

Marine tucuxi dolphin (*Sotalia guianensis*) and its interaction with passive gillnet fisheries along the northern coast of the Rio de Janeiro State, Brazil

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During a monitoring programme of stranded marine mammals conducted along the north-east coast of the Rio de Janeiro State, Brazil, we collected marine tucuxi dolphins (*Sotalia guianensis*) stranded along the beach. We examined the carcasses to identify characteristic evidences of fishery bycatch. From July 2001 to August 2007 43 *S. guianensis* were found in the study area, with an annual mean of 6.1 stranding events. Dolphins stranded with evidence of fishery interaction ('bycatch') occurred in almost every year (annual mean=2). The majority of the bycatch events occurred during winter and spring. Most of the stranded dolphins were sexually matures. From 43 *S. guianensis* stranded from 2001 to 2007, 32.5% (N=14) of these presented evidence of bycatch. Other 29 dolphins did not show clear evidence of bycatch or it could not be evaluated. Most of the bycaught dolphins occurred in the northern zones of the study area where gillnet use is intense.

Keywords: *Sotalia guianensis*, incidental capture, Rio de Janeiro, fishery, dolphins, gillnets, strandings, distribution, coast

INTRODUCTION

Involvement between marine mammals and fisheries has been described worldwide, varying in extent and impact according to factors including the species involved, fishing method, habitat, season and prey consumed (Kastelein et al., 1995, Reeves et al., 2003).

Interactions with fisheries are some of the most pressing threats to the conservation of marine mammals, especially at the stock level, and principally for coastal dolphins.

Along the Brazilian coast there are several reported cases of small cetaceans and fishery interactions, and marine tucuxi dolphins (*Sotalia guianensis*) are the second most vulnerable species (Siciliano, 1994). Interactions with fishery activities, principally gillnet fisheries, represents the most serious conservation problem for this species throughout its range (Siciliano, 1994; Siciliano et al., 2006).

Marine tucuxi dolphins are coastal dolphins generally associated with shallow and protected estuarine waters, bays, mouth of rivers and turbid waters, where they feed on pelagic and demersal prey (Silva & Best, 1996; Siciliano et al., 2006). This dolphin has a presumably continuous distribution, from Florianópolis, Santa Catarina State, Brazil (27°35'S 48°34'W) (Simões-Lopes, 1988) to Nicarágua (15°58'N 85°42'W) (Carr & Bonde, 2000). The aim of this study is to present the results of marine tucuxi dolphins stranded with evidences of fishery activities made during a monitoring program carried out from 2001 to 2007 in the northeastern coast of Rio de Janeiro State.

MATERIALS AND METHODS

The records presented here were made during a monitoring program of stranded marine mammals conducted along the coastline from Saquarema (22°55'12"S 42°30'37"W) to Barra de Itabapoana (21°25'10"S 41°00'36"W), on the north coast of the Rio de Janeiro State, Brazil, initiated in 2001. In this program, we patrolled the coastline of the study area regularly by car driving along the sand beaches (speed of 20 km/h) at intervals of 20 days

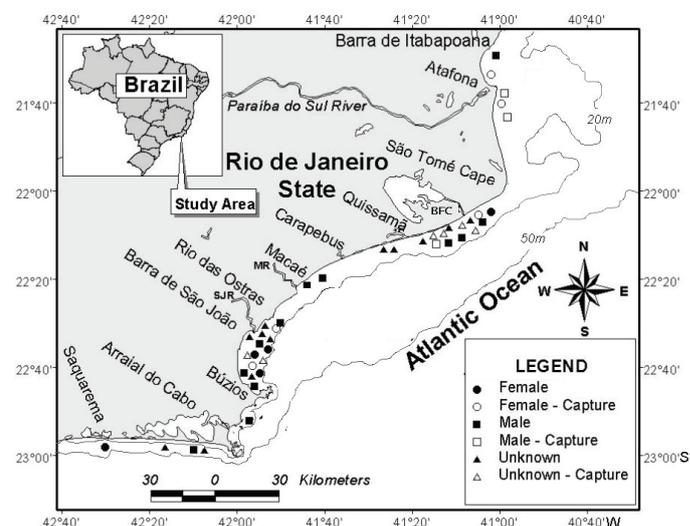


Figure 1. Map showing the north-eastern coast of Rio de Janeiro State. The symbols represent the local of the occurrence of the dolphins according to the sex and related mortality (bycatch or non-bycatch). Barra do Furado Canal (BFC) Macaé River (MR) and São João River (SJR).

looking for stranded marine mammals. The surveys were made by three field researchers: the driver and two observers. The sampling effort was distributed equally throughout the study area (~290 km of the beach monitored). Because of the long distance of the monitoring area the field researchers had to spent all day long working, during the low and high tides.

