



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

Technical Memoranda are used for documentation and timely communication of preliminary results, interim reports, or special-purpose information, and have not received complete formal review, editorial control, or detailed editing.

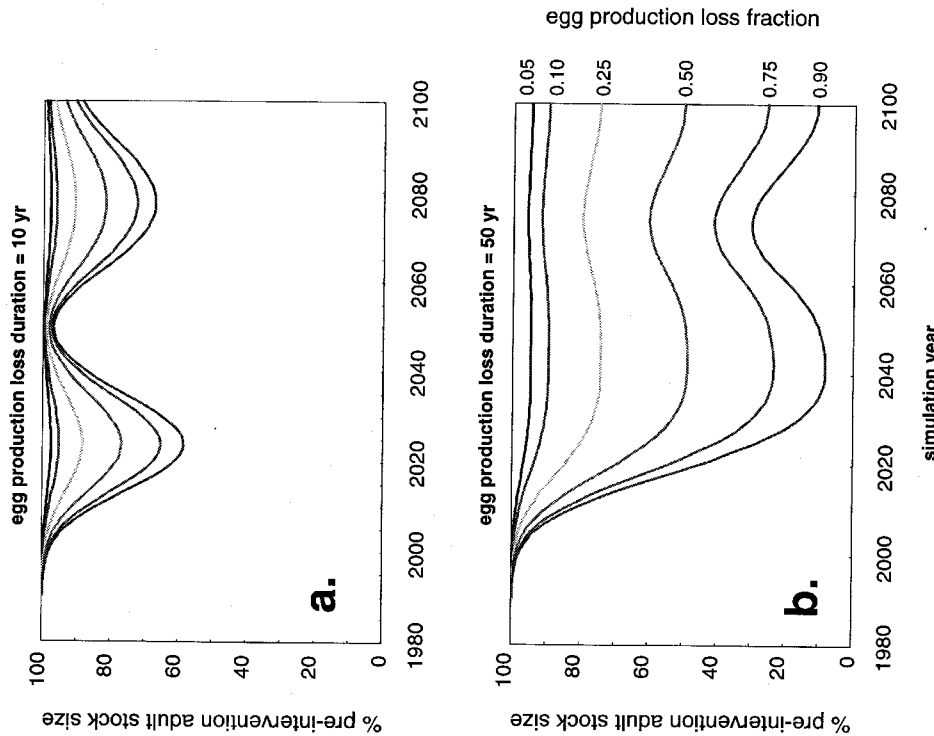


Figure 2: Simulated long-term impact on sGBR adult loggerhead stock size as a function of 6 egg production loss scenarios for (a) a 10-year continuous egg loss duration and (b) a 50-year egg loss duration.

THE POST-NESTING LONG RANGE MIGRATION OF THE GREEN TURTLES THAT NEST AT WAN-AN ISLAND, PENGHU ARCHIPELAGO, TAIWAN

Cheng, I-Jiunn¹ and G.H. Balazs²

¹Institute of Marine Biology, National Taiwan Ocean University, Keelung, Taiwan 202-24, R.O.C.

²NOAA, NMFS, Southwest Fisheries Science Ctr., Honolulu Laboratory, 2570 Dole St., Honolulu, HI, 92866-2396, U.S.A.

Wan-An Island, PengHu Archipelago is one of the remaining green turtle nesting sites in Taiwan. The nesting beaches have been designated as a sanctuary by the Council of Agriculture since December 1995 (Cheng, 1995; Council of Agriculture, 1995). Nesting ecology has been studied extensively (Chen and Cheng, 1995). However, little is known of the whereabouts of the nesting turtles while they are in the ocean. The purpose of this study was therefore to use satellite telemetry to determine the post-nesting migration routes and resident foraging areas of the Wan-An Island nesting green turtles.

MATERIAL AND METHODS

Seven adult female turtles were equipped with Argos-linked satellite transmitters (Telonics, Mesa, AZ, U.S.A.) during the nesting seasons of 1994 through 1996. Two models of PTT's (platform terminal transmitter) were used, ST-6 and ST-14. After nesting or false-crawling, the turtles were captured before reaching the ocean and held in a rectangular plywood "pen" in a natural prone position. The procedures for attachment followed Balazs *et al.* (1966). The dates of capture and release of the seven green turtles are listed in Table 1.

