

## Atlantic Ghost Crab

*Ocypode quadrata*

Contributor (2005): David Knott (SCDNR)  
Reviewed and Edited (2013): Peter Kingsley-Smith (SCDNR)

### DESCRIPTION

#### Taxonomy and Basic Description

In 1787, J.C. Fabricius formally described the Atlantic ghost crab from specimens collected in Jamaica, originally calling it *Cancer quadrata*. Following Linnaeus' development of the modern scientific method of naming organisms, the name '*Cancer*' was commonly applied to a variety of crustacean taxa, not just crabs, by taxonomists and carcinologists. *Ocypode quadrata*, also known for some time as *O. albicans* or the "fleet-footed one of white," was characterized by Phillips (1940) as "an occult, secretive alien from the ancient depths of the sea." Since the time he wrote that romanticized description, much has been learned about this conspicuous inhabitant of the ocean beach community.

A true crab, or brachyuran, the ghost crab belongs in the family Ocypodidae, which also includes the fiddler crabs. Worldwide, there are roughly 20 species of ghost crabs, but *O. quadrata* is the only one found on the East Coast of the United States. The species is a small, straw-colored or grayish-white crab, measuring about 5 cm (2 in.) across the back at maturity. *Ocypode* has the greatest terrestrial adaptation of any crab in South Carolina, returning only occasionally to the water to wet its gills. It can also moisten its gills by extracting water from damp sand, using fine hairs near the base of its walking legs to wick ground water up onto the gills through capillary action (Ruppert and Fox 1988). Despite this semi-terrestrial existence, the ghost crab's link to the sea is a critical one that provides not only moisture for its gills, but also the necessary means for development of larvae that are hatched from eggs that the females release at the water's edge.

### Status

The ghost crab is not presently included in federal lists of threatened or endangered species, and there is no present-day human exploitation of this species. Having few terrestrial predators or competitors, a flexible feeding behavior and the ability to endure starvation for long periods, *Ocypode quadrata* is an ideal top carnivore in a simple, filter feeding-based food chain of the dune and fore-beach ecotone (Wolcott 1978). As such, it may prove to be a useful indicator of the health of that environment.

### POPULATION SIZE AND DISTRIBUTION

Williams (1984) reported a range for *Ocypode quadrata* that extends from Block Island, Rhode Island to Santa Catarina, Brazil, including the Gulf of Mexico, the Caribbean, and Fernando de Noronha, 322 km (200 mi.) off the Brazilian mainland. It is also found in Bermuda, and populations are known to exist as far north as Martha's Vineyard, Massachusetts (Luanne



Johnson, Edgartown, MA, pers. comm.).

Although rarely seen in the winter, during the rest of the year *O. quadrata* is common or abundant on outer beaches and on more protected harbor beaches near coastal inlets along the coast of South Carolina (Fox and Ruppert 1985). Rarely has the species been the target of quantitative study in our state, and despite its abundance, nothing is known of trends in its population status here. Quantitative measures of the population size in South Carolina are non-existent, although estimates based on burrow counts or nocturnal transect counts could provide a good measure of abundance (Wolcott 1978). Such efforts have not been undertaken across a wide geographic area within the State.

## HABITAT AND NATURAL COMMUNITY REQUIREMENTS

While they have long been considered beach scavengers, a careful study of ghost crab behavior showed that on oceanfront beaches they are more likely to subsist on a diet of the common filter-feeding inhabitants of the swash zone, like the clam, *Donax*, and the mole crab, *Emerita talpoida* (Wolcott 1978). There is also evidence, however, that they may be effective scavengers of organic matter; on more protected beaches, their prey is believed to include eggs and nestlings of the loggerhead turtle, *Caretta caretta* (Dodd 1988).

Ghost crabs are largely nocturnal in nature and it is rare to catch a glimpse of them during the day. Most feeding activity occurs at night, which reduces predation by visual predators like shorebirds and gulls that might otherwise be capable of exerting considerable pressure on populations of this species. In the event that they do leave their burrows during daylight, their ability to change color to match the sand where they live lessens their chances of being seen on such a foray.

The burrows dug by ghost crabs may be up to 1.3 m deep (4 ft.). Their habits of periodically closing the burrow opening with sand during the hottest part of the day and of remaining within the burrow through the colder months provide sufficient protection from the climatic extremes that fully aquatic species rarely encounter. These burrows, which take different shapes beneath the sand, are found from near the high tide line to a distance as great as 400 m (0.25 mi.) from the ocean. A distributional gradient based on crab age is typical for this species, with younger crabs generally burrowing closer to the shore than older individuals (Williams 1984).

