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Evidence for Leatherback Sea Turtle (*Dermochelys coriacea*) Nesting in Arraial do Cabo, State of Rio de Janeiro, and a Review of Occasional Leatherback Nests in Brazil

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On 14 March 2001, in the early morning, 13 live and 6 dead leatherback sea turtle (*Dermochelys coriacea*) hatchlings were found by fishermen on a beach in Arraial do Cabo, State of Rio de Janeiro, central-southern Brazil, a small city and fishing port located at 22°58'30"S, 42°01'00"W, about 110 km east of the city of Rio de Janeiro (Figure 1). The hatchlings were found approximately 2 km from the village, on a 40 km long beach (Praia de Massambaba) characterized by fine sand and a deep-water approach. According to the fishermen, "a few more" dead hatchlings were left on the beach. The live and dead hatchlings were not concentrated on one spot, but were scattered along a 50 m stretch of the beach, and some of them were amidst the dunes that back the beach.

The live hatchlings, which were in apparent good health, with vigorous movements, were maintained indoors in a small container with sea water and released in the early afternoon of the same day into the open sea, at a point in front of the village about 1 km from the coastline. We could only go to the beach to look for a nest two days later, but no nest could be located. The sand is very fine there and a steady gentle wind blows relentlessly, moving dunes to and fro and quickly covering small objects and erasing any tracks on the beach.

On the day when the hatchlings were found, the weather was very sunny, calm and clear, and no rain, storms or anomalously strong winds had occurred in the days just before, which could have brought the bunch of hatchlings from the sea onto the beach where they were found - as a possibility, they could have been born

on some other beach nearby. From the beach area where the hatchlings were found, no city lights or other kinds of artificial light sources are visible, which could possibly explain the apparent disorientation of the hatchlings after coming out of a putative nest. The moon, on the night from 13 to 14 March, was in the waning gibbous (full to last quarter) phase, with 77% illumination of the lunar disk, and it was visible from the sea horizon from about 21:15 local time. Studies suggest that the presence of moonlight lessens the incidence of disorientation of loggerhead sea turtle (*Caretta caretta*) hatchlings after nest emergence (Salmon & Witherington 1995). The leatherback hatchlings could possibly have been scattered and/or disoriented on the beach by animal or human predators, but no signs of predation were found.

Four of the dead hatchlings were deposited in the herpetological collection at Museu Nacional, in Rio de Janeiro (MNRJ 8858-8861). Upon examination, each of those four dead hatchlings had an egg-caruncle (egg-tooth) on the snout and a clear "umbilical" gap, indicating that they had hatched very recently. Live hatchlings were not examined. The hatchlings (the 13 live ones and the 4 dead ones deposited at Museu Nacional) measured from 62 to 67 mm in curved carapace length; this range of measurements is compatible with that presented by Márquez (1990) for leatherback hatchlings. Considering those characteristics and the overall conditions verified on the beach, we believe that indeed a leatherback clutch was laid, incubated and emerged in Arraial do Cabo, although the nest could not be located. We are able neither to explain the apparent disorientation of the hatchlings on the beach nor to tell if a greater number of live hatchlings were produced in the clutch.

Nowadays, regular nesting in continental Brazil of the leatherback and four other sea turtle species (*Caretta caretta*, *Eretmochelys imbricata*, *Lepidochelys olivacea*

Figure 1. Map of Brazil. Arrows point to locations (small circles) of occasional leatherback nests (year in parentheses). The only known regular leatherback nesting area in Brazil, in the State of Espírito Santo, is also shown. The horizontal line at latitude 21°40'S marks the approximate southern boundary of the present range of regular sea turtle nesting for any species in Brazil.

and *Chelonia mydas*) only occurs from the northern coast of State of Rio de Janeiro (about latitude 21˚40'S) to the north (Marcovaldi & Marcovaldi 1999). To the south of that range, Arraial do Cabo stands out as a special place, as in that part of the Brazilian coast there is a sizeable upwelling system which produces generally cold waters there, mainly around the summer (November-April), leading to a cold, dry microclimate in that region (Costa & Fernandes 1993; Valentin 2001). Temperatures seem to make beaches there particularly unsuitable for regular sea turtle nesting, although other physical and morphological characteristics of many of those beaches appear adequate for nesting. The leatherback nesting in Arraial do Cabo reported here is an occasional one; no regular sea turtle nesting occurs there.

