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Ontogenetic Changes in the Plastron Pigmentation of Hatchling Hawaiian Green Turtles

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Hatchling green turtles, *Chelonia mydas*, differ from the young of other sea turtles by their sharply contrasting white plastron and dark carapace. Except for the Australian flatback, *C. depressa*, hatchlings of other sea turtle species have a predominantly dark plastron. According to Bustard (1972), hatchling green turtles are "blackish above and immaculate white below." This countershading is believed to serve as camouflage from avian and fish predators while the turtles are floating at the surface in pelagic habitat (Carr, 1969). The black dorsum is also considered to have adaptive significance by elevating body temperature, hence metabolism, through the absorption of solar radiation (Bustard, 1970). No explanation has been offered as to why other hatchling sea turtles are not similarly countershaded, since they also pass through a pelagic phase.

According to Hirth (1971), dorsally the neonatal green turtle is black to dark brownish, or greenish black, with white edges to the carapace and flippers. Ventrally the plastron is white with black at the ends of the flippers, but with white edges. Except for differences in size (ca. 4–6 cm carapace length), only minor variations in the appearance of hatchlings derived from widely separated nesting beaches have been recognized in the literature. Pritchard (1979) alone has indicated that the white underside of the hatchling green turtle sometimes has a dark band of pigment along the marginal scutes, which is said to vary in intensity from one population to another. However, this characteristic may not be very common, since no other authors have mentioned it. No pigment is present along the ventral surface of the marginal scutes of hatchlings examined from Hawaii (Balazs, 1980), nor in those from Tortuguero, Costa Rica which have been deposited in the Florida State Museum (J. Mortimer, pers. comm.).

The available literature indicates that the plastron of the post-hatchling green turtle remains nearly white throughout growth and development. For example, Hughes (1974) states that all

underparts, except the flippers, remain white as green turtles from South Africa grow from hatchlings into 20 cm juveniles. From 20 cm to adult, the plastron is reported to only change from off-white to yellow. Pritchard (1979) also indicates that the plastron stays light colored, merely becoming pale yellow in the adult instead of pure white. However, the pigmentation previously mentioned by Pritchard (1979) along the underside of the marginal scutes "may be intensely black in juvenile Ascension turtles." Similar pigmentation is evident in a captive reared 7.5 cm juvenile from Australia shown, but not described, in Glazebrook (1981). However, it is only faintly present on a 6.5-cm sibling shown in the same paper. Though not stated by Pritchard (1979), it can be assumed that green turtles from Ascension eventually lose such pigment, since it has not been described in larger turtles from this location. Jeanne Mortimer (pers. comm.) recently examined 75 young green turtles from Ascension Island preserved at the Florida State Museum. They ranged from hatchlings to 12 cm juveniles. She confirmed that on the venter the marginals alone are dark in the hatchlings, and this dark pigmentation fades when the juveniles reach 8 to 10 cm in carapace length.

The purpose of this present note is to document and describe a radical color change that occurs in the plastron during the early life stage of the Hawaiian green turtle. Except for brief mention in Balazs (1980), a transition of this nature has not been reported elsewhere in the literature. The plastron and underside of the marginal scutes of neonatal (5 cm) green turtles from Hawaii are white, but by 6 cm become diffused with black and gray pigment. The pigment reaches its greatest intensity at about 7–8 cm. Thereafter, it fades away and usually disappears completely by 13 cm or less, when the undersurface returns to complete white. The three major stages of this pigment transformation are shown in Fig. 1. The formation and subsequent dissipation of dark pigment are entirely dependent on the size of the turtle, and not on its age. Consequently, faster growing turtles pass through the pigmented phase more rapidly than siblings growing at a slower rate. This point has been confirmed through captive rearing of more than 300 hatchlings from Hawaii since 1972 under different dietary and environmental conditions. The pigment changes have not, however, been documented in free ranging turtles, since there have been no opportunities to do so. As elsewhere, Hawaiian green turtles in this size range are almost never seen in the wild, and are presumed to be living in pelagic habitat. In Hawaii, green turtles are absent from nearshore habitat until they reach 35 cm or more.

