

## Hatching Leathery Turtle eggs

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Eastern Mining & Metals Co. Ltd., Trengganu

(Received May, 1958)

THE EXISTENCE of a breeding concentration of Leathery Turtles, *Dermochelys coriacea* (Linn.), on the East Coast of Malaya was made known to the scientific world in 1953, when M. W. F. Tweedie published a paper on these animals in the Proceedings of the Zoological Society of London (Vol. 123, Part II). During the breeding season, which in Malaya extends from May to about the middle of September, numbers of these large sea turtles ascend the beach to make their nests and deposit their eggs. North of the town of Dungun, Trengganu, as many as forty females have been counted in one night along five hundred yards of beach.

The large eggs of *Dermochelys*, roughly the size of billiard balls, are considered a delicacy by the majority of Malaysians. They sell for from seven to twelve cents each in the local markets, the price depending upon the state of the season and the resultant abundance of eggs. Exclusive rights to collect turtles' eggs on specified portions of the coast are granted by the state government. The yearly licences are let out on tender, usually to the highest bidder. Collection of sea turtle eggs is a vigorous local business in the areas where the animals nest, with competition in bidding for the necessary licences to collect the eggs. Each licence holder collects all the eggs laid on his allotment of beach, his goal being 100 per cent harvest of the turtles' production. It has appeared to the writers that the efficiency of the egg collectors may constitute a serious threat to local survival of the species. As part of a program of study on the turtles, it was thought desirable to investigate practicable measures for conservation of the species. The planned hatching of young turtles for release to the sea seemed to be one logical conservation measure.

It is patently impossible to expect the persons holding egg collecting licences, for which they have paid considerable sums, voluntarily to leave nests to hatch. From the point of view of the licence holder who has gambled his money on the expectation of a certain harvest of eggs, this would amount to throwing away part of his investment. The writers therefore wished to test the feasibility of buying morning-fresh eggs from the licence holders and transplanting these to sites where they could be protected during the incubation period.

The Winterflood residence near Dungun was located on a beach front, and it was decided to transplant a clutch of eggs to a prepared "hatchery" site in the enclosed garden there. A test pit dug in the selected site showed clean beach sand at depths of over two feet. The temperature at a depth of three feet, the approximate level at which the eggs are laid in the natural nests, was 29°C. The temperature of the sand on the breeding beaches at a depth of three feet varied from 28.5°C. to 30°C. In one corner of the enclosed garden, a pit was excavated in the form of a quarter circle of about three

foot radius. The two straight edges were formed by narrow flower beds adjacent to the garden fence. The residual garden sod, soil, and sand were removed to a depth of about three feet, and the pit was then filled with clean sand brought from the adjacent sterile beach. The area received little shade from adjacent garden plants, and it was not watered heavily after the eggs were transplanted. A low fence of wire netting was erected around the hatchery site.

The night of 18th August was spent on a turtle nesting beach about six miles by road north of Dungun. One of the late-arriving *Dermochelys* females was selected for collection of eggs to be transplanted to the hatchery site. This female dropped the last egg of her clutch at 0238 hours on 19th August. After she had covered the nest, it was excavated with great care to avoid damaging the eggs. The egg mass measured about ten inches vertically and from twelve to fourteen inches in diameter horizontally; its upper surface was two feet six inches below the general beach surface. The temperature of the interior of the egg mass when first uncovered was 30°C. There were 102 large, normal-sized eggs (49 to 54 mm. diameter) and thirty smaller, abnormal eggs of various shapes and sizes. Only the large eggs were taken for hatching. These were gently transferred to a large muslin bag, carried back to an automobile, and transported to the hatchery site while kept suspended and relatively free from vibration and shocks (in transplantation of Green Turtle eggs, it had been discovered that the delicate membranes inside the eggs were easily ruptured by rough treatment).

