to light since the description, and *T. s. cerebrosus* has been treated variously as a synonym of *T. fulvus* (Stuart 1963; Rossman 1970 — both by implication), as a subspecies of *T. cyrtopsis* (Rossman 1971), or as a synonym of *T. marcianus* (Webb 1982). Clearly, the identity of this nominal taxon is far from settled.

Unlike his predecessors, Webb (1982) gave a detailed redescription of the type series of *cerebrosus*, and he provided the first photographs of the holotype and paratopotype. Rather than repeat his descriptions here, I will merely point out a few differences I observed, and will provide data on several pertinent features that Webb did not discuss. For the holotype, I recorded 66 (rather than 67) subcaudals and 23 (vs. 22) maxillary teeth; I clearly saw the lateral stripe on dorsal scale rows 2 and 3 (vs. not recognizable), and observed short and narrow black bars preceding the posterior margin of supralabials 2-5 (vs. 4 and 5). The male paratopotype appears to have 146 (vs. 149) ventrals and unmarked supralabials (vs. faint bars on 4 and 5). Although not reported by Webb (1982), this specimen, like the holotype, has 23 maxillary teeth. The other male paratype (FMNH 410) appears to have 78 (rather than 79) subcaudals and, to my eyes, lacks distinct supralabial markings save for a very narrow black bar lying along the posterior margin of supralabial 5 (the epidermal scales are missing and the animal is too discolored by preservative to state with any degree of certainty that 6 and 7 were the same color in life as the temporals). This animal possesses 22 maxillary teeth.

Webb (1982) concluded that the holotype was assignable to *Thamnophis marcianus praeocularis* (on the basis of vertebral stripe width and ventral pattern) with a tendency in ventral pattern toward *T. m. bovalli*. He opined that the two male paratypes differed too much from the female holotype and from each other (and, presumably, from *T. marcianus*), to permit allocation without further study.

The width of the vertebral stripe in the holotype of *cerebrosus* may be similar to that of *T. m. praeocularis*, but the holotype has too few maxillary teeth (23 vs. 27-31), too many ventrals (142 vs. 134-138), and too short a tail (21.6% of total length vs. 24.8-26.8%) to belong to that taxon. In these three specific features, the holotype more closely resembles members of the Tehuantepec population of *T. m. marcianus*. Such an association would also make more sense zoogeographically (*praeocularis* being confined to the Caribbean versant), except that I am not convinced this specimen (any more than the male paratypes) is a *Thamnophis marcianus* of any kind. All three lack any trace of the unique head pattern characteristic of all *T. marcianus* (see Rossman 1971, fig. 2) — including USNM 108598-599 from Aquacate, Chiapas. Moreover, the holotype of *cerebrosus* has a broad muzzle tip (internasorostral contact/nasorostral contact = 137.5%), whereas the muzzle tip is relatively narrow in female *T. marcianus* throughout the range of that species (pers. obs.).

If not a *T. marcianus*, what is *cerebrosus?* Assuming the locality data to be accurate, the only *Thamnophis* species known to occur in the Pacific versant of Guatemala are *T. fulvus* (Webb 1982) and *T. proximus* (UTACV R24817, R26339; unpublished records, courtesy of J. A. Campbell). Another garter snake, *T. cyrtopsis collaris*, which ranges into the interior valleys of Guatemala from Chiapas, México (Webb 1982), must also be considered. All three taxa can be eliminated easily. The lateral stripe is on rows 3 and 4 in *T. proximus*, which also has far more subcaudals (82-98 in females from southern México and Central America; Rossman 1963) and more maxillary teeth (27-34; Rossman 1963). Specimens of *T. cyrtopsis collaris* from southern México and Guatemala also have far more subcaudals (86-92; Webb 1982) and more maxillary teeth (25-28; unpublished data). Finally, *T. fulvus* has an indistinct vertebral stripe and more maxillary teeth (27-30; unpublished data). Moreover, all three of these species usually have eight supralabials, whereas *cerebrosus* has but seven (the six in the male paratopotype appears to represent a fusion of supralabials 4 and 5).

What then can we conclude? Either *cerebrosus* represents a valid taxon, presumably isolated in the foothills on the Pacific versant of Guatemala, or the locality data for all three specimens are inaccurate. At this point, I cannot conclude which alternative is correct, but I feel it is important that the uncertain status of *cerebrosus* be brought to the attention of the herpetological community. Our classification might be more "tidy" if *cerebrosus* were left buried in the synonymy of *T. marcianus*, but to do so would only perpetuate this case of mistaken identity. Perhaps by focusing light on this enigma, someone will be encouraged to conduct fieldwork that might finally resolve the matter.

