

***Charybdis hellerii* (Milne Edwards, 1867), a nonindigenous portunid crab (Crustacea: Decapoda: Brachyura) discovered in the Indian River lagoon system of Florida**

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Abstract.—The portunid crab *Charybdis hellerii* (Milne Edwards, 1867), a species of Indo-Pacific origin, is reported from the Indian River lagoon system of Florida. Although this species was reported in 1987–1988 from Cuba, Colombia, and Venezuela, this is the first subsequent record in the western Atlantic, and the first in the continental United States. The specimens found in the Indian River include adults of both sexes (one female ovigerous), and juveniles, indicating that the population is reproducing and that this nonindigenous species has become established in the region. This species must now be considered present in the tropical western Atlantic at least across the entire Caribbean region. Recognition characters of *C. hellerii* are provided, as well as a summary of what is known about its distribution, biology, and probable method of arrival. Comments on other marine decapods introduced in eastern North America are included.

On 20 April 1995, two adult specimens, a male and an ovigerous female of *Charybdis hellerii* (Milne Edwards, 1867), a species of Indo-Pacific origin, were caught in baited traps in the Indian River lagoon system of Florida in the vicinity of the Ft. Pierce Inlet. The male, 74 × 49 mm of carapace width × carapace length, remained alive in an aquarium for over a month until it was sacrificed. The ovigerous female (54 × 39 mm), died the same day it was captured. Following an announcement at The Crustacean Society's summer meeting (Lemaitre 1995) of the discovery of these specimens, several researchers (see names in acknowledgments) working in the Indian River during the period May–August 1995, informed me that they had found additional adults and juveniles in the Sebastian and Fort Pierce Inlets.

Charybdis hellerii was first collected in the western Atlantic in 1987 (Fig. 1), in Cuba by Gómez & Martínez-Iglesias (1990), in Venezuela by Hernández & Bolaños (1995), and in Colombia by Campos & Tür-

kay (1989) where it was also collected in 1988. Although there have been no subsequent published reports of this species, it has been found repeatedly since 1988 in the Santa Marta area of Colombia (N. H. Campos, pers. comm.). The present report of *C. hellerii* in eastern North America extends the range of this species in the western Atlantic across the Caribbean region, to include subtropical Florida.

Keys for the identification of species of *Charybdis* as well as illustrations of *C. hellerii*, are available in a number of publications (e.g., Chopra 1935, Leene 1938, Stephenson et al. 1957, Stephenson 1972, Gómez & Martínez-Iglesias 1990). However, for the benefit of researchers working in the New World who may not have easy access to the earlier, more detailed taxonomic references, it seems appropriate to include here the most important recognition characters of this newly introduced species. Such information may facilitate future discovery and monitoring of populations of this portunid crab.

