Crested Oyster

Ostrea stentina (= *O. equestris*)

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DESCRIPTION

Taxonomy and Basic Description

First described by Say in 1834 as *Ostrea equestris*, the crested oyster is now considered to be *Ostrea stentina*, as described by Payraudeau in 1826 (Shilts 2007; ITIS 2013). The new classification combines oysters previously known as *O.equestris* (Caribbean and North Atlantic), *O. spreta* (South America), and *O. auporia* (New Zealand) with the type species *Ostrea stentina* (Mediterranean). Thus, this species has a world-wide distribution in middle latitudes. In the Mediterranean ,this oyster is known as the dwarf oyster or Provence oyster.

Members of the genus *Ostrea* are brooding oysters and are usually confined to subtidal regions to avoid dessication during the brooding period. This species is small, rarely observed larger than 5 cm, and has no commercial value. Abbott (1974) described this oyster as "usually oval; lower valve has a high, vertical crenulated margin; muscle scar almost central; interior pearly-green to gray; edge of upper valve has a row of denticles." Although oysters fitting this description, with a ruffled edge due to the folds or crenulations on the lower valve, have been observed in South Carolina, crested oysters from oyster reefs in this state are often flat, with no obvious ruffles or folds (as in the picture above). The exterior of the shell may have light purple markings on the outer edges. The crested oyster is distinguished from juvenile Eastern oysters (*Crassostrea virginica*) by the presence of small denticles (teeth) on the interior of the upper valve (Abbott 1974). These are indicated with arrows on the picture above and are the primary characteristic that SCDNR biologists use to distinguish this oyster from juvenile *C. virginica*.

Status

The crested oyster is not a listed species but has recently received attention as a potential host for *Bonamia* spp. *Bonamia* spp. are microcell haplosporidian parasites which infect oyster hemocytes. *Bonamia* spp. are serious pathogens of oysters, causing high mortality in susceptible species, but represent no human health threat. Until recently, *Bonamia* spp. were not known to infect *Crassostrea spp.* The only harvestable oyster in South Carolina is *C. virginica*. In susceptible species, mortality from *Bonamia* infections can exceed 90%. The European oyster industry (*Ostrea edulis*) was devastated by *Bonamia* infections beginning in the late 1970s (Balouet et al. 1983; Elston et al. 1986), and the New Zealand oyster (*Ostrea chilensis*) suffered massive losses in the late 1980s (Hine 1991, Hine et al. 2001). *Bonamia* spp. infections were reported in the non-native oyster *C. ariakensis* during experimental introductions in North Carolina in 2003 (Burreson et al. 2004; Carnegie et al. 2008). In 2005, *Bonamia* spp. were observed in native *O. stentina* in North Carolina (Carnegie et al. 2005, 2006), leading to concern that *O. stentina* might be serving as a reservoir and vector for the parasite (Bishop et al. 2006). In 2012 and 2013, *Bonamia* infections were reported for the first time in *Crassostrea virginica*

from North Carolina and Massachusetts (Carnegie and Bushek 2013). The parasites were identified as *Bonamia exitiosa* (Carnegie and Bushek 2013), the species responsible for mortalities of *O. chilensis* in New Zealand (Hine et al. 2001). *Bonamia exitiosa* is included on the World Organization for Animal Health list of notifiable pathogens. Ballast water is thought to be the source of *Bonamia* spp. introductions (Bishop et al. 2006) but its proliferation and range expansion could be facilitated by *O. stentina* (Schott et al. 2008; Bishop et al. 2006). Thus, greater knowledge of the distribution of *O. stentina* and its infection with *Bonamia* spp. is needed in order to fully understand the implications for the oyster industry in the Southeastern United States.

POPULATION SIZE AND DISTRIBUTION

Ostrea stentina is found in high salinity waters (>20 ppt) from North Carolina to the West Indies and in the Gulf of Mexico (Wells 1961; Galtsoff and Merrill 1962), along the Mediterranean coastlines, and in New Zealand. Although earlier literature indicates that this species is confined to subtidal regions (Galtsoff and Merrill1962), a recent survey in NC (Markwith 2010) found this species in a wide range of habitats from the mid-intertidal down into the subtidal. It was most abundant on floating docks, low intertidal oyster reefs, and low intertidal shell hash. In North Carolina (Markwith 2010) it has a patchy distribution, with patch densities ranging from 5 to 125 oysters/0.25m^2. On North Carolina oyster reefs, *O. stentina* was found to represent up to 10% of the population in sampled areas. *O. stentina* prefers higher salinity than *C. virginica* and population shifts have been reported in relation to drought (Hoese 1960; Galtsoff and Merrill 1962), with *C. virginica* dominating in wet periods and *O. stentina* in dry periods. In conjunction with oyster reef studies in South Carolina, crested oysters were observed on shells of *C. virginica* at 24 sites in 2006 (SCDNR unpublished data). Abundance was quantified on restored oyster reefs at one site near Charleston, SC. Distribution was patchy, with localized abundances as high as 400/m^2, although overall abundances were much lower, ranging from 46/m^2 in the mid-intertidal to 134/m^2 in the low intertidal. *O. stentina* represented 68% of the live oysters found in the lowest intertidal but only 1% in the mid-intertidal range of the restored reefs. The largest crested oyster observed in that study was 36 mm (shell height). Due to the challenges of distinguishing *O. stentina* from *C. virginica* (described above), it may be easily overlooked and therefore more abundant than previously thought.

HABITAT AND NATURAL COMMUNITY REQUIREMENTS

The crested oyster has been observed on low intertidal oyster reefs in NC, SC, and GA as well as on manmade structures (e.g. pilings, floating docks, buoys) and subtidal hard bottom (e.g. shell hash). It appears to be limited to higher salinities (Menzel, ; Markwith 2010) and the lower intertidal or subtidal regions (Markwith 2010; SCDNR unpublished data). In natural habitats, it attaches primarily to other shell material and appears to favor degraded oyster shells, although it will also settle on scallop shells and pen shells. This species does not form reefs.

CHALLENGES

Little is known about the distribution and abundance of *O. stentina* in South Carolina. The potential of this species to harbor *Bonamia* spp. parasites and the first ever report of *Bonamia*

exitiosa in *C. virginica* are cause for concern and warrant further study of South Carolina populations of *O. stentina*, especially given that *Bonamia* spp. infections have decimated oyster populations in Europe and New Zealand. The recent revelation that these parasites can infect *C. virginica* makes vigilance in controlling importations from other geographic areas paramount. The SCDNR bans introduction of non-native species (e.g. *C. ariakensis*) and requires importation permits for native species. These importation permits are contingent on negative results from disease diagnostic testing but it is important to update testing requirements frequently as new parasites such as *Bonamia exitiosa* are identified.

CONSERVATION ACCOMPLISHMENTS

The SCDNR has an indigenous species importation policy requiring negative disease tests for all importations. The SCDNR does not allow importation of non-indigenous species. Some preliminary data on the distribution and density of *O. stentina* has been gathered incidental to other studies on oyster reefs.

CONSERVATION RECOMMENDATIONS

- Cooperate with investigators from other institutions who are evaluating the presence of disease organisms in crested oysters and related issues.
- Continue to require disease testing for indigenous shellfish importations.
- Update disease diagnostic requirements for indigenous shellfish importations at least annually and whenever alerts are received.
- Collect information on the distribution and abundance of crested oysters in SC.

MEASURES OF SUCCESS

South Carolina's oyster populations have been largely unaffected by disease issues which have been problematic in other Atlantic states. A continuing absence of disease epizootics (which might in some cases be facilitated by *O. stentina*) would be considered a measure of success.

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