



K-12 Oysters in the Chesapeake Bay

Grade Level:

Grade 5

Teaching Time:

45-90 minutes

Materials:

- Handouts
- Optional:
 - Live Oysters
 - Aquarium or other clear-sided container with brackish water
 - Dirt (silt)

Teacher Note:

This activity can be used with a demonstration of how live oysters filter the bay.



The Great Oyster Debate

Activity Summary

Students will consolidate their learning, examine other perspectives, and demonstrate their mastery of ecological principles. They realize there are conflicting interests, but that science can be helpful in navigating the complexity of biological and sociological interactions.

Learning Objectives

Student will be able to:

- Integrate learning and demonstrate understanding of current ecological issues.
- Argue an issue based on scientific principles and not belief.
- Apply scientific knowledge to social and economic issues.

Essential Question

Would the health of the Chesapeake Bay improve if the Asian Oyster were introduced?

Background Information

Oysters play key roles in the estuarine environment, filtering water and serving as a food source. Their reefs provide habitats for other marine species and reduce coastal erosion. Oysters play an important role in the economy as well. Overharvesting, habitat destruction, water pollution, and disease have taken a toll on oyster populations. Many efforts are underway to restore the oysters. One option is to introduce

Asian Oysters, which seem to be resistant to MSX and Dermo, the two diseases that are considered the leading cause of oyster mortality.

Key Words

Dermo—a disease which kills oysters (but does not harm humans).

Estuary—An estuary is a body of water formed where freshwater from rivers and streams flows into the ocean, mixing with the seawater. Estuaries and the lands surrounding them are places of transition from land to sea, and from freshwater to saltwater. Although influenced by the tides, estuaries are protected from the full force of ocean waves, winds, and storms by the reefs, barrier islands, or fingers of land, mud, or sand that surround them.

MSX—Disease which kills oysters (but does not harm humans).

Native—Produced, living, or existing naturally in a particular region or environment.

Oyster—Bivalve mollusk with rough irregular shell sometimes eaten as a delicacy and may be farmed for food or pearls. Native Chesapeake Bay oysters are the species *Crassostrea virginica*.

Phytoplankton—Microscopic plantlike organisms in aquatic environments that produce their own food. Oysters eat by filtering these out of the water.

Pollution—Something that is harmful to the environment.

Activity Procedure

Introduce oysters and their role in the Chesapeake Bay environment. Depending on what topics you've covered, you may want to have students examine the environmental conditions, food webs involving oysters, oyster life cycle or biology. This will probably take one 45 minute class period.

Engagement

1. Engage students with the "See, Think, Wonder" thinking routine, slowly revealing a full oyster environment photo. Start by showing a close-up picture oysters (Appendix 8), asking what kids see, think, and wonder, then showing a little more of the picture including the reef and water, and finally, the whole picture with the bird.
2. If desired, show students live oysters and demonstrate how they can clean a tank full of murky water. If live oysters are not available, you can show the video listed in the Web Resources section at the end of the lesson.

Exploration

1. Using the resources in Appendices 1-7, students should explore information about native oysters. Use the Student Handout (Background Information) to help guide and extend their thinking about the challenges to oyster populations.

2. Set up a class-wide debate over the proposed introduction of the Asian oyster into the Chesapeake Bay. The preparation phase will take ~25 minutes and the debate will take ~20 minutes. See the Explanation section for more detailed information about forming groups, debate roles, alternative formats, and debate preparation.
3. Divide students into four distinct "social perspectives" -- Restaurant Owner, Waterman, Environmentalist, and Scientist.
4. The amount of preparation time will vary greatly (between 30 and 90 minutes) depending upon how the activity is structured. Preparation should include group discussion and use of background resources—particularly the Base Articles (in Appendix 1 & 2 or download from Background Resources under Lesson Materials).