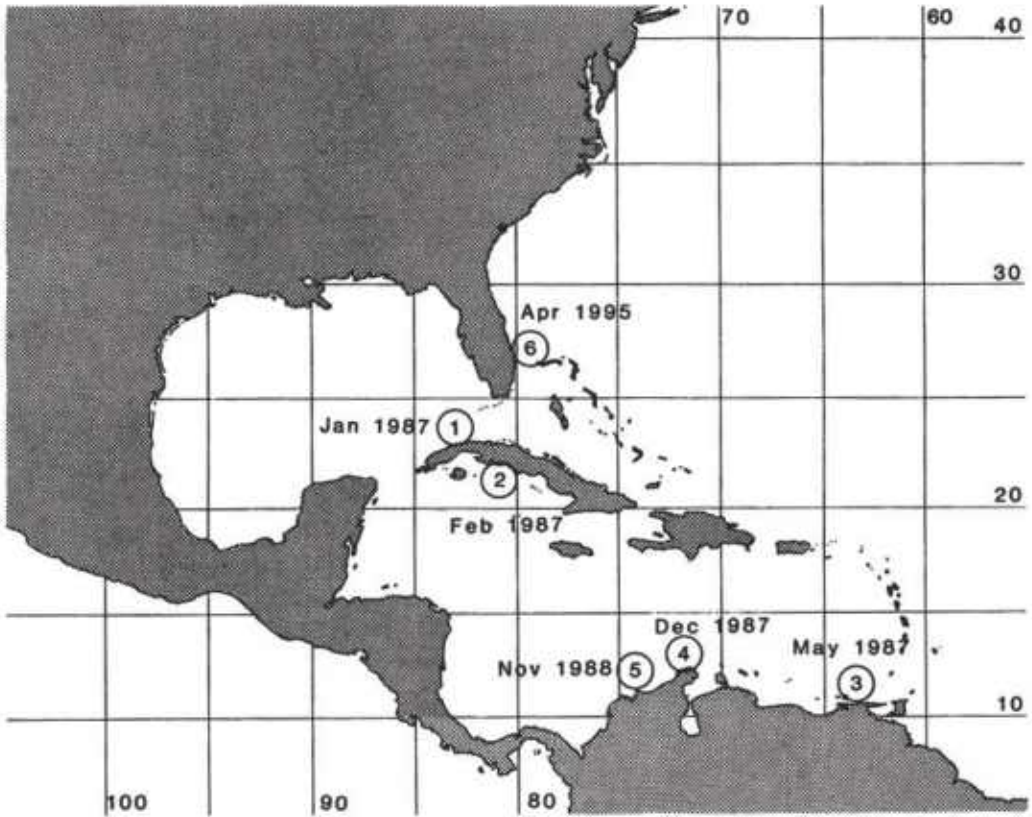


Fig. 1. Map showing collecting dates and locations of capture of *Charybdis hellerii* (Milne Edwards, 1867) in chronological order: 1, 2, Cuba: NE coast, Bahía Gibara (Provincia Holguín), and S coast, Bahía Cienfuegos (Provincia Cienfuegos) (Gómez & Martínez-Iglesias 1990); 3, NE Venezuela: Ensenada de Turpialito, Golfo de Cariaco (Estado Sucre) (Hernández & Bolaños 1995); 4, 5, Colombia: Bahía de Portete (Guajira), and Bahía Chengue (Magdalena) (Campos & Türkay 1989); 6, eastern USA: Indian River, Ft. Pierce, Florida (this report).

Method of capture.—The traps used were cylindrical, and consisted of 50 cm-long sections of PVC pipe of 20 cm diameter. The ends of each cylinder trap were fitted with cone entrances made of galvanized hardware cloth with a 1 cm mesh size. The cones were placed at each end with the narrow end facing the inside of the pipe. A small plastic bait basket was tied in the midsection of each trap. Bait used was mullet, purchased locally. Arrays of four traps were fixed to a long line, with a 20 kg lead weight on each end of the line. Two such arrays were left overnight in the vicinity of the Ft. Pierce Inlet: one in a channel south of Little Jim Island (in 1.5 m depth); and another in the Ft. Pierce turning basin just

north of South Bridge (about 20 m from the mainland shoreline, in 4 m depth). After capture, the specimens were transported to the laboratories of the Smithsonian Marine Station at Link Port, Florida. The adult male and ovigerous female specimens have been deposited in the collections of the National Museum of Natural History, Smithsonian Institution, Washington, D.C., under catalogue number USNM 275907.

Family Portunidae

Charybdis hellerii (Milne Edwards, 1867)

Figs. 1, 2

Recognition characters.—Carapace with dorsal surface naked; anterolateral margin



Fig. 2. *Charybdis hellerii* (Milne Edwards, 1867), male (74 × 49 mm), channel south of Little Jim Island, Ft. Pierce, Florida, USNM 275907.

with 6 sharp, black-tipped teeth (including outer orbital). Frontal region with 6 prominent teeth: 2 inner orbitals plus 4 blunt submedians, latter reaching slightly in advance of orbitals. Chela stout; palm with 5 strong black-tipped spines on dorsal face. Swimming leg with merus and carpus each armed with strong black-tipped spine on posterior margin distally; propodus with row of spines on posterior margin. Sixth abdominal segment of male about as broad as long, posterodistal margins rounded; telson bluntly triangular, basal width less than distal width of sixth abdominal segment. Male first gonopods, when viewed in situ, reaching approximately to suture between fifth and sixth thoracic somite, diverging in distal third; each with row of about 25 slender spines on lateral margin distally (spines diminishing in length distally).

