

TAMAR-IBAMA PROJECT. THE BRAZILIAN MARINE TURTLE CONSERVATION PROGRAM

Maria Ângela Guagni Dei MARCOVALDI, Victor Jose De Andrade PATIRI, Guy Guagni Dei MARCOVALDI

Introduction

TAMAR, the Brazilian program for the protection and research of sea turtles is considered a model project of marine conservation. The main goal of TAMAR is to revert the process of extinction of the five species of sea turtles that occur in the Brazilian coast, re-establishing and then maintaining their populations to guarantee the preservation of genetic variability and ecosystems

The initial objectives of TAMAR were to quantify the distribution and abundance of sea turtles, the seasonality and geographic range of egg-laying, and the primary threats to turtle survival. A comprehensive two-year (1980-1981) survey of the coastline was undertaken to provide specific recommendations on how Brazil could more effectively conserve its sea turtle population.

Sandy beaches span about 6,000 km of coastline from Rio de Janeiro north to French Guiana border. Many are difficult to reach, and the initial survey made use of boats, foot-patrol, and horses. The oceanic islands were also surveyed. Interviews with fishermen were conducted cautiously. Queries were simple and care was taken to prompt answers or provide cues that would bias the information offered. By comparing the responses of interviewees, the distribution of artifacts and crafts, and pertinent field observations, it became clear that (1) five species of sea turtles existed in Brazil: Leatherback (*Dermochelys coriacea*), Loggerhead (*Caretta caretta*), Hawksbill (*Eretmochelys imbricata*), Green Turtle (*Chelonia mydas*) and Olive Ridley (*Lepidochelys olivacea*). (2) There were three main nesting areas on the mainland, (3) the loggerhead turtle was the most abundant nester on the mainland, (4) only the green turtle nested on the islands, (5) the mainland nesting season spanned September-March (sometimes April), (6) the island nesting season spanned December-May, and (7) the main threat was the harvest of eggs and gravid females.

Survey data also revealed that patterns of sea turtle exploitation and usage differed only slightly among villages. There were very few cases where an organized, seasonal fishery was still operating with respect to the turtles. Generally turtles were captured opportunistically, and this was true of nesting females as well as turtles encountered at sea. The annual harvest was substantial and had continued for generations without regard for population size or rates of recruitment. Many interviewees confided that populations had been considerably larger in the past. The turtles had always been exploited at the subsistence level and no formal markets for their products were found. Primary commodities were meat and shell; there was no evidence of a market for oil or skins.

Cultural traditions, as well as turtle-based income and diet, were carefully analyzed to arrive at a holistic conservation strategy. The goal was to minimize social disruption associated with the planned construction of field stations, which were to serve as focal points for research and conservation efforts. In 1982 TAMAR established stations at the primary sites: Praia de Comboios, Espírito Santo; Praia do Forte, Bahia; Pirambu, Sergipe. Study area boundaries were drawn based on an analysis of anecdotal data pertaining to the relative number of nests and taking into account natural rookery boundaries, especially for the rare species. Today, 23 field stations and associated conservation and monitoring activities provide for the complete protection of all sea turtles and their eggs on approximately 1,000 km of coastline and three oceanic islands. In addition, coastal fishing villages have been fully integrated into the program. Fishermen comprise the majority of paid personnel.

Methodology

It is not possible to extend an equal effort to all areas of the Brazilian coastline, even within areas where TAMAR stations have been established. Therefore, an "intensive study area" and a "conservation area" are associated with each station. The former is coincident with the major concentration of nesting activity. A research team comprised of the station manager and a variable number of interns, generally biology students, patrol the intensive study area each night. The study area extends from 5 to 40 km, depending on the station and the circumstances. The more diffuse the nest density, the longer the study area. Vehicles are used to patrol the larger study areas. Nesting turtles encountered during nocturnal patrols are measured (curved carapace length and width) and are flipper-tagged. All nests left *in situ* receive a marker and an identification number. In areas where predators are a serious threat, nests are protected with a plastic mesh cover. In stations where an open-air hatchery has been established, the intensive study area serves as a control and comparison to evaluate the success of the hatchery.

Conservation areas extend beyond the limits of the intensive study areas and are protected by the actions of local fishermen. Fishermen, generally those who in the past were the main egg collectors, are hired by TAMAR to patrol the conservation areas daily at dawn. Each fisherman has the responsibility to cover about 5 km of shoreline. They are supervised by the TAMAR station staff, which receives the eggs at predetermined collection points. Fishermen are provided with styrofoam boxes in which nests are carefully packed for transport. Each TAMAR station has an open-air hatchery that normally receives eggs from 50 km of surrounding beaches. Hatcheries are centrally located, a strategy crafted to reduce transport time and thus negative consequences for the developing embryos. In most areas the boxes are all collected before 07:30 am and eggs are reburied (with caution to prevent the rotation of the eggs) within 12 hours of oviposition. Station staff surveys the entire conservation area at weekly intervals to confirm that all nesting crawls are accounted for and all eggs have been collected for the hatchery.

