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Occurrence and Diet of Juvenile Loggerhead Sea Turtles, *Caretta caretta*, in the Northwestern Gulf of Mexico

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Subadult loggerheads (*Caretta caretta*) are the most common sea turtles in the northwestern Gulf of Mexico (Hildebrand, 1983), occurring nearshore where they feed primarily on benthic invertebrates (Plotkin et al., 1993). Adult loggerheads also occur in the northwestern Gulf but appear to be less abundant than subadults, do not regularly nest on any beach in this region (Dodd, 1988; Shaver, 1991), and presumably migrate to rookeries in the eastern Gulf of Mexico or the western Atlantic Ocean, including the Caribbean Sea (Meylan, 1982; Dodd, 1988). A few documented reports of post-hatchling and juvenile loggerheads exist from the northwestern Gulf of Mexico, most of which come from individuals stranded on the Texas coast within the size range (< 40 cm curved carapace length) once referred to as the "lost year," but more recently termed "pelagic stage" (Carr, 1986, 1987). Pelagic stage loggerheads are known inhabitants of driftlines and convergence zones where they find refuge and food in *Sargassum* and other items that accumulate in these surface circulation features (Fletemeyer, 1978; Carr and Meylan, 1980; Van Nierop and Den Hartog, 1984; Carr, 1986; Richardson and McGillivary, 1991; Witherington, 1993). Pelagic stage loggerheads are rare in US waters (Carr, 1986), but recent strandings in Texas suggest they may be more common than previously believed (Plotkin, 1989).

Between 1987 and 1993 I examined 10 juvenile loggerheads that were stranded on the south Texas coast (Mustang Island, North and South Padre Islands). I measured curved carapace length (CCL) and noted the general condition of each turtle. I performed necropsies on seven dead specimens, collected and preserved digestive tract contents in 10% buffered formalin, and identified food items to the lowest taxon possible. Three live turtles were generally in poor physical condition and were held in captivity, rehabilitated, and then released. The results of these studies are presented in Table 1.

The size of the loggerheads I examined ranged from 10.8 to 32.5 cm CCL ($\bar{x}$ = 20.7 cm, SD = 8.7). These juvenile loggerheads are within the pelagic stage size range which Carr (1986) reported missing from US waters and which are abundant in the eastern North Atlantic Ocean near Madeira and the Azores (Bolten et al., 1993). Carr's (1986) dispersal scenario for neonate loggerheads originating from US Atlantic Ocean rookeries, based on dominant surface circulation patterns of the North Atlantic Ocean, accounts for the apparent absence of pelagic stage loggerheads in US waters. According to Carr's (1986) hypothesis (recently supported in part by Bolten et al., 1993), neonate loggerheads cross the Atlantic Ocean, travel the circuit of the North Atlantic Gyre, and eventually return to US waters where they are recruited into nearshore benthic habitats. The origin of the juvenile loggerheads I examined is unknown, but it is presumed that they originated from rookeries located elsewhere, because there are virtually no loggerhead nesting sites in the northwestern Gulf of Mexico (see map of loggerhead nesting locations in Dodd, 1988).

Based on oceanographic features of the Gulf of Mexico, there are several plausible scenarios that may explain origin(s) of and route(s) travelled by juvenile loggerheads to Texas Gulf beaches (see Carr, 1986, and Collard, 1987, for review). The first hypothesis is that neonate loggerheads from Florida Gulf coast rookeries travel westward and eventually reach the western Gulf of Mexico. An alternative hypothesis is that neonate loggerheads from US Atlantic coast rookeries travel in the North Atlantic Gyre and return to US Atlantic waters, entering the Gulf of Mexico via the Yucatan current. Lastly, it is possible that these loggerheads originated from a rookery outside the US (i.e., the Caribbean, Central America, or South America [Dodd, 1988]) and entered the Gulf of Mexico via the Yucatan current. The two smallest loggerheads (Table 1, turtles 1 and 2) were probably from South American rookeries because their size indicates that they were only a few weeks post-hatching (Dodd, 1988), and the only known areas where loggerhead hatchlings are produced from January through March are located in French Guiana and Brazil (Dodd, 1988). The intermediate sized loggerheads (turtles 3–6) were hatched either during the year they were stranded or in the year prior to stranding. Their origin is probably a rookery from the Florida Gulf coast, the Caribbean, or South America. The largest loggerheads (turtles 7–10) were hatched at least one or more years prior to stranding and could have originated from any loggerhead rookery in the eastern Gulf of Mexico, western Atlantic Ocean, or Caribbean Sea.

Table 1. Date and location of stranding, curved carapace length (CCL, in cm), and digestive tract contents of juvenile loggerhead turtles (*Caretta caretta*) stranded on the south Texas coast (MI = Mustang Island, NPI = North Padre Island, SPI = South Padre Island). Pelagic vs. benthic stages determined by dietary analysis.