Coloration.—Overall dark green except

for light purple area on upper, inner surface of palm, and dark purple on dorsal surfaces of distal 4 segments of walking and swimming legs. Carapace with pale green or whitish arcs on frontal, hepatic and epibranchial regions. Fingers of chelipeds dark purple.

Distribution.—Indo-Pacific: Japan, Philippines, New Caledonia, Australia, Hawaii, and throughout the Indian Ocean, including the Red Sea (Stephenson 1972, Kathirvel & Gopalakrishnan 1974, Vannini 1976, Javed & Mustaqim 1994). Eastern Mediterranean: Israel, and Egypt (Steinitz 1929, Galil 1992). Western Atlantic: eastern Florida, Cuba, Colombia, and Venezuela (Campos & Türkay 1989, Gómez & Martínez-Iglesias 1990, Hernández & Bolaños 1995, this report).

Biology.—This species is considered commercial in southeast Asia (Moosa 1981). Not much is known about its biology. The larvae of *C. hellerii*, for example,

have not been described. Other species of *Charybdis* for which the complete larval development is known, have five to six zoeal stages and a megalopa (Greenwood & Fielder 1980). Fecundity of *C. hellerii*, as expressed by number of eggs, has been reported to range from 22,517 to 292,050 eggs per female (Siddiqui & Ahmed 1992). Other congeneric species (e.g., *C. cruciata*, *C. hoplites pusilla*, *C. natator*, *C. feriatus*) with biology probably similar to that of *C. hellerii*, are known to spawn year round but with peaks in early spring and fall, and have fecundities ranging from 181,230 to 3,200,000 million eggs per female (Pillai & Nair 1970, 1976; Campbell 1984; Sumpton 1990). *Charybdis hellerii* prefers soft bottom, although it is also found in rocky bottom and among live coral, and ranges from the intertidal to 51 m in depth (Stephenson et al. 1957, Galil 1992). Javed & Mustaquim (1994) recently reported specimens of *C. hellerii* from Pakistan that were carrying acorn barnacles (*Chelonibia patula*) on the carapace and chelipeds.

Timing and method of introduction.—Reports on the presence of *C. hellerii* in the Caribbean and Florida suggest that the arrival of this species in the region occurred in relatively recent times, probably in the late 1980's (see Fig. 1). Campos & Türkay (1989), and Gómez & Martínez-Iglesias (1990), observed that the presence of *C. hellerii* in Colombia and Cuba was correlated with increased ship traffic coming from the eastern Mediterranean where this species migrated via the Suez Canal and is now firmly established (Steinitz 1929, Galil 1992). Campos & Türkay (1989:122) indicated the possibility that the species arrived in ballast water or "clinging to the ships trunk". Transport in ballast water is the most probable explanation for the arrival of this species to the Caribbean and eastern Florida. It is unlikely that crabs could cling to the hull of any modern ship, although crabs could be transported by ships in fouled sea chests or fouled seawater intake pipes. As suggested by Gómez & Martínez-

Iglesias (1990:71), it is also possible that this species was introduced in one or more sites and subsequently dispersed via larval stages to various other coastal environments in the region.

Presence in the Indian River of adults, including at least one ovigerous female, and juveniles, leaves little doubt that a reproducing population exists in this area and that the species is already established. The scant information available on the biology of *C. hellerii* indicates the potential of this species to successfully colonize marine ecosystems of South Florida and the Gulf of Mexico.

