MONITORING SEA TURTLE BASKING BEHAVIOR WITH REMOTE VIDEO CAMERAS

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INTRODUCTION

Although it is common for freshwater turtles to bask on land, it is comparatively uncommon for sea turtles to do so. Only the green turtle (*Chelonia mydas*) has been reported basking on land, and it does so only in certain parts of the world, one notable place is the Northwestern Hawaiian Islands (Whittow and Balazs, 1985).

Green turtles have been observed basking at Kiholo Bay Hawaii, on the Kona/Kohala coast, since 1994 (Harrington et al., In press; Rice et al., In press; Rice and Balazs, 2000; Balazs, 1996). The lagoon where they are seen has a shoreline consisting primarily of basaltic rock. The north shore is consolidated pahoehoe lava from the 1859 eruption. The south shore, which separates the lagoon from the ocean, is made of large rounded basaltic rocks, with a small gravel beach we call Turtle Beach. The lagoon is ocean water with a substantial amount of fresh ground water running into it. The surface water (down to ~0.5 meters) has a temperature between 20-22 °C and a salinity of 8-15 parts per thousand (ppt). The subsurface water (>0.5 meters) has a temperature of 24-26 °C and a salinity of 28-30 ppt. Seawater outside of the lagoon is 28 to 36 ppt (Rice et al., In press). While basking occurs on both sides of the lagoon the majority of turtles emerge at Turtle Beach. Work done by Rice et. al., (In press), has shown that basking occurs most frequently between 0900 h and 1000 h and 1300 h and 1400 h. It was also observed that basking was only initiated during the day but may extend into the night. Basking turtles at the lagoon stayed out an average of 2.6 h, but times ranged from 13 min to 11 h. Monitoring basking behavior is a time consuming process, and the physical presence of an observer was required until now. Modern technology has made it possible to place digital video cameras at remote locations for sea turtle research and monitoring purposes (Balazs et al., In press). The two cameras we installed at Kiholo Bay have given us the ability to remotely monitor basking behavior over extended periods. With this technology, we are able to identify individual animals and record unique behaviors constantly during daylight hours.

MATERIALS AND METHODS

Two digital video cameras were powered by 12-volt solar-charged storage batteries. The digital video cameras have 15x optical zoom lenses, as well as pan and tilt capabilities. The video signal is transmitted 19 miles using Primer wireless™ microwave (2.4GHz) transmitters and receivers. The signal is received at the Hawaii Preparatory Academy, and served at times over the World Wide Web through the SeeMoreWildlife web site (http://www.seemorewildlife.com) at 80 Kbs.

Only turtles that basked on Turtle Beach were studied for this project. When a turtle was observed basking it was identified using head-scale patterns, scars, deformities or other unique, permanent characteristics (Bennett and Keuper-Bennent, this volume). Some turtles had a number lightly etched on the left and right second lateral scute (Balazs, 1995). If the turtle could not be identified we captured still images of the turtle's head-scale pattern and any other identifying marks or scars, using Xclaim vr™, for future identification. We often videotaped basking when we could not be observing. A time/date stamp on the videotape allowed us to reconstruct the basking episode.

Turtles were considered basking when at least half of their carapace was above water for a minimum of 10 min. The time the turtle came out and went in, and digital images that were taken, were recorded in a journal, and later entered into a File Maker Pro database. Many basking episodes continued into the night, and we could not observe their termination. These episodes are not included in the confirmed basking duration data.

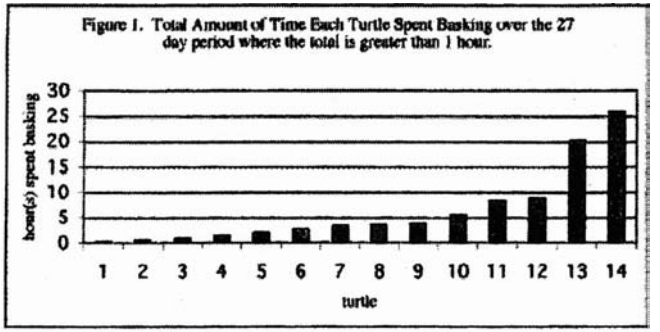
RESULTS AND DISCUSSION

We observed turtles basking over a 27 day period from May 5, 2000 to June 3, 2000. Over the course of those days, 24 turtles were individually identified. The number of basking episodes for each of the 24 turtles was recorded, and varied from 1 to 16 episodes. The total cumulative time that each turtle was observed basking ranged from 0.2 h to 25.9 h (Figure 1). The basking duration mean was 2.2 h (SE=0.3, N=52) and the range was from 0.2 h to 8.8 h. Basking behavior at Kiholo has only been observed starting during daylight hours (Rice, et al., In press). Basking was initiated from 0600 h to 1800 h with the highest frequency occurring at 1300 h (Figure 2). Turtles were sometimes observed initiating more than one basking episode in a single 24 h period. For example, one turtle came out to bask three times in one day (1.3 h, 0.8 h and 2.9 h +).

