benefits, but greater analysis of this behavior would have to be done. Individual turtles (as identified by their carapace numbers) were frequently observed resting in the same locations or home site. Turtles were also observed feeding on algae in and near the pond entrance. Analysis of algae samples taken revealed over 99% *Cladophora hemisphaerica*. Turtles were observed basking in four primary areas. The same turtles consistently basked at the same location. For example, #36 was observed basking on 11/2/99 at 1743 hours and then observed basking at the same site on 1/14/00 at 1455 hours. Many of the numbered pond turtles were observed outside the ponds as well, mainly in the lagoon. For example, on November 1, 1999, turtle 19 was recorded leaving the mixohaline ponds at 0611 hour and was then observed basking in the lagoon later that afternoon at 1457 hour. On 1/15/00, turtle 45 was seen basking in the lagoon and was captured the next day exiting the ponds at 0635 hours (Rice *et al.*, This volume). Tides appeared to be the determining factor for turtles entering the ponds. Numerous turtles were observed attempting to enter the ponds, but currents from the falling tides prevented them from doing so. Current flow measured in the awai during a falling tide was 0.6 m/second in the widest part of the awai and one meter per second in the narrowest part of the awai. Often turtles managed to swim part way up the awai before currents proved too strong and they were forced to abandon efforts to enter the ponds. No turtles entered the ponds when tides were below 0.2 m. However, turtles did not appear to be restricted by tides when exiting the ponds. Turtles left the ponds periodically, but 82% of the turtles observed exiting the ponds left between 0500 hours and 0900 hours, presumably to forage in the adjacent bay outside the ponds. Deep body temperatures (Tb) taken from turtles both entering and then exiting the ponds showed a decrease in temperature for pond residency. The average Tb of the eight turtles captured entering the ponds was 24.8°C. The average Tb for the ten turtles captured exiting the ponds was 21.9°C, an average drop in deep body temperature of 2.9°C. Water temperatures were taken in the ponds at both the top and bottom. The range of water temperatures in the ponds was 20°C to 23°C near the surface, while the bottom was much warmer with a range of 24°C to 26.5°C (depth = 1 m) Salinity measurements were taken at the same time. In pond one, surface readings gave a salinity of five parts per thousand (ppt) and the bottom was 33 ppt. In pond two, surface measurements showed a salinity of 0 ppt and a salinity of 21 ppt at the bottom. The slightly higher salinities in pond 1 are most likely due to the infusion of salt water brought into the ponds through the awai with the tides. The results of this study depict the ponds as an important resting habitat for the green turtles residing there. In the past, the ponds were not used at the current high level, but now turtles can be seen entering and exiting the ponds on a daily basis. Over fifty turtles were observed entering the ponds in a single 24-hour period. All of the turtles using the ponds were immature. The turtles usually left the ponds for at least a few hours each day, presumably to forage in the bay. Turtles were seen foraging and basking in the ponds, but the ponds appear to be principally a resting area. The ponds likely offer protection and safety from predators in the bay as well. Lower deep body temperatures observed in turtles exiting the ponds would lower their metabolism, perhaps resulting in an energy savings. The overall use of the ponds is primarily that of a resting habitat for immature turtles.

Literature Cited

Balazs, G.H. 1995. Innovative techniques to facilitate field studies of the green turtle, *Chelonia mydas*. Pages 158-161 in J.I. Richardson and T.H. Richarson (compilers). Proceedings of the Twelfth Annual Workshop on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-361.

Balazs G. H., M.R. Rice, S.K.K. Murakawa, and G. Watson. 2000. Growth rates and residency of immature green turtles at Kiholo Bay, Hawaii. Pages 283-285 in F.A. Abreu-Grobois, R. Briseno-Duenas, and R. Marquez (compilers). Proceedings of the Eighteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-436.

Lutz, P.L. and J.A. Musick. 1996. The Biology of Sea Turtles. CRC Press. Boca Raton, Florida.

Whittow, G.C. and G.H. Balazs. 1985. Basking behavior of the Hawaiian green turtle (*Chelonia mydas*). Pacific Science 36(2):129-139.

Rice, M.R., G. H. Balazs, D.K. Kopra and G.C. Whittow. This volume. Ecology and behavior of green turtles basking at Kiholo Bay, Hawaii. Proceedings of the Twentieth Annual Symposium on Sea Turtle Biology and Conservation.

