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An Ecotourism Initiative to Increase Awareness and Protection of Marine Turtles in Brazil: the Turtle by Night Program

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The Brazilian Sea Turtle Conservation Program (TAMAR) was founded in 1980. Its main goal has been to protect sea turtle populations along the coast by trying to stop the slaughter of nesting females and egg poaching as well as accidental capture in fishing gear. It is affiliated with the Brazilian Environmental Agency (IBAMA) and co-managed by Fundação Pró-TAMAR, an NGO. Local fishermen, who used to hunt turtles, were hired to patrol the nesting areas and feeding grounds. Throughout the years, TAMAR has raised the awareness of local people for endangered sea turtles and developed new, alternative sources of income for coastal communities. Each of the 22 stations of TAMAR has its own characteristics and particular community-based conservation work. One example is the pioneering work in the states of Espírito Santo and Sergipe, where TAMAR has helped organize women's groups for making handicrafts, such as embroidery and T-shirts with sea turtle motifs. Today, around 30% of TAMAR's budget comes from the sale of its products. Integrating local villagers into TAMAR's work also helps spread the message of conservation to neighboring villages and to tourists who visit some of its stations.

TAMAR also raises funds and awareness for conservation of Brazilian marine turtles through its Sea Turtle Adoption Campaign. By "adopting" a sea turtle for US $50 people can give one more hatchling the opportunity to reach the safety of the sea. Adopters receive an exclusive T-shirt, an adoption certificate, and a participation sticker. Another attractive aspect of the campaign is that participants enter a special raffle that provides a one-week trip for two to Praia do Forte or to Fernando de Noronha Archipelago, with air tickets sponsored by Varig, the Brazilian Airlines, along with food and hotel accommodations.

TAMAR's National Headquarters is based at Praia do Forte beach (12°34'S, 38°00'W), on the northeastern coast of Brazil, 80 km north of Salvador, Bahia (Marcovaldi and Laurent, 1996). Praia do Forte beach has become, during the past 10 years, a major tourist beach, receiving many visitors, especially during the high season summer months of December to February.

At Praia do Forte, where ecotourism is becoming a common activity, adopters have the option of choosing

either the exclusive T-shirt or going on the Turtle by Night Program, a pioneering ecotourism initiative in the area. TAMAR believes that ecotourism can be a productive conservation venture if it: 1) provides income and other benefits to the local community, 2) does not grow to unmanageable proportions, 3) has a substantial component of true environmental education, and 4) provides income for conservation activities.

TAMAR station at Praia do Forte protects 50 km of beaches, including 15.5 km of an *in situ* study area, where turtle nests are left on the beach. The nests in the remaining areas are transferred either to protected areas of the beaches or to open-air beach hatcheries, due to threats such as erosion, inappropriate coastal development, and natural predation. Four species of marine turtles nest at Praia do Forte beach between September and March (loggerhead - *Caretta caretta*, hawksbill – *Eretmochelys imbricata*, olive ridley – *Lepidochelys olivacea*, and green turtle – *Chelonia mydas*) (Marcovaldi and Laurent, 1996).

Praia do Forte Station has a visitor center that is open daily from 0900 to 1900 hrs. It has two open-air beach hatcheries and five display tanks (2.7–5.7 m in diameter) holding about 20 sea turtles of different ages for environmental education purposes. There are also two shops that sell TAMAR products made by residents of coastal communities, a small museum, and a snack bar. Only the museum charges an entrance fee. It is open four hours a day with tours guided by a biologist.

A survey of the number of visitors during the high season, done during the 1995–96 nesting period, showed an average of 1200/day during weekdays and 2000/day during weekends. Only a few visited the museum (average of 14/day). In addition to tourists, the museum also receives journalists, school groups, and local residents without charge. The museum has a TV and a VCR, a computer with a multimedia program about TAMAR, educational panels, turtle skeletons and shells, preserved hatchlings, and an aquarium room. Visitors have the opportunity to learn more about marine turtles and the many different ways they can help TAMAR. Optional activities include participation in the Sea Turtle Adoption Campaign and the Turtle by Night Program (TBN).