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BEHAVIOR OF HATCHLING DIAMOND-BACK TERRAPINS *(Malaclemys terrapin)* RELEASED IN A SOUTH CAROLINA SALT MARSH

Aspects of the ecology and demography of diamondback terrapins *(Malaclemys terrapin)* have been published for populations in Delaware (Hurd et al. 1979), New Jersey (Montevecchi and Burger 1975), Florida (Seigel 1984), South Carolina (Lovich and Gibbons 1990), and Louisiana (Cagle 1952). However, as in most turtle species, very little is known regarding the behavior and ecology of juveniles. Studies of reproductive ecology (Burger 1976, 1977; Burger and Montevecchi 1975; Montevecchi and Burger 1975; Seigel 1980) and hatchling emergence behavior (Burger 1976) have documented the first few weeks of a terrapin's life, but from the time that a hatchling enters the water to approximately the time of sexual maturity, little is known about wild *M. terrapin*.

We have studied a population of *M. terrapin* in Charleston Co., South Carolina since 1983 (Lovich and Gibbons 1990). Like previous investigators (Coker 1906; Hurd et al. 1979) we were intrigued by the

absence of hatchling and juvenile terrapins (0-3 yrs of age) in our sample of over 670 marked individuals, despite repeated efforts to locate them using a variety of collecting techniques.

The objective in this study was to observe the behavior of artificially incubated *M. terrapin* following release into the wild. It was hoped that their behavior would provide clues as to where these animals spend their first few months of life after leaving the nest.

MATERIALS AND METHODS

Nineteen eggs were removed from three *Malaclemys terrapin* nests on Kiawah Island, South Carolina on 21 May 1990. The nests were located on exposed sand dunes with sparse vegetative cover *(Uniola paniculata)* along the Kiawah River. The eggs were returned to the Savannah River Ecology Laboratory (SREL) for incubation at either 27° or 30°C as part of a larger study of terrapin ecology (see Lovich and Gibbons 1990). Eight eggs hatched in late July, 1990. The hatchlings were maintained in an aquarium at SREL, unfed due to the presence of large yolk sacs, for one week prior to being released on Kiawah Island. The mean straightline carapace length (CL) of the hatchlings was 33.4 mm (SD = 1.5 mm, range 32-36 mm). A single individual (36 mm CL) from a clutch hatched in October of the previous year was included in the experiment.

The nine hatchlings were released on 22 August in the salt marsh across the Kiawah River from the nest sites. The release points were located along the shoreline of a small (600 m^2) island in the marsh known to have concentrated nesting activity. The island sustains a few pines *(Pinus taeda)*, live oaks *(Quercus virginiana)* and palmettos *(Sabal palmetto)*, but a dense cover of *Spartina patens* predominates. The marsh around the island is composed of dense to sparse stands of *Spartina alterniflora* that are exposed at low tide. The habitat around the immediate perimeter of the island where the hatchlings were released is the "short *Spartina* high marsh/*Salicornia—Distichlis* marsh" described by Teal (1958). The behavior of each hatchling was monitored by a pair of observers for one hour after being released in the water within 1-2 m of the shoreline or on the island. Releases occurred at 1200 h.

RESULTS

All hatchlings displayed a general avoidance reaction to open water and swam toward shoreline vegetation even when observers were standing on the shoreline in direct view of the animals. The orientation of release, relative to the sun, did not appear to influence this behavior; hatchlings swam toward shore when released on both north and south sides of the island. In addition, upon encountering beached mats of tidal wrack (*Spartina* stems) terrapins immediately burrowed into the mat by pushing the stems apart with their forelimbs. This behavior was remarkably consistent and was repeated by the same animal even when it was pulled out of the mat and allowed to choose again between burrowing and some alternative behavior. Hatchlings released facing away from the island also turned and swam directly toward the shoreline. Hatchlings released on the island within one meter of the line of tidal wrack moved in the direction of the wrack and burrowed. Burrowing behavior always occurred in the tidal wrack at the high tide line. No terrapins were observed to venture beyond this microhabitat into the dry interior of the island.

DISCUSSION

Most hatchling *Malaclemys terrapin* emerge from the nest during the daytime, 1-9 days after hatching (Burger 1977) and move toward the closest terrestrial vegetation. This behavior is consistent regardless of the direction of incline in the terrain (Burger 1976). The apparent negative phototaxis exhibited by this species following emergence may be selected for because of high diurnal predation by shore birds (Burger 1976). In contrast, several other turtle species exhibit positive phototaxis (Anderson 1958), heading straight for the water following emergence from the nest. After entering the water terrapins are rarely seen until they attain sexual maturity some 3-6 yrs later (Lovich and Gibbons 1990).

The only published information on the microhabitat of juvenile *M. terrapin* during the active season is given by Pitler (1985). He observed juveniles with shell lengths ranging from 25-75 mm hiding under "accumulated surface debris and matted *Spartina* grass" in a New Jersey "tidal mud flat." He made 12 observations between 30 May 1979 and October, 1981. Several observations were made of terrapins hiding under rocks, boards, and a low growing *Vaccinium* bush. Lawler and Musick (1972) discovered a 54 mm CL terrapin hibernating in moist sand eight meters from the high tide mark at a depth of about 0.3 m on 7 November 1967 in Virginia. The same individual was periodically uncovered until 23 April the following year to determine depth of hibernation. Vertical and horizontal movements of 2-8 cm were observed.

