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Insights on site fidelity and calving intervals of the marine tucuxi dolphin (*Sotalia fluviatilis*) in south-eastern Brazil

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Ecological aspects of the marine tucuxi dolphin, *Sotalia fluviatilis* (Cetacea: Delphinidae), remain poorly known. Important information can be gathered in long-term studies using photo-identification. Using this methodology, the authors present the first evidence of site fidelity for marine tucuxis in the Cananéia Estuary (25°03′S 48°01′W), south-eastern Brazil. A total of 86 easily recognizable individuals was catalogued from June 1996 to August 2001, but most of them have been sighted from May 2000. From June 1997 to August 2001, three female tucuxis were sighted on nine (KN #19), 22 (KN #30) and 28 (KN #10) different days in a relatively small area (~16 km^2). Each of them was observed with a calf in 1997–1998 and again with a new offspring in 2000–2001. Thirteen other individuals were reported on eight to 19 different days in the same area between May 2000 and August 2001. Our observations lead to conclusions on the evidence of site fidelity and indicate that calving intervals may range between two and three years for this species in the surveyed area.

INTRODUCTION

The marine tucuxi dolphin, *Sotalia fluviatilis* (Cetacea: Delphinidae), is one of the lesser-studied delphinids. Despite its apparently continuous distribution along most of the eastern South and Central American coasts (Borobia et al., 1991; da Silva & Best, 1996; Carr & Bonde, 2000), many aspects of this species' natural history such as site fidelity and calving intervals remain unknown. The tucuxi's preference for coastal and estuarine brackish waters, avoidance response when approached by boats, absence of sexual dimorphism, and small body size are the main features that made this species difficult to study in its natural habitat (Santos et al., 2000). Only in the early 1990s, with the help of photo-identification methods (see Würsig & Würsig, 1977; Würsig & Jefferson, 1990) were some Brazilian researchers able to gather the first information on the ecological aspects of this species. Since 1993, *S. fluviatilis* site fidelity and social structure have been studied in the North Bay (27°30′S), Santa Catarina waters (Flores, 1999). Using the same technique, Pizzorno (1999) conducted a three-year study in the Guanabara Bay (22°40′S), Rio de Janeiro, where the local tucuxi population was estimated to range between 69 and 75 individuals.

MATERIALS AND METHODS

Since March 1995, a marine tucuxi dolphin population found at the Cananéia estuary (25°03′S 48°01′W), São Paulo State (Figure 1), south-eastern Brazil, has been studied (Santos et al., 2000). The surveyed area is inserted into a 160 km long estuarine system with a muddy bottom and relatively turbid waters, surrounded by a large mangrove area with high concentrations of nutrients, zooplankton, shrimps, and fish (Schaeffer-Novelli et al., 1990). This area has special relevance as an important biological reserve, gathering federal and state Environmental Protected Areas (SMA, 1990, 1996). Land-based and boat-based photo-identification efforts have been conducted since June 1996 in the Cananéia Estuary: an area of ~16 km^2 has been covered. Land-based efforts were carried out from two small beaches known as 'Ponta da Trincheira' and 'Itacuruçá'. Both are located in the connection between the local estuary and the sea, where local dolphins enter shallow waters to prey on fish and to teach their calves to catch food (Santos et al., 2000). On some occasions, isolated female-calf pairs approach local beaches, making it easy to identify the adult gender based on their close association with a small calf. Boat-based efforts were conducted from a 5-m motor-powered (35 hp) aluminium boat, mainly from May 2000 to August 2001. The distance between photographers and dolphins ranged from one to ten metres. Water depth where dolphins were photographed varied from one to 19 m. A reflex 35 mm camera, with 75–300 mm lens and ASA-400 coloured film, was used to document individual dolphins. Nicks and notches along the dorsal fins were the main features used to distinguish individual dolphins (see Würsig & Würsig, 1977; Würsig & Jefferson, 1990), but in many cases, such as the following quoted calves, some scars along the dolphin bodies were also used.

RESULTS

A total of 86 easily recognizable individuals was catalogued from June 1996 to August 2001. Most of these individuals (N=73; 84.9%) have been followed since May 2000. This short paper is mainly focused on three females which have been observed since 1997.