Explanation

1. For a class size of 20 to 24, try dividing students into groups of five or six for each of the four roles—Restaurant Owner, Watermen, Environmentalist, and Scientist. For larger classes, create two groups for each role—a class size of 32 would consist of eight groups of four students each. It is not critical for groups to have equal numbers of students...just an equal distribution of reading, analytical, communication, and leadership skills.
 - a. With respect to the four different perspectives, the Watermen role is probably the most straight-forward and the Environmentalist the most complex and nuanced. The “Teacher’s Key” at the end of the lesson outlines the basic positions of each perspective.
 - b. It is best to assign roles in a random fashion. (Perhaps pick a label or symbolic item from a container).
2. Start the debate by having each group explain their position and back it up with three evidence-based points. After each group presents (or after all groups present), the other groups should to *respond directly to the arguments* of the presenting group, not just state their own viewpoints.
3. The Teacher’s Key outlines the basic positions of each perspective and can be used to evaluate the students’ understanding.
4. At the conclusion of the debate, discuss the presentations with the class. Which argument was the most persuasive and why? How well did the groups do responding directly to the arguments and not only giving their opinions? What could the students do to improve their positions or the debate?
5. An alternative debate format is simply to assign each student a “Yes” or “No” position with respect to whether or not the Asian Oyster should be introduced into the Chesapeake Bay. Each individual would then develop a list of three to five reasons that support their assigned position.

Extension

The students can debate another topic such as the introduction of nutria, an herbivore, into the US. Originally imported for its fur, nutria were later sold around the country to control noxious weeds or set free when the fur business was no longer profitable. See Resources section for links to information about nutria.

Evaluation

Formative:

1. Student Background Handout
2. Student Debate Preparation Handout

Summative:

1. Student Debate Notes Handout
2. Student Debate

Education Standards

Three Dimensional Learning		
Disciplinary Core Idea(s)	LS2.A: Interdependent Relationships in Ecosystems Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1)	How Standard is Addressed Students are learning and applying their knowledge of Asian oysters and their effects on the ecosystem as develop a fact-based argument.
Science/Engineering Practice	Engaging in Argument from Evidence Support an argument with evidence, data, or a model. (5-LS2-1)	Students support their position on the introduction of the Asian oyster with evidence from their research.
Cross – Cutting Concepts	Systems and System Models A system can be described in terms of its components and their interactions. (5-LS2-1))	Students learn about the interactions of the Asian oyster and how the ecosystem into which they are introduced is affected.
Common Core Standards		
Ties to Common Core	LA - RI.5.7: Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.	Students use various print and digital resources when gathering facts to support their debate position.
Maryland Environmental Literacy Standards		
Ties to MD Environmental Literacy Standards	STANDARD 1 ENVIRONMENTAL ISSUES Indicator 3: Given a specific issue, communicate the issue, the stakeholders involved and the stakeholders’ beliefs and values.	Students research stakeholder groups and use facts about Asian oysters to develop stakeholder beliefs.

Resources

Background Articles:

Oysters in the Chesapeake overview at

http://www.chesapeakebay.net/fieldguide/critter/eastern_oyster

A good summary of the habitat and biology of the Eastern Oyster from *South Carolina Department of Natural Resources*. Available at:

<http://score.dnr.sc.gov/deep.php?subject=2&topic=15>

“CBF Oysters: Great shellfish of the Bay” (*Chesapeake Bay Foundation*). Web site available at:

<http://www.cbf.org/about-the-bay/more-than-just-the-bay/creatures-of-the-chesapeake/eastern-oyster>

Debate Base Articles

“Oyster Restoration in Chesapeake Bay” (*U.S. Fish & Wildlife Service— Chesapeake Bay Field Office*). Appendix 1 or available online as a pdf at:

<http://cift.pair.com/shasta/~Potomac/comcentr/pubforum/pdfs/AsianOyster.pdf>

“Non-Native Oysters and the Chesapeake Bay.” (*Chesapeake Bay Program*). Appendix 2 or web site available at: http://www.chesapeakebay.net/content/publications/cbp_12233.pdf

Supplementary Articles:

