgulidae**



Pictured: Three algae-covered sea grapes growing on a rope. Sea grapes are small, round, semi-transparent tunicates with two siphons, one thinner than the other.

HABITAT

Sea grapes are common in urban ports and harbors. You can find them attached to hard or soft surfaces (including rocks, sand, oysters, ships, pilings, jetties, and aquaculture gear) at depths of up to 300 feet (around 90 meters).

DIET

Sea grapes feed on phytoplankton, bacteria, and other particles in the water.

COMMON PREDATORS

Mud crabs and carnivorous snails eat sea grapes.



1 - 3.5 cm in diameter

DID YOU KNOW?

If you gently touch a sea grape, they might squirt a jet of water at you!

BOTRYLLOIDES VIOLACEUS

CHAIN TUNICATES

Phylum **Chordata** "Chordates" · Subphylum **Tunicata** "Tunicates" · Class **Ascidiacea** "Sea Squirts"
Order **Stolidobranchia** · Family **Styelidae**

Colonial, encrusting tunicates that are very brightly colored



Grow in flat sheets with an uneven outline

Zooids are teardrop shaped



Orange Sheath Tunicate
Botrylloides digensis

Zooids are arranged in clusters that form wandering chains within a jelly-like matrix

Can be anywhere from orange, to red, to purple, but each colony is one uniform color

Pictured: A chain tunicate growing on a sea grape. Chain tunicates are brightly colored, flattened tunicates with teardrop-shaped zooids arranged in wandering chains.

DIET

Chain tunicates feed on phytoplankton and other particles in the water.

HABITAT

Chain tunicates grow on many hard and soft substrates, including rocks, pilings, docks, jetties, boat hulls, buoys, seaweed, and bivalves. Chain tunicates mostly live in the shallow, intertidal zone of bays and estuaries. But you can find them at depths of up to 160 feet (around 50 meters).

COMMON PREDATORS

Grazing fish, such as cunner, eat newly settled adult tunicates. In New York Harbor, fully grown chain tunicates have few predators. Some flatworms, spider crabs, sea slugs, and sea snails can eat large chain tunicates.



2.5 mm in diameter; Colonies can be up to 20 cm across and 2 - 3 mm thick

DID YOU KNOW?

Colonial tunicates like chain tunicates are some of the only animals made mostly of cellulose, a material that forms plant cell walls.

BOTRYLLUS SCHLOSSERI

GOLDEN STAR TUNICATES

Phylum **Chordata** "Chordates" · Subphylum **Tunicata** "Tunicates" · Class **Ascidiacea** "Sea Squirts"
Order **Stolidobranchia** · Family **Styelidae**

Flat, encrusting, colonial tunicates



Made of brightly colored zooids in a transparent, rubbery matrix

Can be anywhere from orange, to blue, to grey

Zooids in one colony are always the same color

You can tell this species apart from the chain tunicates by their star-shaped zooid groups

Pictured: Two golden star tunicates growing on a blue mussel. One golden star tunicate is blue and the other is orange, but both are the same species. Golden star tunicates are flattened tunicates with brightly colored, star-shaped groups of zooids in a jelly-like matrix.

thrive in shallow, protected waters like harbors, bays, and estuaries.

DIET

Golden star tunicates eat phytoplankton, zooplankton, and other particles in the water.

HABITAT

Golden star tunicates grow on many hard and soft surfaces, including underwater vegetation, oyster cages, docks, jetties, rocks, and wood. Golden star tunicates

COMMON PREDATORS

Crabs and carnivorous snails eat golden star tunicates.



2.5 - 5 mm in length; Colonies are usually less than 10 cm across and 3 mm thick.

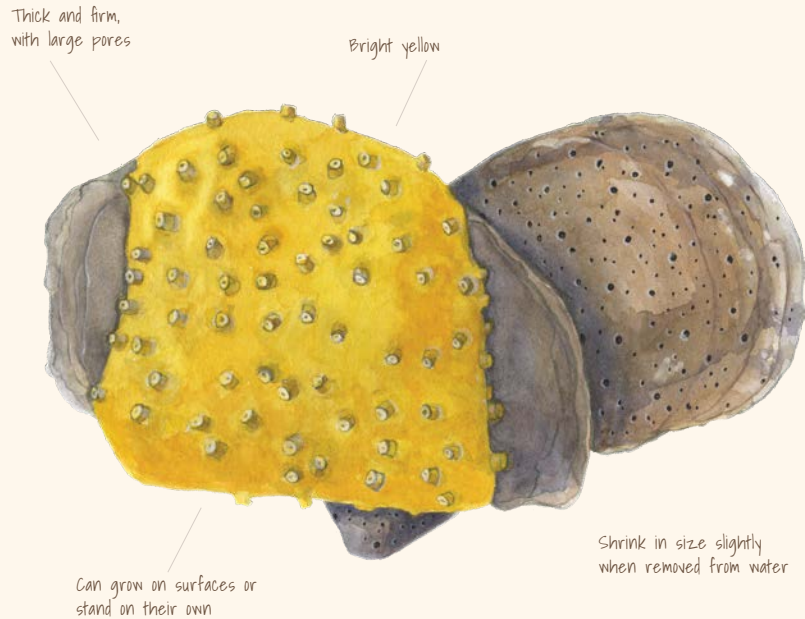
DID YOU KNOW?

Colonial tunicates like golden star tunicates are the only animals with backbones ("chordates") that can reproduce both by budding and by spawning.

CLIONA SPP.

BORING SPONGES

Phylum Porifera "Sponges" · Class Demospongiae "Demosponges" · Order Clionida · Family Clionidae



Pictured: A boring sponge in its "beta" stage growing on an oyster shell (left). Boring sponges are thick, firm, sulfur-yellow sponges with large pores. They can grow on objects or stand alone. Boring sponges drill many tiny holes into bivalve shells (right).

HABITAT

Boring sponges live near the coast in many different kinds of habitat, from rocky ocean shores to polluted estuaries. They are always found growing on or near

calcium-containing surfaces, such as limestone, oyster reefs, or mussel beds.

DIET

Boring sponges eat phytoplankton, zooplankton, and other particles in the water.

COMMON PREDATORS

Snails, isopods, crabs, and sea urchins.



Vary greatly in size. Up to 1 m across; Pores: 2 - 5 mm in diameter

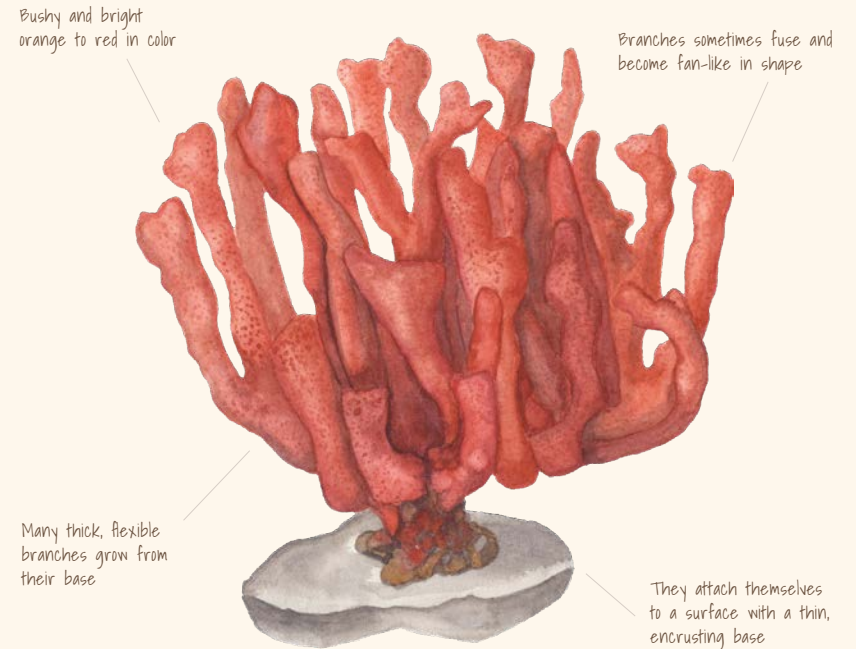
DID YOU KNOW?

Tiny mud crabs have a symbiotic relationship with boring sponges. Mud crabs live inside the sponges' large pores and pay rent by cleaning algae off the sponge.

CLATHRIA PROLIFERA

RED BEARD SPONGE

Phylum Porifera "Sponges" · Class Demospongiae "Demosponges" · Order Poecilosclerida · Family Microcionidae



Pictured: A red beard sponge growing on a rock. Red beard sponges are bright red sponges with many thick branches that grow from a thin, encrusting base.

HABITAT

Red beard sponges are common in protected, shallow waters such as bays, estuaries, salt marshes, eelgrass meadows, and harbors. They can live up to 50 feet (around 15 meters) below the surface. Red beard

sponges commonly grow on the underside of rocks, jetties, shells, and oyster reefs.

