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GROUP SIZE AND BEHAVIOR OF GUIANA DOLPHINS (*SOTALIA GUIANENSIS*) (CETACEA: DELPHINIDAE) IN MARAPANIM BAY, PARÁ, BRAZIL

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Guiana dolphins (*Sotalia guianensis*) are found in coastal and estuarine waters of the Caribbean and the South Atlantic from at least Nicaragua and probably Honduras to Santa Catarina, Brazil (Simões-Lopes, 1988; Edwards and Schnell, 2001; da Silva *et al.*, 2010 this volume). An important concentration of this species is found in Marapanim Bay, eastern Pará State, Brazil, but despite its proximity to shore this population is poorly known (Lima *et al.*, 2006). In Cispatá Bay, Colombia, groups consisted of ten or fewer individuals, and their size did not change significantly with season (García and Trujillo, 2004). In Guanabara Bay, southeast Brazil, groups ranged from one to 40 individuals (Azevedo *et al.*, 2005), whereas in the Cananéia region most groups consisted of two to twelve individuals (Geise *et al.*, 1997; Santos and Rosso, 2007). The population of Marapanim Bay, Pará, Brazil, is likely to be resident but its group characteristics have not been reported. The aim of this work was, therefore, to provide information on group size for this population as well as patterns of behavior.

The estuary of the Marapanim River (Figure 1) is located on the northeast coast of Pará State, Brazil (00°32'30"S-00°52'30"S, 47°28'45"W-47°45'00"W). Its bottom has a low relief and it is dominated by a semidiurnal tide that is > 4.0m, forming sand banks in the riverbed and markedly altering the depth of watercourses (Prost, 2001). There are two distinct seasons in the Amazon region, the rainy season (from November to April), and the dry season (from May to October) (Fisch *et al.*, 1998). The upstream limit of tidal influence varies between 42km (rainy season) and 62km (dry season) (Timouk *et al.*, 2001).

Fifty linear transects were conducted in Marapanim Bay between January 2004 and March 2006, in a motorized wooden boat (5.0m) on days in which the Beaufort sea state was d" 2. Daily observation efforts consisted in approximately six hours between 0600h and 1800h. Boat speed during searches was 10km/h. The location of each detected group was registered with a Global Position System receiver (GPS, Figure 1).

Dolphins were visually categorized as adults/juveniles or calves, the latter being defined as less than two thirds of the adult body size, and regularly accompanying an adult animal (Azevedo *et al.* 2005). In each linear transect conducted, the 'scan-sampling' method was

used to register behavioral patterns (Altman, 1974). Definitions provided in Shane (1990) were used to distinguish behavioral states: traveling (unidirectional movement), feeding (diving repeatedly in one location and surfacing facing in varying directions), socializing (frequent body contact and surface displays such as breaching), resting (floating at the surface or moving forward very slowly) and not visible.

Groups were assigned to one of five categories based on the number of individuals: 1-5, 6-10, 11-15, 16-20 or more than 20. A Mann-Whitney test was used to conduct seasonal comparison among average number of calves per group and group size. The Kruskal-Wallis test was used to compare group size with activity patterns.

During the study period, 326 groups and 1806 individual Guiana dolphins were sighted, with the majority of sightings occurring during the flood tide (60% of all individuals). Group size ranged from one to 60 individuals (mean \pm SD: 6.16 \pm 7.20). Three areas of the bay accounted for more than 40% of all sightings (Figure 1).

The most common group category was that comprising one to five individuals (70% of all groups) (Figure 2). There was a significant difference among group size categories recorded during the rainy and dry seasons, with larger groups occurring more often during the former (mean_{dry season} = 4.17 vs. mean_{rainy season} = 6.15, Mann-Whitney test U = 9905.00, P < 0.05).

The number of calves per group varied from zero to ten (mean \pm SD = 2.24 \pm 1.85). Of the groups with calves, 48% had one only. The average number of calves per group in the rainy season (2.63) was not significantly different from the dry season (1.84) (Mann-Whitney test, U = 1918.00, P > 0.05).

From the 326 group sighted, the most frequently observed behaviors were feeding and traveling (39% and 37%, respectively) (Figure 3). The frequency of larger groups was greater during feeding than during other activities (Kruskal-Wallis test = 38.67, P < 0.05).

In Marapanim Bay dolphins form small groups, often ranging from one to five individuals. Group size in this study area is lower than in other places, like Atafona Bay (21°37'S), where Di Benedetto *et al.*, (2001) observed 86.4% of the groups containing more than ten individuals.

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In Guanabara Bay (22°57'S, 43°10'W), the most common group size varies from two to ten dolphins (Azevedo *et al.*, 2005), and Santos and Rosso (2007) at Cananéia estuary (25°03'S, 47°55'W) registered groups of Guiana dolphins ranging from two to twelve individuals.