The repetition rate for both types of PTT's was 50 seconds. The duty cycle of the ST-14 was 3 hours on, 3 hours off. The ST-6 PTT's were on constantly. The transmitted data were received and processed by the Argos system. The completion of a migration was defined as a tagged turtle stayed in the last location of the migration route for at least 7 days.

RESULTS AND DISCUSSION

PTTs lasted from just over one month (Wan-An No. 7) to 13.7 months (Wan-An No. 5) (Table 2). All but two (Wan-An Nos. 1 and 7) PTTs operated for more than 3 months and provided enough information to reveal post-nesting migrations.

The migration routes of the seven turtles are shown in Fig. 1. Four of the seven turtles migrated to the northeast and the others migrated to the southwest of Wan-An Island. The migration distances ranged from 317 km (Wan-An No. 2) to 1954 km (Wan-An No. 6), and the migration periods lasted from 9 (Wan-An No. 4) to 66 days (Wan-An No. 3). The turtles' estimated swimming speeds ranged from 1.1 to 2.4 km/h, with a mean of 1.6 km/h (Table 3). These rates of travel are comparable to those found in other studies. The final locations of the turtles are shown in Fig. 1 with a star mark.

The results of the present study, which is the first to investigate the post-nesting migrations of green turtles in northeast Asia, suggest that dispersal occurs from Wan-An Island to various locations on the continental shelf to the east of mainland China. Genetic analysis of mtDNA has shown that the Wan-An rookery is distinct from other rookeries that have been examined to date in the Pacific, including Japan, Hawaii, and Australia (Dutton, personal communication).

The present study demonstrated clearly that the green turtles that nest at Wan-An Island are an internationally shared resource. Because the turtles dispersed into the waters of Japan, Taiwan, mainland China and the Ryukyu Archipelago, conservation of the Wan-An rookery clearly cannot depend solely on Taiwan or PengHu County. Thus, a regional program and strategy for long-term research and conservation of green turtles and their habitats, are urgently needed to save this endangered species (IUCN, 1995). Such a program would necessarily involve international cooperation and multinational agreements.

LITERATURE CITED

- Balazs, G.H., Miya, R.K. and Beaver, S.C. (1966). Procedures to attach a satellite transmitter to the carapace of an adult green turtle, *Chelonia mydas*. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-SEFSC-387:39-40.
- Chen, T.H. and Cheng, I.J. (1995). The breeding biology of the green turtle, *Chelonia mydas* (Reptilia: Cheloniidae) at Wan-An Island, Peng-Hu Archipelago, Taiwan I. Nesting Ecology. *Mar. Biol.* 124:9-15.
- Cheng, I-J. (1995). Sea turtles status and research in Taiwan. *Proceedings of the International Congress of Chelonian Conservation.* pp. 87-88.
- Council of Agriculture (1995). The Taiwan green turtle, *Chelonia mydas*. Publication of the Council of Agriculture. 16 pp.

IUCN (1995). A Global Strategy for the Conservation of Marine Turtles. Marine Turtle Specialist Group, 24 pp.

Table 1. The date of capture, transmitter tagging and release of green turtle nesting at Wan-An Island, PengHu Archipelago, Taiwan between 1994 and 1996.

Turtles	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
PPT	ST-6	ST-6	ST-14	ST-14	ST-14	ST-14	ST-14
Capture date							
year	1994	1994	1995	1995	1995	1996	1996
month/day	8/27	8/28	8/4	8/6	8/9	8/8	8/9
tagged/release							
month/day	8/28	8/29	8/5	8/7	8/10	8/9	8/10

Table 2. Duration of transmission of PTT's deployed on the green turtles nesting at Wan-An Island, PengHu Archipelago, Taiwan between 1994 and 1996.

Turtles	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
PPT	ST-6	ST-6	ST-14	ST-14	ST-14	ST-14	ST-14
year	1994	1994	1995	1995	1995	1996	1996
deployed							
duration (days)	60	166	328	161	410	141	32

Table 3. The post-nesting migration distance, duration and swimming speed of the green turtles nesting at Wan-An Island, PengHu Archipelago, Taiwan between 1994 and 1996.

