

Dear Mr. Balazs,

Thank you for writing. My report did very well, I got an A for content and A- for grammar. I'm so sorry that I have taken so long to respond but my teacher had it on exhibition for our school's accreditation. I am sending you xeroxed copies of my report.

Even though I got an A on it, I'm afraid I didn't quite satisfy myself regarding the content of my report, I wish I had had more time to research it. But, it was an interesting subject to write about.

I want to thank you again for all your help, I couldn't have done the job without you.

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MARCH 1981

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The Hawaiian and Other Hawksbills

by

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A/A—

Composition Writing

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The Hawaiian and Other Hawksbills

The Hawaiian Hawksbill turtle is just one of Hawaii's many endangered biota. This unusual turtle nests only on the eight main islands of the Hawaiian archipelago. It figured in the ethnoculture of the Hawaiians and is now on the verge of extinction. This species is imperceptibly but steadily disappearing from the Pacific waters. Unfortunately, there is very little known about this disappearing group. In this paper, I will try to itemize such data as I was able to gather and endeavor to explain the Hawksbill's habits, feeding, nesting, mating etc., and what is being done to save this unusual turtle.

Reptiles are ectotherms (cold blooded animals) that have evolved walking limbs and - distinctively - a dry, scaly skin. They arose from the class Amphibia (lined but moist skinned animals)¹ during the Pennsylvanian Period, toward the close of the Paleozoic Era. By rapid adaptive radiation, ^{they} became the dominant animals on the earth during the Mesozoic Era. One of the reptilian groups gave rise to the birds, another to the mammals.²

Reptiles were the first vertebrates to adapt to life in dry places. Unlike the amphibians from whence they

¹ Websters Third New International Dictionary of the English Language, p.72.

² Carl Ernst and Roger Barbour, Turtles of the United States, p.1.

evolved, reptiles do not have to return to water to lay their eggs. Some developements that contributed to free-

ing the reptile from the water need of amphibians are:

the scaly skin which "has few surface glands...very little fluid is lost cutaneously (through the skin)³. The well developed lungs enable the reptiles to acquire an ample amount of oxygen supply"⁴

...modifications in the heart have made their circulatory system more efficient, produced higher blood pressure and led indirectly to the development of kidneys. Other minor developements - the appearance of claws on the toes, the development of a palate, separating the nasal passages, and evolution of the male capulatory organ, which allows internal fertilization.⁵

Turtles along with lizards, amphisbaenids, snakes, crocodilians and the tuatara compose the vertebrate class Reptilia which is a subphylum of Vertebrata, which is a phylum of Chordata.

Turtles, like all reptiles are cold blooded. That is, their body temperature stays about the same as the environment around them. Turtles cannot be active in cold weather because their body temperature would be too cold for movement. Therefore, they cannot live in regions that are cold throughout the year, but they live everywhere else. Turtles are found in deserts, forests, grasslands, lakes, ponds, rivers, and oceans.

³ Websters New Collegiate Dictionary, p.281.

⁴ Ernst, Turtles of the United States, p.2.

⁵ Ibid.

Turtles evolved a shelled form long before mammals appeared on earth. This shell is a rare feature among the vertebrate group. Most kinds of turtles can pull their heads, legs and tails into their shells which serves as an excellent natural protection. There are many families of turtles. The Hawksbill turtle belongs to the family of Cheloniidae, the seaturtle family. Except for the leatherback seaturtle, seaturtles generally reside in shallow water areas adjacent to land where food and nesting areas are more readily accessible. The Pacific Hawksbill ranges through the tropical portions of the Indian and Pacific Oceans, from Madagascar to the Red Sea on the east coast of Africa, to Australia and Japan in the Western Pacific, to the Hawaiian Islands in the Central Pacific, and from Peru to Baja California in the Eastern Pacific.⁷

The turtle is the only reptile with a shell. The Hawksbill turtle, unlike most terrestrial turtles cannot pull its body into its shell for protection, but relies instead on its size and speed to discourage predators. A few of its more dangerous predators are sharks and whales in the water, and raccoons, dogs and other animals that prey on the eggs on land. On the shore, hatchlings are consumed by dogs, rats, sand crabs and birds. Once in the water, they are eaten by many species of fishes. The predominant predator by far,

⁶George Balazs, "Terrestrial Critical Habitat for Seaturtles Under United States Jurisdiction in the Pacific Region", Journal of the Hawaii Audubon Society, vol. 39, p.37.