Marine decapods introduced in eastern North America.—*Charybdis hellerii* is the third marine decapod to be introduced and become established in the North American Atlantic coast. The other two being the western Pacific grapsid crab *Hemigrapsus sanguineus* (see Williams & McDermott 1990, McDermott 1991), and the European portunid crab *Carcinus maenas* (see Hedgpeth 1993, Carlton & Geller 1993, Cohen et al. 1995, Carlton & Cohen 1996). *Hemigrapsus sanguineus* is now known from Cape Cod to Chesapeake Bay (J. T. Carlton, G. Ruiz, A. H. Hines, Jr., pers. comms.). *Carcinus maenas* is the oldest decapod introduction to eastern North America. This species is known to have been present in eastern North America at least since the early 1800's, although it was then known under the name *Cancer granulatus* Say, 1817 [see Rathbun 1930:15, under *Carcinides maenas* (Linnaeus)]. By the late 1800's, *C. maenas* was well established from Cape Cod to New Jersey (Smith 1879), and currently is known to be established from Nova Scotia to New Jersey (Cohen et al. 1995). It has also been introduced to and is established in Australia, South Africa, Japan, and Pacific North America (Le Roux et al. 1990, Carlton & Cohen 1996). Curiously, the older published information on this species does not mention how it reached eastern North America. Recently, Cohen et al. (1995) have indicated that the global dispersal of *C. maenas* ap-

pears to be linked to the movement of fouled and bored wooden ships.

At least five other marine decapods have been considered in the literature as "introduced" in eastern North America but have not become established. Of these, two Indo-West Pacific penaeids (*Penaeus japonicus*, *P. monodon*) and two eastern Pacific penaeids (*P. stylirostris*, *P. vannamei*) are cultured extensively in South Carolina, Florida, and Texas, and while specimens of the latter three have been found in the wild as escapees from the shrimp farms, no reproducing populations have been reported (Wenner & Knott 1992). The Asian *Eriocheir sinensis* or "Chinese mitten crab", is believed to have arrived to eastern North America in ship ballast water (Nepszy & Leach 1973). Adults of *E. sinensis* have been steadily collected in the Great Lakes, most in Lake Erie, since the early 1970's to 1994 (J. T. Carlton, pers. comm.). However, since *E. sinensis* is catadromous, it cannot reproduce in the Great Lakes. One transient specimen of *Eriocheir sinensis* was found in Louisiana in 1987 but has not been found there since (D. L. Felder, pers. comm.). This species apparently has also been transported as a live food item sold in Asian-American markets (Horwath 1988, 1989).

Acknowledgments

I thank Woody Lee, Smithsonian Marine Station Link Port, Ft. Pierce, Florida, for his invaluable help in trap building, navigational guidance through the Indian River, and assistance during trips to the Station. For providing me with information on additional specimens of *Charybdis hellerii* found in the Indian River, I thank D. L. Felder (University of Southwestern Louisiana, Lafayette), and A. H. Hines, Jr., and R. B. Manning (both from the Smithsonian Institution, Washington, D.C.). I am particularly grateful to J. T. Carlton (Williams College-Mystic Seaport, Connecticut), and an anonymous reviewer for extensive comments and up-to-date information that considerably

improved the manuscript. The following individuals also supplied useful information: Dave K. Camp (Florida Marine Research Institute, St. Petersburg, Florida), A. J. Provenzano, Jr. (Old Dominion University, Norfolk, Virginia), M. Tavares (Universidade Sta. Ursula, Rio de Janeiro, Brazil), E. L. Wenner (Marine Resources Research Institute, Charleston, South Carolina), A. B. Williams (National Marine Fisheries Service, Washington, D.C.), and J. D. Williams (National Biological Survey, Gainesville, Florida). This study was supported by the Smithsonian Marine Station at Link Port, Ft. Pierce, Florida, and is contribution no. 387 from that Station.

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