“Foreign Oysters Not a Quick Fix for Chesapeake Bay, But Aquaculture of Sterile Oysters May Help.” (*The National Academies Press Release*, August 14, 2003). Available at:

<http://www8.nationalacademies.org/onpinews/newsitem.aspx?recordid=10796>

Fahrenthold, David A. “Oyster Decision Could Alter the Bay.” *The Washington Post*, 15 February, 2009. Available at: <http://www.washingtonpost.com/wp-dyn/content/article/2009/02/14/AR2009021401759.html>

Additional Resources:

TeacherTube video on oysters filtering water: <http://www.teachertube.com/video/oysters-filtering-water-time-lapse-211324>

YouTube video on oyster restoration: <http://www.youtube.com/watch?v=iSjkQsH-QsQ>

Government ruling on introducing Asian oysters , (*Chesapeake Bay Foundation*) April 1, 2009.

http://www.chesapeakebay.net/blog/post/officials_rule_against_introducing_asian_oysters_into_bay

For more information about oyster biology see: <http://www.mdsg.umd.edu/lesson-plans/oyster-behavior-larval-stage>

Resources about Nutria

Chesapeake Bay Program Nutria Page: <http://www.chesapeakebay.net/fieldguide/critter/nutria>

Maryland DNR site about Nutria:

http://dnr2.maryland.gov/wildlife/Pages/plants_wildlife/Nutria.aspx

Aquatic Invasive Species – A Maryland Sea Grant Brief:

http://www.mdsg.umd.edu/sites/default/files/files/Nutria_AIS%20brief_PI-2013-02.pdf

USGS Patuxent Wildlife Research Center Fact Sheet:

<https://www.pwrc.usgs.gov/FACTSHTS/FACT1.PDF>

Chesapeake Bay Nutria Eradication Project FAQs:

<http://www.fws.gov/chesapeakenutriaproject/FAQs.html>

Teacher Key—The Great Oyster Debate:

Seafood Restaurant Owner: YES... introduce the Asian Oyster

(C. ariakensis)

- ✦ The taste of the Asian Oyster is very similar to the Eastern Oyster and it returns a traditionally-important food item to local menus.
- ✦ It will increase the supply and decrease the cost of oysters.
- ✦ It will improve the local economy.
- ✦ It will repair oyster reefs and increase the biodiversity of the Bay.

Watermen: YES... introduce the Asian Oyster as quickly as possible.

- ✦ The Asian Oyster grows much faster and larger than the Eastern Oyster
- ✦ It is resistant to local diseases (Dermo and MSX).
- ✦ It will save the oyster industry and local jobs.
- ✦ It will increase oyster populations and improve the health of the Bay.

Environmentalist: YES or NO depending upon the reason and perspective.

- ✦ Oysters are a “keystone species” and restoring the population would restore the *ecological balance* of the Chesapeake Bay ecosystem.
- ✦ The U.S. Fish and Wildlife Service is mandated by Federal Law—the *National Invasive Species Act of 1996*—to prevent and control non-native species.
- ✦ Introduction of the Asian Oyster would quickly improve ‘filtering capacity’ and thus greatly improve the Bay’s *water quality*.
- ✦ Current efforts at reseeded and rebuilding native oyster reefs (*C. virginica*) are not yet complete—more time is needed to evaluate the success of these restoration efforts.
- ✦ Local jurisdictions have not adequately implemented nor evaluated the effect of harvest moratoriums on the recovery of Eastern Oyster populations.
- ✦ Even if there were no downside to introducing the Asian Oyster, it would take more than 20 years for populations to expand enough to have a positive impact.

Scientist: NO... don't introduce the Asian Oyster into the Chesapeake Bay.

✦ There is not enough scientific information to make an informed decision—at least 5 years more years of research is needed.

✦ Past experience has shown that the introduction of non-native species is almost always highly disruptive to the local ecosystem.

✦ Preliminary observations suggests that *C. ariakensis* may not build reefs in the same way *C. virginica* does and therefore its “ecological value” may be somewhat limited.

