

HYBRIDIZATION OF *CHELONIA MYDAS* AND *ERETMOCHELYS IMBRICATA*.—Although the possibility of hybridization occurring among sea turtle species has been suggested (Carr, 1952, 1967), it has never been documented. Cayman Turtle Farm, Ltd., Grand Cayman Island, British West Indies, raises the green sea turtle *Chelonia mydas*. All stock is presently supplied by a captive breeding colony, but prior to 1978, eggs were collected from natural nesting beaches of Surinam, Costa Rica and Ascension Island. Turtles hatched from one clutch collected in Surinam are described here which

appear to be natural hybrids of *Chelonia mydas* and *Eretmochelys imbricata*.

Methods and materials.—The turtles described here as hybrids were hatched in May 1977 from eggs collected in Surinam. Collection and incubation of eggs at Cayman Turtle Farm, Ltd. have previously been described (Simon, 1975; Wood and Wood, 1979). During the collection and incubation of the eggs, there was no indication that they were other than green sea turtle eggs. Approximately six weeks following hatch, a group of turtles was separated from the other hatchlings because of their appearance and behavior. These turtles were subsequently maintained apart from, but under similar conditions, to the remaining stock. At one year following hatch, 37 turtles were classified as apparent hybrids. Data collected from these turtles are presented below. In Nov. 1981, 22 of the turtles were still alive.

Comparative data for green turtles were collected from stock maintained on the farm and represent turtles hatched from eggs collected from Surinam in 1970, 1971 and 1972 and from eggs laid by the farm's breeding colony in 1978, 1979 and 1980. There were no green turtles on the farm of the same age as the hybrids when most of the comparative data were collected. Three hawksbills maintained on the farm for exhibition were used for data comparison. Two were hatched on the farm in 1976 and one mature male has been kept on the farm since 1977. Data were collected from 12 immature hawksbills kept by locals in Grand Cayman and Cayman Brac, Cayman Islands. These turtles ranged in size from 2-30 kg and were kept in concrete tanks. They were regularly fed scrap fish and conch.

All turtles classified as hybrids were sexed via endoscopy, except for three turtles which were obviously male. Laparoscopic examination of the gonads through surgical entry into the body cavity near the rear flipper was performed following anesthesia with sodium thiopental (May and Baker, Ltd, Dagenham, England) or ketamine hydrochloride (Veterinary Products, Bristol Laboratories, Syracuse, New York 13201). (Details of surgical and anesthesia procedures are available on request to the authors.) The turtles weighed 26-44 kg at the time of examination.

Blood samples for electrophoretic analysis of serum proteins were collected through the dorsal cervical sinus. Both fresh and frozen serum

TABLE 1. COMPARISON OF MORPHOLOGICAL CHARACTERISTICS IN THE PROPOSED HYBRID TURTLES TO *Chelonia mydas* AND *Eretmochelys imbricata*.

Characteristics	<i>Chelonia mydas</i>	Hybrid	<i>Eretmochelys imbricata</i>
Carapace imbrication	absent	present	present
Elongated snout	absent	present	present
Second claw on fore flipper	absent	present	present
Dentation of lower jaw	present	present	absent
Prefrontals	one pair	variable ¹	two pairs

¹ Among 22 hybrids represented, 4 had definitely split prefrontals indicating two pairs, 5 had a single pair of prefrontals and 13 had partially split prefrontals.

were used for electrophoresis. Electrophoresis on mylar supported cellulosic strips (Super Sephore, Gelman Sciences Inc., Ann Arbor, MI 48106) was performed for 60 min at 150 volts (3.5 ma). A tris-barbital sodium barbital buffer, pH 8.8, was used for all runs. Relative motilities of the serum protein bands were calculated following staining with Ponceau S and rinsing and clearing with 5% acetic acid and 5%

methanol, respectively. Each serum sample was run in triplicate.

Results and discussion.—The unusual coloration and aggressive behavior of a small number of hatchlings, approximately six weeks old, among 12,000 green sea turtles suggested that the turtles might be hybrids. Morphological features subsequently used to support the classification