Upon reaching the hatchery site, a hole two feet nine inches deep and about one foot in diameter was dug in the centre of the prepared sand. The eggs were placed one at a time in the bottom of this hole, taking care not to rotate them. When 100 eggs (two were withheld) had been placed in the hole, about six inches of loose sand was pushed in on top of the mass. This sand was pressed down gently with the hands, another six inches of loose sand was added and pressed down, and so forth until the pit was filled. The remaining excavated sand was heaped over the pit in a low mound and compacted by treading on the area. Transplantation of the nest was completed in less than seven hours from the time of oviposition.

From the completion of the hatchery nest on the morning of 19th August, the area was left completely alone. On the morning of 16th October, fifty-eight days later, seventy hatchling turtles were found on the surface of the plot. One individual had head and forelimbs projecting out of the sand, the other sixty-nine were free on the surface, trying to make their way through the confining netting toward the sea. A hatchling is illustrated on Plate 24.

On the second morning, 17th October, a further two hatchlings were found on the surface. Examination of the hatchery site on the morning of 18th October showed no more hatchlings on the surface and it was decided to dig out the nest. This was carefully done and it was found that while there were no more hatchlings on their way to the surface, there were three dead individuals and three alive but weak amongst the old egg mass at the bottom of the hole. The three living hatchlings died within twenty-four hours of the time they were found. Five of the twenty-two unhatched eggs contained incompletely formed turtles, the remainder were sterile.

All the live hatchlings were placed in a concrete pool filled with sea water and located in the shade. They showed a marked positive phototaxis, swimming most of the time in the direction of the most intensely illuminated portion of their horizon. If turned by hand away from the light, they swung back toward it like compass needles.

The young turtles showed no interest in food for the first seven to ten days, presumably living off the remnants of yolk incorporated from the egg. When they began to eat the minced fish which was supplied, they were not observed to bite at food on or near the surface, eating only by diving to recover pieces from the bottom of the pool.

Attempts to keep the young turtles in captivity for an extended period met with little success. After the first month, deaths occurred at the rate of one or two each day; none survived longer than four months.

The only account of the incubation and hatching of *Dermochelys* eggs heretofore published appears to be in "The Tetrapod Reptiles of Ceylon", Vol. 1, by P. E. P. Deraniyagala. In this work, Deraniyagala states (p. 63) that, "The period of incubation is from fifty-eight to sixty-five days and varies with the intensity of the sun . . ." Later in the same work he states that *Dermochelys* ". . . is generally apt to take about sixty-seven days to emerge from the egg . . .", and he comments that this is a longer period than the other marine turtles. The basis for mentioning incubation periods of sixty-five and/or sixty-seven days is not clear; the only actual hatchings recorded in the paper occurred after fifty-eight days and seventy-one days. Deraniyagala transplanted several lots of eggs for studies on the embryology of the species; of his material, a total of seven young are recorded to have emerged in natural fashion. A single abnormal hatchling emerged after fifty-eight days from a setting of sixteen eggs; another setting of twenty-five eggs yielded two young after seventy-one days and four more on the seventy-second day.

The present material indicates that a fifty-eight day incubation period is probably well within the normal span for the species, rather than being minimal. It seems likely that development is more rapid in large masses of 100 or more eggs than in Deraniyagala's artificially small clutches, due principally to the higher temperatures which are produced in large masses by the conserved metabolic heat of the developing embryos. Present evidence, then, does not substantiate the claim that *Dermochelys* has a longer incubation period than other marine turtles. Incubation times of transplanted nests of the Green Turtle, *Chelonia mydas* Linn., have been observed to vary between a minimum of 47 days and a maximum of 78 days; 200 nests showed an average incubation time of 54 days.

A per cent hatch as high as seventy under the conditions described is considered sufficiently encouraging to warrant further efforts by interested persons toward hatching clutches of *Dermochelys* eggs so that an increased number of young could be returned to the sea each breeding season, giving extra aid to this largest and most remarkable of all living turtle species against forces operating toward its extinction.