✦ The Asian Oyster might spread beyond the Chesapeake Bay and impact healthy local oyster populations along the East Coast.

✦ Introducing the Asian Oyster could introduce new diseases which might affect other organisms like the Blue Crab. (It is thought the diseases Dermo and MSX entered the Bay when various efforts were made to introduce the Pacific Oyster (*C. gigas*) into the Chesapeake in the 1930's).

✦ The Asian Oyster could out-compete the Eastern Oyster for food and living space and drive it to extinction. (This would prevent the local oyster from evolving a natural defense to the disease parasites).

Student Handout (Background Information)

Name: _____ Date: _____ Period: _____

Oyster Background Information

What is an oyster's environment?

What is oysters' role in a food web?

What impact do oysters and oyster reefs have on wildlife?

What impact do oyster reefs have on the shoreline?

What impact do oysters have on the economy?

What problems affect oyster populations?

What ideas do you have about how to increase oyster populations?

Student Handout (Debate Preparation)

Name: _____ Date: _____ Period: _____

Should the Asian Oyster (*C. ariakensis*) be introduced into the Chesapeake Bay ecosystem?

Directions: Your team will be assigned one of the social roles —Restaurant Owner, Watermen, Environmentalist, or Scientist. First, as a team, decide what position people from your perspective would most likely take (check-off one choice). Then, carefully discuss the issue and list four clear and distinct reasons that support this position. These will serve as your notes for your debate presentation.

Role: _____ ___ Yes ___ No ___ Maybe

1.

2.

3.

4.

Student Handout (Debate Notes)

Name: _____ Date: _____ Period: _____

Restaurant Owner <i>(circle one)</i> YES NO MAYBE	Watermen <i>(circle one)</i> YES NO MAYBE
Environmentalist <i>(circle one)</i> YES NO MAYBE	Scientist <i>(circle one)</i> YES NO MAYBE



U.S. Fish & Wildlife Service

Chesapeake Bay Field Office

Oyster Restoration in Chesapeake Bay

Facts to consider

Native Oyster

- Commercial landings of native oysters (*Crassostrea virginica*) in the Chesapeake Bay are less than 1% of historic levels. The collapse of the fishery can be attributed to centuries of overharvest, habitat degradation, and, most recently, the diseases MSX and Dermo.
- Maryland and Virginia have not conducted a formal stock assessment of the native oyster to evaluate harvest management options, such as temporary harvest restrictions or closure of the fishery, to achieve a sustainable population. Native oysters in Delaware and New Jersey have faced similar disease pressures but harvest in these states is now regulated successfully based on annual population estimates and corresponding harvest limits.
- Restoration efforts for the native oyster are just now emerging from the experimentation phase to an accelerated, large-scale implementation phase with increased Congressional funding and the best technologies available. More time is needed to evaluate the success of native oyster restoration efforts.
- Recently, the number of native oysters in Chesapeake Bay was estimated at approximately one billion, indicating that although they are severely stressed, there are still self-sustaining populations in parts of the Bay.

Non-native Oyster

- State natural resource officials in Maryland and Virginia have proposed to introduce an oyster native to China (*Crassostrea ariakensis*) to the Chesapeake Bay, and the Atlantic Coastal Bays, as a way to restore the economic and ecological role that oysters once fulfilled in the region.*
- Experimental trials in Virginia waters of the Bay have shown that this non-native species grows quickly and is more tolerant of MSX and Dermo. However, scientists recently have found a potentially fatal parasite, *Bonamia*, in a batch of these experimental oysters being raised in North Carolina waters.
- Resource managers cannot currently predict the effects that this oyster may have on native species in the Bay and along the Atlantic Coast because little biological information is available for this species. The states want to introduce the non-native oyster in approximately one year. However, more time will be needed to conduct the studies necessary to make a management decision based on sound science.
- If introduced to the Chesapeake Bay and Coastal Bays, this non-native oyster is likely to spread via human introduction, ballast water release, and/or larval transport to areas outside the Bay. Spread and establishment of this species could affect commercially sustainable populations of native oyster that exist in other parts of the Atlantic Coast and Gulf Coast.