The seasonal difference in group size is most likely related to an increase in the abundance of fish when increasing freshwater discharge in the Amazon River flushes estuarine waters eastward towards the Pará State (Isaac and Barthem, 1995). This water mass comes from productive floodplains of the Amazon and enhances the trophic chain supporting fish resources in Marapanim Bay (Barthem and Fabr e, 2004).

Groups with calves were larger than those without calves, which were also found for Guiana dolphins in

Guanabara Bay and Cananéia (Azevedo *et al.*, 2005; Santos and Rosso, 2007). There and in Atafona Bay (Di Benedetto *et al.*, 2001) and the Cananéia region (Geise *et al.*, 1997), no significant seasonal variation in numbers of calves per group was found.

Also as in Cananéia (Geise *et al.*, 1997) and Cispat  Bay (Garc a and Trujillo, 2004), the most frequently observed behavioral states in Marapanim Bay were feeding and traveling.

The Guiana dolphins are present throughout the year in Marapanim Bay, which can be considered an important feeding area for the species. The dolphins gathered in larger groups during the rainy season, which probably confers them an advantage in successful prey capture at a time when food resources are abundant in the area.

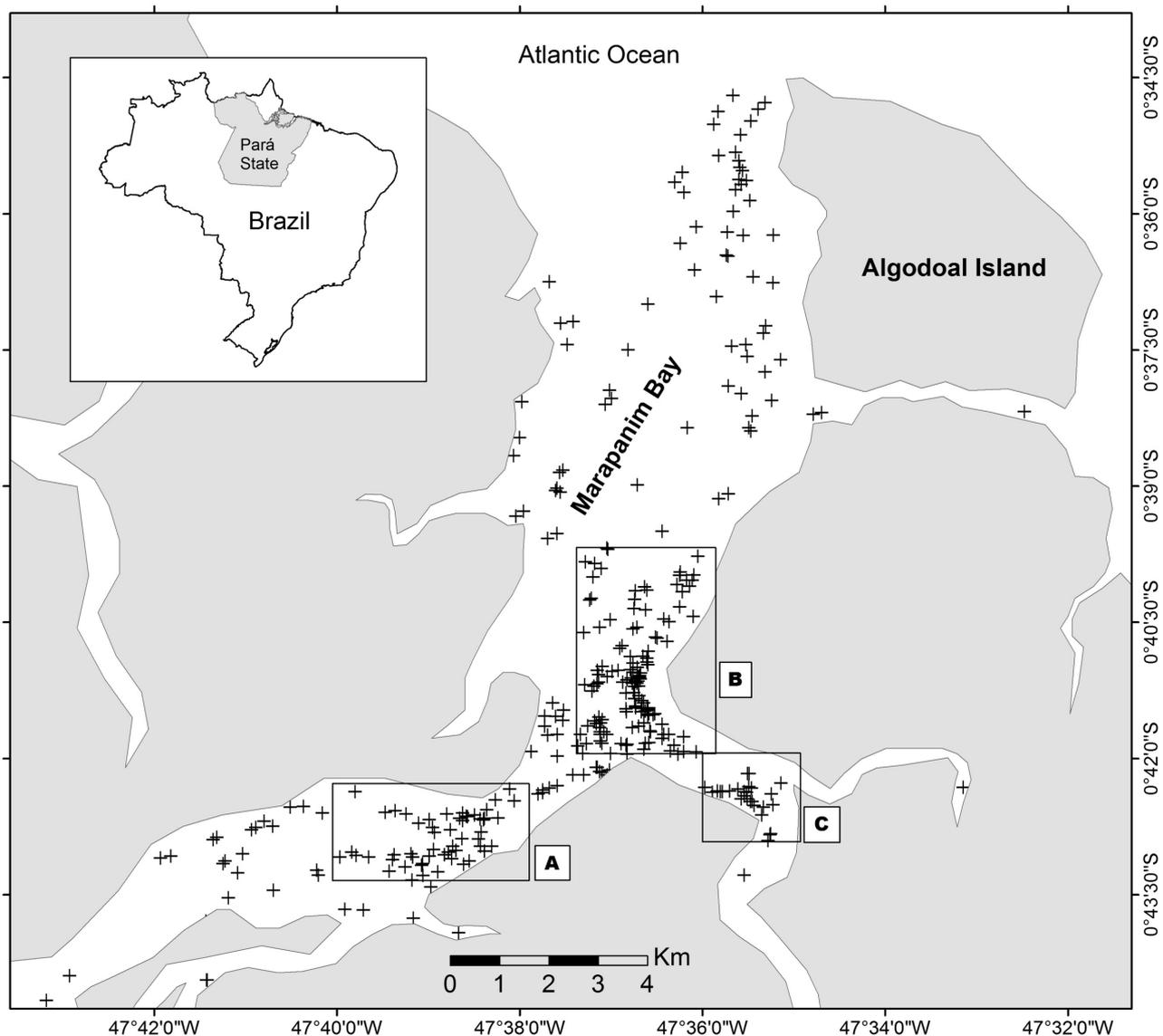


Figure 1. Guiana dolphin groups sighted (+) in Marapanim Bay, Pará State, Brazil. Areas A, B and C accounted for more than 40% of all sightings.