The female catalogued as KN #30 was first sighted in August 1997 (Table 1) and observed with a small calf for the first time in November 1997 close to those two quoted

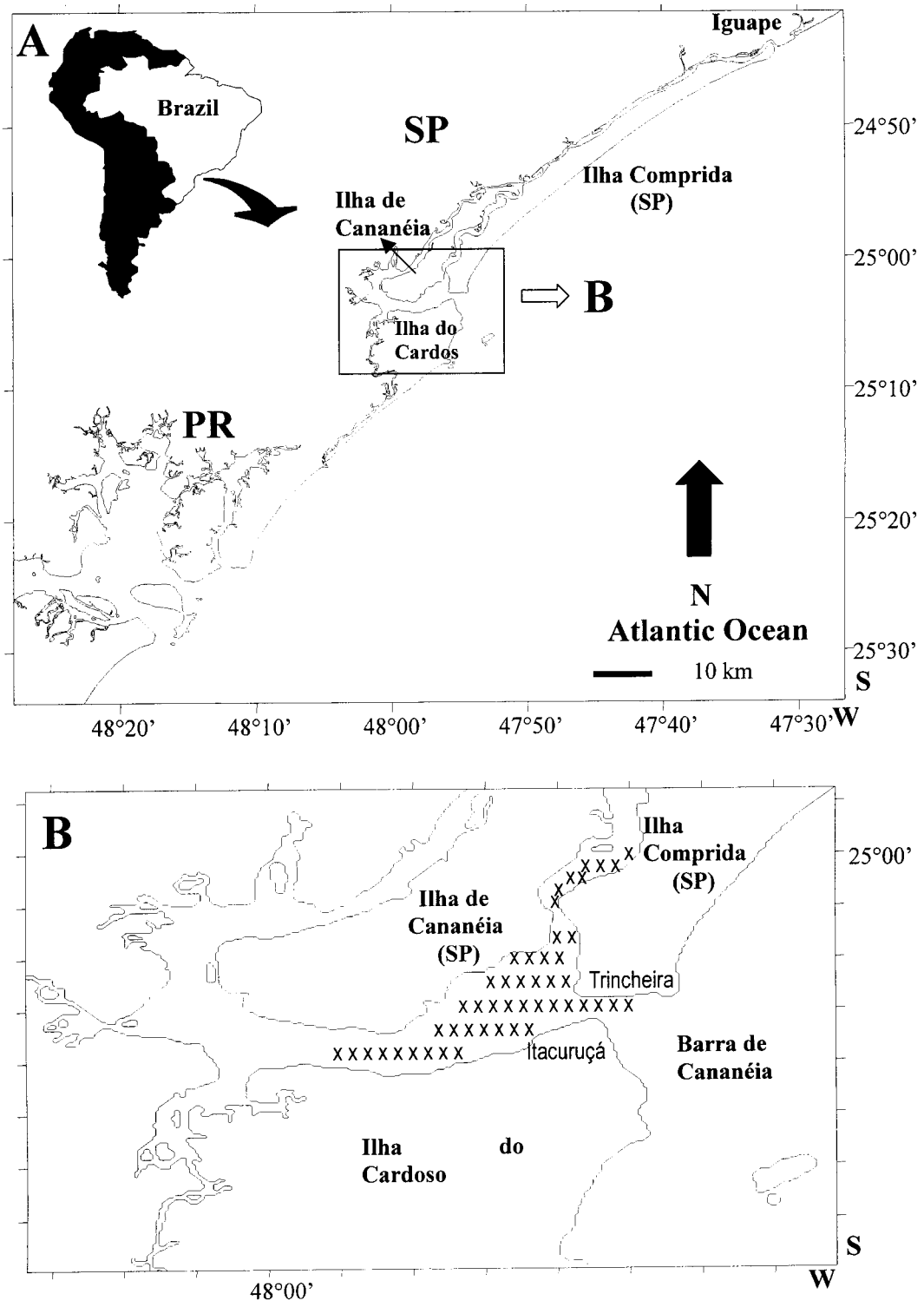

Figure 1. Map showing the exact area (marked by ×) where the marine tucuxi dolphin, *Sotalia fluviatilis*, has been photo-identified since 1997 in south-eastern Brazil. SP, São Paulo; PR, Paraná.

