

SOUND COMMUNICATION AND SOCIAL BEHAVIOR IN AN AMAZONIAN RIVER TURTLE (*PODOCNEMIS EXPANSA*)

CAMILA RUDGE FERRARA^{1,2,3}, RICHARD C. VOGT^{1,2,4,7}, RENATA S. SOUSA-LIMA⁵, BRUNO M.R. TARDIO⁶, AND VIRGINIA CAMPOS DINIZ BERNARDES^{1,3,4}

¹ Centro de Estudos de Quelônios da Amazônia, Instituto Nacional de Pesquisas da Amazônia, Amazon, Brazil, 69083-220

² Associação de Ictiólogos e Herpetólogos da Amazônia—AIHA, Amazonas, Brazil, 69083-220

³ Wildlife Conservation Society—Brazil, Manaus, Amazonas, Brazil

⁴ Coordenação de Biodiversidade, Instituto Nacional de Pesquisas da Amazônia—INPA, Rua André Araújo, Manaus, Amazonas, Brazil, 69067-375

⁵ Laboratório de Bioacústica, Departamento de Fisiologia, Centro de Biociências/Universidade Federal do Rio Grande do Norte, Natal, RN—Brasil and Bioacoustics Research Program, Cornell Lab of Ornithology, Ithaca, NY, USA

⁶ Instituto Chico Mendes- ICMBio, Brazil

ABSTRACT: The social behavior of turtles during the nesting season can be attributed to a series of functions such as reducing predation, increasing hatchling survivorship, and information exchange between nesting females. However, the mechanism(s) used to remain in a group during the different phases of nesting behavior has yet to be explained. The objective of this study is to document the sounds produced by Giant South American River Turtle, *Podocnemis expansa*, during the nesting period, and identify how acoustic mechanisms might facilitate social behavior and group aggregation during this period. From September 2009 to October 2011, the sound repertoire of *P. expansa* was identified during the nesting period, which begins with the migration of the turtles from the flooded forests to the nesting beaches and terminates when the hatchlings emerge and the females migrate with the hatchlings to the flooded forests. Sounds were recorded when the turtles were active in different behavioral patterns (1) migrating; (2) aggregating in front of the nesting beaches before basking; (3) nesting at night; (4) waiting in the water without nesting or after they have nested; and (5) waiting for the arrival of the hatchlings. We observed six types of sound in the recordings of turtles made during the nesting period. These data indicate that this species is social, and that sound plays an important role in the synchronization of the activities of groups during the nesting season.

Key words: Giant South American River Turtle; Migration; Nesting; Underwater vocalizations

THERE IS an adaptive advantage for social animals living in groups. They can reduce the risk of predation by the dilution effect, noting a potential predator sooner or fending off a predator more easily than a solitary individual (Krebs and Davies, 1993). Social behavior in turtles includes foraging behavior of terrestrial species like *Chelonoidis denticulata* (Vogt, 2008) and the “arribadas” (gregarious nesting behavior) of *Lepidochelys olivacea* (Bernardo and Plotkin, 2006). Group nesting behavior (arribadas) is most common and well documented in *L. olivacea*, but also occurs to a lesser extent in other species of sea turtles (*Chelonia mydas* [Carr, 1967], *Caretta caretta*, *Eretmochelys imbricata*, *Natator depressus*, *Dermochelys coriacea*) and freshwater species such as *Carettochelys insculpta* (Doody et al., 2001, 2002), *Podocnemis* spp.

(Vanzolini, 1967; Vogt, 2008), and *Graptemys* spp. (Vogt, 1980). Group nesting perhaps also occurred in large sand-beach nesting species in Asia, *Batagur affinis* and *B. baska*; but population sizes are now so small that they do not form an arribada, so the chances of knowing if vocal communication was a part of their social interactions are nearly zero (Maxwell, 1911; Moll and Moll, 2004).

The patterns of social behavior during different phases of reproduction have attracted attention, particularly during courtship, basking, and group nesting (Doody et al., 2003; Galeotti et al., 2005; Bernardo and Plotkin, 2006; Ferrara et al., 2009, 2010, 2012). Social behavior during the nesting period has been described in detail for the Giant South American River Turtle (*Podocnemis expansa*; Alho and Pádua, 1982; Ferrara et al., 2010, 2012), Pig-nosed Turtle (*C. insculpta*; Doody et al., 2003), and Olive Ridley Sea Turtle (*L. olivacea*; Bernardo and Plotkin,

⁷ CORRESPONDENCE: e-mail, vogt@inpa.gov.br or richard@pq.cnpq.br