EGG-LAYING IN THE SPOTTED TURTLE, *CLEMMYS GUTTATA* (SCHNEIDER)

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Little is known of the life history and nesting habits of the spotted turtle, *Clemmys guttata* (Carr, 1952). Babcock (1919) states that two to four eggs (averaging 30 x 17 mm) per clutch are laid in late afternoon or evening during the period June 10 to 25 in New England. In a later paper (1938), Babcock observed that nests were found among damp logs or moss and noted that the interval between deposition of the first two eggs was 15 min. Pope (1949) states that the hole is flask-shaped, near water, and that a clutch varies from one to four eggs. In the light of these scanty data, the following account should be of interest.

The observations were made of two females of *C. guttata*. The larger, measuring (straight-line) 5 in. carapace length, 3½ in. carapace width, and 2 in. shell height, was collected by Tony and Peter Mars on June 7, 1960, at Lexington, Massachusetts. I collected the smaller female (Kraig K. Adler n. 766), measuring 3¾ x 2⅞ x 1½ in., respectively, on June 27, 1960, in the Venetian Village canals, adjacent to the southeastern corner of Lake Maxinkuckee, Marshall County, Indiana. Both were kept in a large outdoor turtle pond located on the Culver Military Academy grounds near Culver, Indiana. The enclosure was shared with about 40 turtles of various local species of other genera.

Both turtles laid eggs during the evening of July 11, 1960. Rain was not associated with egg-laying; there was little moisture in the soil. The site selected by both was in the sandy earth around the shaded perimeter of the pool, about a half foot from the water, although the terrain several feet from the water appeared just as suitable. Ambient temperatures during the egg-laying period were 72° F at 6:35 PM, 70° F at 10:30 PM, and 67° F at 12:20 AM.

The larger turtle was first observed digging at 6:35 PM when the hole was already 1½ in. deep (all measurements are given along the slope of the hole, unless otherwise stated). The cylindrical hole was directed beneath the turtle and by 7 PM the lower end was slightly larger, thus making the cavity flask-shaped. The depth at this point was 2 in. At 8:18 PM, the hole was 3¾ in. deep (about 2½ in. vertical depth, 2½ in. diameter at the mouth). The hind legs were used successively, each one scraping the opposite side of the hole; after one leg had been used for about six strokes, the other was used for a like number of times. Rests, about 30 sec long, between changes of legs became more frequent as digging approached termination; a 14 min rest occurred between termination of digging and the deposition of the first egg at 9:14 PM. The egg was pushed around with the hind legs in the enlarged cavity. The second egg (9:15 PM) was pulled and extracted from the cloaca with the aid of the hind feet. Then a little dirt was pushed into the hole. The next six eggs were laid at 9:20, 9:21, 9:24, 9:25, 9:29, and 9:41 PM, and were all pushed around with the hind legs. After adjusting the eggs and with few rests, the turtle started to fill in the hole at 9:45 PM. The last egg disappeared beneath the soil at 9:49 PM (this egg was 1 in. below the surface of the ground on the slope). Both legs were used alternately to cover up, one or two strokes each. By 10:04 PM the hole was completely covered and the turtle searched with only her hind legs for excess dirt; the loose dirt was then patted down with the posterior portion of the plastron and the hind legs. The turtle's head was completely withdrawn throughout the whole process following egg-laying. The animal entered the water at 10:14 PM and had considerable difficulty in

stabilizing herself; the anterior end was lower in the water than the posterior. She clawed at her tail by using both hind feet until well after 11 PM, when she could swim almost normally.

The smaller turtle began digging near a small clump of grass about three ft from the larger specimen. Her digging was first observed at 6:45 PM when the hole was 1½ in. deep. By 7:45 PM it was 2¾ in. in depth (1¾ in. diameter at the mouth). Digging with the hind feet was essentially similar to that of the larger turtle, except that the right leg appeared to be employed more than the left. At 8:11 PM a small rock was encountered and after attempts to dislodge it proved futile, the course of the hole was altered slightly. By 10:30 PM the hole was 3 in. deep, and the rests between shifts of legs became more frequent, although these rests were not quite as long as in the larger female. The first two eggs, dropped at 11:28 and 11:32 PM, respectively, were pushed around with the hind legs. The third and last egg was laid, with apparent difficulty, at 11:37 PM; part of the cloaca became extended and was pink in coloration. The turtle began covering the nest immediately and the last egg disappeared from view at 11:55 PM (this egg was ½ in. from the surface on the slope). By 12:13 AM (July 12) the hole was completely covered and the turtle reached out with the hind legs apparently in search of excess dirt. She then patted the loose dirt down in the same manner employed by the larger specimen. She entered the water at 12:45 AM and had less trouble than the larger female did in stabilizing herself. By 12:50 AM she too was picking at her tail with the hind legs, an action which continued until after 1 AM.

On July 14, 1960, both nests were opened and the eggs measured (table 1).

TABLE 1

Measurements of two clutches of Clemmys guttata *eggs 3 days after deposition (in cm)*

Egg number	1	2	3	4	5	6	7	8	avg
Larger female:									
length	2.5	2.9	2.5	3.0	3.1	3.0	3.1	3.1	2.9
width	1.6	1.7	1.6	1.7	1.7	1.8	1.8	1.7	1.7
Smaller female:									
length	2.6	2.9	2.9						2.8
width	1.6	1.7	1.7						1.7

In the clutch of the larger turtle, the eggs were in two levels of four each; in that of the smaller, one egg was in the lower level and two in the upper. Since most accounts list four as the maximum number of eggs per complement, it is of interest that the larger specimen laid eight. However, Blake (1921) examined five specimens, three of which had oviducal egg counts of 9, 9, and 11. Perhaps due to the dry, sandy soil in which the eggs were buried, all failed to hatch; one egg from the larger clutch was opened on August 10 and found to be fertile.

It may be sheer coincidence, or it may be the result of response to some unknown factor that both turtles laid their eggs on the same night, even though they had been obtained from localities about 800 miles apart. My presence did not seem to affect the turtles in the nesting procedure; they did, however, withdraw their heads with a faint hiss as a ruler was inserted into the hole to record depth. There was no cloacal discharge of urine by either turtle. Babcock (1938) states that there is a 15 min interval between the deposition of the first and second eggs; in the two females observed here, the interval was 1 and 4 min, respectively. Throughout the whole process, neither turtle visually examined the hole or nesting site, even after egg-laying was completed. Clement (1958) found that *Clemmys insculpta* turned around to examine its nesting site. This observation was made under unnatural conditions, however.

Pallas (1960) has also given an account of *C. insculpta* but under more natural conditions than Clement. Most of her remarks are applicable to both species (and perhaps most turtles, for that matter), but there are a few differences. *C. guttata* rested occasionally in the digging process, *insculpta* did not. Both species rested during the covering-up process. While digging, the spotted turtle extended the head only slightly; while covering the eggs, the head was completely withdrawn. *C. insculpta* extended its head fully at both times (Clement, op. cit., writes that his specimen frequently withdrew its head and snapped; however, this specimen was held in hand during egg-laying). *C. guttata* dug about six successive times with one leg before using the other; *insculpta* used each leg alternately.

I should like to acknowledge the generous assistance of John L. Curry in taking notes. I am also grateful to Clifford H. Pope, Norman E. Hartweg, Aubrey S. Bradshaw, and Robert E. Gordon for a critical reading of the manuscript.

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