Fiddler Crabs Guild

Mud Fiddler Crab *Uca pugnax*
Atlantic Sand Fiddler Crab *Uca pugilator*
Red-jointed Fiddler Crab *Uca minax*

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DESCRIPTION

Taxonomy and Basic Description

Fiddler crabs are true crabs in the infraorder Brachyura. The Brachyura are the most advanced of the decapods. The crab body is generally short, wide, and flat, and is characterized by a reduced abdomen that lacks a tail fan and is flexed under the body. In all but a few small groups, all 5 pairs of walking legs are large and the first pair is always claws. The majority of brachyuran species pass through a number of planktonic larval stages, with the megalopal stage being the last larval stage before settlement to the crab form. The megalopa stage resembles the adult; however, the abdomen has yet to fold under the body. Fiddler crabs are in the family Ocypodidae that is characterized by eyes that are set close together at the end of long eye stalks.

Fiddler crabs are easily recognized by their square body and a marked difference in size between the right and left claws of males. As the male grows to maturity, the relative weight of its cheliped, or large claw, changes from approximately 2% to 65% of its total body weight. In most fiddler crab species, males can have either an enlarged left or right, with a typical handedness ratio of close to 50:50 in the population. In all fiddler crab species, fights between males of the same handedness are very different to those between opposite handed males. When facing each other, males with different handedness have their claws lined up on the same side, while males with the same handedness have their claws lined up on the opposite side. It may be easier for males of different handedness to judge each other's size, but it may be easier to interlock claws when their claws line up on the same side.

Mud fiddler crabs, *Uca pugnax,* have an H-shaped depression in the middle of the carapace and their eyestalks are long and thin. They are brown in color, with the front of the shell and eyestalks ranging from blue to turquoise. The large claw of the male is usually yellowish-orange to yellowish-white, and its

walking legs are dark and banded. The propodus of the large claw in males has an oblique ridge of small granules on the inner surface that extends from the lower margin to the junction with the dactyl (Williams 1984; Crane 1975).

The carapace of the sand fiddler crab, *Uca pugilator*, is typically a pinkish-purple color, with a bright patch of purple in the center of the carapace. The legs range in color from orange to brown. The inner surface of the large claw in males lacks the row of tubercles which can be used to distinguish sand fiddler crabs from other *Uca* species.


Red-jointed Fiddler
http://animaldiversity.ummz.umich.edu/site/accounts/information/Uca_minax.htm

Red-jointed fiddler crabs (*Uca minax)* are larger than the other two species. The joints of the large claws in males are red and possess a row of tubercles. The merus (fourth segment) of the second walking leg lacks dense pubescence (soft down or short hairs) on the ventral margin.

Status

Although fiddler crabs have no directly quantifiable commercial value, they do occupy an important role in the ecology of salt marshes and are a good environmental indicator as they are sensitive to environmental contaminates, especially insecticides. Their population densities are an example of the high productivity of coastal marshes. Their burrowing activity can erode or undermine marsh banks and can affect the aeration of sediments, which increases the growth of marsh grasses. These activities stimulate the turnover and mineralization of important nutrients. Fiddler crabs are also important regulators of cordgrass-derived production and decomposition. Fiddler crabs are often used as fishing bait, especially for Sheepshead and Black Drum and are an important food source for many other estuarine species, such as blue crabs, clapper rails and other marsh birds (Grimes et al. 1989).

POPULATION SIZE AND DISTRIBUTION

Mud fiddler crabs range from Massachusetts to Florida and are common in marshes along the Southeastern coast. The sand fiddler crab occurs along the Atlantic and Gulf Coasts from Massachusetts to western Florida. Red-jointed fiddler crabs are found along the East and Gulf Coasts of the United States from Cape Cod to Texas. South Carolina is well within the natural range of all 3 species, and they can be found throughout the State's Coastal Zone (Ruppert and Fox 1988).

Fiddler crabs are extremely abundant in South Carolina; however, assessments of fiddler crab populations are scarce. It would be extremely challenging to count these small creatures directly, in part due to their high mobility, and therefore surrogate measures of fiddler crab density can be made from counting burrows. Fiddler crab burrow density was measured along a transect from the forest to the creek bank in North Inlet, SC. Burrow density ranged between 40 and 300

burrows per m^2 (4 and 28 burrows per $ft.^2$) with highest densities at the creek bank (McCraith et al. 2003). Standing stock of the mud fiddler crab at North Inlet, SC was estimated at 29 g/m^2 dry weight (Krebs et al. 1974). In Georgia, the density of fiddler crab populations was reported as 27 crabs per m^2 (2.5 crabs per $ft.^2$) (Teal 1958).