DIET

Red beard sponges eat plankton and other small particles.

COMMON PREDATORS

Crabs and sea slugs eat red beard sponges.



Up to 20 cm tall, 30 cm wide. Encrusting base: < 3 mm thick

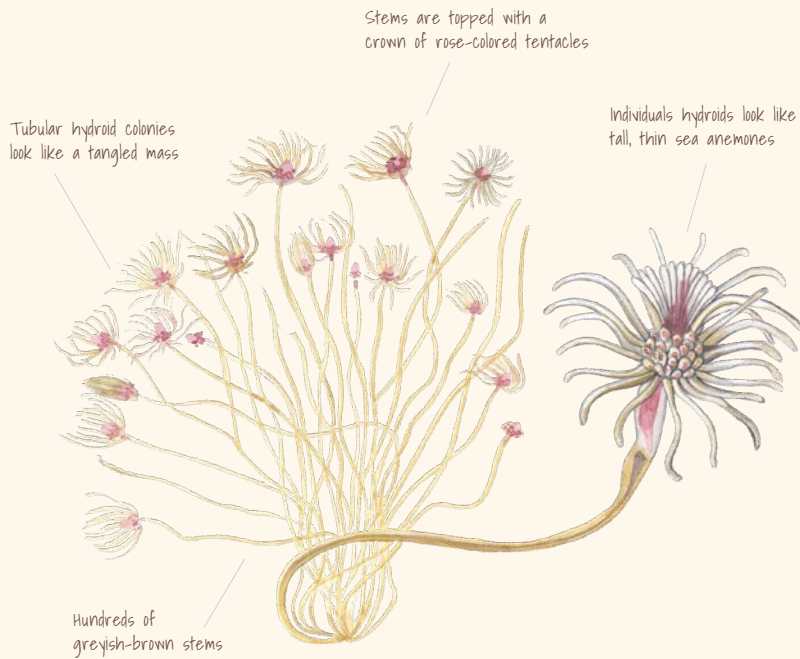
DID YOU KNOW?

Red beard sponges can regenerate their bodies from a tiny broken fragment.

ECTOPLEURA CROCEA

HYDROIDS

Phylum Cnidaria "Cnidarians" · Class Hydrozoa "Hydroids" · Order Anthoathecata "Athecate Hydroids" · Family Tubulariidae



Pictured: A colony of tubular hydroids. Tubular hydroids are long, thin hydroids that grow in a tangled, bushy mass. Each hydroid has a crown of pink tentacles. The hydroid on the right has been enlarged for detail.

HABITAT

Tubular hydroids grow on hard surfaces in the subtidal zone. You can find them on oyster reefs and mussel beds, and on human-made objects like shipwrecks, docks, pilings, boats, and pipes. Tubular hydroids commonly live in polluted coastal environments like urban harbors.

DIET

Tubular hydroids eat zooplankton, including fish, crustacean, and mollusk larvae.

COMMON PREDATORS

Sea slugs, snails, sea stars, flounder, cod, and haddock eat tubular hydroids.

DID YOU KNOW?

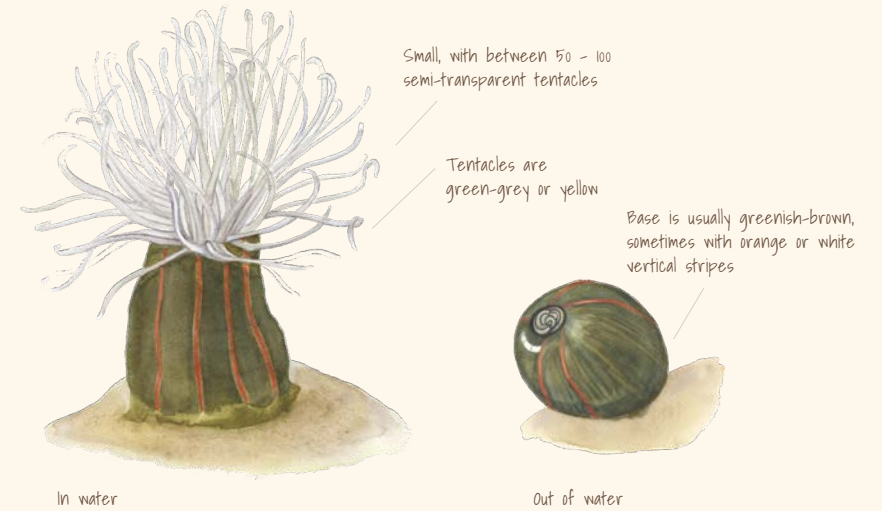
Each hydroid colony can eat its weight in zooplankton every day!



DIADUMENE LINEATA

ORANGE-STRIPED GREEN ANEMONE

Phylum Cnidaria "Cnidarians" · Class Anthozoa "Sea Anemones & Corals" · Order Actiniaria "Sea Anemones" · Family Diadumenidae



Pictured: An orange-striped green anemone in the water (left), with tentacles extended and ready to feed. Orange-striped green anemones are small, greenish-brown anemones with semi-transparent, green-grey tentacles.

(like the undersides of rocks, docks, pilings, wood, and oyster reefs). But they can also grow on cordgrass roots in salt marshes. Orange-striped green anemones prefer to live in sheltered bays, harbors, and estuaries.

An orange-striped green anemone out of the water (right). It has retracted its tentacles into its orange-striped base for protection.

DIET

Orange-striped green anemones eat zooplankton and other small organisms.

COMMON PREDATORS

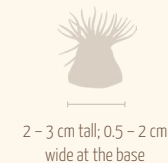
Sea slugs and sea stars eat orange-striped green anemones.

HABITAT

Orange-striped green anemones live on hard surfaces

DID YOU KNOW?

Orange-striped green sea anemones can survive completely drying out during the summer and being covered in ice during the winter!



METRIDIUM SENILE

FRILLED ANEMONES

Phylum **Cnidaria** "Cnidarians"
Class **Anthozoa** "Sea Anemones & Corals"
Order **Actiniaria** "Sea Anemones"
Family **Metridiidae**

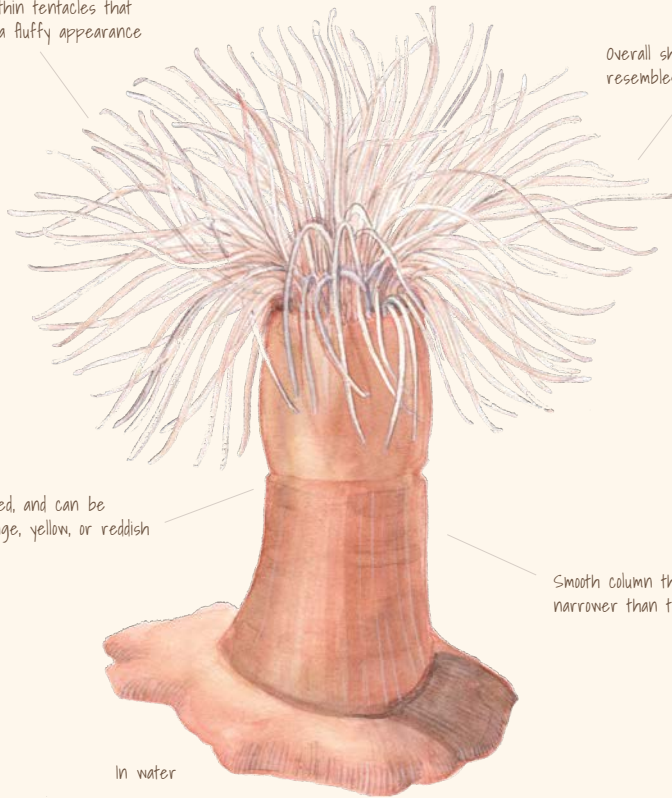
Up to 1,000 thin tentacles that give them a fluffy appearance

Overall shape resembles a palm tree

Light colored, and can be white, orange, yellow, or reddish

Smooth column that is narrower than their base

In water



7.5 - 15 cm diameter at base;
Varying heights: 2.5 - 30 cm

Pictured: A frilled anemone in the water, with tentacles extended and ready to feed (left). Frilled anemones are light-colored, palm tree-shaped anemones with up to 1,000 fluffy-looking tentacles. A frilled anemone out of the water (right), with tentacles retracted for protection.

HABITAT

Frilled anemones prefer to settle on hard surfaces, like rocks, pilings, docks, oyster reefs, and mussel beds. You can find them in areas of the subtidal zone with a strong current. They can live up to 330 feet (around 100 meters) below the surface.

DIET

Frilled anemones eat zooplankton, including the larvae of bristle worms, bivalves, and crustaceans. They also eat copepods and amphipods.

