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National Wetlands Research Center

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**Species Profiles: Life Histories and
Environmental Requirements of Coastal Fishes
and Invertebrates (Mid-Atlantic)**

ATLANTIC MARSH FIDDLER



Fish and Wildlife Service

U.S. Department of the Interior

Coastal Ecology Group
Waterways Experiment Station

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Coastal Fishes and Invertebrates (Mid-Atlantic)

ATLANTIC MARSH FIDDLER

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Vicksburg, MS 39180

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PREFACE

This species profile is one of a series on coastal aquatic organisms, principally fish, of sport, commercial, or ecological importance. The profiles are designed to provide coastal managers, engineers, and biologists with a brief comprehensive sketch of the biological characteristics and environmental requirements of the species and to describe how populations of the species may be expected to react to environmental changes caused by coastal development. Each profile has sections on taxonomy, life history, ecological role, environmental requirements, and economic importance, if applicable. A three-ring binder is used for this series so that new profiles can be added as they are prepared. This project is jointly planned and financed by the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service.

Suggestions or questions regarding this report should be directed to one of the following addresses.

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CONVERSION TABLE

Metric to U.S. Customary

<u>Multiply</u>	<u>By</u>	<u>To Obtain</u>
millimeters (mm)	0.03937	inches
centimeters (cm)	0.3937	inches
meters (m)	3.281	feet
meters (m)	0.5468	fathoms
kilometers (km)	0.6214	statute miles
kilometers (km)	0.5396	nautical miles
square meters (m ²)	10.76	square feet
square kilometers (km ²)	0.3861	square miles
hectares (ha)	2.471	acres
liters (l)	0.2642	gallons
cubic meters (m ³)	35.31	cubic feet
cubic meters (m ³)	0.0008110	acre-feet
milligrams (mg)	0.00003527	ounces
grams (g)	0.03527	ounces
kilograms (kg)	2.205	pounds
metric tons (t)	2205.0	pounds
metric tons (t)	1.102	short tons
kilocalories (kcal)	3.968	British thermal units
Celsius degrees (°C)	1.8(°C) + 32	Fahrenheit degrees

U.S. Customary to Metric

inches	25.40	millimeters
inches	2.54	centimeters
feet (ft)	0.3048	meters
fathoms	1.829	meters
statute miles (mi)	1.609	kilometers
nautical miles (nmi)	1.852	kilometers
square feet (ft ²)	0.0929	square meters
square miles (mi ²)	2.590	square kilometers
acres	0.4047	hectares
gallons (gal)	3.785	liters
cubic feet (ft ³)	0.02831	cubic meters
acre-feet	1233.0	cubic meters
ounces (oz)	28350.0	milligrams
ounces (oz)	28.35	grams
pounds (lb)	0.4536	kilograms
pounds (lb)	0.00045	metric tons
short tons (ton)	0.9072	metric tons
British thermal units (Btu)	0.2520	kilocalories
Fahrenheit degrees (°F)	0.5556 (°F - 32)	Celsius degrees

CONTENTS

	<u>Page</u>
PREFACE	iii
CONVERSION TABLE	iv
ACKNOWLEDGMENTS	vi
NOMENCLATURE/TAXONOMY/RANGE	1
MORPHOLOGY/IDENTIFICATION AIDS	1
REASON FOR INCLUSION IN THE SERIES	4
LIFE HISTORY	4
Mating	4
Eggs	5
Larvae	5
Metamorphosis and Juveniles	5
Adults	6
GROWTH AND MOLTING CHARACTERISTICS	6
ECOLOGICAL ROLE	6
General Considerations	6
Abundance	6
Feeding Habits	7
Behavior	8
Predators	8
Parasites and Commensals	9
ENVIRONMENTAL REQUIREMENTS	9
Temperature	9
Salinity	10
Oxygen	10
Habitat and Substrate	10
The Effects of Contaminants	11
REFERENCES	13