Asian oyster, *Crassostrea ariakensis*
Photo courtesy Chesapeake Bay Program

Appendix 1: Base Article #1

<http://cift.pair.com/shasta/~Potomac/comcentr/pubforum/pdfs/AsianOyster.pdf>

Reversing the decline of the Bay's oyster population is likely to take decades with any species. As stated in the National Research Consortium/ National Academy of Sciences report on this issue: "The failure of a succession of corrective actions to reverse the decline in the fishery...each one of which was once thought to be the solution to the Bay's problems, is testimony to the absence of easy answers and quick fixes."

*Note: An Environmental Impact Statement (EIS) led by the Army Corps of Engineers is being prepared to evaluate the states' proposal, as well as other alternatives for restoring oysters in the Bay. The U.S. Fish and Wildlife Service is a cooperating agency in the development of this EIS because we believe that any non-native species such as the Asian oyster should not be introduced to the Chesapeake Bay (or any other area) until it is scientifically demonstrated there is minimal risk of negative effects to native species and their habitats. In addition, the Service is mandated under the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (amended as the National Invasive Species Act of 1996) to prevent and control the dispersal of aquatic nuisance species.

Information throughout the development of the EIS can be accessed on our website.
<http://www.fws.gov/r5cbfo/Asianoyster.htm>

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<http://www.fws.gov/r5cbfo>
U.S. Fish & Wildlife Service
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Chesapeake Bay Program
A Watershed Partnership

Background

www.chesapeakebay.net

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Due to dramatic declines in the number of oysters living in the Chesapeake Bay and the seafood industry's eagerness to restore a viable local fishery, Bay region scientists and resource managers are exploring the idea of introducing a non-native oyster species into the Bay's waters.

Over the past century, harvests of the Bay's native oyster, *Crassostrea virginica* or the Eastern oyster, have declined from more than 33 million pounds annually in the 1950s to 1.47 million pounds in 2001.

While Chesapeake Bay Program partners continue their work to restore native oysters, efforts are also underway to better understand the risks and benefits surrounding the possible introduction of non-native oysters into the Bay.



Non-native Oysters and the Chesapeake Bay

In hopes of reversing declining populations of native oysters, the Bay states and the federal government are working with researchers to develop innovative restoration programs aimed at returning abundant native oyster populations to the Bay. As recently as July 2003, Bay Program partners re-affirmed their *Chesapeake 2000* commitment to a ten-fold increase in the number of restore native oysters in the Bay.



With native Chesapeake Bay oyster populations about one percent of historic records, researchers are exploring the introduction of *Crassostrea ariakensis* (above) into the Bay's waters.

While most of the historic decline of Chesapeake Bay oyster population is attributed to habitat degradation and overharvest, two diseases - Dermo and MSX - are considered the leading cause of native oyster mortality.

Dermo and MSX were first discovered in the Eastern oyster in the 1950s. While the effects of MSX and Dermo are most acute in higher salinity waters found in the lower portion of the Bay, both diseases have expanded into less saline waters further up the Bay. Scientists believe MSX was inadvertently introduced to the Chesapeake through the importation of a non-native oyster, *Crassostrea gigas*, in the 1930s.

While Chesapeake Bay Program partners continue their work to restore native oysters, efforts are also underway to better understand the risks and benefits surrounding the possible introduction of non-native oysters into the Bay.

Introducing Non-Native Oysters into the Bay

In hopes of reestablishing a Virginia commercial oyster industry, in 1995, the Virginia legislature directed the Virginia Institute of Marine Science (VIMS) to begin a study on non-native oyster species for possible introduction to the Chesapeake Bay.