⁷Ernst, Turtles of the United States, p.233.

however
though, is man.

The aquatic species of turtles are often referred to as terrapins. "Terrapin is usually applied to edible more or less aquatic hardshelled turtles."⁸ The Hawksbill differs from the green sea turtle, Chelonia mydas agassizi, in that it has two pairs of prefrontal scales (see Diagram 1&2)⁹ on its head instead of only one pair.¹⁰ This accounts for its hawklike appearance which has earned it the name of Hawksbill. The Hawaiian Hawksbill's scientific name is Eretmochelys imbricata bissa, which is also the name given to all the Pacific Hawksbills. Another distinguishing characteristic, besides the hawklike beak of this turtle, is the serrated edges and overlapping laminae of the carapace¹¹ in juvenile specimens.¹² This characteristic often disappears as the turtle gets older.

...The (ordinary turtle shell) shell is divided into two parts an upperpart the carapace and a lower part, the plastron (see Diagram 3&4). The two parts are joined on each side by a bridge. The carapace usually consists of about 50 bones (see Diagram 5). The nuchal is the most anterior bone along the midline, behind it are eight neurals, two suprapyrgals and a pygal in that order. Occasionally a preneural may be found between the nuchal and the first neural. The neurals are attached to the neural arches of the dorsal vertebrae, but the other bones of the series are free from the vertebrae. On each side of the neurals are eight costal bones; in some species a pre-costal is also present. Outside the costals and extending along each side from the nuchal to the pygal is a series of about eleven peripherals. Each carapacial bone articulates with the adjacent bones along a suture. The forepart of the plastron

⁸ Ibid., p.1.

⁹ Ibid., pp.5,229.

¹⁰ Sean McKeown, Hawaiian Reptiles and Amphibians, p.73.

¹¹ shell

¹² Balazs, "A Hawksbill Turtle in Kaneohe Bay", Journal of the Hawaii Audubon Society, 1978, p.129.

is composed of a median bone: The entoplastron which is surrounded anteriorly by two epiplastron and posteriorly by two hypoplastra. Behind these are a pair of hypoplastra and xiphiplastra. In some primitive species a pair of mesoplastra occur between the hyoplastra and hypoplastra. Between the forelimbs and the hind limbs the hyoplastra articulate with the 3rd and 7th peripherals. The forelimbs emerges from the axillary notch, the hind limbs from the inguinal notch. Just behind the axillary notches the axillary butresses solidly attach the hyoplastra to the 1st costals, and in front of the inguinal notches the inguinal butresses solidly attach the hypoplastra to the 5th costals (see Diagrams 5&6).¹³

"It has a more heartshaped carapace (than the Atlantic Hawksbill), a fully continuous vertebral keel, all vertebral with ridges that converge posteriorly, and the head and flippers almost solid black."¹⁴

"The Hawksbill is a relatively small to medium-sized seaturtle (43-91 cm).¹⁵ It lives in rocky places and coral reefs. It is also found in shallow-coastal waters, bays and estuaries. Eretmochelys shares its water habitats and nesting beaches with all of the other species of seaturtles."¹⁶

The Hawaiian Hawksbill apparently nests only on the eight main islands. "Only four nestings have been reported in the Hawaiian area during the past decade, three on the Big Island and one on Molokai."¹⁷ Carr (1952) reported that Eretmochelys

¹³ Ernst, pp. 2-3.

¹⁴ Ibid., p. 223.

¹⁵ Ibid., p. 222.

¹⁶ Ibid., p. 223.