Our preliminary observations and those of Pitler (1985) both suggest that young *M. terrapin* seek the underside of dense mats of vegetation. We suspect that small terrapins do this for several reasons. First, the tidal wrack and flotsam provide an abundant source of cover to terrapins at sizes when they are highly susceptible to predation by aquatic and terrestrial predators. Second, since the cover accumulates at the high tide line it is the nearest source of periodically flooded microhabitat to the nest site. Third, in addition to providing moist conditions, the summer temperatures under the debris are well below those of the surface outside the mat (pers. obs.). Fourth, numerous small invertebrates are found beneath the mats, providing a potential source of food for young terrapins. Allen and Littleford (1955) noted that newly hatched terrapins were rather indiscriminate in their initial food habits but preferred shellfish and snails *(Littorina irrorata)*. Our observations have revealed high concentrations of small fiddler crabs (*Uca* spp.), square-backed crabs (*Sesarma* spp.), marsh periwinkles *(Littorina irrorata)* and miscellaneous small insects and amphipods under the *Spartina* mats, all potential food items for young terrapins.

Although it seems logical that hatchling and juvenile terrapins might spend their early years under mats of debris in the marsh, we have been unable to locate these smaller individuals despite intensive searches. It is possible that smaller size classes exist at very low numbers due to heavy predation. Although juvenile habitat preferences can only be identified by more thorough behavioral studies, these limited observations do provide evidence that hatchling *M. terrapin* are not averse to temporarily utilizing the microhabitat beneath tidal wrack.

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OBSERVATIONS OF FORAGING BEHAVIOR IN CAPTIVE JUVENILE *Alligator mississippiensis*

Due to largely nocturnal activity in an aquatic environment, few published observations of foraging behavior among juvenile American alligators (*Alligator mississippiensis*) exist. In a detailed account based on years of field observations, McIlhenny (1935) suggested that juvenile alligators are opportunistic sit-and-wait predators taking any prey which happens to swim past "with a swift side motion of the head". Palis (1989) observed a juvenile alligator apparently attempting to flush prey in emergent vegetation. In conjunction with a food habits investigation of juvenile and sub-adult American alligators (Platt et al. 1990), observations were made of foraging behavior among captive animals.

Four juvenile alligators ($\bar{x}$ TL = 60.1 cm) were collected in July 1988 from the Manchac Wildlife Management Area (MWMA) in St. John the Baptist Parish, Louisiana, USA. They were maintained indoors in a 137 cm diam plastic-bottomed wading pool at 25°C and a water depth of ca. 16.5 cm. Concrete blocks were placed in the pool to provide a basking surface. An acclimation period of two weeks allowed the alligators to become accustomed to, and feed in the presence of, observers. The animals were fed a diet of chopped nutria (*Myocastor coypus*) meat. At the conclusion of the acclimation period, living prey items were introduced and foraging behavior was observed. Prey species offered included crayfish (Cambaridae), mosquitofish (*Gambusia affinis*), sailfin mollies (*Poecilia latipinna*), sunfish (*Lepomis* sp.), and crickets (*Gryllus* sp.). Observations on foraging behavior were made over the next four weeks, under the same conditions as described for the acclimation period.

In taking crayfish, alligators were observed to crawl along the bottom of the pool, moving the head from side to side in a slow horizontal sweeping motion with jaws slightly agape. When contact was made with a crayfish an instant attempt was made to seize it. If successful the alligator immediately surfaced, holding the crayfish in its jaws. Small (ca. < 4.5 cm TL) crayfish were swallowed with no further manipulation. Larger crayfish (maximum = 13 cm TL) were aligned between the jaws on an axis perpendicular to the head and then crushed repeatedly until the exoskeleton was reduced to a pulverized mass. The crayfish were then repositioned and swallowed tail first. We suggest that visual cues were unimportant in this foraging behavior as the nictitating membrane was observed to cover the eyes while the alligator was submerged. This corresponds to the observations of Fleishman and Rand (1989).

Our observations of underwater prey capture by American alligators indicate the necessary tactile stimulation was provided through direct contact with the prey. Crayfish often were captured while motionless and pieces of nutria meat placed on the bottom of the pool also were readily located. Additionally, juvenile alligators in Florida were reported by Fogarty and Albury (1968) to consume large numbers of aquatic snails (*Pomacea paludosa*), a relatively immobile prey species unlikely to be located by water movements. It also is possible that olfactory cues are important in underwater prey capture (Fleishman and Rand 1989).

A sit-and-wait behavior similar to that described by McIlhenny (1935) was used to capture mosquitofish, sailfin mollies, and swimming crickets. In addition, a large moth (Lepidoptera) and several cockroaches (Blattidae) that inadvertently fell into the pool also were taken using this