Atlantic Blue Crab
Callinectes sapidus

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DESCRIPTION

Taxonomy and Basic Description

The Atlantic blue crab is a member of the family Portunidae, the swimming crabs, whose final segment (dactyl) of the fifth walking leg is flattened to a paddle-like appearance to enhance swimming ability. The family is of global economic importance, supporting large fisheries in the Americas and Asia. The Atlantic blue crab can be distinguished from the closely related lesser blue crab, *Callinectes similis*, by its larger adult size (>13 cm carapace width), red color on the chelipeds (claws), and the presence of two interorbital teeth of the frontal margin of the carapace compared to the two interorbital teeth present in *C. sapidus. Callinectes sapidus* also displays a more bluish-green color on the carapace, whereas *C. similis* is characterized by a more violet hue on the carapace and legs (Williams 1984).

Spawning in *C. sapidus* occurs after the female undergoes a terminal molt and is impregnated by the male crab while she is in a "soft" state, prior to the exoskeleton hardening (Van Engel 1958). The females will carry the sperm internally until they deposit eggs that attach to setae on specialized pleopods, forming an egg mass (sponge). Several sponges can be produced from a single mating event (Hines et al. 2003). Figure 1 represents the cycle that follows. Mature females migrate close to or into the ocean prior to eggs hatching; in South Carolina, this occurs from March through early fall (Eldridge and Waltz 1977). Eggs hatch into a zoea stage, and are carried offshore where they undergo development through several zoeal stages (Costlow and Bookhout 1959; Epifaunio 1995). After a period of several weeks, the last zoea stage molts into the megalopa stage and returns to coastal waters from offshore, utilizing tidal and wind driven currents, and eventually entering the estuaries (Boylan and Wenner 1993; Epifaunio 1995). Megalopae transform into juvenile crabs which gradually move upstream into nursery areas such as tidal creeks in South Carolina, or seagrass beds in North Carolina and the Chesapeake Bay as they pass through a series of molts (Orth and Van Montfrans 1987; Mense and Wenner 1989; Whitaker et al. 1998; Etherington and Eggleston 2000). Atlantic blue crabs mature in 6 months to two years, depending on geographic location, with crabs maturing faster

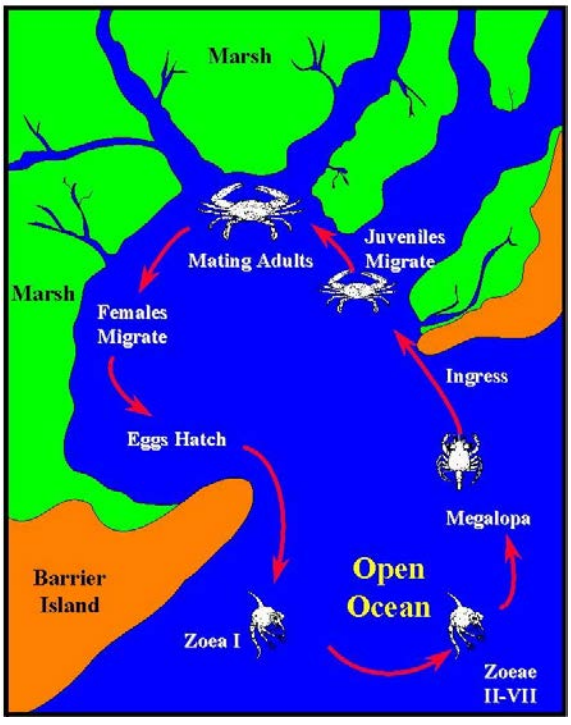

Fig. 1: Atlantic blue crab development cycle.

in warmer climes (Tagatz 1968).

Status

Although the stocks of *C. sapidus* have historically fluctuated widely along the US coast, they have been resilient. The species is not threatened and continues to provide livelihood for thousands of fishermen. The species is managed by the South Carolina Department of Natural Resources (SCDNR) in South Carolina state waters.

POPULATION SIZE AND DISTRIBUTION

Callinectes sapidus ranges from Massachusetts, down the Atlantic Coast, through the Gulf of Mexico, and into South America (Williams 1984). Recent stock assessments for the Chesapeake Bay estimate the number of blue crab to be approximately 500 million individuals in that area (http://dnr.maryland.gov/fisheries/crab/dredge.asp), with annual landings averaging approximately 50 million lb. (http://www.st.nmfs.noaa.gov/commercial-fisheries/index). Annual commercial landings in South Carolina have ranged from 4 to 6 million lbs. in recent years, so it can be assumed that numbers of blue crab in South Carolina would range at least in the tens of millions (Harris 2001). Numbers of licensed commercial crabbers in South Carolina average between 350 and 400 in most years, whereas approximately 20,000 recreational license holders harvested crabs in the mid 1990s during summer months (SCDNR licensing data; Low 1998). The commercial blue crab fishery usually ranks second to the penaeid shrimp fishery in total value to fishermen (>$3 million per year).