COMMON PREDATORS

Sea slugs, sea stars, sea spiders, flounder, and sea snails eat frilled anemones.

DID YOU KNOW?

Frilled anemones never use their "fighting tentacles" on their parents or offspring. They can tell by touch if a nearby rival is a relative or a stranger.

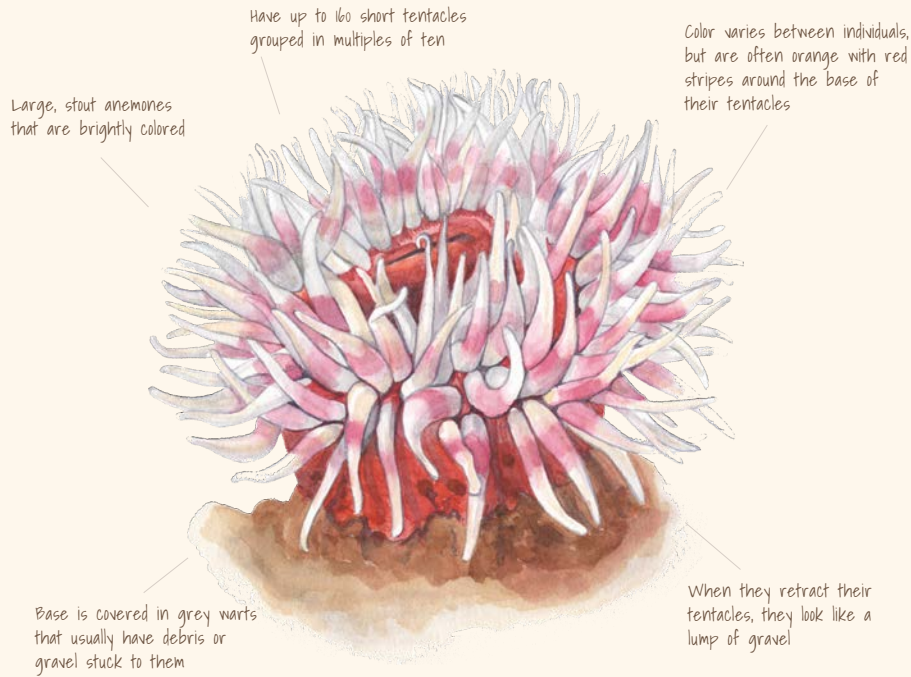


Out of water

URTICINA FELINA

DAHLIA ANEMONES

Phylum Cnidaria "Cnidarians" · Class Anthozoa "Sea Anemones & Corals" · Order Actiniaria "Sea Anemones" · Family Actiniidae



Pictured: A dahlia anemone. Dahlia anemones are large, stout anemones, often brightly colored with stripes around their short tentacles.

DIET

Dahlia anemones eat crabs, limpets, shrimp, bristle worms, and amphipods.

COMMON PREDATORS

Sea slugs, fish, crabs, sea stars, and large bristle worms eat dahlia anemones.

HABITAT

Dahlia anemones prefer shallow, rocky or pebbly areas in the subtidal zone with strong wave action. But you can also find them in mussel beds, among kelp, in estuaries, and at depths of greater than 300 feet (around 91 m).



Base is 7 – 12 cm in diameter; Up to 30 cm with tentacles spread

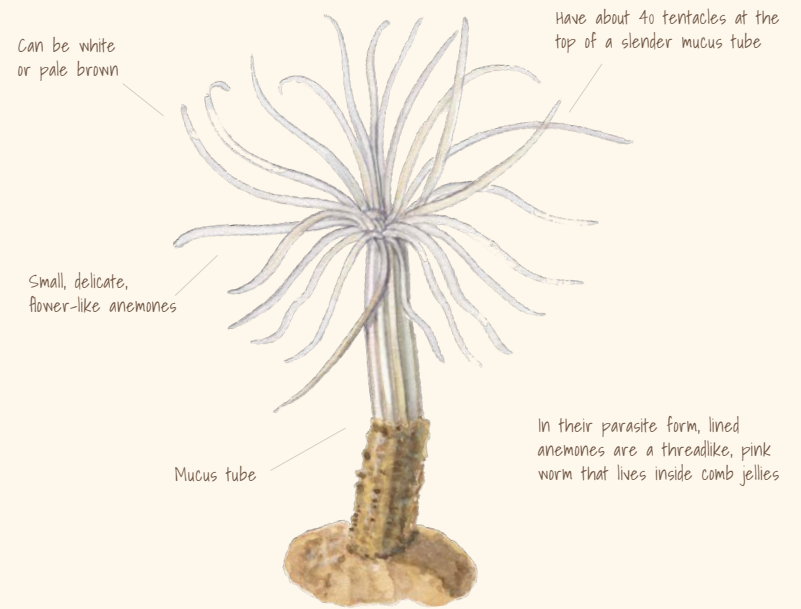
DID YOU KNOW?

Dahlia anemones can live for up to 50 years!

EDWARDSIELLA LINEATA

LINED ANEMONE

Phylum Cnidaria "Cnidarians" · Class Anthozoa "Sea Anemones & Corals" · Order Actiniaria "Sea Anemones" · Family Edwardsiidae



Pictured: An adult lined anemone. Lined anemones are small, pale, flower-like anemones with around 40 tentacles. Lined anemones can also take the form of a pink, wormlike parasite that lives inside comb jellies (not pictured).

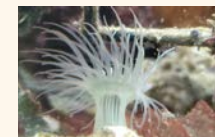
In their parasitic form, lined anemones live inside comb jellies.

DIET

Adult lined anemones eat zooplankton and fish larvae. As parasites, they eat the gut contents of comb jellies.

COMMON PREDATORS

Plankton-eating fish prey on lined anemone larvae. We are still learning about which animals might prey on adult anemones.



2.5 – 3.5 cm tall; parasitic form is about 2.5 cm long

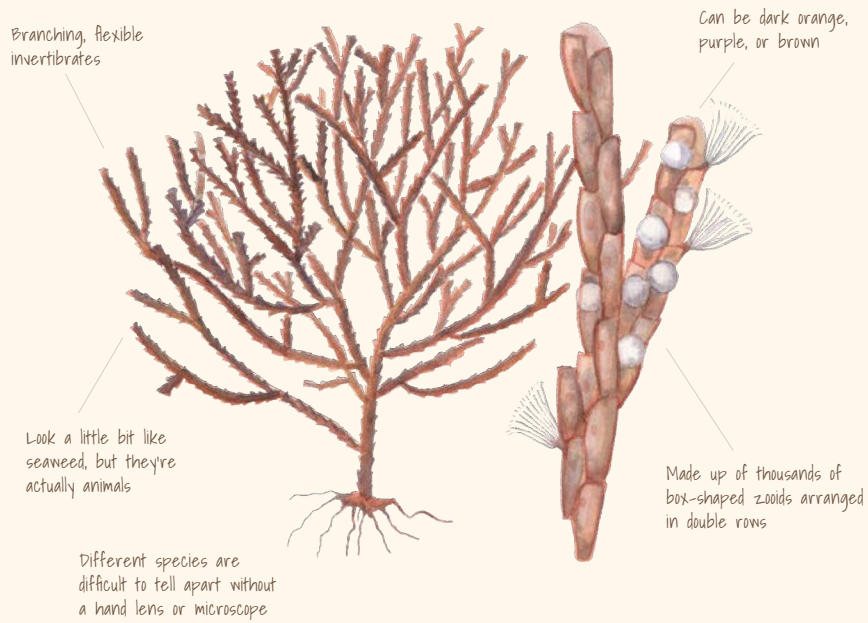
DID YOU KNOW?

You can actually see parasitic lined anemones through the transparent bodies of comb jellies – the anemones look like pink worms.

BUGULA SPP.

BUSHY BRYOZOAN

Phylum **Bryozoa** "Bryozoans" · Class **Gymnolaemata** · Order **Cheilostomatida** · Family **Bugulidae**



Pictured: A bushy bryozoan colony (left). Bushy bryozoans are branching, dark-colored invertebrates made of thousands of box-shaped zooids. If you looked at the zooids under a microscope, you could see their feeding tentacles and round, white egg cells (right).

HABITAT

Bushy bryozoans prefer to grow on hard surfaces, including human-made objects and oyster reefs. You can find them in shallow, protected waters such as harbors, estuaries, and eelgrass meadows.

DIET

Bushy bryozoans eat plankton and other small particles in the water.

COMMON PREDATORS

Sea slugs, sea urchins, and grazing fish eat bushy bryozoans.



