

Commonly seen organisms in Oyster Gardens

This guide was designed to help gardeners identify the many other organisms (besides oysters!) that may inhabit the gardens over the year. Some of these organisms are good, others are harmful to the oysters; but all play a certain role in the oyster reef ecosystem. Inside are some facts about the organisms, and ways to identify it (including pictures).

If you find an organism that you cannot identify, send a picture to afitzgerald@nicu.edu and we will try and identify it! (If you take some really cool photos of your gardens and associated organisms and want to share, send them too!)

Part 1: Predators

These are all organisms that can harm your oysters. They may eat the actual flesh of the oyster, weaken the shell, or simply outcompete the oysters for food and oxygen. If you see a large number of these predators in your garden, be sure to make a note in your data sheet.

Oyster drills (*Urosalpinx cinerea*):

- A small (up to 1 inch) *gastropod* (snail) with a single shell that has one end open and flared out.
- Extremely abundant in intertidal and subtidal areas in northeast.
- Oyster drills prey on oysters by using their long, rough *radula* (tongue-like appendage) to bore a hole in the shell of the oyster and suck the meat out.
- Cannot withstand low salinity, which helps to protect oysters in less saline areas.
- Responsible for a majority of the mortality seen on oyster reefs in NY/NJ/DE/MD/VA

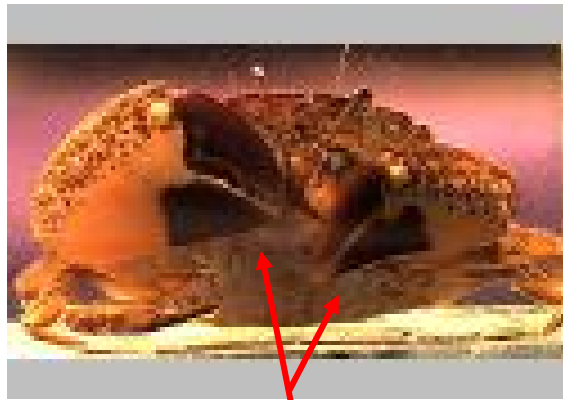


Mud Crabs:

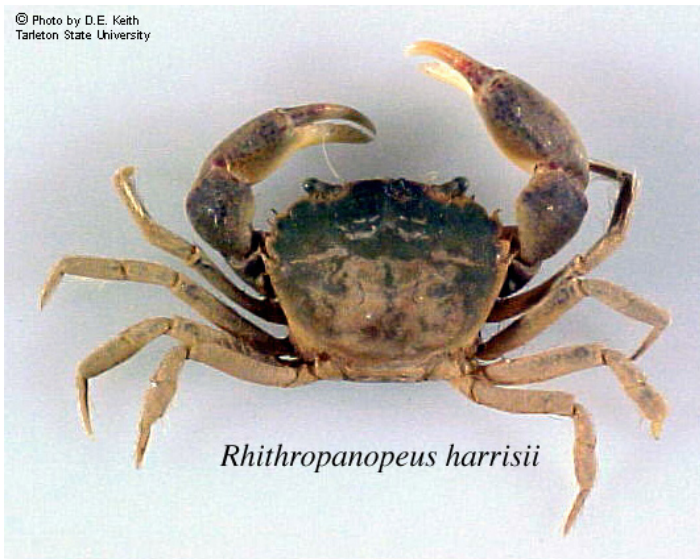
- Small crabs (less than 1 inch) with 10 legs; the front legs have claws (one bigger than the other).
- Claws can be colored differently; the rest of the body is a lighter brown.
- Prey on juvenile oysters and crabs; can crush the shells of up to ½ inch bivalves!
- Species found in NY/NJ:
 - Black fingered mud crab (*Neopanopeus sayi*): claws are usually black/ dark colored ; the most common crab found in estuaries/ intertidal areas.
 - White fingered mud crab (*Rhithropanopeus harrisi*): fingers are lighter than the rest of the body; found under rocks or on oyster beds in brackish water.



