BASKING IN GALAPAGOS GREEN TURTLES

Derek Green

Espey, Huston & Associates, Inc., P.O. Box 519, Austin, Texas 78767, U.S.A.

Basking in Galápagos green turtles (*Chelonia mydas*) was first recorded during the days of the buccaneers. These British buccaneers would take refuge in the islands after relieving Spain of some of its gold along the Pacific coast of South America. The earliest record is June 1684 and was made by both William Dampier (1699) and William Ambrose Cowley (Slevin, 1959), two pirates who were on the same expedition. Basking has been reported by many visitors since then, including other buccaneers, whalers, fur sealers and early naturalists. While not as common as in those early days of the buccaneers, basking in green turtles still occurs in the archipelago.

Basking takes place on many of the Galápagos nesting beaches. These include the islands of Isabela, Baltra, Santa Cruz, Santiago, Española, and Floreana. Basking also takes place on beaches on islands where nesting is not known to occur, such as Fernandina Island. Turtles basking on the beaches were sometimes as far as 50 meters from the water's edge, although usually much closer and often soundly asleep. They also gave the appearance of being exhausted: when approached they would open their eyes but would make little or no effort to return to the sea. The most turtles that I saw basking at one time was eight (all females) on a beach adjacent to Turtle Cove on northern Santa Cruz; six more females were resting in the shallow water of the tide wash. Usually the turtles basking on the beaches were females, although I did observe one male basking on a beach at Punta Espinoza on Fernandina Island and Bob Tindle (pers. comm.) encountered four males on the beach at Quinta Playa on Isabela Island. Snell and Fritts (1983) reported that four of 43 turtles they observed basking on Galápagos beaches were males. Captain Woodes Rogers, who visited the archipelago in May 1709, saw males as well as females on the beaches (Kerr and Eldin, 1824) and Dampier (1699) infers the presence of both sexes.

Basking, however, is much more common in the lagoons, especially around Isabela Island. I commonly saw females and subadults, and occasionally males and juveniles, basking on rocks, on mudbanks, among mangrove stilt roots and other border vegetation, against the trunks of fallen trees, at the edge of the lagoon touching bottom in shallow water, or at the surface. In most cases, the exposed portion of the carapace was completely dry. As on the beaches, the turtles often seemed to be asleep, certainly immobile and even when lightly bumped by the boat or captured took some time to become aware of what was happening. The floating turtles rested with their flippers either spread (as in pre-copulatory behaviour) or tucked alongside the edges of the carapace. At Punta Moreno A Lagoon (Elizabeth Bay, Isabela Island) on 13 October 1975, I counted at least 30 turtles basking at the surface in this manner and several more were caught up in mangroves at the edges of the lagoon. Basking usually started around mid-morning and continued until late afternoon, although I sometimes observed turtles sunning themselves as early as 0700 hrs. Turtles bask year-round.

The question arises as to whether these basking turtles crawled out of the water onto the land or were simply left there by a receding tide. In the lagoons, the latter is probably the case because I have often seen semi-comatose floating turtles drift toward the lagoon edge where they became caught on a rock or fallen trunk or amongst vegetation and were subsequently left high and dry. On only one occasion did I witness a lagoon turtle (a female) crawl out onto land and that was to cross three meters of rock in order to change from one tide pool to another, possibly as a result of being disturbed. On the beaches, too, most of the turtles beach passively. However, evidence from the position of the tracks in relation to the state of the tide indicated that at least some of the turtles actively hauled out. This was particularly evident on the beaches adjacent to Turtle Cove, an important area for copulation, where females at the water's edge made little attempt to follow the ebbing tide and so become marooned. Snell and Fritts (1983) reported that all but 4 (two males and two females) of 43 basking Galápagos turtles stranded passively.