2 - 30 cm tall depending on species

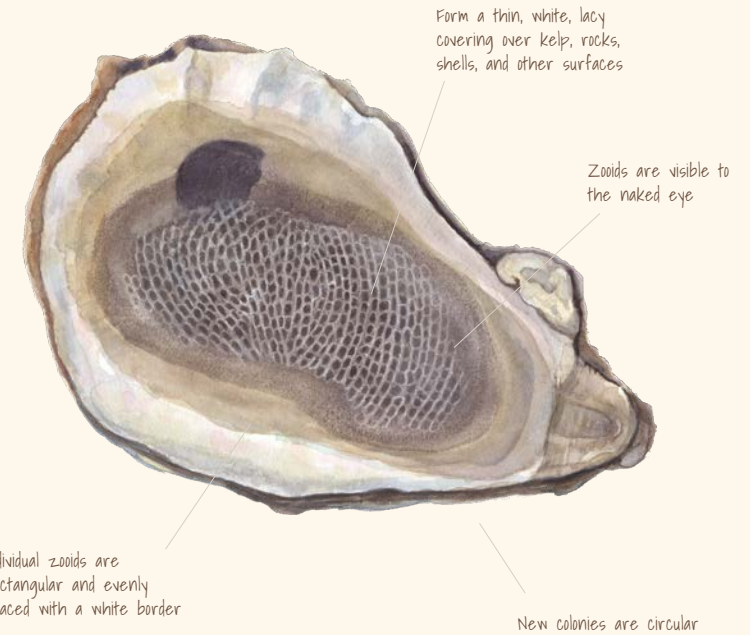
DID YOU KNOW?

Bushy bryozoan larvae can recognize their siblings and will try to settle near them.

MEMBRANIPORA MEMBRANACEA

LACY BRYOZOAN

Phylum **Bryozoa** "Bryozoans" · Class **Gymnolaemata** · Order **Cheilostomatida** · Family **Membraniporidae**



Pictured: A lacy bryozoan colony growing inside an empty oyster shell. Lacy bryozoans are thin, white, lacy invertebrates with rectangular, evenly spaced zooids.

DIET

Lacy bryozoans eat phytoplankton, bacteria, and other small particles in the water.

HABITAT

Lacy bryozoans grow on kelp leaves, rocks, and shells in the shallow waters of the subtidal zone.

COMMON PREDATORS

Sea slugs eat lacy bryozoans in their native range. We don't know of any lacy bryozoan predators in New York Harbor.



Variable; Colonies: up to 8 cm width; Zooids: 0.5 mm length

DID YOU KNOW?

Lacy bryozoan zooids can grow spines to defend themselves against sea slug attacks.

ULVA LACTUCA

SEA LETTUCE

Phylum Chlorophyta "Green Algae" · Class Ulvophyceae · Order Ulvales · Family Ulvaceae



Pictured: A piece of sea lettuce. Sea lettuces are lettuce-like green algae that can grow on a surface or float freely in the water.

DIET

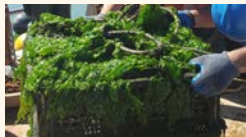
Sea lettuces are photosynthetic.

COMMON PREDATORS

Sea urchins and sea snails eat sea lettuces.

HABITAT

Sea lettuces grow in the shallow intertidal zone. They are often attached to rocks or shells, but can also be free-floating. Sea lettuces are particularly common in polluted bays and estuaries.



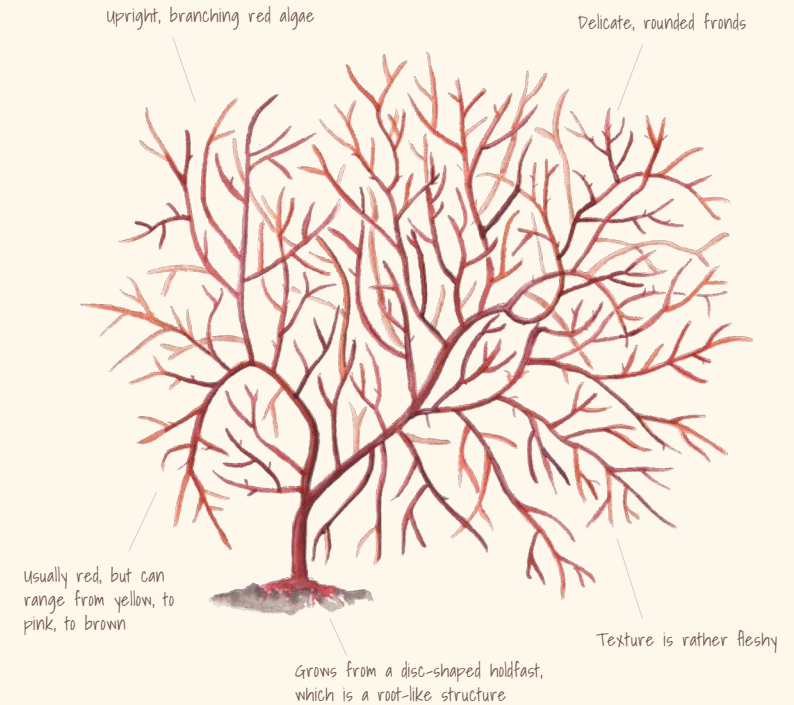
DID YOU KNOW?

Sea lettuces have symbiotic bacteria that tell them to how to develop. Without these bacteria, sea lettuces grow as disorganized clumps of loose cells.

AGARDHIELLA SUBULATA

AGARDH'S RED WEED

Phylum Rhodophyta "Red Algae" · Class Florideophyceae · Order Gigartinales · Family Solieriaceae



Pictured: An Agardh's red weed. Agardh's red weed is an upright, branching red algae with delicate, rounded fronds.

DIET

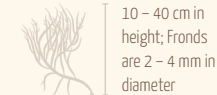
Agardh's red weed is photosynthetic.

COMMON PREDATORS

Sea slugs and sea snails eat Agardh's red weed.

HABITAT

Agardh's red weed lives in the intertidal and subtidal zones. It usually grows on hard surfaces like rocks and shells, but it can also float freely in the water.



DID YOU KNOW?

Agardh's red weed grows on stones or shells. But it can survive and continue reproducing if strong currents or storms rip it free.

SESSILE ORGANISMS OF NEW YORK HARBOR



BARNACLES
Balanidae pg. 72



RIBBED MUSSEL
Geukensia demissa pg. 73



BLUE MUSSEL
Mytilus edulis pg. 74



HYDROIDS
Ectopleura crocea pg. 86



ORANGE-STRIPED GREEN ANEMONE
Diadumene lineata pg. 87



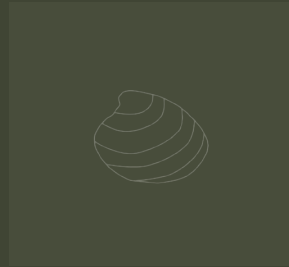
FRILLED ANEMONE
Metridium senile pg. 88



JINGLE SHELL
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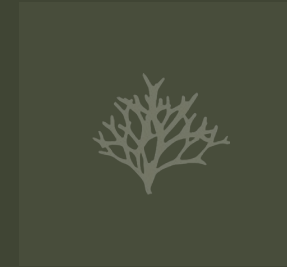
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LINED ANEMONE
Edwardsiella lineata pg. 91



BUSHY BRYOZOAN
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LACY BRYOZOAN
Membranipora membranacea pg. 93



EUROPEAN SEA SQUIRT
Ascidella aspersa pg. 79



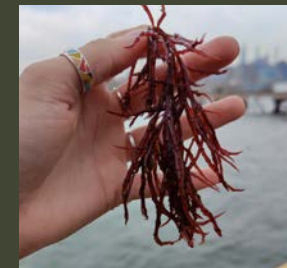
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Molgula manhattensis pg. 81



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Botrylloides violaceus pg. 82



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AGARDH'S RED WEED
Agardhiella subulate pg. 95



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BORING SPONGE
Cliona spp. pg. 84



RED BEARD SPONGE
Clathria prolifera pg. 85

Adaptation (noun): An adaptation is a change that a species makes to become better suited to its environment. Adaptations evolve over several generations through the process of natural selection. An adaptation can be a body structure (like a specially shaped fin), a behavior (like hiding in seagrass), or a physical tolerance (like the ability to breathe in low-oxygen water). Adaptability might help a species survive the effects of climate change.

Algal Bloom (noun): An algal bloom is a sudden increase in algae in the water. During an algal bloom, algae often completely cover the surface of the water. Algal blooms usually happen when an ecosystem becomes eutrophic because of pollution (like sewage or fertilizer from farming). Nutrients like nitrogen and phosphorous run into the water and make algae grow very quickly. Algal blooms can harm the entire ecosystem by blocking sunlight, eating up all the oxygen in the water, and even releasing toxins that can kill fish.

Algonquian (adjective): Algonquian languages are a group of languages spoken by indigenous peoples of North America from the East Coast to the Rocky Mountains.