Methods. — TBN is part of the Sea Turtle Adoption Campaign and takes place only from December to March. This period was chosen due to the high number of nests and hatchling emergences and the great number of tourists visiting the beach at this time. After a two year pilot project in the 1993–94 and 1994–95 nesting seasons, TBN became a regular program in 1995–96. The results of the last season are discussed here.

TBN functions as a tour guided by a biologist. The program informs people about sea turtle biology, management and conservation, and allows participation in TAMAR's field work. It also raises money for supporting other TAMAR activities such as the creation of new job opportunities for local residents. It is run in partnership with a small travel agency specialized in ecotourism which provides transportation and translations as needed. Each tour is limited to a maximum of 14 participants. If there are less than 4 participants, the program functions without the structure of the travel agency and utilizes only TAMAR's own vehicle. Children under age 14 need to be accompanied by an adult. Instead of a "turtle watch" program, a common ecotourism practice in Florida, where visitors watch nesting females (Johnson et al., 1996a,b), the most attractive part of our program is the release of hatchlings that emerge nightly from the beach hatcheries. When signing up for the program, tourists receive a brochure explaining how to behave in the presence of a nesting turtle, what to wear, and what to bring for the nighttime excursion.

The program lasts about two and a half hours. The travel agency brings people to TAMAR's visitor center. At the museum, a biologist shows a videotape on sea turtles and the conservation work of TAMAR. The tourists then join the biologist at the beach hatcheries to check and collect recently emerged turtles, helping to count them and learning about differences between the species. It is explained that the beach hatcheries are used as a management tool and that the best way to protect nests is by keeping them *in situ*, whenever possible. The group is then taken to the nesting beach in jeeps.

Approximately 200 to 350 hatchlings are released during each program. They are released at the main nesting site where the possibility of also finding a nesting female is high and where nests are kept *in situ*. In order to prevent the participants from stepping on the hatchlings, we ask them to stay outside two parallel lines, drawn 4–5 m apart on the sand, between which we release the baby turtles.

To explain about turtles' sea-finding behavior and attraction to light (see Witherington, 1995), we use a flashlight. We ask people not to use their own flashlights at this time. As the turtles head to sea, we turn our light on briefly two or three times to demonstrate how the hatchlings move toward the light. Tourists are free to take flash photography but we ask for some restraint on video cameras with lights (e.g., only allowed for short moments, with intervals of at least 5–10 min).

When all the hatchlings have entered the sea, we observe the *in situ* nests to discuss turtle nesting behavior

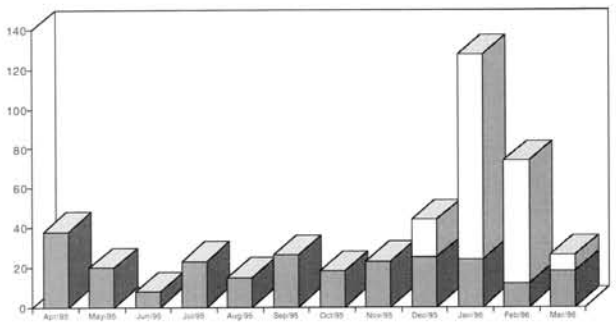

Figure 1. Number of monthly sea turtle adoptions from April 1995 to March 1996 (shaded bars) and number of monthly Turtle by Night Program participants from December 1995 to March 1996 (open bars).

and our field work (tagging program and demography) (Marcovaldi and Laurent, 1996). If we are unable to find a recent nest with the female's tracks and a well-developed body pit, we demonstrate how a nest is made.

When we return to the museum the participants receive their adoption certificate and are invited to visit the museum as many times as they want, without charge. They are then taken back to their hotels.

