

turtle population is unknown, but it caused the death of several sea lions. Another possible source of problems is water pollution, since 60% of the Uruguayan population lives in the coastal environment.

As can be noted, there is a lack of knowledge about the Uruguayan sea turtles, therefore it is essential to develop new lines of research in the issue and so learn to conserve our resources.

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## Satellite Tracking of an Adult Male and Female Green Turtle from Yucatan in the Gulf of Mexico

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Marine turtle migrations are principally studied by tagging, usually with metal or plastic tags. This technique provides information on the locations where turtles were tagged and recaptured, but does not reveal the routes and speed of travel. Satellite telemetry is a technologically advanced method that establishes the turtle's pathway during the actual migration. The use of satellite transmitters began in the late 1970's, and has permitted migration tracking for both terrestrial and marine animals. Over the years there has been a reduction in the size and weight of the transmitters with improved design and battery reserve. In addition, the method of attachment to the carapace of marine turtles has been perfected so as to be safe and secure (Balazs *et al.*, 1996).

The migrations for two green turtles (*Chelonia mydas*), a male and a female, were satellite tracked after a breeding season at Isla Mujeres, Quintana Roo, Mexico (Lat. 21.2N, Long. 86.7W). Two Telonics, Inc. (Mesa, Arizona USA) ST14 satellite transmitters linked to the Argos global tracking system, were attached to an adult male (ID 22132) and adult female (ID 4804), using Silicone Elastomer and fiberglass cloth with polyester laminating resin. The turtles were obtained from the Isla Mujeres Marine Turtle Research Station of the National Fisheries Institute (Instituto Nacional de la Pesca; SEMARNAP). This facility had 70 green turtles (about one-third males and two-thirds females) in an 800 m<sup>2</sup> enclosure with access to a beach where females nested at various times during the season. The turtles were captured near Isla Holbox and Isla Mujeres during April - May 1998, and kept in the enclosure until being set free in early October 1998. A transmitter was attached to the female on 2 October 1998. Data were first received from the transmitter on 4 October at which time the turtle was in front of Cabo Catoche, Yucatán (Lat. 22.1N, Long. 86.9W) traveling

northwest from Isla Mujeres. During the next 10-12 days she migrated northeast across the lower Gulf of Mexico and arrived off the coast of extreme southwest Florida, north of the Florida Keys, in mid-October. The turtle remained in this vicinity (centered around Lat. 25N, Long. 81W) for the duration of transmissions during the following five months. This area is a known resident foraging habitat for adult green turtles that nest in Florida (Schroeder *et al.*, 1996).

The male, also tagged with a satellite transmitter on 2 October 1998, went to the northeast, staying along the Quintana Roo littoral between Isla Holbox and the shore (Lat. 21.5, Long. 86.9), where it was originally captured, keeping within an approximately 90 km<sup>2</sup> area. Females nesting in the Yucatán Peninsula show a high two year internesting interval. Green turtle nesting beaches in Yucatán, such as Isla Aguada, Campeche and Las Coloradas, show high nesting abundance during even years (1990, 1992, 1994, etc.) and low numbers during odd years (1991, 1993, 1995, etc.), for 18 years of monitoring data. Flipper tagging has shown little interchange between these two groups (even and odd years). However, adult males studied in the Isla Mujeres project have been captured in the same nearby zone during various consecutive years (Rolando Chan, pers. comm.). This could indicate significant differences between males and females in their reproductive behavior, migration routes and feeding grounds.

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## Buck Island and Back -- Hawksbill Turtles Make Their Move

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During the past eleven years the National Park Service's Buck Island Sea Turtle Research Program has participated in a series of research activities to answer the question "do hawksbill sea turtles make reproductive migrations?" We approached the question with both low and high tech methodologies. Low tech methods include saturation tagging of all nesting hawksbill turtles coupled with the promise of a long distance tag recovery. Three out of 118 nesting hawksbill females tagged on Buck Island Reef nesting beaches have been recaptured on their foraging grounds off Central America and Cuba.

The first, QQD 035, was recovered in Nicaragua at Witties Cay, in the Miskito Cays (13°58' N, 82°54' W). The approximate distance traveled from Buck Island Reef was 2000 km. QQD 506 was first tagged on July 28, 1997 while nesting on Buck Island Reef. Her tag recovery was reported to NMFS by a Cuban fisheries officer after she was captured in the "traditional harvest area" at Cayo Guajaba (northwest Nuevitas), Cuba, on February 9, 1998 (21°80' N, 77°30' W). The approximate travel distance from Buck Island Reef was 1400 km. QQD 505 was first observed nesting on Buck Island Reef on July 10, 1997. Her tags were purchased from a Miskito Indian on May 9, 1998 for \$5.00 US. The fisherman captured the turtle by hand while diving on the east side of Southeast Rock, Nicaragua (14°10' N, 82°45' W). The approximate distance traveled was 2000 km.

High tech methods include tracking the post-nesting movements of nesting hawksbill females via satellite transmitters. In 1998, in cooperation with the National Marine Fisheries Service's Caribbean Hawksbill Satellite Telemetry Project, two Buck Island Reef nesting hawksbill turtles were fitted with satellite transmitters. The movements of the two satellite turtles were monitored through the ARGOS, Inc. Data Collection and Location Service.

On the morning of September 17, 1998, a transmitter was successfully attached to PPW 840 and she departed the beach. On September 20, 1998, the day before hurricane Georges passed over the islands of St. Croix and Buck Island Reef NM, she was 63 miles north of St. Croix headed toward the British Virgin Islands. She traveled an average of 61 km per day to cross the Puerto Rican Trench (10,000 feet deep). On October 1, 1998, she was ENE of Virgin Gorda in Necker Island passage in the vicinity of Hawks Bill Bank and continues to transmit from this area.

The second satellite transmitter was attached to QQD

374 the following day, September 18, 1998. She was released with her satellite transmitter and transmitted several excellent signals between September 18 - 19 in the vicinity of Buck Island Reef. QQD 374 remained between Buck Island and St. Croix for another interesting interval. She attempted to nest again between October 6-10 and finally nested successfully on October 12, 1998. After laying her fifth nest at approximately 9:30 pm AST she left Buck Island Reef and headed north toward St. Thomas, in the northern U.S. Virgin Islands.

Twenty-four hours after leaving Buck Island Reef NM she was across the Puerto Rican trench having traveled an average of 53 km per day. Arriving near Frenchman's Cap near the island of St. Thomas, U.S. Virgin Islands on October 13, she moved around the island of Culebrita and passed between Culebra and the mainland of Puerto Rico between October 13 to 18, 1999. She has been located off Puerto Rico's southeast coast consistently since then near the town of Punta Figuras.

The three long-distance tag recoveries began to provide information that hawksbill turtles nesting on Buck Island Reef NM do not remain near their nesting beaches during their non-reproductive phase, but migrated back to some distant foraging ground. This low tech information combined with the results of the high tech satellite tracking of post-nesting hawksbill turtle migrations has shown fairly conclusively that hawksbill turtles are a migratory species moving between their foraging and nesting areas, some thousands of kilometers apart. The capture of three Buck Island Reef NM nesting hawksbill females during their reproductive migrations through foreign waters is conclusive evidence that hawksbill turtles are still seriously threatened by ongoing turtle fisheries in spite of international efforts throughout the Caribbean to protect hawksbill turtles. The "question" of whether or not hawksbill turtles make reproductive migrations seems to be answered--yes, they do make reproductive migrations. What remains to be determined is just who is responsible for the protection of the migrating hawksbill sea turtle?

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