Ambush Predator (noun): Ambush predators are also called sit-and-wait predators. Ambush predators conceal themselves by hiding or with camouflage and wait for prey to pass by. Then, they launch a surprise attack and quickly capture their prey.

Amphibious (adjective): Amphibious animals can live both on land and in water.

Amphipod (noun): Amphipods are tiny crustaceans that live in many aquatic environments. Amphipods have no carapace and they are usually flattened from side to side. Amphipods are an important food source for many species of fish, crabs, shrimp, worms, and sea anemones.

Apron (noun): An apron is a flap on a crab's underside. The apron is shaped differently in male and female crabs.

Arctic Ocean (noun): The Arctic Ocean is the ocean that surrounds the North Pole. The Arctic Ocean is the world's northernmost and coldest ocean. On the North American side, the Arctic Ocean begins at the very top of Alaska and Canada.

Arthropod (noun): An arthropod is an invertebrate animal with a segmented body and many-jointed legs. Arthropods are a huge group of animals that includes insects, crustaceans, spiders, ticks, horseshoe crabs, centipedes, and millipedes.

Atlantic Ocean (noun): The Atlantic Ocean is the second-largest ocean in the world, after the Pacific Ocean. The Atlantic Ocean separates North and South America from Europe and Africa.

Ballast (noun): Ballast is any heavy material (like rocks, gravel, sand, or water) that people place in the bottom of ships to make them more stable in rough seas. People often collect ballast from wherever the ship is docked. When people collect ballast, they also collect all the organisms that were living in the rocks or swimming in the water. When the ship arrives at its destination, people sometimes dump the ballast and all the organisms back into the water, even if they're halfway around the world. Ballast is a major pathway for invasive species introductions.

Barbel (noun): A barbel is a sensitive, fleshy whisker that grows from a fish's mouth. Fish use barbels to look for food in dim, murky environments.

Benthic Zone (noun): The benthic zone is the ecological zone at the very bottom of a body of water. The benthic zone is home to organisms that live on the sea floor, or buried into the sand/mud.

Biodiversity (noun): Biodiversity is the variety of organisms that live in an ecosystem. Healthy ecosystems often have high biodiversity, or many different species living in them. Oyster reefs are an example of an ecosystem with high biodiversity. You can find many different species of fish, crustaceans, worms, mollusks, and algae all living together on oyster reefs.

Bioindicator (noun): A bioindicator species tells scientists something about the health of the ecosystem that they live in. Bioindicator species can show us that an ecosystem is healthy or unhealthy simply by existing. For example, high bristle worm populations are a sign that an estuary might be polluted. On the other hand, healthy cunner populations are a sign that the water quality is acceptable. Some bioindicators, like grass shrimp, store

toxins in their bodies. Scientists can study grass shrimp to understand how much pollution has entered their habitat.

Bivalve (noun): A bivalve is an aquatic mollusk that lives in a shell. Bivalve shells are made up of a pair of "valves," which are the two cupped halves of the shell. Each valve is connected by a hinge. Oysters, clams, mussels, and scallops are all bivalves.

Bottom Feeder (noun): A bottom-feeder is any aquatic creature that feeds in the benthic zone, which is the very bottom of a body of water. Many bottom-feeding fish are scavengers who eat dead and decaying material that sinks to the bottom of the ocean. Other bottom-feeders eat living organisms in the benthic zone, like bristle worms and clams.

Brackish (adjective): Brackish water is slightly salty water. Brackish water can range in saltness from slightly less salty than seawater to slightly more salty than fresh water. You can find brackish water in habitats where seawater and freshwater meet, like at river mouths or in estuaries.

Brood (verb): Brooding is a way of incubating eggs. Some animals brood their eggs by sitting on them, carrying them on the outside of their body, or keeping them inside a brood pouch. Seahorses and pipefish brood their eggs, as do blue crabs and slipper snails.

Brood Pouch (noun): A brood pouch is a body structure that seahorses and pipefish use to brood their eggs. These fish protect their fertilized eggs inside of their brood pouches until the eggs are ready to hatch.

Bryozoan (noun): Bryozoans are a group of invertebrate animals that live in water. All bryozoans are filter-feeders that strain particles out of the water for food. Bryozoans are colonial animals. They are made up of individual zooids that work together like cells in a body. Bryozoan species can look very different from one another.

Budding (verb): Some organisms can reproduce without a partner through budding. Budding is when a small growth appears on an organism's body. This growth eventually separates from the body and becomes a new individual.

The new individual is basically a clone of the original organism, as they share the same DNA. Jellyfish, tunicates, sponges, and bryozoans can all reproduce by budding. Budding is a great way to reproduce if there are no other members of your species nearby.

Byssal Thread (noun): Byssal threads are thin threads that some bivalves use to anchor themselves to surfaces. Blue mussels and jingle shells can adjust their position by shortening and lengthening their byssal threads. Oysters don't have byssal threads. Instead, they attach themselves to hard surfaces with a cement-like fluid.

Calcium Carbonate (noun): Calcium carbonate is the main ingredient in the shells of oysters, mussels, barnacles, and many other marine animals. These animals can't make their own calcium carbonate - they have to get it from the seawater around them. Normally, there's plenty of free calcium carbonate in the water that animals can use. But with climate change, the ocean has become more acidic, making calcium carbonate harder to find. Many shelled animals now have difficulty growing and repairing their shells.

Camouflage (noun): Camouflage is a type of coloration that helps animals conceal themselves from predators and prey. Camouflage can make animals look like something they're not. For example, spider crabs decorate their body with other organisms so they look like a rock covered in algae and sponges. Camouflage can also help animals blend in with their background. For example, grass shrimp are transparent, which is a type of camouflage that makes them difficult to see on any background. Other species, like flounder and sea horses, can change their color to blend in with different backgrounds. Countershading is an example of camouflage that many fish use.

Carapace (noun): The carapace is the hard, outer shell of a crab or shrimp.

Carbon Dioxide (noun): Carbon dioxide is a greenhouse gas that humans produce when we burn fossil fuels like coal, oil, and natural gas. In the last 200 years, the amount of carbon dioxide in the atmosphere has increased very quickly because of human industry. Atmospheric carbon dioxide is a major cause of global warming and climate

change. Some of the carbon dioxide that we produce ends up in the ocean, where it causes ocean acidification.

Carrageenan (noun): Carrageenan is a gelatin-like substance that red algae make. People add carrageenan to ice cream, jelly, pudding, and cosmetics to make them thicker in texture.

Cape Cod (noun): Cape Cod is a large coastal landform that juts out into the ocean at the southeastern corner of Massachusetts. Cape Cod is just north of Long Island Sound. Above Cape Cod, the ocean becomes much colder than it is around New York Harbor.

Cellulose (noun): Cellulose is the main ingredient in plant cell walls. Cellulose is a tough and fibrous substance that we use to make paper and clothes. Cotton balls are made of 90% cellulose. Colonial tunicates are some of the only animals on earth that can make cellulose.

Chesapeake Bay (noun): Chesapeake Bay is a long, narrow bay that makes up the largest estuary in the United States. Chesapeake Bay separates Maryland from Virginia, and is south of Delaware Bay. Chesapeake Bay is critical habitat for eastern oysters and blue crabs.

Chlorophyll (noun): Chlorophyll is a green pigment that lives inside the cells of plants and green algae. Chlorophyll helps these photosynthetic organisms make their own food. Chlorophyll allows plants and algae to absorb energy from sunlight and transform it into sugars and starches.

Chordate (noun): Chordates are a large group of animals that have a simple backbone at some stage in their life cycle. Humans and fish are both chordates and vertebrates, because we have relatively complex backbones and many other bones that help us move. Tunicates are chordates because their larvae have a simple backbone called a “notochord”. But tunicates are not vertebrates like fish and humans, because tunicates don’t have a complex backbone or any other internal bones.

Cilia (noun): Cilia are tiny, short, hair-like projections that help filter-feeding animals trap plankton.

Cirri (noun): Cirri are slender, hairlike tendrils. In feather blennies, cirri look like two feathery tentacles growing

out of their head.

Colonial (adjective): Colonial animals live together in groups. Some colonial animals (like bats, bees, and ants) form colonies to breed and rest, but can move around independently. Other colonial animals (like tunicates, corals, and hydroids) are physically connected to one another and can’t live independently.

Copepod (noun): Copepods are a group of tiny, shrimp-like crustaceans. Some copepods are zooplankton, while others live in the benthic zone. Copepods are an important source of food for many young fish and filter-feeding animals.

Coronet (noun): A coronet is a crown-shaped, bony crest on a seahorse’s head. Seahorses use their coronet to communicate with other seahorses. The coronet is a seahorse’s “thumbprint,” because each coronet is shaped differently.