Basking appears to serve several functions. According to Bustard (1972), the basking turtles on Bountiful Island in the Gulf of Carpentaria, Australia, are all females and thus he suggests that basking is a way of avoiding the unwanted

attentions of the courting males since males can not mount females unless they are in at least 60 cm of water. Such beaching to avoid males has also been reported for Australian green turtles by Booth and Peters (1972), for green turtles at Tromelin Island in the Indian Ocean (Hughes, 1974), and for Ascension Island green turtles in the Atlantic Ocean (Mortimer, 1981). While passive stranding of green turtles in Australian waters (Rocky Island, Gulf of Carpentaria) was also reported by Garnett *et al.* (1985), the authors concluded that such strandings were not to avoid the unwanted attentions of males, but the optimization of energy use (cf Bustard (1972) for the same area -- Gulf of Carpenteria). Avoidance of males seems to be the case for many of the females basking today on the Galápagos beaches. The presence of the occasional male on the beaches may have been accidental or even the result of overzealousness; perhaps they were too exhausted or not inclined to move back into the water after having followed the females too closely inshore. One factor possibly contributing to the apparent exhaustion shown by the females has little to do with the presence or absence of males. Many of them (and males, too, for that matter) undertake journeys of 2,000 km or more from the mainland of South America to nest in Galápagos (Green, 1984).

Because many subadults as well as females bask in the lagoons in Galápagos, avoidance of males can not be the main reason in these areas. The lagoons bordering Elizabeth Bay on western Isabela where most of the basking was observed are used primarily as resting areas (Green, in press). While some feeding takes place in these lagoons, much of the feeding occurs in the main bay and turtles leave periodically to feed. The lagoons are usually well protected by mangroves so that the waters are calm and with little current. Large sharks such as hammerheads (*Sphyrna* spp.) and the tiger shark (*Galeocerdo cuvier*) that occur in Galápagos waters are absent from these lagoons. Apart from basking at the surface, the turtles also spend much of their time resting on the bottom. Surface basking would allow turtles to breathe without periodically having to swim to the surface to do so. Thus conservation of energy could be a major function in the Galápagos lagoon baskers. Garnett *et al.* (1985) came to a similar conclusion for their Australian turtles.

In the Hawaiian Archipelago, males and immatures as well as females bask on both the beaches and rocky shores throughout the year (Balazs, 1980). While more common in the daytime, basking in Hawaii also occurs at night and Balazs suggests that basking, especially at night, may be a possible adaptation to predation by tiger sharks, particularly since these sharks are principally nocturnal predators. However, he concedes that nocturnal basking could also be the result of a scarcity of underwater resting sites; nevertheless, basking would certainly reduce exposure to predation. Most of the basking occurring at Rocky Island, Australia was during the night (Garnett *et al.*, 1985). I have not observed nor do I know of any reports of nocturnal basking in Galápagos green turtles.

Another function of basking is thermoregulation. Hughes (1974) believes that the basking behaviour of green turtles in calm seas off Europa Island in the Indian Ocean may be a warming process after turtles have spent an hour or so sleeping on the bottom. During basking, the body temperature increases in both land baskers and in floating turtles. Balazs (1980) found a maximum cloacal-sea temperature difference of 5°C in land-basking Hawaiian Chelonia and Sapsford and Van der Riet (1979) recorded an increase of 3.3°C in two hours for a 42-kg loggerhead floating at the surface of a large open-air tank. Such an increase in body temperature may serve to aid digestion. Thermoregulation as a function is also likely with Galápagos green turtles, since some of them were observed basking in the lagoons as early as 0700 hrs.

Contrary to earlier conclusions, basking is not restricted to green turtles. Hughes and Richard (1974) observed groups of olive ridleys (*Lepidochelys olivacea*) basking at sea on calm days off Nancite, Pacific Costa Rica. Basking at sea has also been reported for the loggerhead in Madeira and the Canary Islands (Thomas Dellinger, pers. comm.). It is noteworthy that apart from the avoidance behaviour of female green turtles on Ascension Island (Mortimer, 1981) there are no accounts in the literature of basking in Atlantic green turtles.

LITERATURE CITED

Balazs, G. 1980. Synopsis of biological data on the green turtle in the Hawaiian Islands. U.S. Dep.Commer., NOAA-TM-NMFS-SWFC-7. 141 pp.

Booth, J.B. and J.A. Peters. 1972. Behavioural studies on the green turtle (*Chelonia mydas*) in the sea. Anim. Behav. 20:808-812.

Bustard, H.R. 1972. Sea turtles -- their natural history and conservation. Collins, Glasgow. 220 pp.