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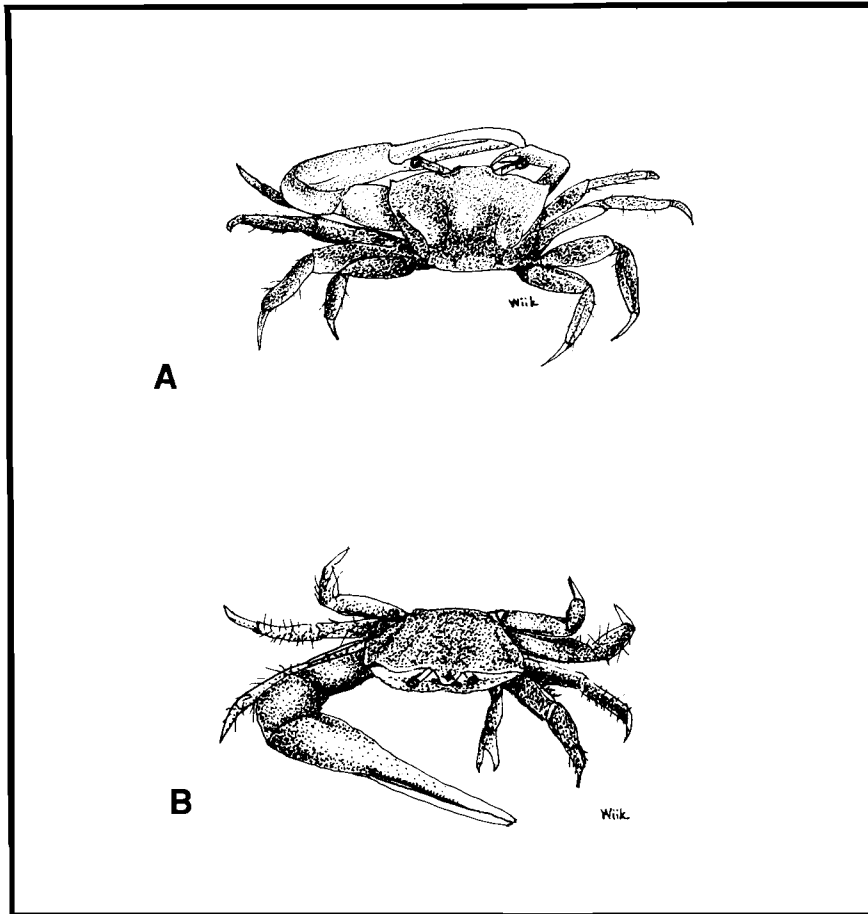


Figure 1. Male Atlantic marsh fiddler (carapace length 12 mm) (Crane 1975). A. Dorsal view. B. Frontal view.

ATLANTIC MARSH FIDDLER

NOMENCLATURE/TAXONOMY/RANGE

Scientific name.....Uca pugnax
 (Smith)
 Preferred common name.....Atlantic
 marsh fiddler (Figure 1)
 Other common names.....Calling
 crab, fiddler crab, fiddler, mud
 fiddler (Williams 1984), mud fiddler
 crab (Wheeler 1978), marsh fiddler
 crab (Ward et al. 1976).
 Class.....Crustacea
 Order.....Decapoda

Family.....Ocypodidae
 Geographic range and habitat: Estu-
 arine intertidal marshes from
 Provincetown, MA, to Daytona Beach,
 FL. (Figure 2) (Crane 1975; Williams
 1984).

MORPHOLOGY/IDENTIFICATION AIDS

Crabs belonging to the genus Uca
 are moderate to large in size. The
 three species common to the Mid-