Countershading (noun): Countershading is a type of coloration that helps many marine animals camouflage. Fish with countershading have dark-colored backs and light-colored bellies. When a predator looks at a fish from below, the fish’s white belly blends in with the light sky above it. When a predator looks at a fish from above, the fish’s dark back blends in with the dark water (or sea floor) below it. Countershading helps fish blend in with their background from many different angles.

Crustacean (noun): Crustaceans are a group of invertebrate animals that includes crabs, shrimp, amphipods, isopods, and copepods. Crustaceans are a smaller group within a larger group called arthropods, which includes insects and horseshoe crabs.

Cyst (noun): A cyst is a tough, protective coating that forms over some animals during droughts, freezing temperatures, or other harsh periods. Animals like orange-striped green anemones can remain dormant in cysts for several months while they wait for better conditions to return.

Decomposer (noun): A decomposer is an organism that eats dead or rotting material and breaks it down into smaller pieces. Decomposers are very important in food

webs. Without decomposers, ecosystems would be over-run with dead plants and animals. But if there are too many decomposer bacteria in an aquatic ecosystem, they can use up most of the oxygen.

Delaware Bay (noun): Delaware Bay is a large bay that separates southwestern New Jersey from northeastern Delaware. Delaware Bay is south of New York Harbor and north of Chesapeake Bay.

Dormant (adjective): When organisms become dormant, they enter a state that is similar to a very deep sleep. Their normal activities, like feeding, moving, and breathing, may slow down or even temporarily stop. Many fish in New York Harbor become dormant for several months during the winter, when the water temperature is very cold. Dormancy helps animals survive through difficult periods in the year when there isn’t a lot of food available.

Dredging (verb): Dredging is when people scoop out mud and rocks from the bottom of a waterway to make it deeper. New York Harbor has been dredged many times so that large ships can enter the harbor without scraping the bottom. Dredging destroys the aquatic life on the sea floor. It takes a long time for the ecosystem to return to normal after it has been dredged.

Embryo (noun): An embryo is an organism’s developing, unborn (or unhatched) offspring. In many sea creatures, embryos grow inside of eggs after they have been fertilized.

Encrusting (adjective): Encrusting organisms grow as a thin layer (or crust) that is tightly attached to an underwater surface. Sponges, tube-building bristle worms, and tunicates are all examples of encrusting animals.

Erosion (noun): Erosion is a natural process that happens when the repetitive movement of wind and water grinds rocks to dust. Then, these same forces pick up the dust and carry it far away. Storms, rainfall, currents, and human activities can all increase erosion on sea cliffs and river banks. Erosion can happen slowly, over thousands of years. Humans and animals can also make erosion happen too quickly, which is harmful to ecosystems. Some animals, like mitten crabs, make erosion worse by weakening river banks. Other animals, like ribbed mussels, reduce

erosion by stabilizing plants that grow in river banks.

Eutrophic (adjective): All organisms need nutrients to survive. But too much of a good thing can cause problems. Eutrophic ecosystems have too much nitrogen, phosphorous, and other nutrients that algae love. In eutrophic harbors and estuaries, algae and bacteria grow out of control and suffocate the other organisms. In New York Harbor, eutrophication is mostly caused by untreated sewage flooding into the Harbor during rainstorms. That sewage is fuel for algal blooms, which can devastate local ecosystems.

Fertilization (noun): Fertilization is the joining of a female egg and a male sperm. Once the sperm fuses with the egg, the egg is fertilized. The egg can then begin to develop into an embryo.

Filter-Feeder (noun): A filter-feeder is an animal that feeds by straining small particles out of the water. Filter-feeders often have unique body structures in their mouths, gills, or tentacles that help them trap plankton. Filter-feeders make the water clearer by removing algae, mud, and other particles from the water. Filter-feeders are often keystone species, because they can drastically change how an ecosystem looks and functions.

Flatfish (noun): A flatfish is a flattened marine fish (like a flounder) that swims on its side and has two eyes on the same side of its body.

Foot (noun): The foot is a muscular organ that some mollusks use to move around. Snails, whelks, and oyster drills all move using their foot. Some bivalves, like blue mussels and quahog clams, can also move by extending their foot out of their shell and dragging themselves along the ground. Oyster larvae have a foot, but they absorb it after they settle down and metamorphose into spat.

Fron (noun): A frond is a soft, leaflike tendril that some red algae and bryozoans have.

Gamete (noun): A gamete is a generic term for a male or female reproductive cell. Eggs and sperm are examples of gametes. Fertilization happens when male and female gametes fuse together. After fertilization, the embryo can begin to grow and develop.

Genus (noun): A genus is a category that people use to talk about groups of species that are very closely related. When you look at an organism's Latin name, the first word is the genus category. For example, the Latin name for striped killifish is *Fundulus majalis*, and the Latin name for mummichog is *Fundulus heteroclitus*. Both species of fish are in the genus *Fundulus*, which means they are very close relatives.

Gill (noun): Gills are organs that many aquatic animals use to breathe underwater. In fish, gills often look like thin slits near their head. In other animals, like bristle worms and barnacles, gills can look like feathery tendrils. Oysters and other bivalves have gills inside of their shells. Gills are perfectly adapted to remove oxygen from flowing water, but they don't work very well in air. When you handle aquatic animals, make sure to put them back in the water as quickly as possible.

Gill Raker (noun): A gill raker is a body structure that some filter-feeding fish have on their gills. Gill rakers are bristly growths that look like tiny pipe cleaners. As water flows through the gills, plankton get trapped on the gill rakers. Larger gill rakers tend to trap larger prey, like zooplankton. Smaller gill rakers tend to trap smaller prey, like phytoplankton.

Gizzard (noun): A gizzard is an organ that many birds, fish, and invertebrates use to grind up tough food (like seeds or mollusks) before it enters their stomach. Animals with gizzards sometimes eat pebbles on purpose. These pebbles stay in the gizzard and act like a second set of teeth, helping the animal crush and crunch up their food.

Gonads (noun): Gonads are reproductive organs that produce either eggs or sperm.

Gulf of Maine (noun): The Gulf of Maine is a large water body in the Atlantic Ocean. The Gulf of Maine begins above Cape Cod and ends at the southern portion of Nova Scotia, in Canada. The waters of the Gulf of Maine were historically very cold, but they are warming rapidly because of climate change.

Gulf Stream (noun): The Gulf Stream is a warm, fast-moving ocean current that starts in Florida, travels along the coastline of northeastern North America, and then moves

out to sea toward Greenland. The Gulf Stream current is so large that it can influence weather on both land and sea. The Gulf Stream also serves as a highway for many migrating marine fish.

Herbivore (noun): A herbivore is an animal that mainly feeds on plants or algae.

Hermaphroditic (noun): Hermaphroditic animals can produce both eggs and sperm at some point in their life cycle. Some animals start out life as female and eventually become male (or vice versa). Other animals can produce both eggs and sperm at the same time throughout their life. Some hermaphroditic animals, like bryozoans, have male and female individuals living in a single, connected colony. Some hermaphroditic animals can fertilize themselves.

Holdfast (noun): A holdfast is a root-like structure that algae, sponges, and bryozoans use to attach themselves to rocks and other hard surfaces.

Host (noun or verb): Just like you might host a guest in your home, some animals host other animals that live on or in their bodies. Comb jellies host lined anemones, which live inside the comb jellies' guts as parasites during part of their life cycle. Parasites and hosts evolve together very closely. Some parasites can only live on one host species.

Hudson River (noun): The Hudson River is a long river that runs from north to south, beginning in the Adirondack mountains of New York and draining into New York Harbor. The upper part of the Hudson is freshwater, but as you travel closer to the Harbor, the water becomes more brackish and estuarine.

Hybrid (noun): A hybrid animal is the product of two different species mating and reproducing. Most of the time, different species can't successfully breed together. But if they're closely related (like lions and tigers), they can sometimes produce hybrid offspring. Hybrids don't happen very often in the wild. Sometimes, hybrid animals are sterile and can't have offspring of their own.

Hydroid (noun): A hydroid is a life stage for animals called hydrozoans. Hydrozoans are related to jellyfish, corals,

and sea anemones. In hydrozoans, the hydroid stage is sessile and attaches to hard surfaces. Like jellyfish and sea anemones, hydroids use tentacles to filter-feed. Hydroids can look very different from one another, but most are colonial.

Inlet (noun): In a large water body, an inlet is a long, narrow finger of water that juts into the shoreline. An inlet is like a very narrow bay.

Intertidal Zone (noun): The intertidal zone is the area of the shore that is above water during low tide and underwater during high tide. Many plants and animals are adapted to live in the intertidal zone. Intertidal organisms must be able to endure extreme environments, including exposure to air for a few hours.