Dampier, W. 1699. A new voyage round the world. 3 vols. James Knapton, London (originally published in 1697 as one vol.). Vol. 1, 550 pp.

Garnett, S.T., G.M. Crowley and N.Goudberg. 1985. Observations of non-nesting emergence by green turtles in the Gulf of Carpentaria. Copeia 1985:262-264.

Green, D. 1984. Long-distance movements of Galapagos green turtles. J. Herpet. 18:121-130.

Green, D. in press. Sea turtles of the Galápagos Archipelago, Ecuador. Bull. Texas Mem..Mus.

Hughes, D.A. and J.D. Richard. 1974. The nesting of the Pacific ridley turtle *Lepidochelys olivacea* on Playa Nancite,Costa Rica. Mar. Biol. 24:97-107.

Hughes, G. 1974. The sea turtles of South-east Africa. II. The biology of the Tongaland loggerhead turtle *Caretta caretta* L. with comments on the leatherback turtle *Dermochelys coriacea* L. and the green turtle *Chelonia mydas* L. in the study region. Oceanog. Res. Inst. Invest. Rep. 36. Durban, South Africa. 96 pp.

Kerr, R. and F. Eldin (eds.). 1824. A general history and collection of voyages and travels, Vol.10. W. Blackwood, Edinburgh and T. Cadell, London. 513 pp.

Mortimer, J.A. 1981. Reproductive ecology of the green turtle, *Chelonia mydas*, at Ascension Island. Ph.D. diss., University of Florida, Gainesville. 162 pp.

Sapsford, C.W. and M. van der Riet. 1979. Uptake of solar radiation by the sea turtle, *Caretta caretta*, during voluntary surface basking. Comp. Biochem. Physiol. 63A:471-474.

Slevin, J.R. 1959. The Galápagos Islands -- a history of their exploration. Occas. Pap. Calif. Acad. Sci. 25. 150 pp.

Snell, H.L. and T.H. Fritts. 1983. The significance of diurnal terrestrial emergence of green turtles (*Chelonia mydas)* in the Galápagos Archipelago. Biotropica 15:285-291.

STRESS, SEX, AND STEROIDS IN KEMP'S RIDLEY TURTLES (*LEPIDOCHELYS KEMPII*)

Lisa F. Gregory[1] and Jeffrey R. Schmid[2,3]

[1]Department of Zoology, University of Florida, Gainesville, FL, 32611, U.S.A.
[2]Archie Carr Center for Sea Turtle Research, University of Florida, Gainesville, FL, 32611, U.S.A.
[3]National Marine Fisheries Service, Southeast Fisheries Science Center, Miami, FL, 33149, U.S.A.

Plasma corticosterone, glucose, and testosterone concentrations were measured in wild, subadult Kemp's ridley turtles (*Lepidochelys kempii*) captured by tangle net near the Cedar Keys, Florida. Initial blood samples were collected immediately after capture and additional samples were collected 30 and 60 minutes after the initial sample. Plasma corticosterone and testosterone concentrations were determined by radioimmunoassays. Plasma glucose concentrations were determined by an enzymatic-colorimetric assay. A significant increase was observed in mean plasma corticosterone concentrations over time indicating that the hypothalamus-pituitary-adrenal axis of subadult Kemp's

NOAA Technical Memorandum NMFS-SEFSC-415

PROCEEDINGS OF THE SEVENTEENTH ANNUAL SEA TURTLE SYMPOSIUM

4-8 March 1997
Orlando, Florida U.S.A.

Compilers:

Sheryan P. Epperly
Joanne Braun

U. S. DEPARTMENT OF COMMERCE
William M. Daley, Secretary

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
D. James Baker, Administrator

NATIONAL MARINE FISHERIES SERVICE
Rolland A. Schmitten, Assistant Administrator for Fisheries

December 1998

NOAA Technical Memorandum NMFS-SEFSC-415

PROCEEDINGS OF THE SEVENTEENTH ANNUAL SEA TURTLE SYMPOSIUM

4-8 March 1997
Orlando, Florida, U.S.A.

Compilers:
Sheryan P. Epperly
Joanne Braun

December 1998

U. S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Science Center
75 Virginia Beach Drive
Miami, FL 33149