

EASTERN OYSTER, *Crassostrea virginica*



- [Life History](#)
- [Fisheries](#)
- [Management](#)
- [Stock Status Overview](#)
- [Research Needs](#)
- [Links](#)

Life History

The eastern oyster (*Crassostrea virginica*) is a non-moving, filter feeding shellfish occurring naturally along the western Atlantic Ocean from the Gulf of St. Lawrence off Quebec, Canada to the Gulf of Mexico and the Caribbean Islands. The eastern oyster has been called the ultimate estuarine animal. It can tolerate a wide range of salinity, temperature, turbidity and dissolved oxygen levels, making it well adapted to the ever-changing conditions of the estuary. The distribution and survival of eastern oysters within habitat types is influenced by abiotic (non-living, physical) factors such as salinity, tide, oxygen levels and flow, as well as biotic (living, biological) factors such as disease, shell erosion caused by other species and predation. North Carolina's oyster stocks are composed of both intertidal (oysters growing between the mean high and low tide levels) and subtidal (oysters growing below the mean low water level) populations.

Oysters are typically dioecious (separate sexes) but can change their sex (hermaphroditic) once each year. Researchers have found that natural oyster populations maintain relatively balanced sex ratios, but exposure to stress, such as food limitation and pollution, results in a higher ratio of males. Gonads may develop in oysters two to three months old. Fully developed oysters entering their first summer season may spawn, but large portions of these young oysters are not sexually mature. Age or size selective mortality from disease and harvest pressure can alter oyster population demographics and result in a shift from male to female. The rate of oyster growth is highest during the first six months after the spat (juvenile oyster) sets and gradually declines throughout the life of the oyster. Seasonally, adult oysters grow most rapidly during spring and fall in North Carolina, reaching market size (3 inches) in about three years. Growth

rates in other East Coast and Gulf Coast regions produce market size oysters in time periods ranging from 18 to 24 months in the Gulf of Mexico to four to five years in Long Island Sound.

Fisheries

Oyster harvest has provided an important source of food in coastal areas since before recorded history. Oyster harvesting in North Carolina was the most valuable shellfish fishery in the state until the 1970s. Until recently, most of the focus on oysters was on means and methods of continuing their harvest. Oyster harvest has fluctuated over time because of response to changes in demand, improved harvesting and increases in polluted shellfish area closures. Overall, commercial oyster landings from public bottom has been variable and landings from private bottom in the past few years has increased significantly due to increased interest in shellfish aquaculture (Figure 1). The most significant increase in landings occurred in the mechanical harvest fishery from public bottom in Pamlico Sound during the 2009-2010 and 2010-2011 seasons (Figure 2). There was a high abundance of oysters in some areas in Pamlico Sound that had not been seen in more than 20 years. High market demand and an increase in new participants in the fishery likely influenced these higher landings, as well. In 2013, General Statute 113-169.2 limited the use of the Shellfish License to hand harvest methods only. Hand harvest has shown a slight increasing trend in landings for the past ten years, although 2016 shows a slight decline from the previous years (Figure 2). This likely resulted from the removal of mechanical harvest under the Shellfish License and a fee increase for all commercial licenses in the past few years.