Introduced (adjective): An introduced species is an organism that humans have intentionally or accidentally brought to a new part of the world. Introduced organisms are not native, but they may or may not be harmful to the ecosystem. People have introduced many species to New York Harbor through international shipping. Green crabs and sea vases are examples of introduced species in New York Harbor.

Invasive (adjective): An invasive species is an introduced species that harms the ecosystem and/or the economy. Invasive species like mitten crabs play an important role in their native ecosystems. But when people introduce invasive species to new parts of the world, they can throw off the balance of the ecosystem. Often, invasive species have few predators in their introduced range, so they can grow out of control. In some cases, invasive species have caused the extinction of other species.

Invertebrate (noun): An invertebrate is any animal that doesn't have a backbone. Most of the animals on earth are invertebrates, including all insects, crustaceans, worms, octopuses, squid, jellyfish, sea anemones, sponges, and bivalves (like oysters). Some invertebrates have external skeletons (or "exoskeletons"). Other invertebrates have soft bodies and live inside of shells.

Iroquois (noun): The Iroquois (or Haudenosaunee) people are an indigenous confederacy whose historical homelands extend throughout the northeastern

United States. The Iroquois confederacy is also known as the Six Nations, and is made up of the Mohawk (or Kanien'kehá:ka) Onondaga (or Onöñda'gaga'), Oneida (or Onyota'a:ka), Cayuga (or Gayogohó:ño'), Seneca (or Onödowá'ga), and Tuscarora (or Skarù:re) tribes.

Isopod (noun): Isopods are small, armored crustaceans that usually live around water. Pill bugs (or roly-polys) are probably the most famous isopods. All isopods have two pairs of antennae and hard plates covering their bodies. Some isopods are parasites that suck the blood of fish. Other isopods live freely and eat rotting wood, plants, or plankton.

Jetty (noun): A jetty is a human-made structure that sticks out into the water from the land. Jetties can be made of wood, rocks, or concrete. In urban harbors, jetties act like artificial reefs that provide shelter for fish, crabs, and sessile organisms.

Juvenile (noun or adjective): A juvenile is a young animal.

Kelp (noun): Kelp is a large brown alga (or seaweed) that grows in dense, underwater forests. Kelp forests support a lot of biodiversity, but they are threatened by climate change and invasive species.

Keystone Species (noun): A keystone species is an organism that drastically changes the environment it lives in. Keystone species are critically important to the health of ecosystems. Keystone species can be very small, like krill. They can also be huge, like bison. Oysters are an example of a keystone species. Estuaries with oyster reefs look very different (and support much more biodiversity) than estuaries without oyster reefs.

Landlocked (adjective): A landlocked water body is completely surrounded by land and has no exit to the ocean.

Larva (noun): A larva is the hatchling (or newborn) form of many marine animals. Larvae usually look quite different from their adult form. Many sessile animals, like oysters, have mobile larvae that swim around in the water. Eventually, the larvae will metamorphose into their adult form.

Lenape (noun): The Lenape (or Lenni Lenape) people are an indigenous tribe whose historical homeland includes

parts of Pennsylvania, New Jersey, and New York. The Lenape were the main inhabitants of the New York Harbor area when the first Europeans made contact in the 16th century.

Limpet (noun): A limpet is a type of aquatic snail. Limpets have pyramid-shaped shells. They cling tightly to rocks in the intertidal zone.

Long Island (noun): Long Island is a large, populated island due east of Manhattan. Long Island forms the eastern border of New York Harbor. The New York City boroughs of Brooklyn and Queens are on Long Island. The stretch of ocean in between Long Island and mainland New York/Connecticut is known as Long Island Sound.

Marine Snow (noun): Marine snow is a shower of organic particles that falls from the surface of the water down to the depths of the ocean. Marine snow is made of bits of dead animals, plankton, and fish poop!

Matrix (noun): In tunicates, the matrix is a jelly-like substance that holds zooids in place.

Medusa (noun): The medusa is the free-floating life stage of a jellyfish. The medusa is what you think of when you imagine a jellyfish. Medusas have an umbrella-like shape and stinging tentacles. Medusas reproduce by spawning eggs and sperm into the water. Many jellyfish also have a polyp stage. Unlike medusas, polyps are sessile and reproduce by budding.

Metamorphosis (noun): Metamorphosis is when an animal transforms from its larval form into its adult form. Caterpillars metamorphose when they turn into butterflies. Just like caterpillars, many aquatic creatures metamorphose at some point in their life. Fish larvae undergo metamorphosis when they transform from zooplankton into young fish.

Midden (noun): A midden is a trash dump where people once threw out unwanted material, like bones, vegetable matter, and shells. Modern-day humans can learn a lot about earlier societies by looking at their middens.

Migration (noun): A migration is a long journey that some animals undertake at certain times of year. Animals mi-

grate for many reasons, including to find food, to escape extreme weather, and to breed.

Mollusk (noun): Mollusks are a large group of invertebrate animals. Snails, slugs, bivalves (like mussels and oysters), octopuses, and squid are all mollusks. Mollusks have soft, squishy bodies that are often covered with hard, protective shells. Mollusks usually live in or near water.

Molt (verb): Molting is when animals shed their skin, shells, feathers, or hair. Crustaceans (like crabs and shrimp) have to molt their carapaces every now and then as they grow larger.

Monogamous (adjective): Monogamous animals have only one mate at a time. Seahorses are a rare example of a monogamous fish.

Mycobacteriosis (noun): Mycobacteriosis is a fish disease caused by harmful bacteria.

Narragansett (noun): The Narragansett people are an indigenous tribe whose historical homeland is in Rhode Island. The Narragansett language is in the Algonquian language family.

Narragansett Bay (noun): Narragansett Bay is a narrow bay and estuary at the southern boundary of Rhode Island, southwest of Cape Cod and northeast of Long Island.

Ocean Acidification (noun): Ocean acidification is a harmful consequence of climate change. When humans burn fossil fuels (like oil), we release lots of carbon dioxide as a waste product. Some of the carbon dioxide we release enters the ocean and dissolves in seawater. Carbon dioxide has made the ocean more acidic today than it has been for millions of years. Animals that make shells, like oysters, have difficulty growing and surviving in acidic water.

Omnivore (noun): An omnivore is an animal that eats a mixture of plants and animals.

Onondaga (noun): The Onondaga (or Onōnda'gaga') people are an indigenous tribe whose traditional homeland is in upstate New York, south of Lake Ontario and in the vicinity of the Finger Lakes. The Onondaga people are

members of the Iroquois (or Haudenosaunee) Confederacy.

Oral Arms (noun): Oral arms are four long, stinging tentacles that jellyfish use to hunt and eat. Jellyfish use their oral arms to stun plankton and bring them to their mouth.

Parapodia (noun): Parapodia are bristly structures that bristle worms use to crawl, swim, hunt, and/or breathe underwater.

Parasite (noun): A parasite is an animal that lives on or inside another animal. Parasites always harm their host animal in some way. Some parasites steal a portion of whatever their host eats. Other parasites suck their host's blood or burrow into their flesh. Some parasites weaken and eventually kill their host, but most parasites have less-than-lethal effects.

Pelagic Zone (noun): The pelagic zone is the area from the surface of the water to just above the sea floor. Pelagic animals spend much of their time swimming in the water column, unlike benthic animals which live on or in the sea floor.

Periostracum (noun): The periostracum is a skin-like coating on the surface of some animals' shells.

Pheromone (noun): A pheromone is a chemical that animals produce and release into their environment. Other animals smell the pheromone and it changes their behavior in some way. Pheromones can trigger animals to run away, attack, group up, or get ready to breed.

Photosynthesis (noun): Photosynthesis is how green plants and algae create their own food from sunlight, carbon dioxide, and water. Photosynthesis involves a green pigment called chlorophyll that is found inside of plant cells.

Phytoplankton (noun): Phytoplankton are microscopic, plant-like organisms that use photosynthesis to create their own food from sunlight. Phytoplankton are usually smaller than zooplankton, which are animal-like plankton that eat other plankton.

Pilings (noun): Pilings are sturdy posts that hold up docks and piers. Pilings can be made out of wood, metal, or concrete. In urban harbors, pilings act as habitat and shelter for many aquatic plants and animals.

Poaching (verb): Poaching means illegally hunting, fishing, or collecting plants. Hunting and fishing laws are meant to protect wildlife populations and make sure that nobody harvests too many plants or animals. When people poach plants and animals, they put those species at a higher risk of becoming endangered or locally extinct.

Polyp (noun): A polyp is the sessile life phase of a jellyfish. Polyps look like tiny sea anemones. They grow attached to surfaces and use their stinging tentacles to capture plankton. Polyps reproduce by budding. Polyps also produce medusas, which are the free-floating life phase of a jellyfish.

Prehensile (adjective): Prehensile tails are able to grasp tightly onto objects. Many monkeys have prehensile tails, as do seahorses.

