



Fig. 1.

beyond the capabilities of man. Thus, it seems that the anteater is accurately described as macrosmatic.

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BIOLOGY

Mechanism of Nocturnal Emergence from the Nest in Green Turtle Hatchlings

It has been known for many years¹ that hatchling green turtles (*Chelonia mydas* (Linn.)) almost all emerge from the nest after dark. Moorhouse referred to hatchlings which emerged during the day usually burying themselves again, and noted that the few which attempted to reach the water were invariably taken by gulls and herons. Hendrickson² has pointed out that nocturnal emergence has marked survival value, because during the heat of the day surface sand temperatures would be rapidly lethal to hatchlings and the danger of predation is much greater during the day. He wrote: "It is believed that, upon encountering temperatures much above about 33° C, the hatchlings cease activity in their escape chamber, resuming active movements only when lower temperatures return with the fall of night".

During large scale ecological investigations now in progress on the green turtle population at Heron Island on the Great Barrier Reef of Australia, I have frequently observed natural emergence from the nest and investigated the mechanism whereby this is almost entirely restricted to the hours of darkness.

The efficacy of this behavioural pattern was demonstrated when the time of emergence in natural conditions for 5,287 green turtle hatchlings in a hatchery at Heron Island was recorded during February 1966. Only 161 (3.0 per cent) emerged during the day.

The egg chamber in the sand is pear-shaped with well defined walls and emergence results from a concerted attack on the sand in the neck, which is much less firmly packed, by the sixty or more hatchling turtles.

On at least a score of occasions I have found a nest during the heat of the day with several (usually between two and six) hatchlings visible at the sand surface. In most cases only the head protrudes, but occasionally part of the anterior region of the carapace may also be exposed. These turtle hatchlings show no sign of life,

remaining completely immobile for periods of many hours. Detailed observation, however, has shown that in this position they are able to remain alive in conditions where complete exposure is fatal within minutes. Prodding the hatchlings exposed at the surface does not elicit any movement, whereas in other circumstances hatchlings when touched usually show a burst of activity. After dark these hatchlings become active, emerge from the nest, followed by the rest of the brood, and make for the water. I have never observed hatchlings which emerged during the day burying themselves again as described by Moorhouse¹.

Any mechanism preventing daytime emergence must explain how inactivity, caused by bright light or temperature, is transmitted to hatchlings deeper down in the nest shaft which are unable to experience these differences in the physical environment. Carr³ has shown the significance of social facilitation in synchronous emergence in this species of turtle. I suggest on the basis of the observations reported above that the comatose condition of the few turtles which reach the surface has a dampening effect on the activity of those below. Furthermore, those at the surface act like corks in a bottle, occupying the opening of the nest shaft and making exit difficult if not impossible for those below. Experimental removal of individuals the heads of which are protruding from the sand together with others then immediately visible has led to activity within the nest and emergence of the turtle brood within minutes during the day.

Examination and observation of nests where hatchlings appeared at the surface during the day showed that sometimes activity of the brood resulted in several of the top-most turtles being pushed out of the sand by the activity of those below. These few individuals often perished before they were able to reach the beach, showing signs of heat torpor after moving several yards, and the few that reached the beach were invariably taken by gulls. The behavioural pattern of the first turtles to reach the surface, however, resulted in the majority remaining within the nest at a level where no light could penetrate and where temperatures were not appreciably higher than those experienced in the nest pit before the upward journey was commenced. It is noteworthy that those individuals the heads of which only were exposed normally survived

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¹ Moorhouse, F. W., *Rep. Great Barrier Reef Committee*, 4, 1 (1933).

² Hendrickson, J. R., *Proc. zool. Soc.*, 130, 455 (1958).

³ Carr, A., *Animal Behaviour*, 9, 65 (1961).