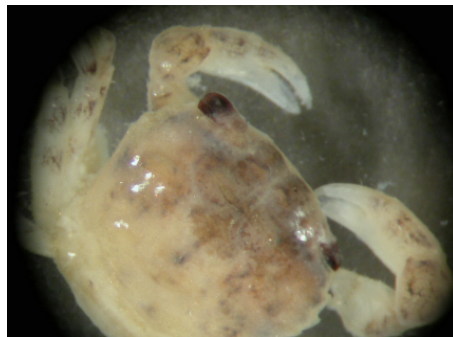
N. sayi



Note the claw sizes



Rhithropanopeus harrisi



Blue Crabs (*Callinectes sapidus*):

- With a wider shell than mud crabs, and larger size (up to 9 inches for adults).
 - Last pair of legs are modified into *swimmerettes*.
 - Spiny projections off the sides of the *carapace* (body).
- Olive green-bluish coloring, with brighter blue color under claws and a whiter underbelly.
- More common in estuaries than intertidal coastal areas, but can live in deeper water as well, and freshwater.
- Crabs “molt” and shed their exoskeletons periodically.
 - It is during this intermitten time when ‘soft-shelled’ crabs are caught for commercial fisheries.



juveniles

swimmerette

Note the wide carapace with a spine on each side



Green Crab (*Carcinus maenas*):

- The shell has 5 *teeth* (small pieces sticking out) behind each eye; the shell is about 90 mm wide.
- Usually a darker green color on top, with a yellowish underbelly; during *molting* the color can become orange and blotched with white spots.
- Found commonly in marine and estuarine shallows and intertidal areas, usually by sandy or rocky substrates, or salt marshes in which they can hide.
- Known to eat bivalves, especially juvenile oysters (the crab is limited by the oyster's size- it can't eat larger oysters).
 - Green crabs are thought to have destroyed several bivalve populations, including soft shell clams in New England.
- This is an *invasive species*- one that is not native to the NY/NJ area, but was introduced here by accident (usually from boats) and now thrives in our local ecosystems.
 - Harms native intertidal crabs (like the Dungeness crab, *Cancer magister*) by preying on juveniles and outcompeting them for food and space.

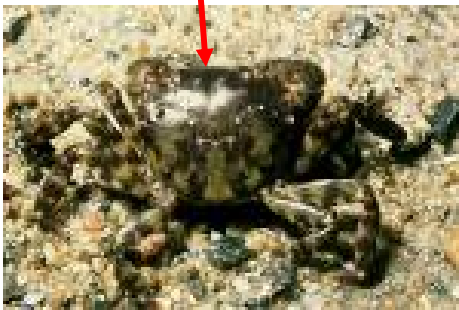
Note the
teeth
behind
each eye



Japanese Shore Crab (*Hemigrapsus sanguineus*):

- Another *invasive species*, it first appeared on the NJ coast in 1988 and quickly spread north.
- Occurs in the intertidal zone, using the rocks as places to hide and forage for food; also seen on oyster reefs and mussel beds.
- Small size (adults are usually up to 1.5 inches) with a more square-shaped *carapace* (the part of the shell that covers the main body) than other crabs.
- Usually dark brown- green-black in color; *walking legs* are usually banded in color.
- Eats blue mussels, soft-shell clams, and oysters mainly; can have a large effect on these populations.

Square-shaped *carapace*



Note the colored leg-bands

Flatworms:

- These flattened, wider worms are usually found as *parasites* (an animal that lives off of another, causing harm or death to the host) on larger organisms, such as oysters.
 - Very small size (up to 1 inch) and usually need to be identified to species with microscope.
 - Thin, translucent body with 2 eyespots and no appendages.
- Feed on oysters and barnacles by slipping under the shell and eating the animal from within.
- There are also free-living (non-parastic) species that can be found under rocks and inside shells in shallow estuarine waters.
- Species found in NY/NJ:
 - Oyster flatworm (*Stylochus ellipticus*): pale colored with *eyespecks* along front margin and tiny *tentacles* on top of body.

*Note: there are very few clear pictures of these around, especially when not on the oyster shell. If you think you may have found a flatworm, consult a reference guide or scientific text for confirmation.