All marine tucuxi dolphins that were accessible were necropsied and examined for interaction with gillnet fishery according to the protocol of Pugliares et al. (2007). Those dolphins that presented evidences of gillnet fisheries interaction (e.g. attached gear, line or net marks) were classified as positive for incidental bycatch. Those specimens that did not show any obvious incidental bycatch characteristics (determined by photographs, necropsy, or pathology), were classified as non-bycatch strandings in this study, including those in advanced state of decomposition. Data on gillnet fisheries along the study area were collected in each fishing locality through interview of the main fisheries along the study area.

To determine if there were seasonal trends in the bycatch or non-bycatch strandings, the data were categorized into four seasons: January–March (summer), April–June (autumn), July–September (winter), and October–December (spring).

The stranded dolphins were divided into six classes according to the total body length of each specimen to investigate possible trends in the strandings (class I=72–93 cm; class II=94–115 cm; class III=116–137 cm; class IV=138–159; class V=160–181 cm; class VI=182–203). We classified as mature females those dolphins presented in the classes V and VI and as mature any dolphin included in class VI, including males, females and unsexed dolphins (Di Benedetto & Ramos, 2004).

RESULTS & DISCUSSION

From July 2001 to August 2007 43 marine tucuxi dolphins were found in the study area, with an annual mean of 6.1 strandings (Figure 2). The highest number of strandings occurred during 2006, followed by 2002. Dolphins showing evidence of fishery interaction occurred in almost every year (annual mean=2), except during 2001. The 43 stranded marine tucuxi dolphins were found throughout the study area, but some regions appeared to have more records than others.

From 43 marine tucuxi dolphins stranded from 2001 to 2007, 32.5% (N=14) showed evidences of fishery interaction while the others did not present clear evidence (or it could not be evaluated). Some of these dolphins were possibly victims of fishery bycatch; however, this was not possible to ascertain due to the advanced decomposition state of the carcasses.

Marine tucuxi dolphins were found throughout the study area, but lacks of strandings occurred in the regions near Carapebus and São Tomé Cape. However, most of the by-caught dolphins stranded in the northern portion of the study area, and according to Di Benedetto (2003), in the north coast of the Rio de Janeiro State (from Macaé to Barra de Itabapoana) marine tucuxi dolphins are the second most species frequently bycaught. This author also estimated that 100 marine tucuxi dolphins have been bycaught annually there. These results may reflect the passive gillnet fishery activities distributed into the study area (Table 1).

As in the region around Arraial do Cabo there is no presence of gillnets no dolphins found there showed evidences of bycatch. During previous effort of sightings of marine mammals on land based observations conducted in this region since 1999, few marine tucuxi were sighted. This southern portion of the study area is characterised by a relatively narrow shelf, with the coastline changing abruptly from north-south to an east-west direction (Muehe & Valentini, 1998; Campos et al., 1999). In addition, this area is strongly influenced by intense coastal upwelling. Because of the high biological production associated with the upwelling process, oceanic predators (e.g. killer whales, *Orcinus orca*) are attracted to feed in this area and could predate on marine tucuxi dolphins (Siciliano et al., 1999; Siciliano et al., 2006). Furthermore, at this zone the fall water temperature (<18°C) could be avoided by this dolphin as it is thought to occur in the southern limit of its distribution (Borobia et al., 1991). The presence of predators and cold waters present in

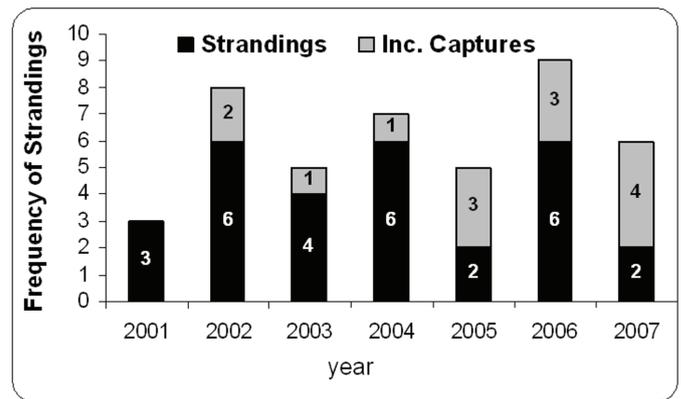


Figure 2. Number of marine tucuxi dolphin bycaught or non-bycaught in each year, from July 2001 to August 2007 (N=43), in north-eastern coast of Rio de Janeiro State, Brazil. The numbers in each bar represents the number of dolphins reported in that year.

Table 1. Characteristics of the passive gillnet fishery in each of the study area. In the region of Arraial do Cabo gillnets are not used. The main target fishes of these fisheries are sharks, pomatomids and scianids.