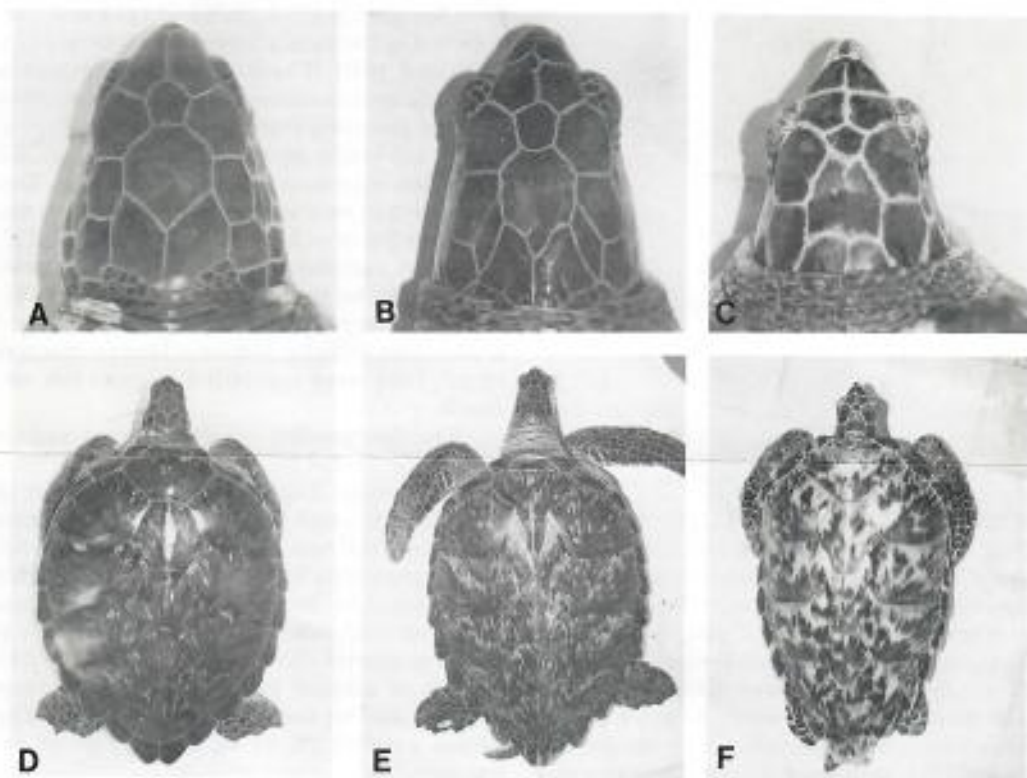


Fig. 1. Head and carapace for *Chelonia mydas* (A and D), hybrid (B and E), and *Eretmochelys imbricata* (C and F). Curved carapace length of green sea turtle was 60.0 cm; curved carapace length of hybrid was 73.5 cm; curved carapace length of hawksbill was 54.5 cm.

TABLE 2. RELATIVE MOTILITIES OF SERUM PROTEIN BANDS IN *Chelonia mydas*, APPARENT HYBRIDS AND *Eretmochelys imbricata*.

Band	Relative motility, $\bar{x} \pm SD^1$		
	<i>Chelonia mydas</i> (20) ²	Hybrid (25) ²	<i>Eretmochelys imbricata</i> (15) ²
1	929 \pm 11	931 \pm 10	938 \pm 7
2	632 \pm 24	622 \pm 19	615 \pm 14
3	489 \pm 36 (19)	502 \pm 30 (20)	483 \pm 16
4	366 \pm 44	366 \pm 43	
5	291 \pm 49 (2)		
6		227 \pm 42	223 \pm 29

¹ Mean R_f value, defined as the ratio of the distance from the origin to the fraction peak to the total distance of the run, mean \pm standard deviation.

² Numbers in parentheses represent the number of samples in which the band was present if different from total samples indicated.

of the turtles as possible hybrids of *Chelonia mydas* and *Eretmochelys imbricata* were carapace scute imbrication, number of prefrontal scales, snout length, number of claws on the fore flippers and dentation of the lower jaw. Fig. 1 illustrates carapace and head features for normal green and hawksbill turtles and for one of the hybrids. The aspects of carapace imbrication and snout length were difficult to quantify and were therefore expressed subjectively. For the three representative individuals shown in Fig. 1, the following distinctions apply. The respective ages of the green, hybrid and hawksbill shown were 38, 54 and 66 months; diet and husbandry were similar for all the turtles. The carapace scutes of the hawksbill and the hybrid are obviously imbricated, while those of the green turtle are not. The marginal scutes of the hybrid are sharp and pointed, similar to those of the hawksbill. The hybrid shows the *Eretmochelys* character of two claws on each fore flipper. The prefrontals of the hybrid shown in Fig. 1 are split although in the other hybrids they were sometimes partially split or unsplit. The alveolar surface of the lower jaw of the hybrid appears more similar to *Chelonia* in that a median tooth is present. Table 1 summarizes the physical characteristics of the turtles examined.

The relative motilities of the electrophoretic serum protein bands for green, hybrid and hawksbill turtles are given in Table 2. The distinction among the three groups of turtles lies in the bands arbitrarily identified as 4 and 6. *Chelonia* shows only band 4 and *Eretmochelys* only band 6; the hybrid serum samples have both 4 and 6. Functional and quantitative determina-

tions of the bands were not made, but offer an interesting field for further research because of the differences shown. Particularly, 2 of the 26 *Chelonia* tested showed a fifth band, although this was statistically ($P < .05$) different in relative motility from band 6 of *Eretmochelys* and the hybrids. Band 3 was absent in some of the green and hybrid samples as indicated in Table 2. There was no apparent relationship between the presence of these bands and the serum quality or age and origin of the turtles examined.

The Surinam coast is a major nesting ground for *Chelonia mydas*. *Eretmochelys imbricata* nests to a much lesser extent, but has a season overlapping that of *Chelonia* (Schulz, 1975). It would therefore be geographically feasible for a mating between the two species to occur. Eggs of *Eretmochelys imbricata* are considerably smaller than those laid by *Chelonia mydas* (average diameter 38 mm vs 48 mm, Hirth, 1980). Since small eggs were not noticed during either collection or incubation this suggests that the hybrid eggs were laid by a green turtle who had been mated by a hawksbill. The growth of the hybrids, averaging 35 kg at 4 years of age, is similar to that observed for captive reared green turtles. The two captive reared hawksbills are much smaller, approximately 17 kg at 5 years, than the hybrids or the greens. All of the hybrids are male; whereas, the sex ratio of the green turtles hatched at the same time and condition was 2.7 females to each male (Wood and Wood, 1982). Sex of some sea turtles would appear to be dependent upon temperature of incubation (Yntema and Mrosovsky, 1980), however, it is possible that the hybrid cross predetermines the production of males. Fertility of the hybrids may be ascertained in the future.

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