Previous research done on basking turtles at Punalu'u, Hawaii using TDR's, and also at Kiholo Bay (Rice et al., In press) found that turtles basked for a mean of 2.6 h and ranged from 13 minutes to 11 h (Rice et al., 1998, Rice et al., In press). The lower mean 2.1 h, calculated from our data may have been lower because the animals could not be observed at night. The longest basking duration we observed was 8.8 h, which is shorter than Rice's, which was 11 h. Our data may have underestimated basking intervals because we could not observe the turtles after dark, and we could not observe or identify them very well if they basked somewhere else in the lagoon.

Although the head-scale identification method aided us greatly in identifying the turtles, it also created some problems. Often we would only capture one side of the turtle's head, hoping the next time we saw it we would be able to photograph the other side. In one case we had one turtle listed under two different names. As the project continues, however, our database of known turtles will become more complete and these types of problems will diminish.

Overall the head-scale identification method aided us greatly. The cameras enabled us to identify individual turtles, observe turtle behavior and characterize basking patterns accurately and consistently without having to be in the field.



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LITERATURE CITED

Balazs, G. H. 1996. Behavioral changes within the recovering Hawaiian green turtle population. Proceedings of the Fifteenth Annual Symposium of Sea Turtle Biology and Conservation, p. 16-21, NOAA Tech. Memo. NMFS-SEFSC-387.

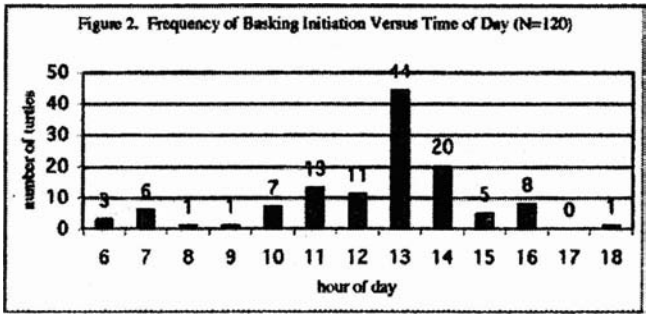
Balazs, G. H. 1995. Innovative techniques to facilitate field studies of the green turtle, *Chelonia mydas*. Proceedings of the Twelfth Annual Workshop on Sea Turtle Biology and Conservation , p. 158-161, NOAA Tech. Memo. NMFS-SEFSC 361.

Balazs, G.H., M.R.Rice, P.A.Bennett, and D. Zatz. In press. Remote interactive imaging: Implementation of a SeaTurtleCam system in the Hawaiian Islands. Proceedings of the Twentieth Annual Symposium on Sea Turtle Biology and Conservation.

Bennett, P. A. and U. Keuper-Bennett. This volume. The use of subjective patterns in green turtle profiles to find matches in an image database. Proceedings of the Twenty First Annual Symposium on Sea Turtle Biology and Conservation.

Harrington, K.A., M.R. Rice and G.H. Balazs. In press. Habitat use of mixohaline fish ponds by green turtles at Kiholo Bay, Hawaii. Proceedings of the Twentieth Annual Symposium on Sea Turtle Biology and Conservation.

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



Rice, M. R. and G. H. Balazs. 2000. Obake turtles of Hawaii. Proceeding of the Nineteenth Annual Symposium on Sea Turtle Biology and Conservation.

Rice M. R., and G. H. Balazs, L. Hallacher, W. Dudley, G. Watson, K. Krussel, and B. Larson. 2000. Diving, basking and foraging patterns of a subadult green turtle at Punalu'u, Hawaii. Proceeding of the Eighteenth Annual Symposium on Sea Turtle Biology and Conservation, p. 229-231, NOAA Tech. Memo. NMFS-SEFSC-436

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

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