Turtles	post-nesting migration distance (km)	traveled duration (days)	swimming speed (km/h)
Wan-An No. 1	1703	59	1.2
Wan-An No. 2	317	10	1.5
Wan-An No. 3	1756	66	1.1
Wan-An No. 4	305	9	1.4
Wan-An No. 5	928	16	2.4
Wan-An No. 6	1954	41	1.9

Wan-An No. 7

562

15

1.6

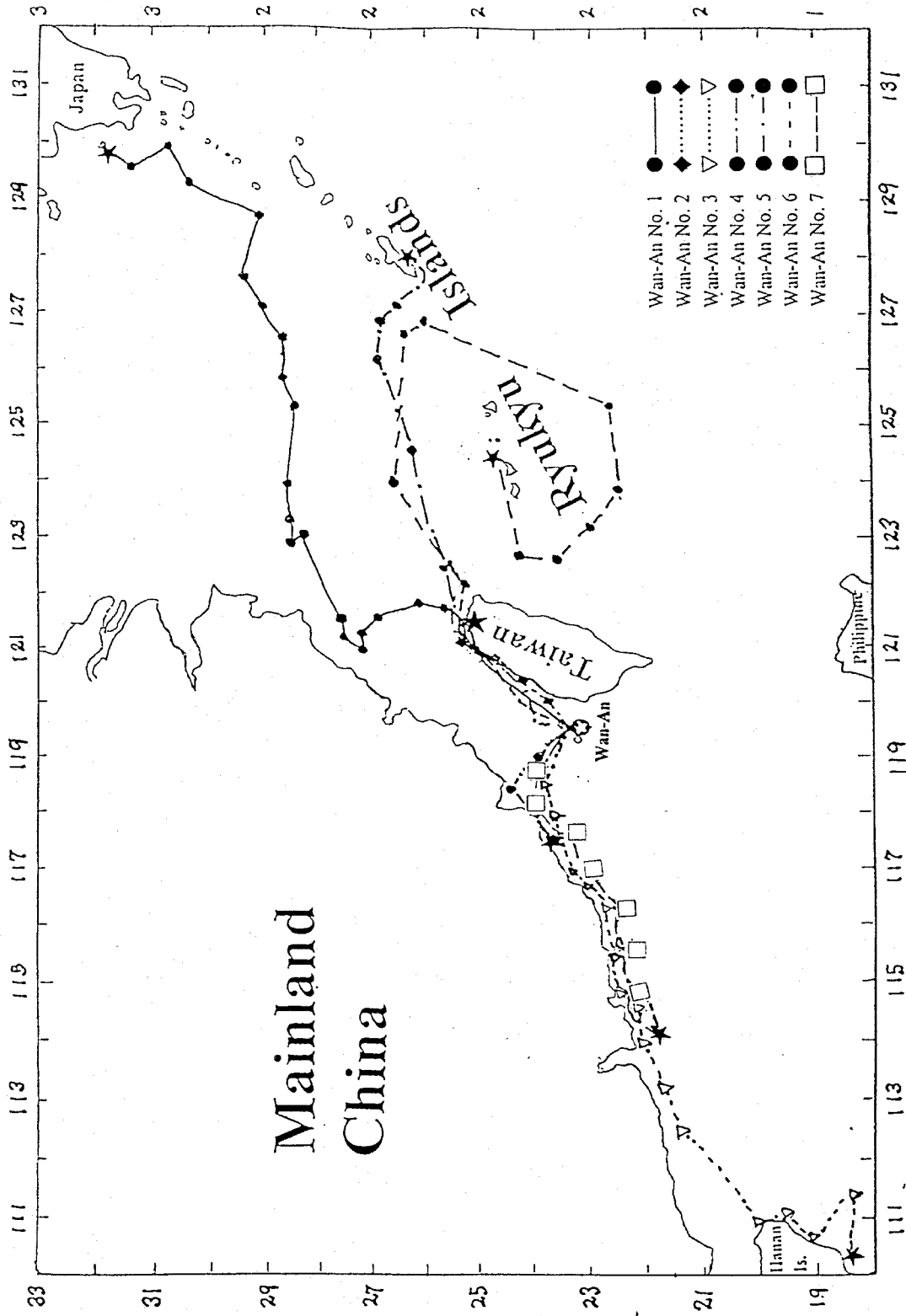


Figure 1. The post-nesting migration routes of seven green turtles that nested at Wan-An Island, PengHu Archipelago, Taiwan between 1994 and 1996. The end points are denoted by a star (★).