¹⁷ McKelown, p. 72.

matures sexually at three years and on attaining a weight of about thirty pounds.¹⁸ "Adult turtles migrate to, and mate in the ocean off the nesting beach. Each gravid female comes ashore at night digs a deep hole...and lays 125 to 175 perfectly round white eggs."¹⁹ The eggs average about 38 mm in diameter. Reptiles have evolved a specialized egg which "has a calcareous or parchment like shell that retards the loss of moisture. The egg also has embryonic membranes, amnion, chorion, and allantois...as well as a yolk sac containing nutrients. The amnion forms a fluid-filled compartment surrounding the embryo."²⁰ After the female lays her eggs, she covers the hole and goes back to the relative safety of the water. The eggs usually hatch within 52 to 74 (average 59)²¹ days. Nesting takes about an hour. Carl et al. (1966) gives this very lucid account of a nesting of Eretmochelys:

Oviposition. The nest-digging stage tapers off in a series of light, unproductive scrapes at the interior of the nest. Finally these stop, and both back fins come to rest, palm down, several inches on each side of the nest opening. The tail is then dropped low into the cavity, the cloacal opening is everted slightly, and extrusion of the eggs begins.

Throughout oviposition the hind legs keep their position at the right and left of the nest, and the fore fins rest half folded against the body partly embedded in the sand. The first eggs may fall as far as 14 inches to the bottom of the nest. The whole clutch generally fills the cavity to within 5 to 8 inches of the level of the opening. Mucus is frequently secreted between the extrusion of eggs...²²

¹⁸Ernst, p.223.

¹⁹McKeown, p.72.

²⁰Ernst, p.1-2.

²¹McKeown, p.72.

²²Ernst, p.225.

In the four nests examined by Carr, et al. (1966), the distances from the surface of the ground to the top of the egg clutch and to the bottom of the nest cavity, respectively were, 9 by 11 inches, and none varied by more than 2 inches from this average in either dimension.²³

Hatching most often happens at night or in early morning. The eggs of any one clutch hatch almost at the same time "and the hatchlings follow one another to the surface in quick succession."²⁴

The hatchling carapace is heart-shaped and has a vertebral keel; the plastron has two longitudinal ridges. Hatchlings are black or very dark brown except for the keels, the shell edge, and areas on the neck and flippers, which are light brown. Sizes and weights are as follows: carapacial length 39 to 50 mm, carapacial width 27 to 35 mm, plastron length 30 to 37 mm, and weight 14 to 15 g.²⁵

Eretmochelys is omivorous but seem to prefer invertbrates. It is known to eat sponges, coelenterates (Portuguese man-of-wars, hydroids), sea urchins, gastropod and bivalve mollusks (Pinna, Ostrea), barnacles, crustaceans, ascidians and fish. Plants eaten are algae, Cymodocea, Conferea, and sargassum. Captive specimens eat fish, meat, bread, octupi, squid, crabs, mussels and oysters. Hatchlings seem to be herbivorous, but become more omnivorous as they grow older.²⁶

²³ Ibid., p.227.

²⁴ Ibid., p.228.

²⁵ Ibid.,

²⁶ Ibid.

Little is known about the behavior of Eretmochelys. Apparently it is diurnal (chiefly active during the day) except during the nesting season.²⁷ "Hawksbills are at times aggressive toward their own kind, and they have been known attack Chelonia mydas (green turtle) in captivity."²⁸ It is found that, newly caught, individuals are very aggressive. They will bite and snap at anything within their reach. When it gets a hold on something, the turtle will not release it readily, and they bite very painfully.²⁹

"The Hawksbill Seaturtle ("Ea") is the second most prevalent marine turtle in the Hawaiian waters³⁰ though it is no longer common."³⁰ Although found in tropical oceans worldwide it is now becoming increasingly rare. This species of turtles has been declared endangered and it may not be taken from the Hawaiian waters for any reason.³¹ Carr has proposed that this may be the most endangered marine turtle in the world.

"Ancient Hawaiians specifically sought hawksbills for laminae which were used both for medical purposes and to fashion fish hooks and other implements."³² Since then, man has overexploited this untapped resource. There has been a sort of turtle fad. Now some restaurants will not open without turtle on their menu, and more and more stuffed turtles are being smuggled into homes that can afford them. The world

²⁷ Ibid., p.223.

²⁸ Ibid.

²⁹ Ibid.

³⁰ McKeown, p.73.