Fishing Locality	Net immersion by boats each day (hs)	Annual fishing efforts (km of net×days)	Net length (km)	Distance from the coast (km)
B. Itabapoana	12	468	1.65	05–48
Atafona	12	7000	03	72
S. Tomé Cape	08	1320	03	40
Quissamã	08	264	03	40
Macaé	12	22680	6,3	05–32
R. Ostras	12	7992	04	0 8
B. São João	12	7632	2.6	05–32
Búzios	12	15660	1.5	4

this southern region may act as a limiting factor for the occurrence of marine tucuxi dolphins.

In all years, most strandings (both bycaught or non-bycaught dolphins) occurred during spring (44.4%) followed by winter (41.9%) (Figure 3). Only three strandings were recorded during the autumn and two during summer. Dolphins which showed evidences of bycatch had the highest frequency in winter (N=8) and spring (N=5) with a peak in August. During autumn and summer only one bycaught dolphin was reported, respectively. Similar results were found by Meirelles et al., (2006) off the Ceará coast. Despite small overall home ranges (Flores & Bazzalo, 2004), marine tucuxi dolphins show seasonal variation in its movements, possibly linked to their prey availability, however, it trend seems to vary among the study areas (Lodi, 2003, Garcia & Trujillo, 2004). However, Di Benedetto & Siciliano (2007) studying the diet of the stranded dolphins reported in this study, showed that marine tucuxi dolphins in this area feeds on neritic prey that are distributed through the water column and are abundant all year round. It suggests that the temporal environmental variables, such as wind direction and sea currents may promote strong influences in the seasonal variables of the stranding distribution of marine tucuxi dolphins in the study area. In general, their prey species have low commercial value or are considered as bycatch species in the local fisheries (Di Benedetto et al., 1998).

The results of the strandings referring to different classes of body length are presented in Figure 4. Most of the dolphins bycaught were included in class V (N=5) and VI (N=5), both representing 44.1% of all dolphins measured, showing that most were sexually mature (Figure 4; Di Benedetto & Ramos, 2004). In Ceará State Monteiro-Neto et al. (2000) showed that bycatch was more frequent in marine tucuxi dolphins that were >160 cm total body length. Santos et al. (2003) and Meirelles et al. (2006) also found similar results in south-east and north-east coast of Brazil, respectively.

Gillnet fisheries can cause serious impacts on dolphins community, particularly on the species living in coastal waters. Therefore, further studies have to be carried out to evaluate the population density of these dolphins in the study area to highlight the real threat that passive gillnets present to the existence of the animals.

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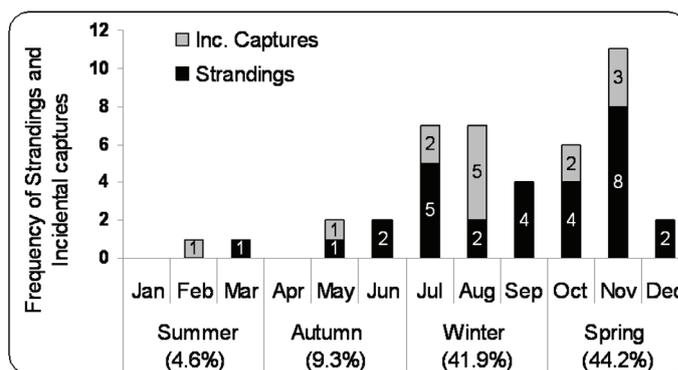


Figure 3. Number of marine tucuxi dolphin bycaught or non-bycaught in each season and month of the year, from July 2001 to August 2007 (N=43), in north-eastern coast of Rio de Janeiro State, Brazil. The numbers in each bar represents the number of dolphins reported in that month.

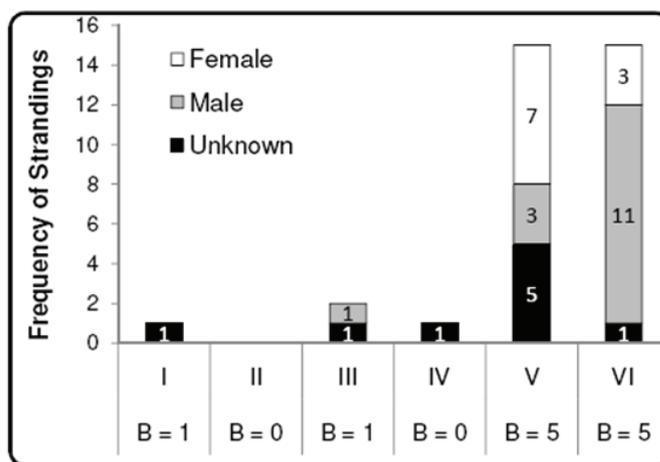


Figure 4. The number of bycaught or non-bycaught strandings for males, females, and unknown sex in each length-class stratum, from July 2001 to August 2007, in north-eastern coast of Rio de Janeiro State. B, Bycatch.

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