RESIDENCE PATTERNS OF THE GUIANA DOLPHIN SOTALIA GUIANENSIS IN BABITONGA BAY, SOUTH COAST OF BRAZIL

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ABSTRACT: Photo-identification and video-identification techniques were applied to study the residence of Sotalia guianensis in the Babitonga Bay, north coast of Santa Catarina State. From November 2000 to February 2003 a photo-identification effort was conducted through 21 months, with additional video-identification conducted from August 2003 to August 2004, totaling 34 months of identification effort. Fifty-one different animals were identified with residence rates varying from 2.9% (n = 1 sighting) to 67.6% (n = 23 sightings). During the four years it was founded that more than 30% (n = 16) of identified individuals were observed during three years, and 25% (n = 13) only were seen within one year. Considering previous studies, the longest period of residence reached eight years for one individual. Due to the high rates of resightings observed for most of the animals and the small percentage of animals only seen once, it is clear that S. guianensis is resident year-round in the studied area.

RESUMO: Técnicas de foto e de vídeo-identificação foram aplicadas objetivando estudar a residência de Sotalia guianensis na Baía da Babitonga, litoral norte de Santa Catarina. De novembro de 2000 a fevereiro de 2003 um esforço de foto-identificação foi conduzido através de 21 meses, somado a um esforço adicional de vídeo-identificação, conduzido de agosto de 2003 a agosto de 2004, totalizando 34 meses de esforço total de identificação. Cinqüenta e um animais foram identificados com diferentes taxas de residência, variando de 2.9% (n = 1 observação) à 67.6% (n = 23 observações). Durante os quatro anos verificou-se que mais de 30% (n = 16) dos indivíduos identificados foram observados por um período de três anos, e 25% (n = 13) foram observados apenas no período de um ano. Considerando estudos anteriores, o mais longo período de residência atingiu oito anos para um indivíduo. As altas taxas de recapturas observadas para a maioria dos animais e a pequena porcentagem de animais observados em apenas uma ocasião evidenciam a residência anual de S. guianensis na área estudada.

KEYWORDS: photo-identification, video-identification, residence patterns, Sotalia guianensis, Babitonga Bay.

Introduction

It is known that residence and habitat use patterns in dolphins may vary from one region to another (Ballance, 1990). It has been suggested that the variations with regard to the number of resident individuals are related to changes in the distribution of food resources (Wells et al., 1980; Shane et al., 1986; Ballance, 1992). Photo- and video-identification techniques have been used on a large scale to follow such displacements and to determine fidelity to some areas (Scott et al., 1990; Simões-Lopes et al., 1999; Zolman, 2002; Rossi-Santos et al., 2007).

Sotalia guianensis has a continuous distribution, from Nicaragua, Central America to Florianópolis, Santa Catarina State, Brazil (Simões-Lopes, 1988; Carr and Bonde, 2000; da Silva et al, 2010 this volume). This species is classified as ‘Data Deficient’, according to the IUCN (Reeves et al., 2003), which calls attention to the relevance of long-term studies. Some resident populations are found along the Brazilian coast, like in the Caravelas River Estuary (Rossi-Santos et al., 2007; 2011), Guanabara Bay (Pizzorno, 1999; Azevedo et al., 2007), Cananéia Estuary (Santos, et al., 2001; Oshima et al., 2010), and Norte Bay (Flores, 2003). Variable degrees of residence have been observed for some individuals (Pizzorno, 1999; Santos et al., 2001; Flores, 2003). Previous studies showed that Babitonga Bay is an important shelter area for the species, where the population shows evidence of residence (Cremer, 2000). The knowledge of how a population uses its habitat is considered a key issue for the elaboration and implementation of species conservation strategies and for supporting works of environmental assessment (Primack and Rodrigues, 2001). This work aims to analyze the residence patterns of S. guianensis in the Babitonga Bay, Santa Catarina.

Methods

STUDY AREA

Babitonga Bay is located in the north of Santa Catarina State, southern Brazil (26º02’S to 26º28’S and 48º28’W to 48º50’W) comprising an area of approximately 160km², with 20km in length and a maximum width of 5km (Figure 1). It is connected to the Atlantic Ocean through a deep channel of about 1.7km width. Its surroundings consist of mangrove vegetation, covering approximately 6200ha, and margins of sand banks and rocks. The bay receives many rivers but is considered a homogenous estuary (IBAMA, 1998). The average depth is 6m reaching a maximum of 28m near to main channel of the San Francisco do Sul harbor. The maximum tide variation is about 2.3m according to the tide table of San Francisco do Sul harbor.

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DATA COLLECTION AND ANALYSIS

A 5m aluminum boat equipped with a 60Hp outboard engine was used. Between November 2000 until August 2003 photo-identification was conducted using a Canon EOS5 photographic camera with 100-300mm zoom lenses, color films ASA 200 and 400 and only in good luminosity condition (between 0900h to 1500h). Considering previous studies, the fieldwork was mainly carried out in the two known areas of concentration of this species in the bay (see Cremer, 2000).

Only photographs of high quality (better definition, focus, clearness and proximity) were used to define natural marks in the animals’ dorsal fins. For the photographic analysis, 2.5x eyecup lenses were used. Analyses were carried out with two or more experienced researchers in 1h or less to avoid observer fatigue, which could interfere with the analysis. The best photograph of each animal was enlarged, printed and scanned, and used as a ‘standard photograph’ for the elaboration of the digital photographic catalogue. The catalogue included the description of natural marks used for the individual identification in the different parts in which the dorsal fin was divided for easier recognition.

