

Notes on Nesting of *Podocnemis unifilis* (Chelonia: Pelomedusidae) in Small Agricultural Clearings in Eastern Amazonia, Caxiuanã, Pará, Brazil

Notas sobre o Ninho de *Podocnemis unifilis* (Chelonia: Pelomedusidae) em Pequenas Clareiras de Agricultura, na Amazônia Oriental, Caxiuanã, Pará, Brasil

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In spite of their importance as game and the resultant human pressure on their populations (Mittermeier, 1979), the nesting habits of Amazonian chelonians are still poorly elucidated. The yellow-headed sideneck turtle, *Podocnemis unifilis* Troschel, 1848: 647 (Pelomedusidae), locally known as *tracajá*, has a widespread distribution through the entire Brazilian Amazon basin, the Orinoco River basin of Venezuela, eastern Colombia, eastern Ecuador, northeastern Peru, the Guianas, and northern Bolivia (Pritchard; Trebbau, 1984). This species is considered to be mostly aquatic in its habits. Solitary females of this species usually nest in sandy beaches along main rivers of the region but also along streams and in other types of soils (Souza; Vogt, 1994). The species' mating period varies depending on locality, and nesting has been recorded for most months of the year in northern South America, with clutch sizes averaging 15 to 25 eggs, but sometimes with as many as 40, in nests 30 cm in average depth. In general nesting period overlaps with the dry season when the water level of the rivers is low and appearing the sand beaches.

This species is considered threatened throughout the Amazon and Orinoco River drainages (IUCN, 2003). Moreover, *P. unifilis* is listed in Appendix I to the Convention on International Trade in Endangered Species (CITES). On 02 June 1970, the U.S. Fish & Wildlife Service designated the *tracajá* as endangered throughout its entire range.

A different nesting habitat for *Podocnemis unifilis* was found in early March 2003, in the middle of the rainy season, in slash-and-burn agriculture fields in the Caxiuanã National Forest, municipality of Melgaço, Pará State, Brazil. The difference in the females nesting behavior in this case is that the opened cultivated area where multiple nests were located was 115 m from the Curuá River, a small affluent of the Caxiuanã River. In fact, the site was so far removed from the water as to be imperceptible for ovigerous females searching for nesting sites along the river margins. Moreover, in the open nesting site in the swidden, the nest farthest from the river margin was also situated 65 m from the edge of the forest. Therefore, the nesting female would have had to traverse at least 180 m in an advanced secondary forest, whose canopy was almost

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20 m in height, and in the agricultural clearing, in order to reach the chosen nest site. In the open agricultural clearing of about 4 ha in area manioc (*Manihot esculenta*) and corn (*Zea mays*) were growing together. Apparently, oviposition occurred just after the field was burned at the end of the dry season, either late October or early November, 2002, according to local residents.

The soils at the nest site were sandy latossols with high levels of organic matter and ash due to the burning of fallen trunks. Nests were shallow (around 10 cm in depth), compared to the mean nest depths of 30 to 40 cm found in other studies (Souza; Vogt, 1994; Pezzuti; Vogt, 1999). A possible explanation for the shallower nests is that the soil was harder and more compacted than the sandy beaches normally used for nesting. The ground was relatively level, with a slight slope towards the river.

Table 1 shows the localization and estimated clutch sizes of the four nests found in the agricultural clearing. Eggs in two nests were partially predated, and eggs in the other two nests were collected by local inhabitants. The empty egg shells found inside the nests and within a few meters of it are a strong indication that the predator was the tegu lizard, *Tupinambis nigropunctatus*.

Hatchling survivorship is also probably lower when nesting is done farther from the water. Although there are no studies on hatchling survivorship for Amazonian species, Pezzuti (unpublished data) found a strong relationship between distance to the water and predation levels on hatchlings by *T. nigropunctatus* in Mamirauá, Amazonas state. Subsistence crops could also harbor different potential predators. Fire ants (*Solenopsis* spp.) and army ants (Formicidae: Ecitoninae), for instance, are abundant in these areas but uncommon on sandy river beaches that remain below water during most of the year.

Nest 1 was situated on a slightly more elevated site, around 20 cm above the main soil level (Table 1). This small elevation was approximately 2 m in diameter, and the nest was almost in the center.

The other three nests were also situated on slight elevations. Such nesting site selection could be adaptive since flooding is one of the major causes of nest losses in the Amazon basin (Alho; Padua, 1982; Pezzuti; Vogt, 1999). The selection of elevated sites for egg laying was also observed for another Amazonian pelomedusid turtle species, *Peltocephalus dumerilianus*, in the Jaú National Park, Rio Negro, Amazonas state (DFS, unpublished data).

Nesting in an open agricultural clearing sites relatively far from the water appears to be an extreme behavior of nesting females ready for egg - laying when more adequate nesting beaches are not available. Local residents in Caxiuanã confirmed that *P. unifilis* females also nest in overgrown, abandoned fields. Most probably, this nesting site will be rejected when a closed canopy is formed and reduces insulation, an important variable for proper egg development.

The management of *P. unifilis* in areas where nesting beaches are infrequent can be promoted by traditional techniques such as habitat manipulation and cleaning the margins of rivers and lakes. Attention should be paid to areas previous modified by human usage, such as old fields and clearings. Additional data on the frequency of turtle nesting in man - made clearings is needed, and we hope to monitor continuously both egg and hatchling survival rates in the future. An environmental awareness campaign is necessary to make sure that turtles hatching in agricultural clearings have a fair chance of reaching relative safety in the water.

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Table 1. Localization and egg clutch sizes of *P. unifilis* nests found in a subsistence agricultural clearing in the Caxiuanã National Forest, Pará, Brazil.

Nest Number	Distance to forest edge (m)	Distance to nearest river margin (m)	Total number of eggs	
			Predated	Removed by local residents
01	65	180	13	-
02	34	149	11	-
03	28	143	-	All
04	19	134	-	All

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