Proboscis (noun): A proboscis is a tube-shaped organ that bristle worms use to capture prey. Some bristle worms keep their proboscis tucked away unless they are hunting. When it's time to eat, they extend their proboscis, which often has a pair of jaws at the end of it.

Radula (noun): Snails and slugs have radulas, which are sandpaper-like, tongue-like organs. Herbivorous snails use their radulas to scrape algae off of rocks. Carnivorous snails like oyster drills use their radulas to drill into bivalve shells.

Ram-Feeding (noun): Ram-feeding is a hunting strategy that some carnivorous fish use to capture their prey. Ram-feeding predators swim forward quickly with their mouth open and swallow their prey.

Ray (noun): Fish fins have long, thickened rays which support the thinner webbing that makes up the fin. Fin rays can be hard and bony (sometimes called spines), or soft and flexible.

Rostrum (noun): In crustaceans (like shrimp and crabs), the rostrum is a beak-like snout in between their eyes.

The rostrum is part of the carapace.

Sac (noun): A sac is a body structure that acts like a bag or pouch. Egg sacs are simply hollow, flexible structures that carry eggs.

Sargasso Sea (noun): The Sargasso Sea is a large sea in the Atlantic Ocean. The Sargasso Sea stretches from the east coast of North America to the west coast of Africa, and from northern Canada to the Caribbean. The Sargasso Sea is surrounded by four currents that swirl around its edges, but the Sea itself is very calm. The Sargasso Sea is the only place in the world where American eels breed.

Scavenger (noun): A scavenger is an animal that eats dead, rotting plants and animals. Scavengers don't hunt and kill their own food. Instead, scavengers spend much of their time searching for carcasses and other decaying material.

School (noun): A school is a large group of fish that swims together, often in coordinated patterns.

Sessile (adjective): Sessile organisms stay in one spot for most of their adult lives. Oysters are examples of sessile animals, although oyster larvae do swim around before their metamorphosis. Some animals are only partly sessile – they are capable of moving if necessary, but most of the time they remain fixed in place.

Siphon (noun): A siphon is a tube-shaped organ that some animals use to inhale water, oxygen, and food and to exhale waste and larvae.

Sound (noun): In geography, a sound is a long, thin stretch of ocean that separates two bodies of land. A sound is like a large inlet.

Spat (noun): Spat are oyster larvae that have settled down and attached themselves to a hard surface.

Spawn (verb): Spawning is when aquatic animals release their eggs and sperm into the water. The eggs and sperm mingle in the water and fuse randomly. Spawning usually happens at certain times of year, when water conditions are just right.

Sperm (noun): Sperm are male reproductive cells. Sperm can swim freely with the help of a long tail. Fertilization happens when an egg and a sperm fuse together. After fertilization, the embryo can begin to grow and develop.

Spermatophore (noun): A spermatophore is a small package that contains lots of sperm and (sometimes) nutrients. In some species, the male animal creates spermatophores and passes them over to the female.

Spore (noun): In algae, spores are reproductive cells. Spores can swim freely, and they don't need to be fertilized to grow and develop into a new individual.

Streamlined (adjective): Streamlined animals have a body shape that helps them move quickly through the water. Streamlined fish are often shaped like a torpedo or a jet plane, with a pointed snout and a wider body. Streamlining reduces drag on the animal's body as they swim.

Stress (noun): In wild animals, stress is simply a response to threats and challenges. Stress can be a good thing, because it helps animals escape from potentially dangerous situations. But too much stress can be harmful to an animal's health.

Subtidal Zone (noun): The subtidal zone is the part of the ocean that is below the low tide line, but still relatively shallow and close to shore. The subtidal zone is covered by water at all times. The subtidal zone is home to organisms that cannot tolerate being exposed to air, but still like to live in shallow, coastal water.

Surf Zone (noun): The surf zone is the part of the ocean where waves break near the shore. The surf zone is relatively shallow, and is home to many crabs, clams, and young fish.

Sustainable (adjective): Sustainable activities don't use up natural resources faster than they can be replenished. In sustainable fisheries, the fish population remains stable or grows even with some amount of fishing. Scientists have to study fish populations very carefully to make sure that fisheries remain sustainable.

Swimbladder (noun): The swimbladder is an air-filled organ that helps fish float. Fish control how much air fills

up their swimbladder depending on where they want to swim. When fish want to rise to the surface, they inflate their swimbladder with oxygen from the surrounding water. When fish want to sink to the sea floor, they deflate their swimbladder. Some fish don't need a swimbladder, because they spend their whole life near the sea floor.

Symbiosis (noun): A symbiosis is any close relationship between two different species. Parasitism is a type of symbiosis where one animal benefits and the other animal is harmed. "Mutualism" is another type of symbiosis where both animals benefit from the relationship. A classic example of a mutualistic symbiosis is the relationship between sea anemones and clownfish. Sea anemones protect clownfish from predators, while clownfish feed sea anemones with their droppings.

Telson (noun): A telson is a tail-like appendage that some arthropods have. Horseshoe crabs use their telson to maintain their balance and to flip themselves over if they get turned upside down.

Territorial (adjective): Territorial animals defend a piece of habitat from other animals of the same or different species. Territorial animals can be aggressive to other animals, and might chase away or even try to hurt intruders in their territory.

Thorax (noun): In arthropods, the thorax is the middle section of the body in between the head and the abdomen.

Trait (noun): In biology, a trait is a physical attribute or behavior that comes from your DNA. You inherit many traits from your biological parents. Having dimples, being left-handed, and enjoying the taste of cilantro are all traits. The traits that animals inherit can determine whether they survive or die, especially in changing environments.

Trophic Cascade (noun): Trophic cascades happen when one level of the food web disappears from the ecosystem, usually because of human activities. Trophic cascades cause compounding problems in the ecosystem that can be difficult to predict. Overfishing can cause trophic cascades in lakes and estuaries. When people harvest too many predatory fish, zooplankton-eating fish grow out of control and eat all of the zooplankton in the ecosystem.

Without zooplankton, phytoplankton grow out of control and turn the surface of the water green.

Tunicate (noun): Tunicates are a group of marine invertebrate animals that includes sea squirts. Tunicates are sessile (non-mobile), and often grow on hard surfaces in harbors. Tunicates can be colonial or live independently. Tunicates use two siphons to filter-feed on plankton in the water.

Upstream (adjective): Upstream means in the opposite direction of water flow in a river. If you head upstream, you will be traveling toward the source of the river and away from the river mouth, which is near the ocean.

Vertebrate (noun): A vertebrate is an animal that has a backbone and (usually) an internal skeleton. Humans and fish are vertebrates. Crustaceans, insects, snails, and most of the animals in the world are invertebrates.

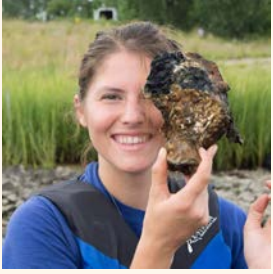
Vulnerable (adjective): Vulnerable species are likely to become endangered in the future. In a more general sense, vulnerable can mean that an animal is sensitive to environmental conditions or at risk of declining.

Wampanoag (noun): The Wampanoag (or Wôpanâak) people are an indigenous confederation of tribes whose historical homeland is in southeastern Massachusetts.

Wampum (noun): Wampum are cylindrical beads made out of whelks and quahog clams. Indigenous peoples of New York use wampum in storytelling, ceremonies, and trade. Wampum are very important to dozens of tribes Eastern North America.

Zoid (noun): In tunicates and bryozoans, zooids are the individual animals that make up a colony. Zooids are like cells in an organism. Each zooid has different functions and abilities. Zooids can reproduce by budding.

Zooplankton (noun): Zooplankton are microscopic, animal-like plankton that eat other plankton. Zooplankton are often larger than phytoplankton. Many fish, crustaceans, and bivalves (including oysters) start out their lives as zooplankton before they metamorphose into their adult form.



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Agata Poniatowski is the Outreach and Engagement Manager at the Billion Oyster Project. Agata manages the Oyster Research Station Program engaging with schools throughout New York City, providing outdoor education opportunities, community engagement and developing harbor related informal education curriculum. She graduated with a B.S in Sustainable Development and Natural Resource Management through the CUNY BA program. In the past, she interned with WWF Bhutan, WCS in Coney Island and Organization for Aquatic Resource Management in the Sinharaja Forest Reserve, Sri Lanka.



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As a founding teacher of New York Harbor School, Ann brings her knowledge of field science and love of teaching to the Billion Oyster Project. When she's not in the classroom or at the water's edge educating others, you will find her enjoying the outdoors and spending time with her sons, Theo and Benji. Ann is a pathfinder currently working to expand harbor literacy through the development of new Harbor Schools focused on the marine environment and careers.



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