[more →](#)

The Chesapeake Bay Program is restoring the Bay through a partnership among the U.S. Environmental Protection Agency representing the federal government, the State of Maryland, the Commonwealth of Pennsylvania, the Commonwealth of Virginia, the District of Columbia, the Chesapeake Bay Commission, and participating citizen advisory groups.

VIMS first studied *C. gigas*, a popular and widely cultivated non-native oyster. The studies used oysters in a triploid, or non-reproductive, form. The *gigas* results were unimpressive, showing inferior growth and survival in lower salinities compared to the native oyster.

Introducing *Ariakensis*, the Suminoe Oyster

Once researchers determined *gigas* unsuitable for Bay waters, efforts began to focus on an Asian Suminoe oyster, *C. ariakensis*. In limited field trials, the Suminoe oyster demonstrated lower mortality from Dermo and MSX, hearty and rapid growth, and success in taste tests. Researchers found Suminoe oysters grow to market size in only nine months as opposed to two years for the native *virginica*. This has resulted in increased pressure from the seafood industry to adopt the non-native alternative.

As of August 2003, approximately 60,000 triploid Suminoe oysters have been tested in the Bay. The Virginia Seafood Council has received permits to initiate industry trials with one million triploid Suminoe oysters.

Due to the possibility of oysters reverting to diploid, or reproductive form, some scientists and managers are concerned that the proposed industry trials could result in establishing a free-living reproductive Suminoe population in the Bay.

Such a non-native introduction could be an irreversible action, and some are concerned that it could significantly affect the health of the Bay ecosystem. Because of this concern, federal and state permits for the Virginia Seafood Council trials imposed strict bio-security and monitoring requirements.

What's at Stake?

Within the Bay community, there is an ongoing debate among those supporting immediate *ariakensis* introduction and those advocating further research before making a decision about introducing the species to the Bay.

Some stakeholders, including the Virginia Seafood Council and some Maryland and Virginia watermen,

view the Suminoe oyster as a promising solution to several problems, and strongly urge widespread introduction of sterile – or possibly even fertile – Suminoe oysters. Their view is that the Suminoe oyster could serve to revitalize the industry as well as provide the means for improved water quality through increased bio-filtration. Other potential benefits include a reduction of fishing pressure on the native oyster and the creation of hard substrate for further oyster attachment and reef development.

Other stakeholders believe that a non-native species introduction needs to be approached with a high level of caution. Many are concerned about the species' disease-harboring capabilities including possible pathogens that could harm native populations of aquatic plants and animals. Others are concerned about food web effects that could alter benthic communities and ecosystems, while competition and reproductive interference with the native oyster may create additional pressures on already low *virginica* populations.

The National Research Council Study

The National Research Council's National Academy of Sciences recently completed a year-long study to evaluate whether enough is known about the biology of *ariakensis* to effectively assess these benefits or risks at this time.

The study represents the most complete analysis to date of available literature and science pertaining to the possible introduction of non-native oysters into Chesapeake Bay. It will serve as the basis for both near- and long-term management strategies affecting the future of non-native oysters in the Chesapeake. Its findings will guide new research, establish risk assessment needs and form a significant component of a planned Environmental Impact Statement regarding the possible introduction of the Suminoe oyster.

The \$315,000 study was funded by the U.S. Environmental Protection Agency, National Oceanic and Atmospheric Administration, U.S. Fish and Wildlife Service, the states of Maryland and Virginia, the National Fish and Wildlife Foundation and the Maryland, Virginia and Connecticut Sea Grant programs.

For more information, please visit www.chesapeakebay.net/nonnativeoyster.htm

8/2003

Eastern Oyster

Great Shellfish of the Bay

Since colonial times, the Chesapeake (meaning "great shellfish Bay" in Algonquin) has lost more than 98 percent of its oysters. Gone are the days when oyster reefs posed navigational hazards to Chesapeake Bay explorers or watermen pulled 17 million bushels of oysters each year. Now, Maryland and Virginia watermen and the seafood industry have lost \$4 billion in income in the past 30 years alone. But as recent studies find, all is not lost.