Movements of Loggerheads Around the Canary Islands (Northeastern Atlantic)

Luis F. López-Jurado, Idoya Cabrera, Nuria Varo, and Daniel Cejudo

Universidad de Las Palmas, Departamento de Biologia, Universidad de Las Palmas, Las Palmas 35017, Canary Islands, Spain (luisfelipe.lopez@biologia.ulpgc.es)

We present the first data on movements of loggerheads (*Caretta caretta*) in the Canary Islands (Northeast Atlantic), the commonest species in this area, where there is a developmental habitat. They seem to belong to the nesting population from the southeastern United States, and live around the archipelago as immature stages before returning to natal beaches. Body size ranges from 20 to 70 cm of curve carapace length (CCL), being occasionally

larger. Since November 1998, eight individuals of *Caretta caretta* have been tagged using Platform Transmitter Terminals (PTT's): seven in the Canary Islands, and one in the Strait of Gibraltar, both areas included in migratory routes described for this species in the North Atlantic. Seven transmitters still work, the last three were released very recently and the data are still poor. The first PTT deployed was transmitting for five months before the batteries ran out. The routes followed by the turtles are different: the one from the Strait of Gibraltar and the one from the Canary Islands appear to swim towards the Western Atlantic; two other turtles went to the Northeast Atlantic and stand close to Moroccan coast; one individual was around the archipelago since its release ten months ago; and the last three tagged animals still remain in the release area. There may be a relationship between body size and direction of movements, since the two larger individuals swam towards the Western Atlantic, and the smaller ones remained close to archipelago. Data provided by these turtles, and those obtained from animals tagged in a near future, will allow us to discuss this hypothesis.

Changing the Landscape: Evidence for Detrimental Impacts to Coral Reefs by Hawaiian Marine Turtles

PETER BENNETT[1], URSULA KEUPER-BENNETT[1], AND GEORGE H. BALAZS[2]

[1]*Turtle Trax, www.turtles.org, 24 Reid Drive, Unit 3, Mississauga, Ontario L5M 3A6, Canada (howzit@turtles.org)*

[2]*National Marine Fisheries Service, Southwest Fisheries Science Center, Honolulu Laboratory, 2570 Dole Street, Honolulu, Hawaii 96822, USA*

HOME SWEET HOME

Site fidelity to a particular stretch of coastal waters is a recognized characteristic of the Hawaiian green turtle, or honu (Balazs, 1980; Bennett *et. al.*, This volume; Keuper-Bennett and Bennett, This volume). The turtles living at Honokowai, West Maui, Hawaii are also dedicated "reef potatoes." Through benign observations using photographs and videotape, conducted during July and August each year from 1989 to 1999, we have shown that turtles from all post-pelagic size classes have called Honokowai home for many years (Keuper-Bennett and Bennett, This volume).

Further, we have discovered that the honu are faithful not just to a general area such as the Honokowai reef system, but also to specific places on the reef. We have documented numerous areas that individual turtles regard as "private" resting sites. These are specific ledges, shelves, and depressions that become "home" to one turtle. The same animal can occupy its private space for years and will defend it stubbornly from intrusion by other honu.

CONSEQUENCES OF THIS FIXITY

The consequences of such site-specific residency are clearly visible on the reef. Turtles engage in three types of activities causing three forms of destruction. Finger corals are broken and trampled, plate and lobe corals are ground smooth, and large coral heads are split asunder.

The area we call the Turtle House was a mound of thriving corals in 1989. A decade later, these corals are unrecognizable, having been pummeled into rubble or ground down to their rock base. A colony of honu can indeed change the landscape-and do so dramatically!

Whether it's a case of many turtles huddled around a shared piece of habitat (such as a scratch post) or that of an individual turtle calling a ledge home, the results are the same. As these hard-shelled creatures come and go for daily foraging and resting, the environment bears testimony to their long-term presence.

THREE TYPES OF DESTRUCTIVE ACTIVITIES

Landing/Resting/Leaving

The effect of 100 kg turtles taking off and landing atop corals leaves little to the imagination, but honu can do damage even when resting. Fragile finger corals (*Porites compressa*) are major victims. Their remains litter the "floors" of most Honokowai resting places. We call these sites "Turtle Tramples" because that's exactly what the turtles do, even during the course of such an innocent activity as resting. They trample and grind the corals into rubble simply by physical contact.

Scratching

Generally speaking, an "itchy" plastron is the easiest itch to satisfy. A honu simply needs to drag itself over a section of coral using its front flippers to move itself back and forth. If an "armpit" or abdominal region is itchy, a turtle can find relief on any handy piece of coral; however, a coral head that offers top-quality easy access for armpit/ abdominal scratching becomes a shared resource. Over time it can be worn to a point, thus making it an even more effective itch "satisfier."

While scratching plastron and soft body parts is easily accomplished, there is a logistical problem with an itchy carapace, since a turtle can't (or won't) roll over. To satisfy this kind of itch requires some overhanging structure. For small turtles, any ledge or coral "lip" works well. Large turtles, however, require suitably sized overhangs of either rock or durable coral-and therein lies the problem.