Turtle	Date	Location	CCL	Digestive tract contents
Pelagic Stage				
1	17 Apr 1988	MI	10.8	*Sargassum*, *Janthina* (purple sea snail), jellyfish, balloon, latex rubber, aluminum foil, hard plastic
2	27 Apr 1988	MI	11.2	not examined
3	10 Jun 1988	MI	14.8	not examined
4	1987	SPI	16.0	*Sargassum*, bird feathers, woody vegetation
5	17 Apr 1988	NPI	16.0	*Sargassum*, *Janthina*, styrofoam
6	23 Apr 1988	NPI	16.5	*Sargassum*, stomatopod and decapod larvae, barnacle cirri, bird feathers, woody vegetation
7	9 Apr 1988	MI	26.6	not examined
8	8 Apr 1988	NPI	30.0	*Sargassum*, jellyfish, styrofoam
9	5 Apr 1993	NPI	32.4	*Sargassum*, plastic bag pieces
Benthic Stage				
10	27 Apr 1992	MI	32.5	*Virgularia presbytes* (sea pen)

Digestive tracts of the 9 smallest loggerheads examined contained *Sargassum*, pelagic crustaceans and mollusks, flotsam, and anthropogenic plastic debris (Table 1), indicating they had been feeding in upper surface waters. This is consistent with previous observations of pelagic stage loggerheads (see Dodd, 1988, for review). Digestive tract contents of the largest loggerhead I examined (turtle 10, 32.5 cm CCL) were different from the others, as it had been foraging on benthic sea pen (*Virgularia presbytes*). Subadult and adult loggerheads (51 to 105 cm CCL) in the northwestern Gulf of Mexico are nearshore benthic foragers that feed predominantly on sea pen in 6 to 12 m water depth (Plotkin et al., 1993). Further evidence that turtle 10 was post-pelagic stage and already resident in the benthic community were numerous turtle barnacles (*Chelonibia testudinaria*) attached to its carapace. Turtle barnacles are common commensals of subadult and adult loggerhead turtles from this region but are rarely seen attached to pelagic stage turtles (*pers. observ.*). It is unknown when loggerheads leave the pelagic stage or what prompts this shift in habitat and resource use. Turtle 10 is one of the smallest loggerheads ever recorded foraging in a benthic habitat and probably represents the lower end of the size range at which loggerheads are recruited from pelagic to nearshore benthic feeding grounds.

The number of pelagic stage loggerheads found stranded on Texas Gulf beaches suggests they may be more abundant in US waters than previously believed and that the Gulf of Mexico may be important developmental habitat. Alternatively, the temporal distribution of the loggerhead strandings suggests their occurrence may be a rare "group" event. Six of the specimens I examined had stranded in the same geographic area during a discrete time period (April, 1988) and may have been transported in the same water mass before coming ashore. Unusual or fluctuating oceanic conditions may concentrate pelagic stage loggerheads in the northwestern Gulf of Mexico, and we cannot yet state that their occurrence in these waters is either normal or frequent.

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First Record of *Heosemys spinosa* from the Philippines, with Biogeographic Notes

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Heosemys spinosa, the spiny turtle, is a widespread southeast Asian batagurid, distributed from Tenasserim in southern Myanmar, south to the tip of the Malay Peninsula, and also on the islands of Sumatra, Borneo, and Natuna (Smith, 1931; Pritchard, 1979; Iverson, 1992). It is apparently absent from Indo-China, and not previously known from the Philippines.

Two specimens of *H. spinosa* collected in the Philippines have now been identified in the collection of the Herpetology Division, Philippines National Museum (PNM). These include an adult male (Fig. 1) (identifiable from the deep plastral concavity and everted cliteropenis) and an adult female (showing a flat plastron and a wide postanal gap). They were collected on Mindanao Island by ornithologists Robert Kennedy and Pedro Gonzales. This comprises the first record of *H. spinosa* for the Philippines.

Measurements taken with vernier calipers to the nearest 0.1 mm of the larger adult male, PNM 2233, followed by the smaller adult female, PNM 2232, and descriptions of the two turtles are given below.

Straight carapace lengths 193.6 and 179.3 mm; straight carapace widths 161.3 and 141.5 mm; greatest plastron lengths 181.2 and 179.7 mm; median plastron lengths 164.1 and 167.0 mm; anterior plastron lobes 85.3 and 85.3 mm; posterior plastron lobes 107.5 and 97.1 mm; head widths 31.3 and 30.4 mm; tail lengths (vent to tip) 21.4 and 27.0 mm; plastral concavity depths 8.8 and 0.02 mm. Lengths of vertebral scutes, anterior to posterior: 43.3, 34.9, 32.0, 32.9, 35.7 and 37.7, 33.0, 30.2, 30.2, 33.9 mm. Lengths of plastral seams, anterior to posterior: 25.7, 12.3, 39.4, 38.3, 34.0, 14.8 and 18.9, 16.4, 40.8, 39.8, 36.8, 16.3 mm.

Shell moderately elevated, with a flattened vertebral region. A distinct vertebral keel, but lacking lateral keels. The anterior margin of the carapace is unserrated, the posterior margin weakly serrated. Nuchal small and triangular. Vertebral I constricted anteriorly. All vertebrals broader than long, and as broad as the costals. Plastron large, the greatest length approximately as long as the carapace, emarginated anteriorly and notched posteriorly. The longest median suture in the plastron is between the abdominals, the shortest between the anals. Both anterior and posterior lobes of the plastron are narrower than the median plastron length, the posterior lobe wider than the bridge. Both specimens have 27 annuli on costal III. Head small, upper jaw weakly