A Maryland Department of Natural Resources study released in 2011 showed higher levels of oyster reproduction and a lower mortality rate for the Chesapeake Bay oyster. [Photo by Tom Pelton/CBF Staff.](#)

A two-month Maryland Department of Natural Resources survey conducted in 2011 revealed higher levels of oyster reproduction and a lower mortality rate. In fact, Chesapeake Bay oysters seem to be growing heartier and more robust. Given that each adult oyster filters and cleans up to 50 gallons of water per day—gobbling up algae, and removing dirt and nitrogen pollution—that's good news for the health of the Chesapeake Bay *and* for us.

After a devastating bout with disease in the late 1980s combined with decades of overharvesting, habitat destruction, and water pollution, the oyster was hanging on by a thread. "That was a turning point really," says Chesapeake Bay Foundation (CBF) Fisheries Director Bill Goldsborough, "because up until that point, for the previous 100 years, oysters had supported the most valuable fishery in the Chesapeake Bay."

Now, thanks to increased awareness, extensive restoration efforts such as [CBF's citizen oyster-gardening program](#) and [reef ball production](#), resisting the introduction of a non-native oyster species, and favorable weather conditions, there is hope for the mighty oyster yet.

[Learn more about CBF's oyster restoration efforts.](#)

Oyster Biology & Ecology

Scientific Name: *Crassostrea virginica*

Common Names: Eastern oyster, American oyster

Classification:

Kingdom *Animalia*

--- Phylum *Mollusca*

----- Class *Pelecypoda* or *Bivalvia*

----- Order *Lamellibranchia*

----- Family *Filibranchia*

----- Genus *Crassostrea*

----- species *virginica*



Range and Habitat

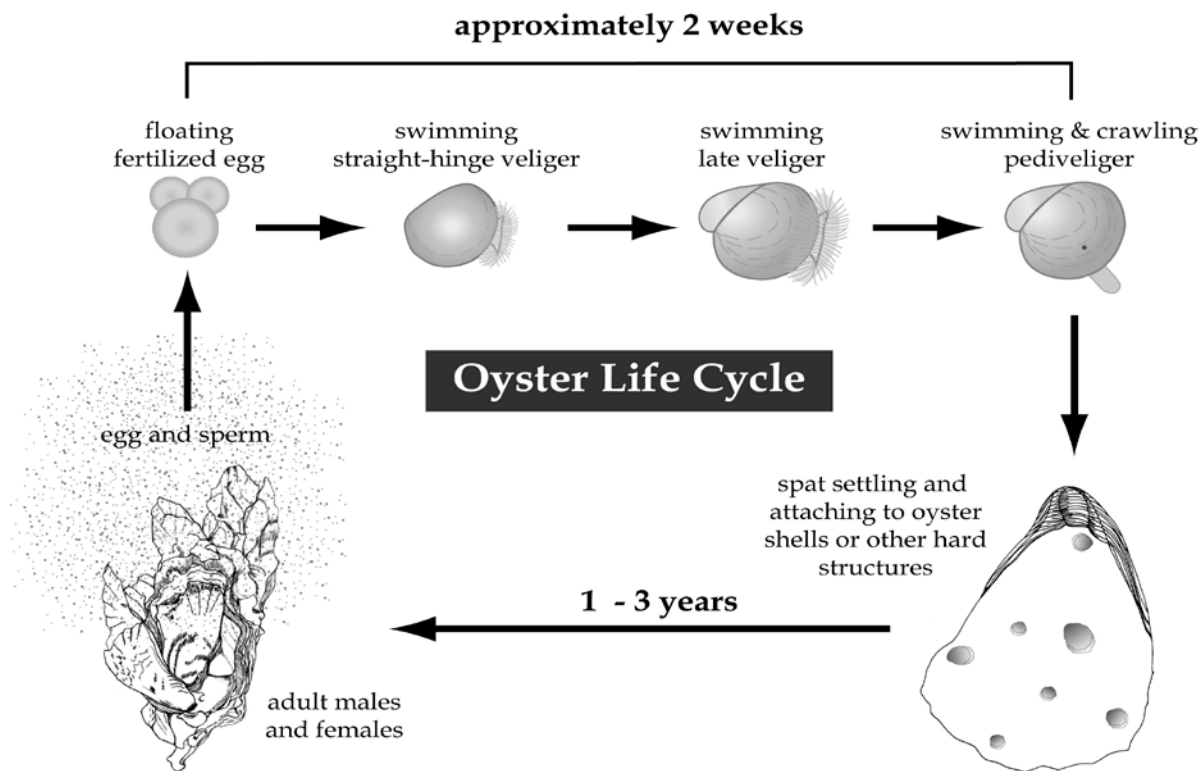
The American or eastern oyster is found along the Atlantic and Gulf of Mexico coasts of North America. Oysters form reefs, which are a dominant feature of many coastal estuaries. Oysters are often considered a "keystone species," providing valuable shelter and habitat for many other estuarine organisms, improving water quality, and reducing bank erosion.