In Brazil, very occasional leatherback nesting has been observed in the southern part of the coast. There was one nest in Içara, State of Santa Catarina, and one in Torres, State of Rio Grande do Sul, both in 1995 (Soto *et al*. 1997), and two nests in Florianópolis, State of Santa Catarina, in 1999 (Anonymous 1999a, 1999b) (Figure 1). A nest was also reported in 1990 from Prado, southern State of Bahia (Claudio Bellini, pers. comm. 1999) (Figure 1). However, the only place where regular leatherback nesting is known to occur is located about 400 km to the north of Arraial do Cabo, on the northern coast of the State of Espírito Santo, about 100 km north of the State capital of Vitória (Figure 1). Nesting occurs mainly on the beaches of Comboios and Povoação (around latitude 19Ɣ35'S), where two stations of Projeto TAMAR, the Brazilian sea turtle conservation program, are located. A small number of females, about 5 per year on the average, are estimated to nest in the State of Espírito Santo (Projeto TAMAR, unpublished data).

In Espírito Santo, about 92% of the leatherback nests occur between October and January, and the incubation period ranges from 56 to 90 days (Projeto TAMAR, unpublished data). The last nest recorded in Espírito Santo in 2000/2001 occurred on 15 January 2001 (Projeto TAMAR, unpublished data). So, the date of laying of the putative nest in Arraial do Cabo falls within Espírito Santo's main nesting season, even allowing for a possibly more extended incubation period in Arraial do Cabo, due to lower sand temperatures there.

Sea turtles, although generally showing marked philopatry, are known to stray sometimes in their nesting attempts. Genetic analyses through the use of mtDNA suggest that leatherback turtles have a somewhat reduced sense of natal homing, when compared to other sea turtle species (Dutton *et al*. 1999). Eckert *et al.* (1989) present data from three leatherback nesting areas in the Caribbean, indicating that generally less than 10% of the number of turtles in each population stray in their nesting attempts within a season. If turtles of other leatherback populations stray at the rate found in the Caribbean, this means that, for a nesting population as small as the one in Espírito Santo, stray nests should be very rare in absolute numbers.

The nest in Arraial do Cabo, as well as the one reported in 1990 from Prado, southern State of Bahia, about 220 km north of the beaches in Espírito Santo, could both be stray nests from the Espírito Santo population. Genetic analyses, whenever tissue samples are available, might help to clarify this matter. It should be noted that the distances from Arraial do Cabo and Prado to the main nesting beaches in Espírito Santo are greater than distances compiled by Eckert *et al.* (1989) for intraseasonal movements of leatherback turtles between nesting areas in the Caribbean and in several other places around the world.

Although the leatherback population in Espírito Santo is a likely source for the nests in Arraial do Cabo and Prado, the occasional nests in Brazil farther to south, in the States of Santa Catarina and Rio Grande do Sul (Anonymous 1999a, 1999b; Soto *et al*. 1997), are more difficult to explain with the straying argument, as those states are located at more than 1000 km from the State of Espírito Santo, and more than 800 km from the southern limit of the present range of regular sea turtle nesting for any species in Brazil (Figure 1). Outside Brazil, the nearest leatherback nesting site in the Atlantic is located in French Guiana (Girondot & Fretey 1996), about 4000 km from Espírito Santo along the South American coast, and other important nesting sites exist at greater distances, in the Caribbean and Africa (Spotila *et al.* 1996). These distances make it unlikely that the occasional nests in central-southern Brazil are strays from those far-away populations.

In Brazil, sea turtles are known to have nested in greater numbers in the past (that is, before widespread exploitation) than they do today (Medeiros 1983), although no quantitative information is available on this matter. The southern limit of regular sea turtle nesting in the past is not known. Historical patterns of leatherback nesting might help to explain occasional nests like the one in Prado, State of Bahia, to the north of the present day southern limit of the range of regular nesting (Figure 1). Occasional nesting to the south of that range, where temperatures are presumably unsuitable for adequate incubation, are harder to explain. One of the leatherback clutches found in the State of

Santa Catarina in 1995 showed no signs of embryonic development, while the other clutch did produce hatchlings, although the hatching success can not be computed, as the nest was not located (Soto *et al*. 1997). The reasons for the occasional nests are unknown. They could be the direct consequence of particular physiological and/or environmental conditions, or they could be simply the result of occasional failure of the navigational abilities of leatherback females, who then randomly choose, along the course of their migratory routes, a beach to nest.

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