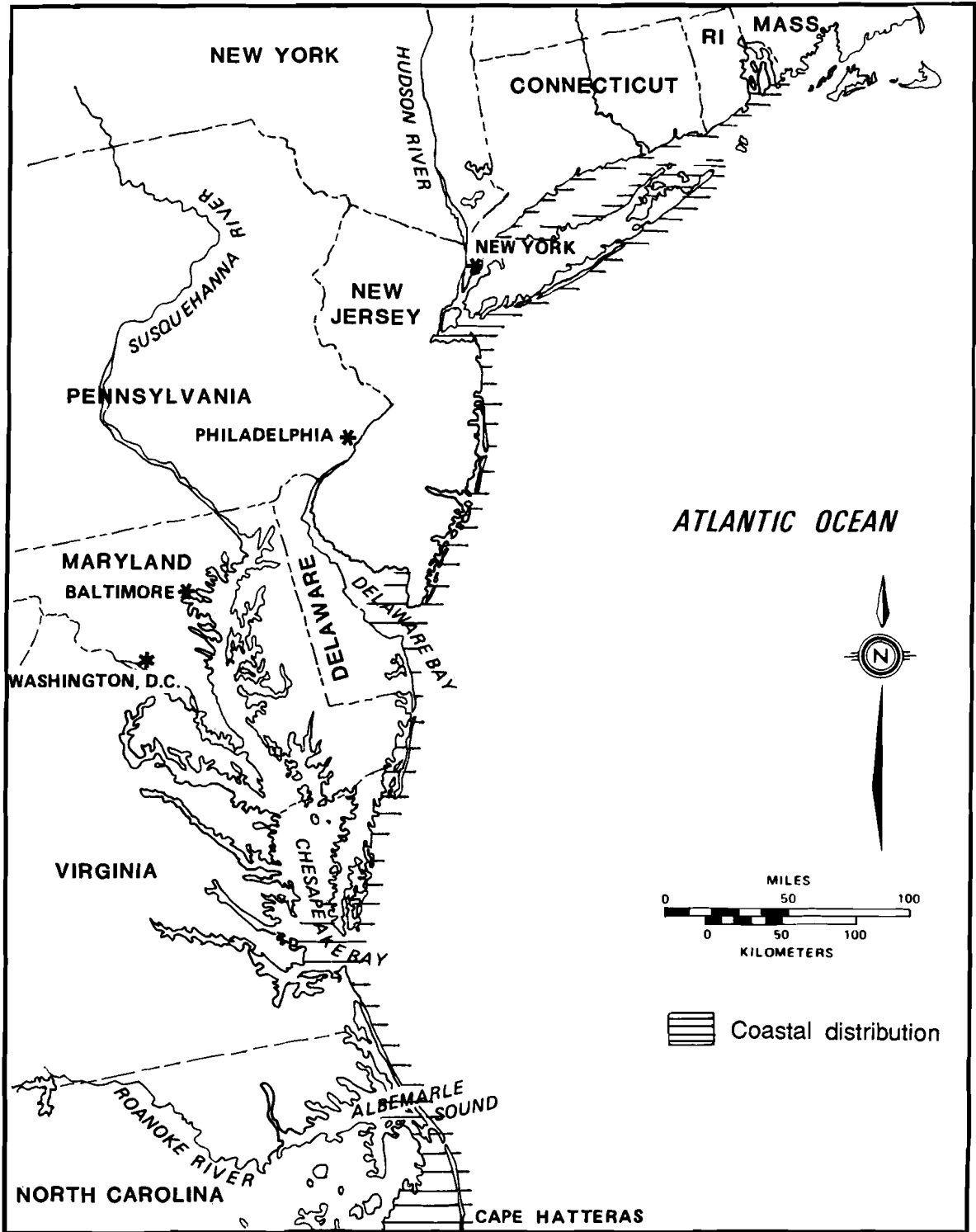


Figure 2. Distribution of the Atlantic marsh fiddler along the Mid-Atlantic coast.

Atlantic region are Uca pugnax (Atlantic marsh fiddler), U. minax (red-jointed fiddler), and U. pugilator (sand fiddler). The carapace of the Atlantic marsh fiddler male averages 15 mm long X 23 mm wide; that of the female averages 13 mm long X 18 mm wide (Williams 1984) (Figure 1).

In life, the Atlantic marsh fiddler is mostly brown (with some pale gray in the gill regions). The anterior part of the carapace and eyestalks range from blue to blue-green (Crane 1975; Williams 1984). There are no purple or red spots as are found on other fiddlers. The frontal region is about two-sevenths of the body width, with slender eyestalks (Figure 1) (Williams 1984). The dorsal carapace is flattened rather than convex as in other crabs (Barnwell and Thurman 1984). At the intersection of the front and lateral edges of the dorsal carapace, there is a sharp angle (Figure 1).

Specific identification characteristics are usually descriptive of the male and often refer to the major cheliped (large claw) (Figure 3). In the Atlantic marsh fiddler, the major cheliped ranges from a dull yellowish orange to yellow-white. In males, joints of the major cheliped have a yellow or yellow-brown border (Williams 1965). In the northern part of the range, fingers of the major cheliped are nearly always white (Crane 1975). These structures in females are colored less strongly than males (Crane 1975).