## CHALLENGES

Berry (1976) reported that because of their burrowing and scavenging habits, ghost crabs might be adversely affected by increased oil tanker traffic and the resultant increase in the amount of stranded oil on ocean beaches. Contact with the oil, although it appears not to be acutely toxic to the crabs, may cause a reduction in the breeding rate and increased mortality at molting.

The decline in undeveloped beachfront habitat may represent the greatest threat to the ghost crab. In South Carolina, coastal regions claim a significant portion of the State's tourism; in 1996 these coastal areas accounted for 56% of the State's visitors (SCDNR and NOAA 2000). Spending time at the beach is a highly popular activity among tourists during their visit to the

coast. Alterations to the upper intertidal zone caused by residential or commercial development of coastal areas and other beach construction may eliminate *Ocypode* from its natural habitat, either by direct mortality or by displacement to less optimal habitat. Such development, undertaken to accommodate increased recreational uses of the beaches, has been cited as the cause of the elimination of the ghost crab *O. stimpsoni* from the coastal Chinese region of Rizhao (Gao and Xu 2002).

In a recent study conducted in North Carolina, Peterson et al. (2000) found significant deleterious effects on ghost crab populations resulting from beach nourishment and bulldozing activities on eroding beaches. Although these short-term responses to erosion are considered to be preferable to “hardening” the shoreline by constructing of seawalls and groins, Peterson et al. (2000) demonstrated a clear impact, not only on ghost crabs but also on the abundance of their principal prey items. These erosion control measures are readily permitted and widely practiced on barrier islands in the Southeastern states (Leonard et al. 1990; Peterson et al. 2000); for that reason, erosion control measures present a potential but undefined threat to the well-being of ghost crab populations in South Carolina.

Even well-meaning conservation efforts targeting other species may present a threat to ghost crabs. Previous turtle protection efforts, for example, have included measures to destroy ghost crabs when its burrows were found in close proximity to loggerhead turtle nests (*Caretta caretta*), based upon wide-spread reports of predation. The true impact of such predation on the loggerhead population, however, has not been adequately assessed; there is recent evidence that this level of predation is insignificant (Thompson 1995; Von Harten et al. 2002; Sundin undated).

## CONSERVATION ACCOMPLISHMENTS

Mathews et al. (1980) previously recognized the importance of protecting the beach/dune ecosystem in South Carolina. Five of the top 14 areas in South Carolina identified by the US Fish and Wildlife Service as needing preservation measures included barrier islands with pristine dune habitat.

Although not directed specifically at the conservation of ghost crabs, a 2004 judicial ruling will keep 30 ha (75 ac.) of oceanfront property in Georgetown County uninhabited, which will ensure the preservation of that critical habitat for the Atlantic ghost crab. The ruling serves to maintain the suitability of this pristine acreage as prime habitat for sea turtles and numerous species of shorebirds, as well as ghost crabs.

Acquisition and conservation easements on undeveloped uplands and coastal islands in the ACE Basin drainage area have resulted in the protection of roughly 56,656 to 64,750 ha (140,000 to 160,000 ac.) though conservation measures on public and private land (Mike McKenzie, ACE Basin Committee Chairman, pers. comm., 2004). The ACE Basin National Estuarine Research Reserve includes four barrier islands, assuring protection of significant ghost crab habitat on Otter, Pine, Edisto and Morgan Islands. Some additional protection is afforded by state ownership of 4 oceanfront parks (Hunting Island, Edisto Beach, Huntington Beach, and Myrtle Beach) that include substantial amounts of suitable ghost crab habitat, although beach maintenance efforts at some of them may have the negative impacts noted above.

Although numerous beach nourishment studies conducted in the past failed to include an assessment of impacts on ghost crabs, this oversight has recently been recognized; measures are underway to include such evaluations at several sites in South Carolina in the near future (Pam Jutte, SCDNR, pers. comm., 2005). Peterson et al. (2000) recently conducted such a study of nourished and bulldozed beaches in North Carolina.

## CONSERVATION RECOMMENDATIONS

- Assess impacts of beach nourishment projects on Atlantic ghost crab populations in South Carolina.
- Investigate the impact, if any, that ghost crab predation may have on loggerhead turtle populations.
- Establish estimates of population size and determine trends for ghost crabs in South Carolina by widespread and long-term monitoring of ghost crab abundance, incorporating both unaltered and developed areas along the entire coastline.
- Work with municipalities and private landowners to schedule beach renourishment activity so that it is completed prior to the warm season, when *Donax* and *Emerita* (two primary food sources for ghost crabs) return in large numbers to intertidal beaches.
- To mitigate impacts to ghost crabs associated with beach bulldozing practices, encourage municipalities and private landowners to implement dune stabilizing techniques such as planting grasses.
- Develop either a state or federal management plan for the Atlantic ghost crab.
- Continue SCDNR participation in Emergency Response training programs to ensure that the Department has the most current information on planning logistics and technology for dealing with coastal oil and hazardous material releases, as well as the most effective design of aftermath shoreline assessments.