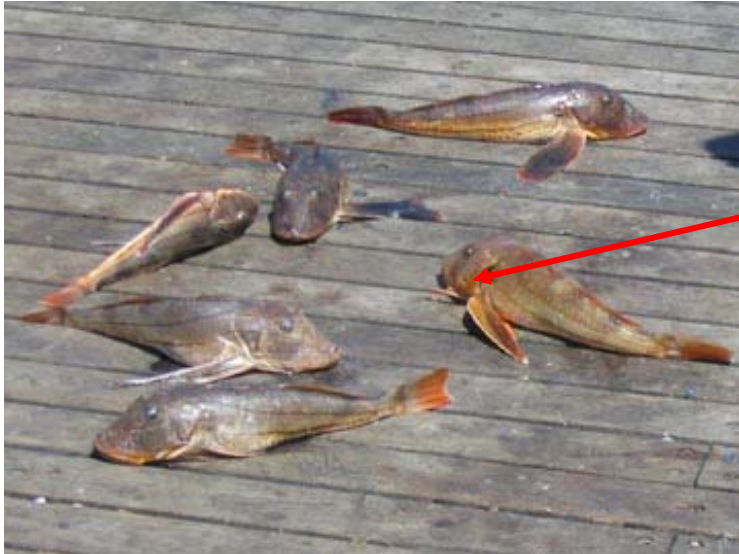
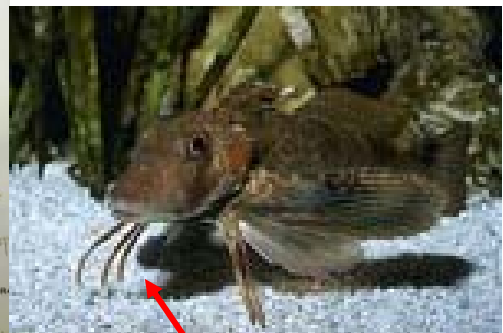


2 worms in each
shell are pictured



Sea Robin (*Prionotus carolinus*):

- A small fish (usually smaller than 1m long as adults) that lives its life near the bottom of the intertidal area.
- The fish can make a loud, drumming sound by causing its *swim bladder* (an internal organ that helps keep the fish afloat in the water) to vibrate
- It has a bony head, and larger *pectoral fins* (located towards the head of the fish, under the gills).
 - The fins almost resemble stubby 'arms' as they are very fleshy.
 - Three spines are coming off of each fin and are used as feelers.
- Grey- reddish brown coloring, with some paler spots and stripes on the back and sides; white coloring on belly; yellowish- brown fins
- Feeds on bivalves, worms, crustaceans, and other smaller fish.



Spiny-projections off
the pectoral fins

Seen off of Coney Island, NY

Black Fish (*Tautoga onitis*)

- Has very prominent 'lips' (a *protrusible mouth*) with teeth jutting outwards.
- Usually less than 2m long as an adult.
- Found in brackish estuaries and salt water, in intertidal or subtidal areas.
- Often associated with reefs (mussel and oyster).
- Feeds on bivalves, snails, and crustaceans.
- Most abundant from MA to DE; often seen around NY and NJ waters.



Check out that
mouth! Teeth
visible too

Part 2: Reef Associates

These are organisms that live with the oysters on, or around, an oyster reef. The relationship can be either *mutualistic* (where both parties benefit) or *commensalistic* (where only one party benefits, but the other is not harmed). Usually, these organisms benefit from the protection of the oyster reef and clearer water that can occur over the reef, but the oysters themselves do not benefit.