³¹ Ibid.

³² Balazs, "Hawksbill in Kaneohe Bay," p.128.

can ill afford to lose another species of its wildlife because a few individuals find it necessary to have a stuffed turtle as an interesting and expensive conversation piece.

Today, peoples, to whom the turtle represents the "backbone" of their ethnoculture, are being persuaded into over-killing of that "backbone."³³ Commercial "tortoise-shell" from the shell scutes of this turtle used to be extracted before the takeover of plastics.³⁴ Unfortunately, "exploitation of shells is still widespread even today outside of the U.S."³⁵

Fishing nets pose a serious threat to all marine turtles in areas where substantial ^{sp?} feeding and breeding take place. Shrimp trawl nets, especially, are of international concern due to the large number of turtles that drown accidentally in the fishing effort. The ^{sp?} hazard of gill nets has not yet attracted the international attention of the trawl nets.

Unfortunately at present, no terrestrial or marine critical habitat has been legally designated for any kind of species of seaturtles.³⁶ The most apparent uses of terrestrial habitat by seaturtles are: 1) nesting by females, 2) incubation and hatching of eggs, 3) movement of hatchlings to the oceans.³⁷ Studies have been made to try to lay down foundation to the setting up of critical terrestrial habitat for seaturtles. Protected terrestrial habitat is especially needed for nesting.

³³ Archie Carr, "Great Reptiles, Great Enigmas," Audubon, vol. 74, p.72.

³⁴ McKeown, p.72.

³⁵ Ibid.

³⁶ Balazs, "Critical Habitat for Seaturtles....," p.37.

³⁷ Ibid.

Let them manage the turtles in some way.

One of the reasons why the subject of critical terrestrial habitat for seaturtles is so hard to resolve is because there is no clear division between terrestrial and marine habitats for these reasons: land masses play an integral part in the formation of sheltered underwater area, such as lagoons and bays where some turtles regularly retreat. Also, freshwater runoff from land enhances the growth of certain algae, sea-grasses and invertebrates used by turtles as food.³⁸

On July 1977, a memorandum of understanding was finalized between the Fish and Wildlife Service (Dept. of Interior) and the Marine Fisheries Service (Dept. of Commerce) which gives the former agency jurisdiction over seaturtles while they are on land, and the latter agency jurisdiction while they are in water. The Fish and Wildlife Service is currently gathering data on land area under U.S. jurisdiction which serves as critical habitat for endangered seaturtles.³⁹

Eretmochelys, like so many animals the word over, faces an uncertain future. Perhaps there will be no future for many. If man can streighten out the responsibilities that nature has placed on him with his superior brain, if he can realize that this earth and its magical life (found no where else so far) are not disposeable, if he stops unnecessary waste and the poisoning of his environment, than all life on this earth can look to a more secure future.

³⁸ Balazs, "Terrestrial Critical Habitat," p.37.

³⁹ Ibid., pp.37-38.

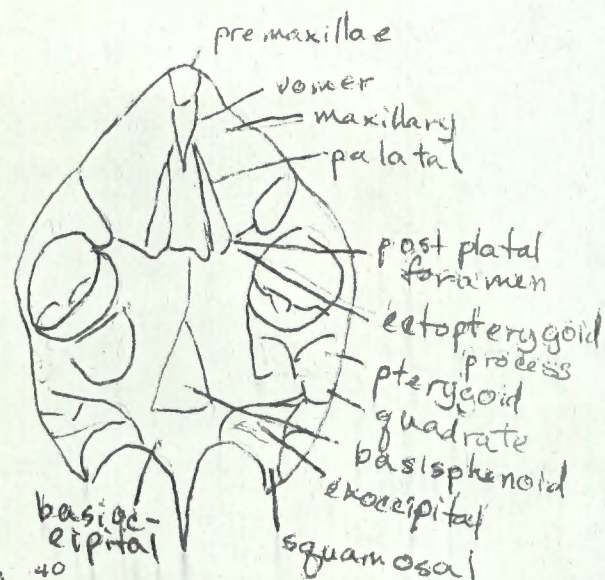
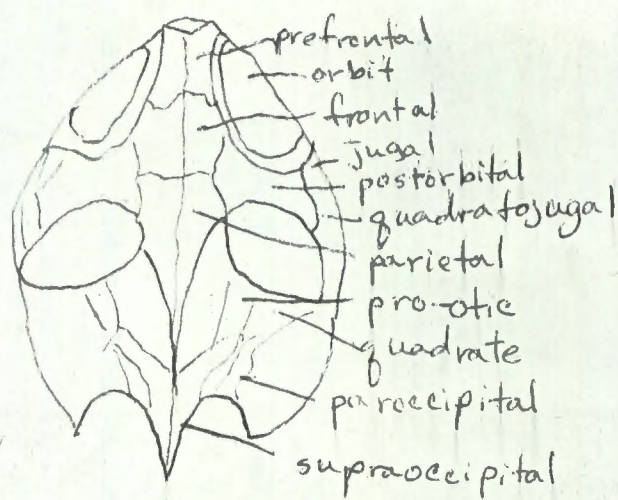