Oysters are typically found in estuaries, sounds, bays, and tidal creeks from brackish water (5 parts per thousand [ppt] salinity) to full strength seawater (35 ppt salinity). Oysters are tolerant organisms, able to withstand wide variations in temperature, salinity, and concentrations of suspended sediments and dissolved oxygen. Throughout much of its range, the oyster occurs mostly in subtidal areas. But in South Carolina, almost all oysters live in the intertidal zone. Intertidal oysters typically have elongated, irregularly shaped shells. When submerged by the tide, oysters feed by filtering phytoplankton (microscopic plants) from the water column.

Appendix 6: Oyster Biology & Ecology biology of the Eastern Oyster from **South Carolina Department of Natural Resources**. Available at: <http://score.dnr.sc.gov/deep.php?subject=2&topic=15>

Life Cycle

Adult oysters begin reproduction when water temperatures become greater than 68 degrees F (~20 degrees C). In South Carolina this generally occurs from May through October. Oysters are broadcast spawners, meaning they release eggs and sperm into the water column. A fertilized egg develops into a planktonic (free-swimming) **trochophore larva** in about 6 hours. A fully shelled **veliger larva** is formed within 12 to 24 hours. The larva remains planktonic for about three weeks. Towards the end of this period it develops a foot (hence, **pediveliger**) and settles to the bottom of the water column where it seeks a hard substrate. When a suitable surface (ideally adult oyster shell) is located, the larva cements itself and metamorphoses to the adult form. This newly attached oyster is known as a "**spat**."



Credit: Karen R. Swanson/COSEE SE/NSF

Appendix 7: Oyster Biology & Ecology biology of the Eastern Oyster from **South Carolina Department of Natural Resources**. Available at: <http://score.dnr.sc.gov/deep.php?subject=2&topic=15>

Reef Ecology

Oysters are the building blocks of one of the most important benthic communities in South Carolina estuaries, the oyster reef. Formed as a result of years of oyster production and settlement in concentrated areas, reefs have become home to a complex [assemblage of animals](#) and plants. Benefits of oyster reefs to the coastal environment include the following:

- Providing solid structure within the water column for sessile (permanently attached or fixed) organisms (for example, barnacles and sea anemones)
- Providing spawning substrate for fishes (for example, gobies, blennies, and skilletfish)
- Stabilizing bottom sediments for benthic organisms (for example, hard clams) and aquatic plants
- Creating homes and hiding places for organisms seeking refuge from predation (for example, polychaete worms and soft-shell blue crabs)
- Concentrating prey (food) species for larger predator fishes (for example, striped bass)
- Serving as breakwaters to protect adjacent shorelines from erosion
- Filtration and clarification of water

Some of the information in this section is modified from *Oysters in the Environment* found at www.mdsg.umd.edu.

Appendix 8: Eastern oyster reef with an American oystercatcher. Photo credit: Dale Glass