No questionnaire was given to the participants. Visitor response to the TBN has been obtained by compiling answers to informal questions, the number of return visits to the visitor center, the number of letters and phone calls received afterwards, and the number of people applying for the TBN on the recommendation of former participants.

Results and Discussion. — During the 1995–96 nesting season, between 21 December and 15 March, the Sea Turtle Adoption Campaign had 236 participants, of which 192 (81.3%) participated in the Turtle by Night Program (Fig. 1). The average number of participants per TBN was 7.4 (range, 2–14) on a total of 26 programs. A profile of the participants in the TBN is presented in Table 1.

The TBN was usually seen by the participants as an alternative program during their holidays, but also as an educational option for children, since families with children represented 44.8% of the participants. Most participants were from Brazil (88%), a very high percentage, as TBN was initially designed to enroll foreigners visiting Praia do Forte. Of the Brazilians, most (84.6%) were from São Paulo state, the richest part of the country, and only a very low proportion was local, from Bahia state (1.5%).

At the end of each TBN, most participants responded positively and indicated having enjoyed being in a small group and getting close attention from a biologist. Participants also appreciated the extra privileges such as free museum visits, adoption certificate, and participation sticker. TBN cannot be considered or announced as a "turtle watch" program since an encounter with a nesting turtle cannot be guaranteed. People do come to TBN with high expectations of finding a female turtle at the beach. However, one rarely encounters nesting females in Praia do Forte during the TBN because the beach program only lasts 1.5 hours, is restricted to 1 km of beach, and is not held during the peak of the nesting season. Because of this, we anticipated some dissatisfaction with the program. However, we found that participants enjoyed just releasing the hatchlings and learning about our field work. We did not encounter any nesting turtles during the 26 TBN programs this season.

Table 1. Categories of participants in the TBN Program.

By Age	Adults	145
	Children (< 14 yrs)	47
By Sex	Men	85
	Women	107
By Citizenship	Foreigners	23
	Brazilians	169
By Groups	Families with Children	30 (n = 86)
	Couples	28 (n = 56)
	Singles	50

Conclusions and Recommendations

1) TBN is a program designed to raise money to support sea turtle conservation through educational activities and to create new job opportunities for residents. We believe that experiences like this should be encouraged.

2) It is not advisable to take more than 15 tourists to the beach simultaneously. This policy is necessary to protect the hatchlings on their way to the sea and to make people enjoy the small group atmosphere. Programs that include watching nesting turtles often take larger groups (Johnson et al., 1996b), but we do not recommend it for a program like TBN.

3) People want to touch the hatchlings, so participants are given the opportunity to either count them in the hatcheries or release them on the beach. By allowing the participants to help the biologist by counting and releasing the turtles, the animals are not subjected to additional stress. It also provides the benefit of having more people help TAMAR spread the message of marine conservation.

4) Turning on flashlights briefly while hatchlings head to the sea could have an effect on their orientation. Mrosovsky (1978) suggested that intermittent flashing has less effect on orientation than intensity of light, in that hatchlings seem to integrate light over a broad time span rather than react to brief flashes. We nonetheless suggest that the use of lights be restrained to avoid any subsequent effects on the animals (LeBuff, 1990).

5) TAMAR hopes to continue this program every year, expanding the number of times the Turtle by Night Program is offered. We intend to improve the program by making people feel good about participating, about helping TAMAR, and about acquiring knowledge of marine turtles.

6) To be economically viable, a program like the TBN can only be managed in places where the number of tourists is high.

7) Additional programs, educating both tourists and local residents about sea turtle biology and expanding awareness on the danger of extinction of these animals, are also being developed in other TAMAR stations, free of charge, as a part of TAMAR's growing education program (Thomé et al., 1995).