HABITAT AND NATURAL COMMUNITY REQUIREMENTS

Fiddler crabs are one of the most conspicuous inhabitants of the marsh surface and intertidal zone. They can often be seen foraging in large groups along creek banks at low tide.

Mud Fiddler Crab

The mud fiddler crab prefers a muddy marsh environment where the substrate is relatively free of heavy plant roots, yet stable enough to allow for the construction of its burrows, which can be up to 60 cm (23 in.) deep.

Male fiddler crabs wave their oversized claw up and down to attract the attention of females for mating and to intimidate potential male competitors. They also stomp their walking legs and make noises with them in an effort to attract mates. Such displays reach a peak during spring tides, and mating occurs thereafter inside the males' burrows. The females remain inside their burrows during the two-week incubation period and come out to release their eggs, which are swept out to sea by neap tides (i.e. especially weak tides that occur during quarter moons).

After hatching, larvae go through several developmental stages (5 zoeae and a megalopal or first post-larval stage) over the two-week period that they are adrift in the ocean. Larvae are then transported back inside estuaries on the subsequent spring tide. Larvae are predatory and feed on zooplankton in the water column. They remain pelagic for some time after reaching the megalopal stage, gradually adopting a benthic existence.

Adult fiddler crabs feed on organic material extracted from mud, which is rolled into small balls after the food is removed, and deposited back onto the substrate. They appear different from pellets formed during burrow excavation; excavated pellets are much larger than feeding pellets. Mud fiddlers are adept at regulating their metabolism over a wide range of temperatures, which may explain their widespread abundance.

Sand Fiddler Crab

The sand fiddler is an abundant species on sandy and muddy intertidal areas near salt marshes and banks of tidal creeks. Burrows are constructed along the edges of marshes; however, the sand fiddler crab may occur on the marsh surface when the substrate contains more sand than mud. Sand and mud fiddler crab populations may intermingle, and large populations can be seen feeding in the intertidal areas bordering marshes along tidal creeks in the Southeastern United States. The sand fiddler crab burrow is unbranched and dug at an angle to the surface. The biology of the sand fiddler crab is similar to that already described for the mud fiddler crab above. Sand fiddler crabs have specialized spoon-shaped bristles on their maxillipeds (appendages used in feeding) that enable the crab to remove algae and other organic matter from

sandy sediments. Once the sediment has been “cleaned” by the fiddler crab, the mouthparts shape the inorganic matter into balls that are deposited around the openings of burrows (Williams 1984; Heard 1982).

Red-jointed Fiddler Crab

The red-jointed fiddler crab occurs in low salinity and freshwater tidal marshes. It is generally found on mud and sandy substrates with high organic content. This species can withstand low oxygen conditions. Red-jointed fiddler crabs may move near terrestrial areas away from the intertidal zone of marshes. Feeding habits and biology are similar to other fiddler crabs occurring in the Southeastern United States.

CHALLENGES

Contaminants, such as polychlorinated biphenyls (PCBs) and insecticide/fertilizer mixtures, will adversely affect the health of fiddler crab populations (Krebs et al.1974). Fiddler crabs apparently concentrate these toxins from seawater or food. Fiddler crabs accumulate PCBs from contaminated sediments and detritus and can transfer them to aquatic, avian, and terrestrial food webs when preyed upon by fishes, birds, and small mammals. When the insecticide, Dieldrin, is concentrated in crab tissues, it impairs locomotion, eventually killing crabs at higher concentrations (Krebs et al. 1974). Chemical contaminants can drastically reduce populations of fiddler crabs in the marsh (Krebs et al. 1974). Fiddler crabs have also been found to be sensitive to mercury (DeCoursey and Vernberg 1972) and cadmium (O'Hara 1973). Heavy metals such as mercury, copper, and zinc are toxic to fiddler-crab larvae, causing a significant delay in larval development as well as deformities.

Spraying marsh habitats with pesticides for mosquito control can also cause a significant decrease in the natural fiddler crab populations downwind of the pesticide application area (Rookery Bay NERR 1996). Studies in Florida have shown that the mortality of fiddler crabs can be markedly reduced when high-pressure nozzles are used in combination with the mosquito adulticide, Dibrom. Methods that reduce the size of the pesticide droplets not only improve the effectiveness of a pesticide to kill mosquitoes but also significantly reduce the amount of pesticide needed (Rookery Bay NERR 1996).