Hatchery nests are constantly monitored and maintained as closely as possible to the natural condition. Emergent hatchlings are immediately counted, recorded, and released in the vicinity of the highest concentration of nesting activity. Nests are exhumed within 24 hours of hatchling emergence, unhatched eggs are opened and examined, and nest contents are categorized and recorded. It is noteworthy that in areas where TAMAR has been working for several years, the level of involvement and commitment to the project is very high in the adjoining villages. As time passes, nests are left *in situ* over ever-larger areas of the intensive study area. These nests are clearly marked and are not disturbed over the course of incubation.

The island programs are more expensive and logistically challenging. The only oceanic island where TAMAR has established a station is the Marine National Park of Fernando de Noronha. A field team resides at the station year-round. There are several beaches on the main island of this archipelago, which are patrolled nightly (December-May) to tag and measure nesting females and to mark and monitor nests. All nests are protected *in situ*; after hatching, nests are exhumed and the contents recorded. In the case of the Biological Reserve of Atol das Rocas, field teams are transported to the atoll by boat and remain there for two-week periods. There is complete coverage of the 1 km beach (December-May) to tag and measure nesting females and mark and monitor nests. Samples of nests are exhumed post-hatching and analyzed each year. There has been a regular tagging of gravid females on Trindade Island, but no conservation efforts have been necessary. There is a naval facility there and the island, which supports the largest green turtle rookery in Brazil, is closed to the public. Trindade Island provides an excellent research opportunity because the local green turtle colony has been undisturbed.

Institutional structure

TAMAR, at first a federal government program created in 1980 by IBAMA to protect the sea turtles of Brazil quickly expanded and became unmanageable for a number of reasons. Chief among these was an increasing need for a single entity to manage the financial aspects of the program. In 1988, the decision was made to create a legal institution, called FUNDAÇÃO PRÓ-TAMAR, a non-profit foundation, to support, raise money and co-administer TAMAR with the government. At the present time, TAMAR is funded in approximately equal shares by the government and the foundation. The foundation receives funds from private corporations and donors. Another important source of income is provided by the sale of TAMAR products made by local communities.

Of the 300 people working in the 23 TAMAR field stations, 250 are salaried by FUNDAÇÃO PRÓ-TAMAR; about 90% of them are fishermen and other local villagers. In most of the beaches where TAMAR is active, the program is a primary source of income, both direct and indirect, to the local village. Most of the funds raised by FUNDAÇÃO PRÓ-TAMAR are invested in the communities where TAMAR develops its activities and this is one of the main reasons that the program has been so successful in the fishing villages.

Educational programs

TAMAR staff lives at the stations year-around, not just during the nesting season, and their presence has bolstered the image of the program. TAMAR is seen not as an elitist project, but as an integral part of the village community. This integration is the heart of the TAMAR project and central to the success of its efforts to provide for the sustained conservation of sea turtles and a corresponding benefit to the lives of coastal residents. One of the most important aspects of the project is community outreach and education within the coastal villages, including school presentations of videos and slides, hatchling release ceremonies, and festivals. To the extent possible, the resident TAMAR station manager also provides direct assistance to the villagers. This may include the provision of medical or other essential supplies, support for alternative sources of income (crafts, eco-tourism, T-shirts), transportation in emergencies, sponsorship of special clubs or entertainment programs for children, etc. The primary community benefit, however, has been the hire of ex-poachers to patrol the beaches, giving them status within their communities, greater knowledge of the sea turtles, an enhanced conservation ethic as well as an alternative source of income.

One station in each state is equipped with simple rearing facilities where a small number (20-40) of turtles in various life history stages are maintained for public education purposes. These facilities are open to the public. TAMAR also has an intern training program involving approximately 50 biology students or recent graduates each year. The main objective of the intern program is to train individuals in marine turtle protection and management by providing them with conservation experience and the opportunity of integrating their academic background with the practical realities of conservation, and to infuse new ideas into TAMAR.

Future goals

Now that TAMAR is well established in providing for the protection of sea turtles on all main nesting beaches, it is focusing on the development of protection programs in priority feeding areas. These areas are often characterized by an increasing number of accidental drowning due to various forms of fishing nets (seines, trawls) and "currais" (a type of large fish trap). Based on the nesting beach model, three research and monitoring stations have already been established. Another main objective is to increase the self-sustainability of the conservation and development activities of TAMAR.

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