The minor (smaller) chela is white. The other appendages--the walking legs--are usually dark and may be banded (Crane 1975; Williams 1984). A patch of rows or paired rows of dense velvety pubescence, as well as sparse rows of stiff hairs, are on the ventral surface of the merus (the long section of the appendage closest to the body) of the second and third walking legs (Crane 1975). The meral

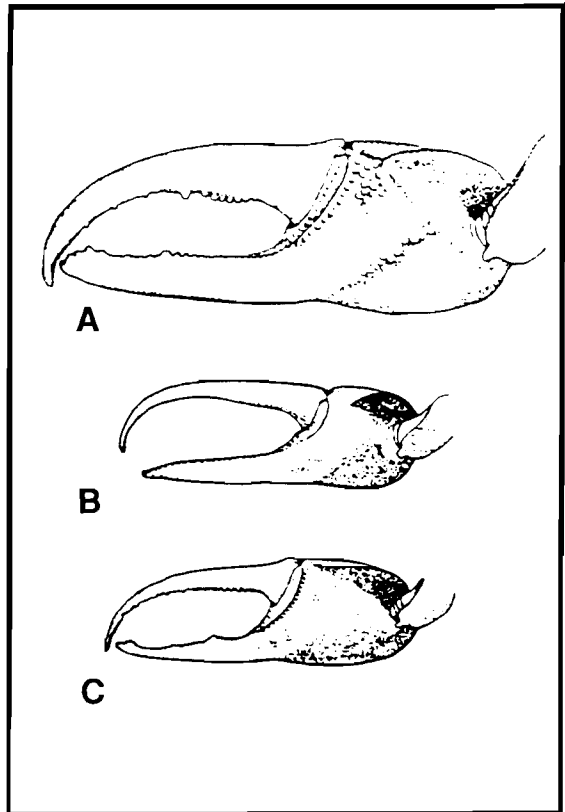


Figure 3. Inner side of the larger cheliped of the males of three species of fiddler crabs common on the Mid-Atlantic coast: A. Uca minax; B. U. pugnax; C. U. pugilator (20 mm) (Williams 1965).

surface of the second maxilliped usually has 0-75 spoon-tipped hairs (Williams 1984).

The large claw of the males occurs about equally on the right or on the left of the Atlantic marsh fiddler (Crane 1975). The weight relationship of the large cheliped ranges from 2% to 65% of the body weight (Huxley 1927). Females have two small chela that are equal in size and are colored similarly to males, but the color is less vivid (Williams 1984).

REASON FOR INCLUSION IN SERIES

Fiddler crabs are the most abundant and conspicuous invertebrates in many salt marshes (Montague 1980). They are probably the most thoroughly studied of the shore crabs in North America (Barnwell and Thurman 1984). Although there are 15 species along the North American coast, the Atlantic marsh fiddler is the only one endemic to the temperate Mid-Atlantic coast of the United States (Miller and Vernberg 1968; Barnwell and Thurman 1984). The Atlantic marsh fiddler, red-jointed fiddler, and the sand fiddler are the three major species on this coast and make up the greatest animal invertebrate biomass in the salt marsh intertidal zone (Teal 1962; Bason and Frey 1977). The Atlantic marsh fiddler is the most abundant of these (Crane 1975).

The ecological influence of fiddler crabs in the salt marsh is large. Their activities and byproducts can significantly influence the transfer of energy and nutrients within the marsh ecosystem (Montague 1980; Daiber 1982). The sensitivity of these crabs to pollutants and their role in the balance of the salt marsh ecosystem, are major reasons for the inclusion of the Atlantic marsh fiddler in this series.

For further information on the Atlantic marsh fiddler as well as other species of *Uca* in the Mid-Atlantic region, the reader is referred to selected lengthy review articles and books by Crane (1975), Powers (1977), Montague (1980), Daiber (1982), Barnwell and Thurman (1984), and Williams (1984).

LIFE HISTORY

Mating

Courtship of the Atlantic marsh fiddler consists of a series of visual

and acoustical displays and were extensively studied and characterized by Crane (1943, 1975). Visual and acoustical signals replace the standard chemical communications of most aquatic crustaceans (Bliss 1968; Salmon and Atsides 1968b).