HABITAT AND NATURAL COMMUNITY REQUIREMENTS

Some *C. sapidus* inhabit oceanic waters as adults, but all undergo larval development in the ocean, relying on winds and ocean currents for distribution back to nearshore habitats before entering estuaries as megalopae (Epifaunio 1995). Recent changing climatic conditions could negatively influence many biological and physical factors that affect the survival and recruitment of larval crab (NEFSC 2009). In the estuary, *C. sapidus* can be widely distributed across habitats from euryhaline to freshwater environments, depending on geographic location, season, and life stage (Williams 1984). In South Carolina, small *C. sapidus* inhabit marsh-tidal creek habitats, mudflats, and oyster reefs (Mense and Wenner 1989; Kingsley-Smith et al. 2012) whereas larger *C. sapidus* move upriver in the warmer months (Archambault et al. 1990; Childress 2012). *Callinectes sapidus* feed opportunistically on a wide variety of live and dead food items but seem to prefer bivalve mollusks when available (Darnell 1958; Hines et al. 1980; Laughlin 1982; Fitz and Weigert 1991). Blue crabs are preyed on by many species, including sharks and sea turtles (Frazier, SCDNR pers. comm.). Although tolerant of a wide range of conditions such as relatively low dissolved oxygen, drought, and high freshwater runoff, good water quality and undegraded estuarine habitats help ensure sustainability of the blue crab resource (Eldridge and Waltz 1977; Engel and Thayer 1998; Bell et al. 2003; Bauer and Miller 2010; Childress 2012).

CHALLENGES

As a heavily fished stock, *C. sapidus*—as is the case for most exploited species—is probably vulnerable to overharvesting, but that condition is difficult to document. Apparent population declines in the past have usually been followed by rapid recoveries (Sharov et al. 2003). Efforts to cap the number of commercial licenses as a means of stabilizing fishing effort have been

unsuccessful in South Carolina to date. Projected human population growth along the coast may well be detrimental if development is not carefully planned to minimize runoff and non-point source pollution (Engel and Thayer 1998). Increased water demands (Wilber 1994) may alter estuarine salinity patterns. Educating the public and garnering support for lower impact development may be the greatest challenge facing resource managers in regard to blue crab and all species that utilize the estuaries.

CONSERVATION ACCOMPLISHMENTS

Regulations on minimum size and prohibition of possession of egg-bearing females have ensured some protection of the *C. sapidus* stock in South Carolina. Protection of the Coastal Zone by legislation passed in the 1970s has lessened the scale of destructive human activities such as dredging and filling of marshes and improved treatment of wastewater (Engel and Thayer 1998). The protective stance and support of organized conservation groups such as the Coastal Conservation League and SC Wildlife Federation have promoted continued awareness of threats to the coastal environment in South Carolina.

A suite of 6 microsatellite loci have been isolated for use in research on the genetic characterization of blue crab populations in SC as well as their application as genetic tags for future experimental stock enhancement research. Estimates of genetic diversity suggest the current Charleston Harbor blue crab population is genetically 'healthy'. [Darden and Cushman 2013]

CONSERVATION RECOMMENDATIONS

- Support efforts by SCDNR to more actively manage the commercial blue crab fishery by stabilizing effort and exploring short term closures or limits on harvest of female blue crab during times of low population abundance.
- Collect data, including survey information, to improve our understanding of the numbers of crabs removed from populations by recreational harvesting of blue crabs and the impacts of these practices on wild populations.
- Continue to support outreach and education and acquiring basic knowledge about the blue crab resource within an ecosystem context. Fishermen and interested members of the public should be involved in these efforts.
- Promote continuing monitoring and protection of critical habitats.
- Develop stock enhancement methods to better understand how blue crabs function in the habitat.
- Examine modeling techniques that have predictive value to assess how future human population growth and climate change will impact watersheds and blue crab stocks.

Additional information on blue crab can be found on the SCDNR Website:
http://www.dnr.sc.gov/marine/species/bluecrab.html,
http://www.dnr.sc.gov/marine/pub/seascience/bluecrab.html

MEASURES OF SUCCESS

As the above-mentioned action items are accomplished and yield valuable information, adaptive management procedures will be evaluated and implemented for this crab species.

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