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Internesting Behavior of the Green Turtle, *Chelonia mydas*, at a Mid-Ocean Island Breeding Ground

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Three female green turtles were tracked during the internesting interval at Ascension Island, central equatorial Atlantic. The average speed of movement along the nesting shore was about 1.5 km/hr, with maximum speed of at least 7.2 km/hr attained. Two of the travel paths showed clear concurrence and were closely similar to a plot from other data obtained in 1969. Some direct observations on the behavioral ecology of the females between nestings are reported.

ONE of the conspicuous gaps in the behavioral ecology of the Green Turtle, *Chelonia mydas*, is the lack of data on the movements of females during the 12–14 day periods between their emergences at the nesting beach. The usual breeding place is a high-energy shore on which heavy surf maintains the necessary deep-sand nesting beach but precludes development of feeding habitat for year-around maintenance of the herbivorous green turtle. Courtship and mating occur there, but this activity must occupy only a fraction of the one-to-two month sojourn of a female at the breeding ground.

The usual Atlantic green turtle migrates between 200 and 2000 km to nest (Carr and Ogren, 1960; Carr and Hirth, 1962; Schultz, 1968; Carr, 1972; Pritchard, 1973). She obviously will not return to her home pastures during the 12–14 day period between successive nestings. Where she goes is unknown, however. When the breeding place is a small, virtually foodless island such as Ascension, isolated in the central equatorial Atlantic 2000 km from the Brazilian feeding ground, bounded by precipitous cliffs and with deep water close inshore, the question of internesting ecology is a puzzling one.

TRACKING EXPERIMENTS

Promising techniques for investigating this little-known phase of the life cycle are optical, electronic or sonic tracking. If these are done during the early part of the season there is a high probability that a turtle instrumented after nesting will not carry the equipment away on a return migration, but will stay somewhere in the vicinity of the breeding place and nest again.

Results of several tracking runs made at Tortuguero were collated by Carr (1972), and one plot made at Ascension Island was

Fig. 1. Green turtle movements near Ascension I.

Fig. 2. Green turtle movements near Ascension I.

figured there. During March, 1973, three additional runs were made by Ross and Stephen Carr at Ascension. While the data obtained are inconclusive, they shed a little light on internesting movements, and begin to build a basis for comparing individual post-nesting travel patterns.

Methods.—Tracking was done visually. Lens-shaped styrofoam floats 30 cm in diameter, 20 cm deep and coated with fiberglass were towed by the turtles on 24 m lines. Each float supported a fiberglass mast bearing an orange pennant and a 3-volt flashlight bulb powered by batteries imbedded in the body of the float. Numerous previous trials with floats of this and other designs have shown no discernible effect on the locomotion, orientation or goal-drive of the experimental animals. Turtles thus rigged, after being interrupted in their nesting and being displaced for long distances, promptly returned to emerge and nest, dragging their floats behind them. In the present tests each turtle used was allowed to finish nesting, then immediately released and tracked until the float was lost. Successive bearings were taken from shore with transits, and positions were determined by triangulation.

Results.—Results are shown in Figures 1–4. All turtles stayed within the 18 m line for the time they were under observation. This suggests that none had finished her season's nesting at the time she was drafted for the experiment. The most protracted and continuous record is that of turtle No. P-460, shown in Fig. 1. Over and above the interest that this holds as a short case history, the agreement of the behavior of No. P-460 with that of a female tracked in 1969 (Fig. 2) appears significant. In both cases, after entering the water the turtle cruised slowly northward, skirting the docks at Georgetown and proceeding directly to the shallow water off another nesting beach known as The Long Beach. The concurrence of the two tracks is such that they seem almost to have followed an established underwater pathway. The bottom off The Long Beach is bare sand without vegetation except for scattered encrustations of sponges on wrecks and rocks. This is a favored aggregating place for the breeding colony, and courtship behavior, mated pairs and contests between contending males are often seen here. The record of P-392 (Fig. 3), though less complete, suggests similar travel. The behavior of No. B-645 was completely different (Fig. 4), with

Fig. 3. Green turtle movements near Ascension I.