Between August 2003 and August 2004, video-identification with a digital video camera (mini-DV) Sony DCR-TRV33 with 2x optical lenses was used, with the digital zoom turned off. Zoom approaches of the animals’ dorsal fin were made according to Sanino and Yañez (2001). Usually, framing distance remained open to ensure the possibility of capturing images with better resolutions, considering that animals showed up in an unexpected way. All the images were first divided in stretches according to better framing and definition and selected from the original Mini-DV tapes. The images from the camera were transferred through a Universal Serial Bus (USB) cable to an edition center. The best selected stretches were analyzed through the software AdobePremière 6.0® for the transformation of the stretches into pictures. Each stretch resulted in a variable number of pictures. The best pictures of each stretch were recorded as photographs in the Joint Photographic Experts Group (JPEG)® file format. Then photographs were edited and improved with the software Adobe Photoshop 7.0® following the methodology of Sanino and Yañez (2001). These images were compared with those of the catalogue for identification of new and previously identified animals. The images were inserted in the catalogue considering marks description to compare photographs with similar characteristics (Zolman, 2002).

The residence of *S. guianensis* in the Babitonga Bay was analyzed in two different ways: through residence levels and through residence rates. Residence levels were analyzed following an adaptation of the terms proposed by Würsig and Jefferson (1990), Ballance (1990), Simões-Lopes and Fabian (1999) and Zolman (2002) for *Tursiops truncatus*. The analysis of residence levels were based...
on the seasonal presence or absence of individually identifiable dolphins in the area. A year was divided into four seasons: summer (January-March), autumn (April-June), winter (July-September) and spring (October-December). Dolphins identified in the area in all four seasons (regardless of year), were considered as residents (R). Dolphins identified in the study area in three different seasons were considered as partially resident (PA-R). Those animals observed exclusively in the same season in consecutive years were considered as seasonal residents (S-R), and those identified in only one or two consecutive seasons were considered as non-residents (N-R). Residence rates were adapted from Simões-Lopes and Fabian (1999). To estimate the residence rates, we looked at the number of times that an identified animal was seen throughout the studied period. In this way a table of monthly presence and absence of animals was elaborated. The residence rates of the individuals (considered as the number of resighted individuals divided by the number of months) were expressed in percent (%).

Results

Photo- and video-identification were conducted over a period of 34 months in which 51 different animals were identified. A total of 2707 photographs with 13.5% (n = 367) of useful photographs were taken. The video-identification consisted of nine hours and 36 minutes of footage, with 552 stretches selected, 41.6% of which were useful for individual identification. The images edition (stretches selection, edition center and image treatment) had a length of 52.1h. The curve of newly identified dolphins became asymptotic in both the photo- and video identification studies suggesting that the population was well sampled throughout the studied period (Figure 2).

According to the residence levels, 19 animals (37.2%) were considered as residents (R), 9 (17.5%) were observed during three consecutive seasons and were considered as partially residents (PA-R), 5 (9.8%) were seasonal residents (S-R) and 16 (31.3%) were considered as non-residents (N-R). Residence rates were adapted from Simões-Lopes and Fabian (1999). To estimate the residence rates, we looked at the number of times that an identified animal was seen throughout the studied period. In this way a table of monthly presence and absence of animals was elaborated. The residence rates of the individuals (considered as the number of resighted individuals divided by the number of months) were expressed in percent (%).

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Discussion

Considering the high percentage of animals seen in the Babitonga Bay and the small number of animals observed only once, it became clear that *S. guianensis* has a regular occurrence throughout the year in the study area. Most of the identified animals (n = 38; 74.5%) were observed in the area in more than two years and more than one third of the animals (n = 16; 31.3%) were found in Babitonga Bay for three years or more. Similar residence levels for *S. guianensis* had been also observed in other localities. In Guanabara Bay, Pizzorno (1999) observed that 32 animals were resident for three years, and Santos et al. (2001) observed that 16 animals lived throughout two years in Cananéia Estuary. In Norte Bay, Santa Catarina, 23 animals were observed during a period of 4.8yr (Flores, 1999). In Caravelas, Northeastern Brazil, Rossi-Santos et al. (2007) identified 58 animals, with a three years residence for seven individuals.

Considering previous studies (Cremer, 2000), it has been stated that two animals, ‘Peninha’ and ‘Cut’, lived in the area for more than seven and eight years, respectively, showing a long term residence. This was also observed in Norte Bay, where 13 animals were observed to reside periods that varied from three to 10yr (Flores, 2003). Site fidelity or year-round residence patterns have been also registered in other coastal species of dolphin such as the common bottlenose dolphin *T. truncatus* in high latitudes (Wursig and Wursig, 1977; Wursig and Harris, 1990; Williams et al., 1993; Wilson, 1995; Feinholz, 1996; Simões-Lopes and Fabian, 1999; Zolman, 2002). Williams et al. (1993) and Wilson (1995) confirmed the long-term residence of more than 60 bottlenose dolphins in New Zealand and Scotland, respectively. In some cases, long-term residence patterns are very expressive in *T. truncatus*. Simões-Lopes and Fabian (1999) registered the same individuals for more than 13yr in Tramandaí, Southern Brazil. Wells et al. (1987) recorded 18yr of residence for Florida dolphins, USA, and Connor and Smolker (1985) more than 20yr of residence for Shark Bay dolphins, in Australia.

The residence of *S. guianensis* in Babitonga Bay, as well as the observations made for Norte Bay (Flores, 2003), indicates that those areas probably provide sufficient food supply for the population during the entire year. The results presented here show that Babitonga Bay represents an important area for a small population of *S. guianensis*, with some individuals using the area throughout the year.

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