ABUNDANCE ESTIMATES OF GUIANA DOLPHINS (*SOTALIA GUIANENSIS*) IN ILHA GRANDE BAY, BRAZIL

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INTRODUCTION

Estimates of population size are an essential component of the information needed to manage human impacts on wild cetaceans (Wilson *et al.*, 1999). Studies concerning abundance estimates are scarce for *Sotalia guianensis* (Cetacea, Delphinidae) along its entire geographical distribution. Guiana dolphins are found in coastal areas, such as estuaries, bays and shallow waters, from Northern Honduras (15º58'N, 79º54'W) to Southern Brazil (27º35'S, 48º35'W) (Simões - Lopes, 1988; Carr & Bonde, 2000). Those habitats are strongly exposed to anthropogenic activities, which may directly influence wild species' population sizes. The conservation status of *S. guianensis* is "data deficient" according to the IUCN (Reeves *et al.*, 2003), largely because of lack of research in different populations. In Ilha Grande Bay, few studies were made in the past, contrasting to the large groups (*ca.* 450 individuals) of Guiana dolphins reported for the area (Lodi & Hetzel, 1998). In order to overcome these deficiencies, this study presents results about abundance estimates gathered in an 1 - year study period at the study area.

OBJECTIVES

The main objective of this work was to determine the population size of *Sotalia guianensis* in Ilha Grande Bay, southeastern Brazil.

MATERIAL AND METHODS

Boat trips were made from May 2007 to March 2008, comprising all seasons of the year, in the west side of Ilha Grande Bay (23º10'S 44º41'W to 23º02'S 44º26'W), southeastern Brazil. It is considered an important estuarine system, receiving a great amount of water influx from the continent, which increases the local primary productivity (Nogara, 2000). Photo - identification techniques were the base for this capture - recapture study (Hammond *et al.*, 1990; Mazzoil *et al.*, 2004). An observer was positioned at the boat for taking photographs of the dorsal fins, using a Canon EOS 20D digital camera equipped with Canon Zoom EF 75 - 300 mm 1:4-5,6 III lens and 1 GB memory card. The laboratory work consisted in sorting, classifying and analyzing all the pictures taken in each field trip. All of them have passed through an intense selection, in order to use only good to excellent quality pictures. This process was made using the software Adobe Photoshop™ 7.0 and Windows XP™ Picture and Fax Viewer (see Espécie, 2008 for more details).

A capture - recapture study must consider some assumptions in order to produce reliable estimates. For this reason, the assumptions below were followed (Krebs, 1999):

1 - The population was closed during the sample period;

2 - All animals have the same chance of getting caught in the first sample;

3 - Marking individual does not affect their catchability;

4 - Animals do not lose marks between the sample periods.

Abundance estimates were performed using four different estimators for closed populations: Lincoln - Petersen method, an unbiased estimator for Lincoln - Petersen method (modified by Chapman), the Schnabel method and the Schumacher - Eschemeyer method (see Krebs, 1999 for more details). All of them consider only the proportion of animals marked during the sample period. An approximation of the real population size was made considering the proportion of unmarked animals in the population (such as calves and juveniles), as proposed by Williams *et al.,* (1993). Confidence intervals at a 95% of significance were calculated for all estimators. Particularly for the Schnabel and Schumacher - Eschemeyer methods, a regression plot of the proportion of marked animals (Y axis) on the number of previously marked (X axis) was calculated to determine if their assumptions were true.

RESULTS AND DISCUSSION

Twenty - three boat trips were made in the study area. A

total of 17.969 photographs were taken, from which 6.014 pictures (33,5%) were characterized as "good" or "excellent" quality pictures. From these, 462 guiana dolphins were identified and catalogued, based on markings found on their dorsal fins. Considering only the marked proportion of the population, abundance estimates performed by each estimator were: Lincoln - Petersen N= 573 dolphins (IC 95% 534-611); Lincoln - Petersen modified by Chapman N= 577 dolphins (IC 95% 538-615); Schnabel N= 542 dolphins (IC 95% 477-628); and Schumacher - Eschemeyer N= 574 dolphins (IC 95% 455-778). A plot of the accumulated number of marked animals against the proportion of marked animals in each sample was linear (R^2= 0,965), suggesting that all the assumptions underlying Schnabel and Schumacher - Eschemeyer methods were fulfilled. The proportion of marked individuals in the population was 0= 0,52. Estimates of population size calculated using this proportion were: Lincoln - Petersen N= 1113 dolphins (IC 95% 1033-1192); Lincoln - Petersen modified by Chapman N= 1121 dolphins (IC 95% 1041-1200); Schnabel N= 1053 dolphins (IC 95% 1027-1078); and Schumacher - Eschemeyer N= 1115 dolphins (IC 95% 1087-1142). Populational closure is the most important feature in an abundance study. Because of the small sample period we could assume that losses and gains related to deaths and births, respectively, in this population were minimum (considering that Guiana dolphins may live for 35 years and have low fecundity and reproduction rates). As postulated by HAmmond *et al.,* (1990), markings found at the dolphin's dorsal fin are permanent, since those tissues cannot regenerate themselves. For this reason, all individuals have recognizable marks, which allow a confident identification. Behavioural responses (*trap - shy* and *trap - happy* animals) were not observed in this study. However, heterogeneity in catchability might have happened, mainly because some individuals may have some habitat or group preferences, turning their photo - identification difficult. In this case, during the data collection, the boat made random dislocations to assure that all individuals in all groups were photographed. Lincoln - Petersen method tends to overestimate the actual population size when the number of captured animals is small (Krebs, 1999). However, in this study this number was high, producing a reliable estimate. Compared to the modification proposed by Chapman, which is considered an unbiased estimator (SEBER, 1982), the results were similar. In this study, the regression plot provided for Schnabel and Schumacher - Eschemeyer estimators suggests that the assumptions were not violated. However, the Schnabel method underestimated the population size. This may be related to the assumption of equal catchability, which may not occur in natural populations, as explained before. For this reason, this estimator was considered the most biased. Excluding the results from Schnabel method, there was an overlap among confidence intervals of three estimators. So, the population size of Guiana dolphins in Ilha Grande Bay ranges from 1041 to 1142 individuals. This represents the biggest population of *Sotalia guianensis* along its entire geographical distribution reported until the present. Previous studies about group size in the area have suggested that the great aggregation of this species found in the area may be strongly related to the diversity of habitat patches of the bay (Lodi, 2002). In the Cananeia Estuary, São Paulo State, the population was estimated between 290-360 animals (Santos & Zerbini, 2006). At Guanabara Bay, Rio de Janeiro State, the population size is between 69-75 individuals, and this may be related to the high level of human impacts at the area (Pizzorno, 1999). So far, the biggest population reported for this species was of Sepetiba Bay, which is located 70 km far from Ilha Grande Bay, ranging from 1004 to 1057 individuals (Nery, 2008).

CONCLUSION

Data provided by this study indicate that Ilha Grande Bay holds the biggest population of *Sotalia guianensis* along its entire geographical distribution (1041 to 1142 individuals). It seems that the southern coast of Rio de Janeiro State (Sepetiba Bay and Ilha Grande Bay) holds the largest populations of this species, and should be considered an area of great ecological and conservation interest for the species. Furthermore, both bays are suffering an intense increase of anthropogenic activities, which may affect these wild populations in some ways. The results found in this study are important for a management plan for *S. guianensis* at the west side of Ilha Grande Bay.

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