Nonpoint source runoff from residential areas, roads, and golf courses can have negative impacts on marsh creek ecosystems by impacting water quality. Any one discharge may involve only small amounts of chemicals that are diluted by the receiving streams, but when combined with other chemicals from multiple other discharges, significant concentrations of pollutants may result. Pollution may disrupt the food web in the salt marsh by killing off certain species and prompting others to greatly increase in abundance.

CONSERVATION ACCOMPLISHMENTS

Non-point source pollution is difficult to control. A remedy to the problem that has been adopted in many communities in South Carolina is the maintenance of buffer zones and retention ponds

(George et al. 2001). Studies have shown that fiddler crab populations respond in a positive way when wetlands are restored and good water quality is maintained (Knott et al. 1997).

CONSERVATION RECOMMENDATIONS

- Assess burrow density before and after impacts to marsh habitat to evaluate its recovery.
- Evaluate the effects of mosquito control on fiddler crab populations in South Carolina.
- Conduct studies to investigate the use of high-pressure nozzles in combination with the mosquito adulticide, Dibrom, to determine the effectiveness of this method in reducing the mortality of fiddler crabs.
- Encourage the continued use of Best Management Practices (BMPs) to reduce nonpoint source pollution runoff.

MEASURES OF SUCCESS

By evaluating the effect of mosquito adulticides and application technology on fiddler crab populations, South Carolina Department of Natural Resources (SCDNR) would be able to recommend changes in application techniques to the South Carolina Department of Health and Environmental Control (SCDHEC), resulting in more stable fiddler crab populations. In addition, by monitoring population trends in fiddler crabs, SCDNR will be better able to assess the health of and protect marsh habitat for all fish and wildlife species.

LITERATURE CITED

Crane, J. 1975. Fiddler crabs of the world Ocypodidae: Genus Uca. Princeton University Press, Princeton, New Jersey. 736 pp.

DeCoursey, P.J. and W.B. Vernberg. 1972. Effect of mercury on survival, metabolism, and behavior of larval Uca pugilator. *Oikos* 23:241-247.

George, R.Y., G. Bodnar, S.L. Gerlach and R.M. Nelson. 2001. Buffer zones promoting oligotrophication in golf course runoffs: fiddler crabs as estuarine health indicators. *Water Science and Technology* 44(11-12):591-8.

Grimes, B.H., F.T. Huish, J.H. Kerby and D. Xoran. 1989. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Mid-Atlantic)--Atlantic marsh fiddler. U.S. Fish and Wildlife Service Biological Report 82(11.114). U.S. Army Corps of Engineers, TR EL-82-4. 18 pp.

Heard, R.W. 1982. Guide to the common tidal marsh invertebrates of the northeastern Gulf of Mexico. Mississippi-Alabama Sea Grant Consortium, MASGP-79-0002. 82 pp.

Krebs, C.T., I. Valiela, G.R. Harvey and J.R. Teal. 1974. Reduction in field populations of fiddler crabs by the uptake of chlorinated hydrocarbons. *Marine Pollution Bulletin* 5:140-142.

Knott, D., E. Wenner and P. Wendt. 1997. Effects of pipeline construction on the vegetation and macrofauna of two South Carolina, USA salt marshes. *Wetlands* 17 (1):65-81.

McCraith B.J., L.R. Gardner, D.S. Wethey and W.S. Moore. 2003. The effect of fiddler crab burrowing on sediment mixing and radionuclide profiles along a topographic gradient in a southeastern salt marsh. *Journal of Marine Research* 61(3):359-390.

O'Hara, J. 1973. The influence of temperature and salinity on the toxicity of cadmium to the fiddler crab, *Uca pugilator*. *Fisheries Bulletin* 71:149-153.

Rookery Bay National Estuarine Research Reserve. 1996. Reducing the environmental damage caused by mosquito control pesticides. http://nerrs.noaa.gov/Doc/SiteProfile/RookeryBay/rsrcmgt/enviro/contampdf.pdf

Ruppert, E. and R. Fox. 1988. Seashore animals of the southeast. University of South Carolina Press. Columbia, South Carolina.

Teal, J.M. 1958. Distribution of fiddler crabs in Georgia salt marshes. *Ecology* 39(2):185-193.

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.