Usually in precopulatory behavior, male fiddler crabs display a high intensity waving of the major cheliped and produce acoustical signals (Pearse 1912, 1914; Crane 1943); however, male Atlantic marsh fiddlers often have lethargic displays. Acoustical displays by males are produced by vibrating and stamping of the walking legs on the substrate (Salmon 1967; Salmon and Atsides 1968 a, b). The waving of the large claw can be seen at considerable distances and is weakly circular and very jerky (Crane 1975). Displaying males are not bleached in color during mating to the extent shown by males of other species of fiddlers, but the major cheliped lightens to light brown or yellow (Crane 1975). Nocturnal reproductive behavior, including acoustical displays, of the Atlantic marsh fiddler in the southern part of its geographic range, has been reported in Salmon (1965).

After these courtship displays, the female usually follows the male to his burrow to mate (Crane 1975). Although herding (the male physically maneuvering the female to his burrow) is found in other species of fiddler crabs, it is seldom seen in the Atlantic marsh fiddler (Salmon 1967). Copulation usually takes place in the burrow, but has been observed on the surface of the marsh in nature; in captivity, mating has been observed underwater (Herrnkind 1968a). Unlike mating in some other crabs, fiddlers mate while the exoskeleton of the female is in a hardened state (Hartnoll 1969; Crane 1975).

Eggs

The fertilized eggs are carried on the abdomen of female intermolt Atlantic marsh fiddlers until they hatch and are released. DeCoursey (1979) found clutches (eggs per crab) of 1,500 to 94,000 eggs. Other reports of the Atlantic marsh fiddler clutches range from 4,500 to 23,700 (Shanholtzer 1973). The size of the clutch, commonly known as the sponge, is probably related to the size of the female (Gray 1942).

Ovigerous females have been observed along the eastern U. S. coastline beginning in April in Florida and in July and August at Woods Hole, Massachusetts (Pearse 1914), and New Jersey (Crane 1943). Crane (1943) suggested that there are two breeding seasons in New York--one in July and one in August. Spawning periods are extended--May to September--in the lower latitudes (Crane 1975).

DeCoursey (1979) found that eggs hatched over a period of 2 hours. The larvae were released (with the aid of abdominal contractions) in phase with the nocturnal high tide. In laboratory experiments, isolated females released their larvae in synchrony with those females in the wild (DeCoursey 1979). Wheeler (1978) found that larval release coincided with the lunar cycle in the Delaware Bay, and that the Atlantic marsh fiddler released larvae during the spring and neap tides. It is hypothesized that the synchrony with the nocturnal high tide maximum allows minimal exposure of the ovigerous females to predation and provides the zoeae with a favorable tidal current upon which to be swept from the marsh into the coastal waters (Crane 1975; DeCoursey 1979; Christy 1982; Salmon et al. 1986). Christy (1982) concluded that the timing of the release of zoeae probably is a response to selective pressures that cause larval mortality such as lethal high temperature, low salinity, and predation by planktivores.

Larvae

After hatching, the planktonic larvae of the Atlantic marsh fiddler pass through five zoeal stages (each lasting from 7 days to a month) and one megalops stage of 4 days to a month (Hyman 1920, 1922; Herrnkind 1968a). Most published information on larval and postlarval stages of fiddler crabs is on sand fiddlers (Herrnkind 1968a); however, the Atlantic marsh fiddler larvae are similar in most respects to those of sand fiddler larvae though they are smaller (Hyman 1920). The zoeae of all three Atlantic species of fiddler crabs are carnivorous.

The zoeae of the three common Mid-Atlantic fiddlers make up a significant portion of the estuarine plankton; for example, Sandifer (1973) found zoeae of fiddler crabs to be the most abundant larval decapods in the Chesapeake Bay, reaching numbers greater than 100 per cubic meter plankton tow. Larvae in this bay were present from June to October, with peak abundance in July. In Delaware estuaries, the zoeal stages lasted 15 days at 25 °C and 25 ppt salinity, and the megalops stage lasted 12.5 days (Wheeler 1978).

The distribution of zoeae appeared to be stratified in the water column, and surface waters were preferred by first and second stage zoeae. Third stage zoeae were found in intermediate depths, and fourth and fifth stages were in greater depths (Hyman 1920, 1922).

Metamorphosis and Juveniles

Megalops larvae of the Atlantic marsh fiddler metamorphose into the first crab stage (lasting from 3 to 4 days) and settle to the substratum (Hyman 1920, 1922). The second crab stage lasts 4 to 5 days and the third stage lasts 7 days (Hyman 1920, 1922; Herrnkind 1972). While in these stages the crabs are weak, cling to