Barnacles:

- Small organism, found cemented to rocks or other hard substrates (such as along the ropes and mesh of the oyster gardens and on the oysters themselves).
- These are usually white to beige in color, and have a pyramid-like shape, with plates forming a cone above the filtering apparatus of the barnacle and protecting the internal organs.
- Barnacles have numerous legs with fine hair-like extensions (*cirri*) that help to fan the water over them and filter out the small particles of food (hence the term '*filter-feeders*').
- The outer surface of the barnacle is hard, due to calcium-carbonate *shell plates*.
- Barnacles are *hermaphroditic* (male and female organs), but have to cross-fertilize.
 - Nauplii are planktonic, and float/weakly swim in the water column.
 - When the nauplii matures and changes into an adult, it finds a hard surface to settle onto, and cements itself head-down to the rock, and the calcareous plates form around the body.
 - The barnacle is then *sessile* (non-moving) for the rest of its life.
- There are 2 main types of barnacles: *acorn barnacles* (smaller, mainly intertidal, with 6 shell plates) and *goose barnacles* (larger, with a calcified stalk and plates, oceanic but may be washed ashore from boats and storms).
 - Common species seen in NY/NJ: Northern rock barnacle (*Balanus balanoides*) which is found in more saline waters, and the Ivory barnacle (*Balanus eburneus*), which is found in lower salinity water.



Blue Mussels (*Mytilus edulis*):

- Small bivalve (up to 4 inches) with 2 shells (hinged together) that occurs attached to hard substrates (rocks, pilings, ropes, etc) and usually found in clumps.
- Shells are smooth on the outside, blue-black in color and often glossy/shiny.
- Found in estuaries, and all the way out to subtidal coastal areas
 - Mussels attach themselves using tough *byssal threads* which glue the bivalve to the surface.
 - Mussels can form shoals and 'reefs', even if only a few rocks are around to attach to.
- May be mistaken with: *Congeria leucopheata* (the Platform mussel; not a true mussel but looks and grows just like *M. edulis*; smaller size and browner shell; is found in the Hudson River estuary but in lower saline areas).



Byssal threads

Platform mussel (for comparison)

Ribbed mussel (*Geukensia demissa*; previously known as *Modiolus demissa*):

- Long, thin bivalve with 2 hinged shells that have ribs running lengthwise; brownish, green-brown coloring.
- Found in salt marshes and other estuarine areas, usually attached to the base of marsh grass (*Spartina altiniflora*, *Phragmites* spp., etc.) and half-buried in the sediment.
 - Usually occur in clumps
 - Attach to the plants/each other using tough *byssal threads*.
- Mussels feed by opening their shell and siphoning in water.
 - The water filtered over the gills and small food particles retained, and the excess water is expelled.
- During low tides, shells are usually closed to prevent dehydration, but the bivalves sometimes open to take in air.



Note the ribs in the shell

Sea Squirts/ Tunicates:

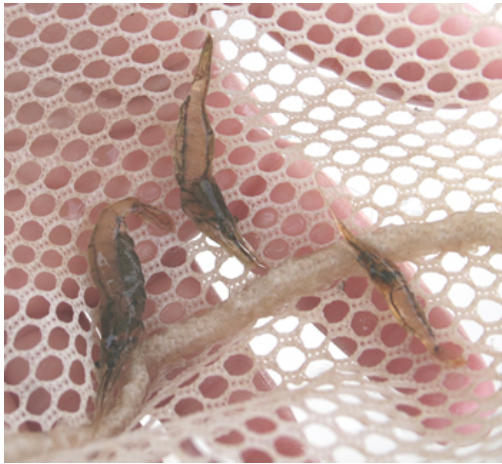
- Small, round, jelly-like animal that occurs in large numbers all over oyster gardens.
- Animal is rounded, with 2 siphons on the top side.
 - “Sea grapes” (*Molgula* and *Bostrichobranthus* spp.) have uneven siphons; most other species of sea squirt have even siphons.
- Most species live attached to hard substrates, such as ropes and oyster nets; a few are free-living on or in the muddy bottom sediment.
- *Siphons* pull in water and internal gills filter out food particles.
 - Squeezing the sea grape can cause the siphon to shoot water out at you (hence the name, sea squirt!)
- Outer surfaces are often covered in debris and encrusting algae.
- Species seen in NY/NJ:
 - *Molgula manhattensis*: a larger, unattached species (1.5 inches); found in intertidal and subtidal areas; one of the only sea grapes found in intertidal areas south of MA. Highly tolerant of the “foul water in New York Harbor” (Peterson Field guide).