## MEASURES OF SUCCESS

If the burrow-counting census methods of Wolcott (1978) were used in conjunction with other periodic beach monitoring efforts (e.g. horseshoe crab surveys), a cost-effective program of data collection could be undertaken that would initially provide a baseline assessment of the ghost crab population size. Ultimately, this could be used to follow population trends, provide data necessary for determining what conservation measures, if any, are needed, and enable managers to make informed decisions on how useful this species might be as an indicator of the overall “health” of the dune and fore-beach ecotone. The measurement of success will be stable population trends for the Atlantic ghost crab and increased conservation of front beach habitat in South Carolina.

## LITERATURE CITED

Berry, P.F. 1976. Natal's ghost crabs. *African Wildlife* 30:35-37.

Dodd, C.K., Jr. 1988. Synopsis of the biological data on the loggerhead sea turtle *Caretta caretta* (Linnaeus, 1758). U.S. Fish and Wildlife Service, Biological Report 88 (14). 110 pp.

Fox, R.S. and E.E. Ruppert. 1985. Shallow-water marine benthic macroinvertebrates of South Carolina. University of South Carolina Press, Columbia, SC. 330 pp.

Gao, X. and J. Xu. 2002. Impact of Rizhao coastal area exploitation on inter-tidal habitats and zoobenthic communities. *Studia Marina Sinica*. 44:61-65.

Mathews, T.D., F.W. Stapor, Jr., C.R. Richter, J.V. Miglarese, M.D. McKenzie and L.A. Barclay, eds. 1980. Ecological characterization of the Sea Island coastal region of South Carolina and Georgia. Vol. 1: Physical features of the characterization area. U.S. Fish and Wildlife Service, Office of Biological Services, Washington, D.C. FWS/OBS-79/40. 212 pp.

Peterson, C.H., D.H.M. Hickerson and G.G. Johnson. 2000. Short-term consequences of nourishment and bulldozing on the dominant large invertebrates of a sandy beach. *Journal of Coastal Research* 16:368-378.

Phillips A.M. 1940. The ghost crab – adventures investigating the life of a curious and interesting creature that lives on our doorstep, the only large crustacean of our North Atlantic coast that passes a good part of its life on land. *Natural History* 46:36-41.

Ruppert, E.E. and R.S. Fox. 1988. Seashore animals of the southeast – a guide to common shallow-water invertebrates of the southeastern Atlantic coast. University of South Carolina Press. Columbia, South Carolina. 429 pp.

South Carolina Department of Natural Resources and National Oceanic and Atmospheric Administration, Coastal Services Center. 2000. Characterization of the Ashepoo-Combahee-Edisto (ACE) Basin, South Carolina. CD-ROM. SC Marine Resources Center Special Scientific Report Number 17. NOAA/CSC/20010-CD. Charleston, SC: NOAA Coastal Services Center.

Sundin, G. 2001. A test of three simple trap designs for suitability in controlling ghost crab depredation on sea turtle nesting beaches. University of South Carolina Beaufort Pritchards Island Research and Education (<http://wwwsc.edu/beaufort/pritchar/res00.htm>)

Thompson, M.S. 1995. The effect of ghost crab predation on the survival rate of loggerhead sea turtle eggs. In: Keinath, D. E., Barnard, D. E., Musick, J. A. and Bell, B. A., compilers. Proceedings of the Fifteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-387. pp. 323-324.

Von Harten, A., G. Sundin and C. Tambiah. 2002. Evaluation of specific biotic and abiotic factors affecting loggerhead (*Caretta caretta*) nests on Pritchard's Island, South Carolina, U.S.A. In: Seminoff, J. A., compiler. Proceedings of the Twenty-Second Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-503. pp. 172-173.

Williams, A.B. 1984. Shrimps, lobsters, and crabs of the Atlantic coast of the eastern United States, Maine to Florida. Smithsonian Institution Press, Washington, DC. 550 pp.

Wolcott, T.G. 1978. Ecological role of ghost crabs, *Ocypode quadrata* (Fabricius) on an ocean beach: scavengers or predators? *Journal of Experimental Marine Biology and Ecology* 31:67-82.