Diagram 1

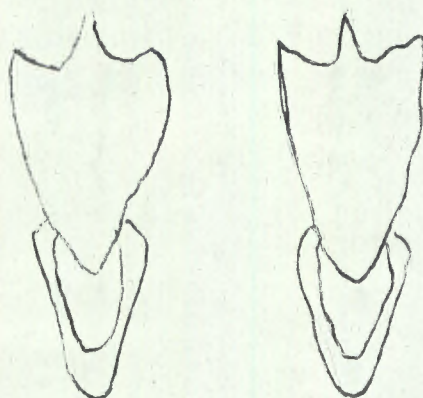


Diagram 2

⁴⁰ Ernst, p. 5.

⁴¹ Ibid., p. 229.

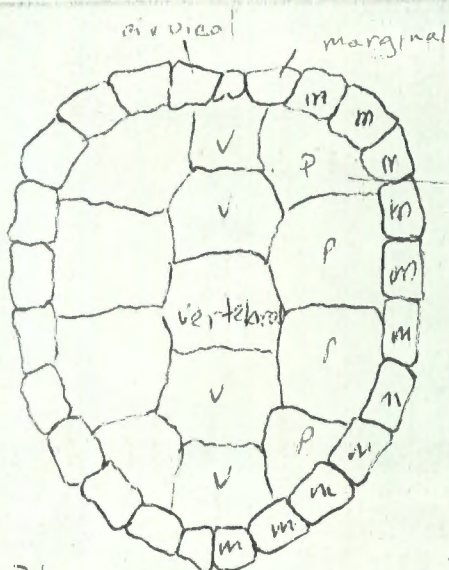


Diagram 3⁴⁴

Scutes

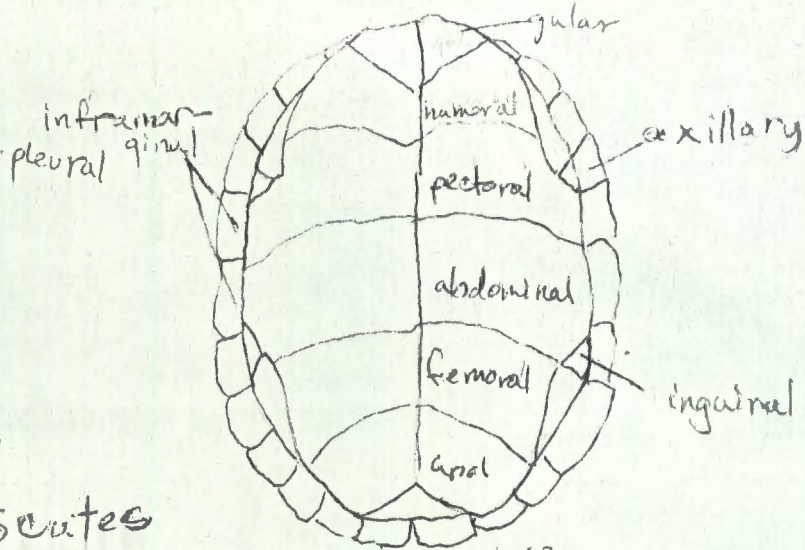


Diagram 4⁴³

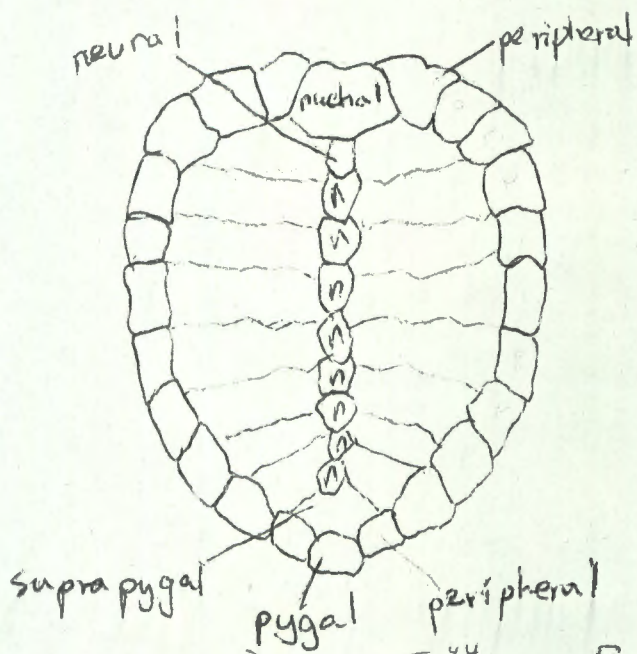


Diagram 5⁴⁴

Bones

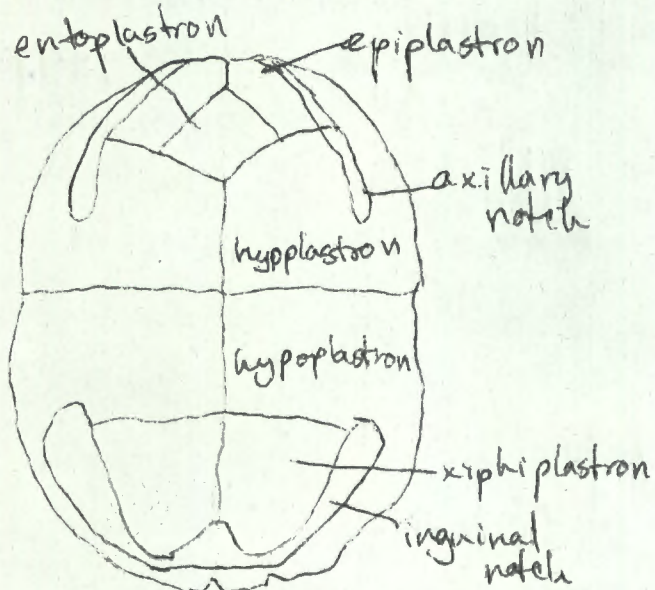


Diagram 6⁴⁵

⁴² Ibid., p. 4

⁴³ Ibid.

⁴⁴ Ibid. p. 3

⁴⁵ Ibid.

BIBLIOGRAPHY

- Balazs, George, "Green Turtles Uncertain Future,"
Defenders, vol.?, pp.521-523
- Balazs, George, Hawaiian Seabirds Turtles and Seals ,
Honolulu, World Wide Distributors, 1976
- Balazs, George, "A Hawksbill Turtle in Kaneohe Bay,"
Journal of the Hawaii Audubon Society, vol.38, No.1,
pp.128-129
- Balazs, George, "Terrestrial Critical Habitat for Seaturtles
Under United States Jurisdiction in the Pacific Region,"
Journal of the Hawaiian Audubon Society, vol.39, No.4,
October 1978, pp.37-41
- Carr, Archie, "Great Reptiles, Great Enigmas ," Audubon,
vol.74, No.2, March 1972, pp.24-34
- Ernst, Carl and Roger Barbour, Turtles of the United States,
Kentucky, University Press, 1972
- McKeown, Sean, Hawaiian Reptiles and Amphibians, Honolulu,
Oriental Publishing Co., 1978
- "Turtle," The World Book Encyclopedia, 1977 edition, vol.19,
p.426