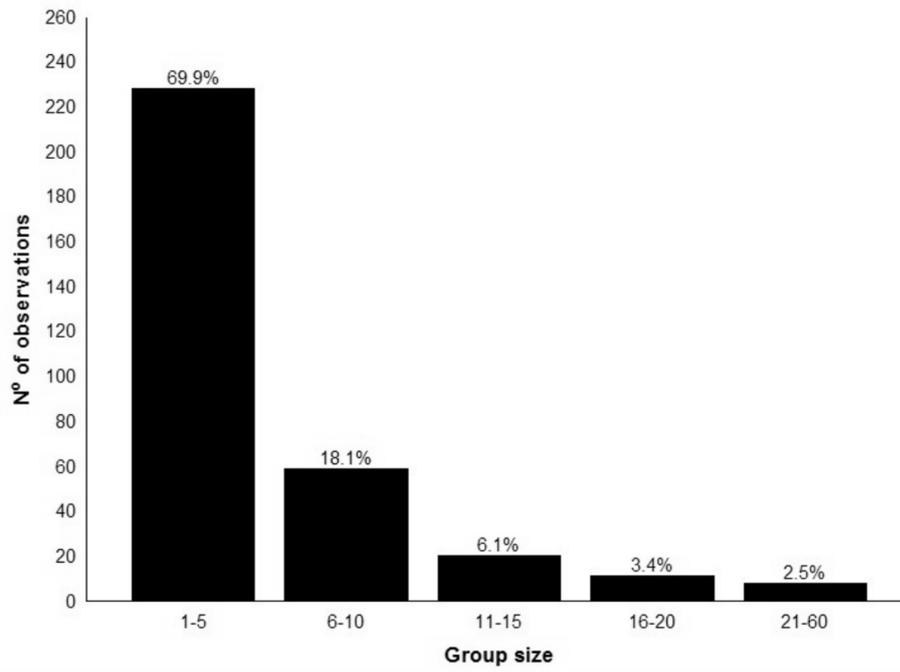


Figure 2. Distribution of group size of Guiana dolphins, *Sotalia guianensis*, in Marapanim Bay (0.67°S, 47.62°W), Pará, Brazil.

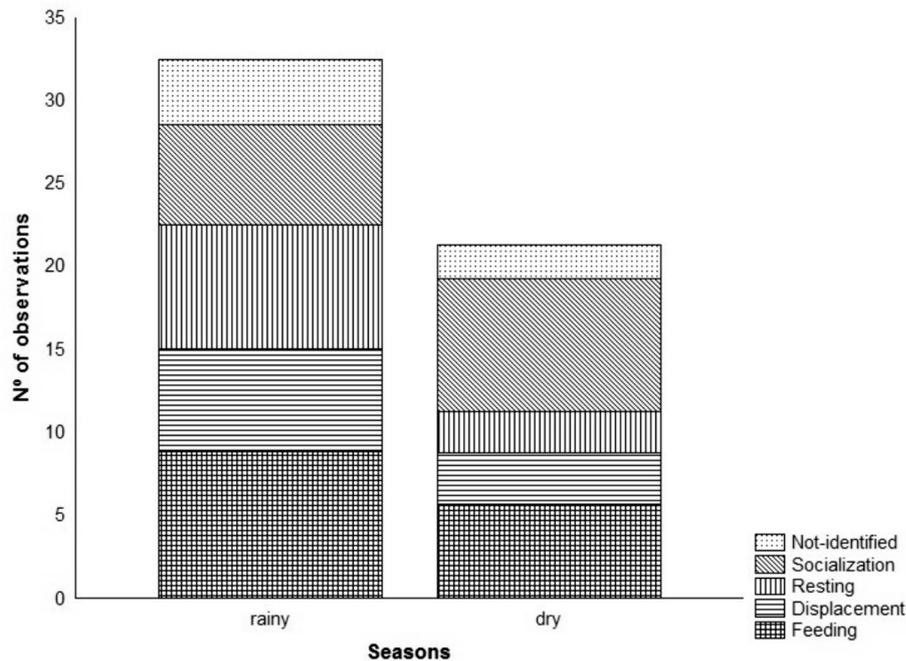


Figure 3. Differences in behaviour patterns of Guiana dolphins, *Sotalia guianensis*, between seasons in Marapanim Bay (0.67°S, 47.62°W), Pará, Brazil.

These results suggest that group size in Guiana dolphins increases with rising productivity, thereby providing a potential monitoring tool for detecting ecosystem changes related to alteration of freshwater regime that may occur in the Amazon due to upstream water development (*e.g.* construction of dams) and global climate change.

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