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An Anomalous Specimen of *Pelusios sinuatus* Lacking Mesoplastra

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The pleurodiran turtle family Pelomedusidae is partially characterized by the presence of mesoplastral bones. Of the two African genera, *Pelomedusa* has small lateral mesoplastra and *Pelusios* has large mesoplastra in broad median contact. The only previous record of a pelomedusid lacking mesoplastra concerned a *Pelomedusa subrufa* from Uganda (Williams, 1954).

Pelusios sinuatus is the largest species in its genus, attaining a maximum carapace length of 485 mm in Lake Tanganyika (Broadley, 1981). It also has a long fossil record, extending back to the upper Miocene (Broin, 1988) and contributed 98% of the fossilized chelonian fragments from the Pleistocene deposits of Olduvai Gorge (Auffenberg, 1981). The present range of the species extends through East Africa from Somalia south to South Africa and west to the upper Zambezi, where it is the common species in large rivers and lakes. In the Plio-Pleistocene it extended as far west as Tchad (Broin, 1969).

During examination of an extensive series of skeletal shells of *P. sinuatus*, I discovered one large specimen lacking mesoplastra and having the first six pleurals on both sides fused into single bones. The specimen in question, NMZB 7589, was caught as an adult in Lake Kariba, Zimbabwe, and lived in captivity for many years before it died.

In life the specimen looked like a deformed *P. sinuatus* and it keyed out to that species (Broadley, 1981), i.e., axillary scute present, posterior width of first pair of marginals 102% of anterior width of first vertebral, posterior margin of carapace serrated, and plastron yellow with a symmetrical black angular peripheral pattern. The carapace measured 245 mm long by 245 mm wide, the anterior lobe was 100 mm long, and the shell 115 mm deep. The number of scutes was normal, although the median vertebrals and costals were strongly compressed (Fig. 1).

The prepared skeletal shell showed striking abnormalities for a species in which the only bones usually variable in number are the four to seven neurals (Broadley, 1983). The specimen has four anterior neurals, but only three pleurals on each side, numbers one to six being fused. There are the usual 11 peripherals on each side. The striking feature of the plastron is the absence of mesoplastra, the anterior lobe being hinged directly onto the hypoplastra, which are partially fused to the xiphiplastra (Fig. 1).

The numerous anomalous fusions in the shell suggest fusion occurring early in life and perhaps representing fusion rather than absense of the mesoplastra. Support for

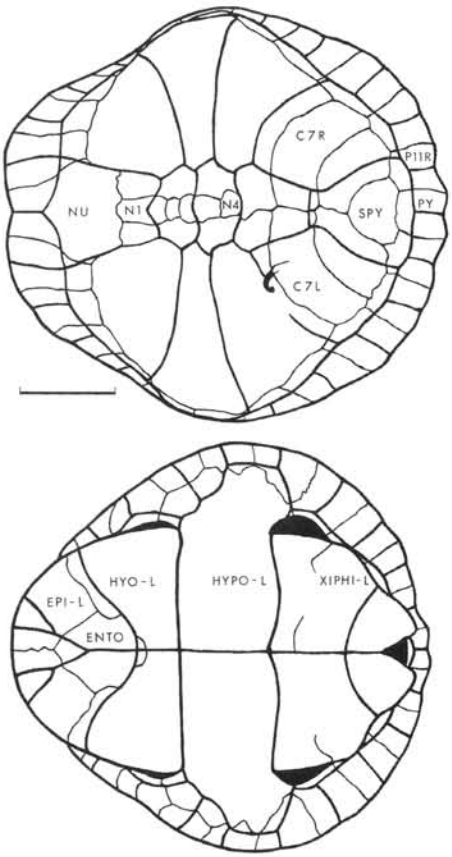

Figure 1. Dorsal and ventral views of the anomalous shell of *Pelusios sinuatus* NMZB 7589 from Lake Kariba, Zimbabwe. Thick lines indicate sulci between scutes, thin lines are sutures between bones. The line indicates 1 cm to scale.