beaches. On six different days between November 1997 and July 1998, this female-calf pair was re-sighted. KN #30 was then observed without a calf on six occasions from May to November 2000. In November, KN #30 was accompanied by another offspring, with whom she has been observed until August 2001 on nine different days. The other female, KN #10, was catalogued in June 1997 (Table 1). KN #10 was observed in close association with a calf approaching a small inlet in August 1997, and associated with another two groups in December 1997. This female was again observed alone and with another offspring with a crooked dorsal fin in April 2000, with whom she was observed in close association until August 2001. Both were seen together on 19 different days for 16 months, so far denoting the first long-term notification on this species female-calf social bonds. The last of the three

Table 1. *Total number of sightings of identified marine tucuxi dolphins,* Sotalia fluviatilis, *at the Cananéia Estuary, south-eastern Brazil, from June 1997 to August 2001. From 1997 to 1999, only the number of sightings per year is presented. From 2000, the number of sightings per each survey month is presented. Only the individuals with eight or more sightings are presented.*

	1997	1998	1999	2000							2001							Total no. of
Id no.				04	05	06	07	08	10	11	01	02	04	05	06	07	08	sightings
10	8	1		4	3					1	1	3		1	4	2		28 30
4	3			2			1	2		1	1	1	1		1	3	1	22
83					1	1		1	2		2	2	1	1	2	4	2	19
43			1	2	1		1	2	1	1		1	1		2	2	2	17
147						2		1	2	1			1		1	2	2	12
155					1		1	1	1			1	2	1		3	1	12
157						2		1	2	2			1		1	1	2	12
75						1	2	1		2				1	2	1	1	11
71				1		2				1	1	2		1	1			10
19	1				1		2	2		1			1				1	09
86					1					1	1		3	1	2			09
100					2	1		1			1		1	1	1	1		09
162						1			1		1	1			1	2	2	09
52				1			1			1	1		1		2	1		08
143						1		1			1				1	2	2	08

females, KN #19, was first sighted in November 1997 with a small calf in close association. It was re-sighted again on seven days between May 2000 and April 2001 (Table 1). In July 2000, KN #19 was observed in three groups composed of five to ten individuals in close association with a calf, but it was not possible to confirm if it was her calf. Allo-parental observations were already observed in this studied population (Santos et al., 2000). In August 2001, KN #19 had the close companionship of another offspring. It is not possible to ascertain if this female lost a calf between 1999 and 2000 and had another one in 2001.

DISCUSSION

The quoted observations, added to the observation of calves year-round, suggest the significance of the use of local estuarine waters as an important breeding and calving area for local tucuxis. The first known evidence of three female tucuxis site fidelity to a relatively small area of $\sim 16\,km^2$ in the Cananéia Estuary is presented. The relatively high frequency of sightings of 13 other individuals year-round (see Table 1) also represents further evidence of residence patterns in the surveyed area. Site fidelity was also observed in two other sites of *Sotalia fluviatilis* distribution. Flores (1999) showed that 23 tucuxis were observed at the North Bay, Santa Catarina, for 4.8 years. At the Guanabara Bay, Rio de Janeiro, Pizzorno (1999) showed that 32 tucuxis were local residents in a three-year period survey. All three areas, North Bay, Cananéia Estuary and Guanabara Bay, are relatively protected from coastal waters, providing shelter from predators and plenty of food to marine tucuxis. As the gestation period of the species is estimated to be about ten months (da Silva & Best, 1996), and there were no re-sightings of these three individuals in 1999, the authors suggest that calving intervals may range from two to three years. The *continuum* of the photo-identification efforts in local estuarine waters in a broader period of time and also in an extended area, can lead the authors to reach more precise conclusions on this species habitat use and calving intervals. Thus, we will be able to conduct broader comparisons with the two other tucuxis studies, as well as with other better-known cetacean societies, such as bottlenose and spotted dolphins.

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