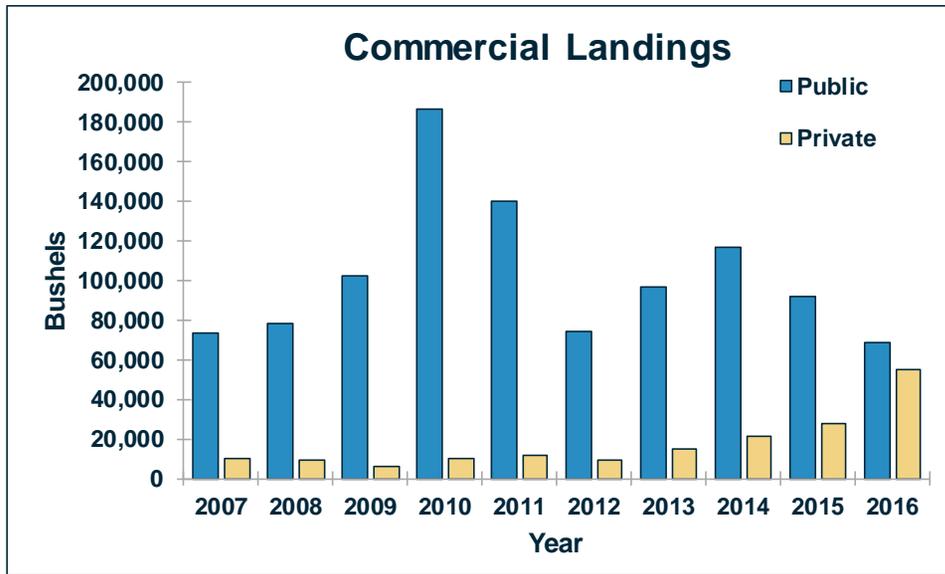


Figure 1. Annual commercial landings of oysters in North Carolina off public and private bottom, 2007-2016.

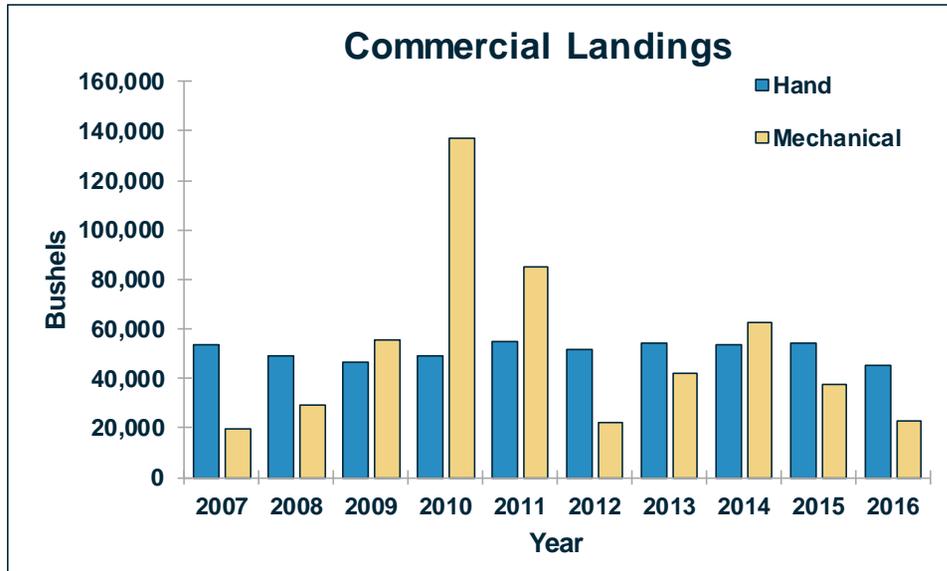


Figure 2. Annual commercial landings of oysters in North Carolina off public bottom taken by hand and mechanical methods, 2007-2016.

Recreational landings for oysters in North Carolina are unknown because there are no license requirements to take shellfish for personal consumption and, therefore, no way to fully determine the user group to collect their harvest information. Since 2011, the division has collected effort and catch data from the recreational oyster harvesters by surveying those individuals that indicate participation when purchasing a recreational fish license. This survey does not include recreational oyster harvesters that do not purchase a recreational fish license. Effort continues to produce statewide estimates of recreational oyster harvest.

Management

The North Carolina Marine Fisheries Commission adopted an Oyster Fishery Management Plan in 2001. Amendment 1 to the plan, adopted in 2003, changed one of the criteria for designation of hand harvest from public bottom from waters 10 feet deep to waters less than 6 feet deep. Management measures adopted in Amendment 2 in 2008, included a 15-bushel harvest limit in Pamlico Sound and a 10-bushel harvest limit for all gears (hand and mechanical) in designated areas around the sound; a reduced harvest season; modifications to lease provisions; and expanded oyster sanctuary

construction. Supplement A to Amendment 2, adopted in 2010, raised the potential harvest limit in Pamlico Sound to 20 bushels and created a monitoring system to determine when to close mechanical harvest from public bottom in that area. Amendment 3, adopted in 2013, created two new seed oyster management areas in Onslow County. Management measures in Amendment 4, adopted in February 2017, continued the monitoring system for when to close mechanical harvest off public bottom; a reduction of the commercial culling tolerance from 10 percent to 5 percent from public bottom; a reduction of the daily harvest limit off public bottom for Shellfish License holders; and modified shellfish lease provisions.