Note the uneven siphons

Shore Shrimps (*Palaemonetes* spp., especially *P. pugio*):

- Small (1.5-2 inches); often clear with dark streaks; with numerous legs and antennae.
 - First and second legs have claws, others with hairlike projections for swimming.
 - The *rostrum* (piece over the head) extends outward beyond the antennae.
 - Feed by using claws and legs to filter water for small food particles.
- Three species of *Palaemonetes* are found; difficult to distinguish without microscopic observation of the claws and rostrum.
- Found in estuarine lagoons, inlets, bays; usually in warmer waters.
 - Like to hide out in eelgrass or other seagrass beds, or congregate around pilings
 - Many can “tolerate substantial pollution” (Peterson field guide) such as in NY harbor and along Staten Island.
- Known as “grass shrimp” but are not true Grass shrimp (*Hippolyte* spp.)



Slipper shells:

- A small gastropod with a one-valved shell, which is found attached to the underside of hard substrates (including other shells and live organisms).
 - The underside of the shell has a platform extending about $\frac{1}{2}$ way across the shell opening.
 - The *foot* of the animal (the muscle) suctions onto the hard surface.
- Usually white-beige in color.
- Found in intertidal estuaries.
- Slipper shells start off as males while younger/smaller in size; change to females when they get larger and older; can be *hermaphrodites* (male and female parts at the same time) for part of their life as well.
- Often considered a “nuisance species” in oyster gardens and beds because they compete with oysters for food and space, and can inhibit oyster spat from setting onto a shell.
- Species seen in NY/NJ:
 - Eastern slipper shell (*Crepidula plana*): flattened, pure white, and small (up to 1 inch); often oyster spat are mistakenly identified as this instead!
 - Common/ Atlantic slipper shell (*Crepidula fornicata*): has a more rounded/arched shell, with brown markings and a slightly crooked axis (tip is bent to one side); small size (1.5 inches).



Crepidula plana



Crepidula fornicata

Mud Snails (*Ilyanassa obsoleta*)

- Small (up to 3 cm) gastropod snail with a whorled, cone-shaped shell.
 - Opening to the shell is oval and large (1/2 the height of the shell).
- Dark black or brown in color.
- Often the shell is covered in mud, algae, and encrusting bryozoans.
- Extremely abundant in Mid-Atlantic intertidal estuaries
- Crawls along surface of the mud.
- Eats algae, worms, and *detritus* (dead and decaying matter) in the mud; eaten by birds.



Mudsnail *eggs*:
found in large
amounts covering
all surfaces on the
intertidal.



Mudsnails seen in
Soundview Park, Bronx,
NY

Mud Tube Worm (*Spionidae* family, especially *Streblospio benedicti*)

- *Polychaete* (marine segmented worms) with one pair of *parapodia* per segment (paddle-like appendages)
 - Head is cone shaped, with 4 eyes, a pair of tentacles, and 2 pairs of gills.
- Reddish-brown coloring with dark green around gills.
- Small size (up to 6 mm)
- The worms ingest sediment and remove any organic matter and food from it, then pass the rest of the sediment through the gut.
 - Therefore, must live in fine sandy, and silty sediments that are easy to ingest.
- Make *tubes* out of sediment and mucus and live inside the tubes, right below the surface.
- *S. benedicti* is very numerous around the NY/NJ Harbor; however *dredging* (the removal of sediment to make the harbor deeper or wider for ships) can have a negative impact on the worms by removing their habitat and food.



Parapodia are small



Head with tentacles and gills coming out of it



Amphipod (*Gammarus* spp.)

- Amphipods are small *crustaceans* (like crabs, shrimp, and lobsters) that are laterally flattened.
- Have large eyes on either side of the head.
- Has multiple pairs of legs on the *thorax* (middle portion), which are modified for certain functions.
 - Smaller legs are used for feeding; longer legs towards the rear of the animal are used in movement.
 - *Gnathopods* are appendages used to feed; have small claws called *subchelae* on them.
- Amphipods feed on small bits of detritus and organic matter.
- Larvae have low rates of mortality, so populations can build up and become very large quickly.
- Live on or associated with salt marsh grasses, intertidal mud flats, etc.
- Species found in NY/NJ:
 - *G. palustris*- intertidal estuaries; more fresh water;
 - *G. lawrencianus*- found in more saline waters; around salt marshes in Staten Island and NY Harbor;
 - *G. mucronatus* – brackish water, usually among Eelgrass; has a more spiny back than other *Gammarus* spp.