It is unknown if this color change is unique to Hawaiian green turtles, or has simply been overlooked in certain other populations. For many populations, hatchlings have undoubtedly not been reared in captivity to carefully record ontogenetic changes. Even where captive rearing has occurred, there is a human tendency to focus attention on the dorsal more readily visible surfaces of young turtles held in tanks. Pigment along the marginal undersurfaces of juvenile Ascension green turtles mentioned by Pritchard (1979), and Australian ones shown in Glazebrook (1981), indicate that color changes do occur to some degree in other populations. However, no literature reports have shown or suggested it to be as pronounced as reported herein for the Hawaiian population.

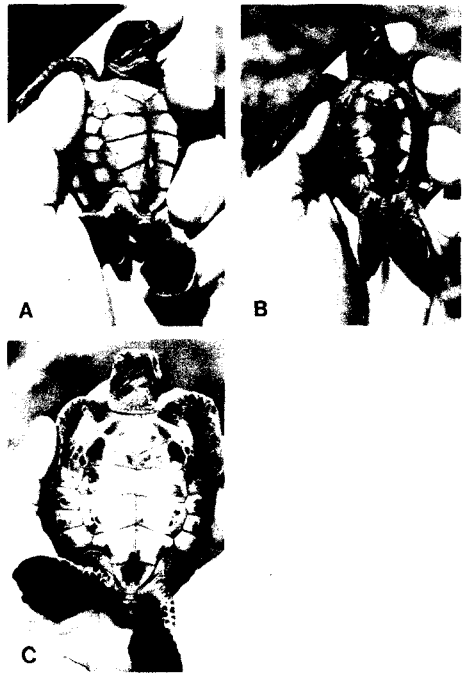

FIG. 1. Changes in the plastron pigmentation of the Hawaiian green turtle. A. Beginning of dark pigment at 5.8 cm carapace length (2 weeks old). B. Intense dark pigment at 7.0 cm carapace length (4 weeks old). C. Dissipation of dark pigment at 11.2 cm carapace length (16 weeks old).

In the eastern Pacific, the taxonomy of *Chelonia* has not been resolved. The name "black turtle" is commonly used for this markedly different form. Scientific names referring to the black turtle have included *Chelonia agassizi*, *C. mydas agassizi*, and *C. mydas carrinegra*. Mature adults are characterized by their black carapace and other dark dorsal surfaces, and large blotches of gray pigment throughout most of the plastron and ventral marginal scutes. However, almost nothing has been

written about plastron coloration in the hatchling or juvenile black turtle of the eastern Pacific. Caldwell (1969) stated that hatchlings of the *mydas* form could not be distinguished from the black turtle, so presumably the latter also has a completely white underside. In 1980, Archie Carr at the University of Florida raised a single black turtle hatched in the laboratory from an egg acquired at Maruata Bay, Michoacan, Mexico. As a neonate, the ventral surface of this specimen was reported to be completely white. Dark pigment subsequently developed in a manner similar to what has been described for the Hawaiian green turtle, but not as intense at its darkest point. At 15 months of age (18–20 cm) this turtle still had considerable dark pigment (K. Bjorndal, pers. comm.). However, according to Archie Carr (pers. comm.) fading had started to occur when it died several months later. The turtle is preserved in the Florida State Museum, Gainesville.

It is unknown what adaptive value, if any, may accrue from dark pigmentation occurring in the ventral surface of 6 to 9 cm Hawaiian green turtles. A similar phenomenon appears to take place in eastern Pacific black turtles and possibly other populations of green turtles. More work is needed to elucidate this point, and others, by simultaneously rearing groups of hatchling green turtles from different locations under similar environmental conditions.

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