

## HERPETOLOGICAL NOTES

*Copeia*, 1981(3), pp. 723-724  
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Ichthyologists and Herpetologists

**PREDATION ON DIAMONDBACK TERRAPIN (*MALACLEMYS TERRAPIN*) EGGS BY DUNEGRASS (*AMMOPHILA BREVILIGULATA*).**—Adversity between plants and turtle nests has occasionally been documented: "Grasses and roots may pierce, erode, or encase the eggs" (Ewart, 1979). An example of a grass sprout growing through a turtle embryo was reported by Turkowski (1972), but there was no suggestion of predation in this seemingly accidental case. A more ominous situation was reported by Caldwell (1959) involving a population of sea turtles, *Caretta caretta*, and the grass called sea oats, *Uniola paniculata*. In this case 5.3% of the turtle eggs were killed by roots and stolons. The eggs were desiccated, their shells eroded, and their contents penetrated in some cases. The situation we report here similarly seems to involve active predation by the plants on turtle eggs.

Reproductive biology of the diamondback terrapin (*Malaclemys terrapin*) has been well documented, especially in New Jersey, by Burger and Montevecchi (1975), Burger (1976) and Montevecchi and Burger (1975). In these works



Fig. 1. Terrapin (*Malaclemys terrapin*) nest massively infiltrated by *Ammophila* rootlets. Egg and hatchling mortality was 100 percent.

comparative data are cited for Virginia, the Carolinas, Florida and Texas. Farther north in the Great Marsh at Barnstable, Massachusetts, and nearby at Sandy Neck these terrapins resemble those studied at Brigantine, New Jersey, in that they tend to select high dune nest sites and tend to emerge on high tides. They differ, however, in many other aspects detailed by Auger and Giovannone (1979) and Lazell (1979).

At Sandy Neck, terrapins appear to take far longer in nest site selection and often make non-nesting and false nesting excursions. They seem always to employ facial probing or "sand sniffing." They often nest on unvegetated dune faces. These attributes may be related to the occurrence in five of a total of twenty nests inspected (50% of those in vegetation) of massive infiltration by rootlets from rhizomes of dune grass, *Ammophila breviligulata* (Fig. 1). Rootlets actually entered one egg located at bottom center of the clutch in three cases where penetration was determined; rootlets packed and burst the egg (Fig. 2). In nine nests which were monitored during development, the bottom center egg appeared to be infertile and did not develop; we suspect it was the first laid. Even if only an infertile egg is penetrated by *Ammophila* rootlets, however, the infiltration and packing of the whole clutch region may be sufficient to stifle hatching activity and prevent hatchling eruption: Two nests which overwintered but failed to erupt in the spring of 1979 were found to be totally enmeshed in rootlets.

We theorize that the grass actively seeks out the nests and consumes moisture and nutrients from the eggs. We are impressed by the rapidity of rootlet growth, for the eggs are laid be-



Fig. 2. *Ammophila* rootlets packed, burst and replaced the bottom center egg in this terrapin clutch. This egg may have been infertile.

tween 10 June and 20 July. This allows only 40 to 80 days for total egg consumption to be accomplished.

The process of "sand sniffing" or facial probing is well documented in some marine turtles (Carr and Ogren, 1960). We originally assumed this process was related to homing to a particular nest site. However, in four cases on Sandy Neck where a marked female laid two clutches in a particular season, the females made other nests at widely separated places on the spit. We now wonder if the probing activity, which we postulate involves chemoreception, might not be related to rhizome avoidance. We would welcome advice from botanists and plant physiologists as to proper experimental procedures to further elucidate this remarkable phenomenon.

*Acknowledgments.*—The Sandy Neck Ecology Project is funded by the Town of Barnstable, Massachusetts, with grants or contracts from Coastal Zone Management, Youth Conservation Corps, the Center for Action on Endangered Species and The Nature Conservancy.

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*Copeia*, 1981(3), pp. 724–726  
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Ichthyologists and Herpetologists

ANTI-PREDATOR ROLE OF SALAMANDER EGG MEMBRANES.—The role of predators in organizing fresh water communities has been reviewed by MaCan (1977). Amphibians are very susceptible to certain types of predators (e.g., fishes) and have evolved a great number of anti-predator devices (Dodd, 1976). The present note recounts experiments to test the effectiveness of ambystomatid egg membranes in deterring predation by a series of invertebrate and vertebrate aquatic predators.

Eggs of the spotted salamander, *Ambystoma maculatum*, were collected from Salamander Pond, Tyson Research Center, St. Louis Co., Mo., during the springs of 1978 and 1979. The eggs were in late tail bud or later stages of development. A series of potential predators (Table 1) was collected from that pond or from nearby ones. The eggs and predators were maintained in aquaria at 26 C on a 12L:12D photoperiod schedule.

Manipulations to the eggs consisted of removing none, some, or all of six concentric zones (B–F) of sulphated acid mucopolysaccharide membranes surrounding them [nomenclature follows Salthe, 1963]. The eggs were presented in one of four states to potential predators: 1) intact egg masses; 2) partial egg masses (mass cut through zone F to include a definite number of eggs, each surrounded by zones B–E); 3) encapsulated eggs (single eggs plus zones B–E and removed from the matrix of zone F); 4) naked eggs (surrounded only by the vitelline membrane).

A known number of conspecific predators (Table 1) was introduced into the experimental aquarium 24 h before the start of the experiment. Most aquaria were plastic containers 29 × 19 × 12 cm in dimension; they were filled with water to a depth of 10 cm. Tests utilizing chironomid larvae were carried out in finger-bowls 10 cm in diameter which were filled with water to a depth of 5 cm. The treated eggs were