Stock Status Overview

There are insufficient data to conduct a traditional stock assessment for the eastern oyster in North Carolina, therefore population size and the rate that oysters are removed from the population could not be determined. Species designated by the Division of Marine Fisheries with a concern status exhibit one or more of the following: increased effort, declining landings, truncated age distribution, or are negatively impacted by biotic (living, biological) and/or abiotic (non-living, physical) factors, such as water quality, habitat loss, disease, life history or predation. The status of oysters in North Carolina continues to be defined as concern based on trends in commercial landings and other factors that affect the stock. North Carolina commercial oyster landings have been in decline for most of the past century. This decline was likely started by overharvest and increased by other factors such as, habitat disturbance, pollution, disease, or other biological and environmental stress. Oysters are believed to be more vulnerable to overharvest because these other factors also impact their survival.

Division staff conduct sampling of juvenile oysters (spat) on cultch (dead shells or limestone marl) planting sites annually in January, and if required, through April (Figure 3). This sampling provides an annual juvenile abundance index for oysters. In deeper subtidal areas, a standard oyster dredge is towed over the planting site until, at a minimum, 30 pieces of cultch are collected. In shallow subtidal or intertidal plantings, hand harvest methods are used to collect the samples. Thirty pieces of cultch are randomly selected from each sample and the type of cultch (oyster, calico scallop, sea scallop, surf clam, or marl) is noted. The total number of spat on each piece of cultch is counted and the average number of spat per piece of cultch is calculated by summing the number of spat per cultch piece, divided by the total number of cultch pieces sampled. The annual juvenile abundance index is calculated as the average number of spat per site and then averaged across all sites within that year. This index gives a relative measure of the juvenile population. The juvenile abundance index has been somewhat variable from year to year, but shows a slightly decreasing trend for the past 10 years (Figure 3). The 2016 juvenile abundance index was the lowest and below the 10-year average for the time series.

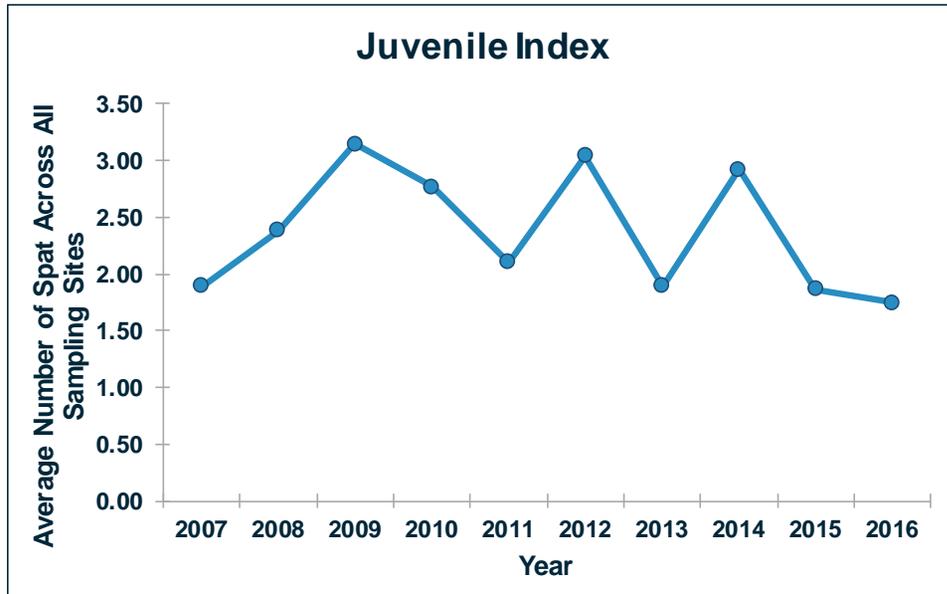


Figure 3. The annual average number of oyster spat across all sampling sites in the N.C. Division of Marine Fisheries Spatfall Evaluation Survey, 2007-2016.

Research Needs

Research needs include determining regional oyster abundance estimates and improving landings data for commercial and recreational harvest from both public and private bottom; determining the effects of harvest on the suitability of habitat for oysters; and expanding restoration efforts to improve recruitment, growth, and water quality function of oysters in both subtidal and intertidal areas.

Links

Management Agencies

[North Carolina Division of Marine Fisheries](#)



Fishery Management Plans, Amendments, Revisions, & Supplements
[North Carolina Fishery Management Plan](#)

Contacts

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