Gnathopods



Note the numerous pairs of legs, with different shapes and functions



Sand Worm (*Nereis* spp.; commonly called Clam worms)

- Polychaete worm, with a set of *setae* (bristled, spiny-like projections) and *parapodia* (appendages) on each segment.
 - Parapodia used for locomotion; setae for locomotion and sensory systems.
 - Head has a pair of sickle-shaped jaws, and short blunt *palps* near the eyes.
- Species hard to identify without a microscope; most differences are seen in the arrangement of the parapodia and jaws on the head.
- Live in low intertidal to subtidal marsh areas.
- The worm buries itself in the sediment and uses its parapodia and setae to push sediment into its gut.
 - The food (algae; other small invertebrates; detritus) is removed as the sediment passes through the gut.
- Species found in NY/NJ: *N. pelagic*, *N. grayi*, *N. zonata*, and *N. virens*.

Parapodia



Note the small tapered head with sharp jaws

Sponges:

- The simplest of all true 'animals', sponges look like a plant but are really living animals.
- They are planktonic as larvae, then transform and settle to the substrate to become sessile adults.
- Sponges can be *free-standing*, *encrusting*, and *boring* (becoming intertwined with their substrate).
- Many have small *spicules* (skeletal pieces interspersed throughout the cells; made of silica or calcium carbonate) which can be used for support and protection.
- Have many small holes in the body that are used to suck in water; cells in the body remove food particles from the water, and then it is expelled out through the *osculum* (central cavity).
- Species found in NY/NJ:
 - Red beard sponge (*Microciona prolifera*): a reddish-orange-brown sponge that encrusts on a substrate, with small raised lobes or cups. Can grow up to 8 inches; in shallow subtidal estuaries; can withstand polluted areas and deeper areas such as oyster beds.
 - Boring sponges (*Cliona* spp.): very small (less than ¼ inch), yellowish in color; bore into mollusc shells (especially oysters!). Doesn't eat the oyster, but can weaken the shell enough for another parasite or predator to kill the oyster.



Cliona on a European oyster



Red-Beard sponge

And the most important organism found in your oyster garden...

Oysters!

- Bivalve molluscs with an uneven, hinged valve; the top valve is larger and more concave than the smaller, flattened bottom valve.
- Form vast reefs when able to, with larval oysters ('spat') settling out of the water column onto the older shells of the reef.
 - Adults release eggs and sperm into the water column; larvae go through many stages before changing to a spat.
 - Spat follow many chemical cues, and change once more into the adult form, in doing so they settle down out of the water column and become sessile on the bottom (benthic).
 - Oysters build up on top of live and dead adult oysters, inside empty shells, and wherever else they can stick on to.
 - Spat generally accumulate on inner surfaces, as to seek protection from predators.
- Feed by filtering food particles out of the water with their gills.
 - In doing so, they filter the water and clean the toxins, and remove excess sedimentation.
- Can accumulate pollutants in vast quantities; while the oyster can withstand the toxins, they may be passed on to humans when eaten that cannot.
- Species found in NY/NJ:
 - Eastern oyster (*Crassostrea virginica*): the oyster used to be incredibly common in the New York harbor estuary and Raritan Bay, but overfishing, disease (MSX and Dermo), and other predators (oyster drills, crabs, flatworm parasites, and humans) have ravaged the population and caused it to crash. Now, there are small discrete populations of oysters left in NY/NJ; many local groups participate in oyster restoration projects that aim to reestablish reefs where they historically were found, and increase the health of the ecosystem.



Oyster attached to a tire in Soundview Park, Bronx. Also seen are a large number of mudsnails and their eggs on the inside of the tire, and green algae.



Spat attached to an adult, empty shell (called *cultch* when used to attract juvenile oysters to a new, restored reef)



Note how one shell is flattened and the other more curved

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