Fig. 4. Green turtle movements near Ascension I.

a period of protracted quiescence comparable to behavior in internesting Tortuguero females (Carr, 1972).

Another noteworthy feature of the behavior of turtle No. P-460 was a spurt of speed that for no evident reason occurred between 0330 and 0345 hrs. A distance of 1.8 km was covered in the period of 15 minutes. This represents a speed of 7.2 km/hr for this section of the journey. Mean speed for the period in which the turtle was constantly moving (0205–0545 hrs) was 1.8 km/hr. Swimming speeds of green turtles calculated in other tracking efforts are shown for comparison in Table 1. It seems likely that in longshore travel *Chelonia* maintains a speed of about 1.5 km/hr for several hours at a time and is capable of brief bursts of 4–7 km/hr.

All the above tests were interrupted by failure of the tracking lights, and were terminated when the turtles disappeared behind inaccessible promontories. The technique nevertheless appears promising, requiring, for protracted contact, that tracking stations be manned in advance on properly spaced seaside cliffs, including those not accessible by road. The floats used in 1973 appear suitable both for visual longshore tracking

TABLE 1. TRAVEL SPEEDS OF FEMALE GREEN TURTLES TRACKED OFF THE NESTING GROUNDS AT ASCENSION ISLAND AND TORTUGUERO, COSTA RICA.

Turtle	Locality	Maximum Speed km/hr	Mean Speed, Continuous Travel: Speed, km/hr	Mean Speed, Continuous Travel: Time Interval hrs.	Date	Source of Data
P460	Ascension	7.2	1.8	3.6	March 1973	Present study, Fig. 1
P592	Ascension	4.4	3.5	1.6	March 1973	Present study, Fig. 3
B602	Ascension	3.0	0.9	5.1	March 1969	Carr, 1972, Fig. 8
T5115	Tortuguero	2.3	1.6	0.25	August 1968	Carr, 1972, Fig. 7
T3908	Tortuguero	—	1.1	5.6	August 1968	Carr, 1972, Fig. 5
T3022	Tortuguero	3.9	2.2	1.6	August 1968	Carr, 1972, Fig. 6

and as vehicles for long-range electronic tracking apparatus.

Miscellaneous Observations

Fragmentary information on the ecology of this internesting phase of the life cycle has come from direct observations made from shore, or by divers using snorkel or scuba gear. Although the heavy seas and rocky shoreline hinder diving, underwater observations by University of Florida personnel, corroborated by the numerous personal communications of members of the local diving club permit the following generalizations:

1) Mating begins as the turtles arrive at the island in January, and diminishes as the season progresses.

2) What has been seen of courship, precourtship fighting by males, and copulation agrees with observations made at Tortuguero (Carr and Giovannoli, 1957 and unpublished information) and with the more detailed descriptions of Booth and Peters (1972) from observations on the Great Barrier Reef.

3) The bottom over or on which the turtles are most often seen courting and copulating is mostly bare sand, with scattered rock outcrops.

4) Periods of rest and sleep are frequently spent under rock ledges or in crevices and caves in the shore and cliff bases.

5) There is no adequate submarine source of vegetable food for the breeding colony, and the sojourn at the island is clearly a period of fasting. Nevertheless, when refuse is dumped from ships or from shore, turtles sometimes move in to feed on it.

6) Of the few turtles that remain about the island after departure of the main colony in June, there appears to be a significantly high incidence of injured individuals—turtles with lost flippers or with shells damaged against the rocks that flank each of the short segments of nesting beach.

Conclusion

The limited information on Ascension Island as an internesting habitat reveals no ecologic emoluments other than freedom from egg predation that would explain the evolution of the extraordinary adaptation of traveling 2000 km or more to breed on an isolated mid-ocean island.

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