

Movements of the bottlenose Dolphin (*Tursiops truncatus*) in the Rio de Janeiro State, Southeastern Brazil

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Abstract: Aiming to verify the movements of the bottlenose dolphin (*Tursiops truncatus*) at Rio de Janeiro State coast, southeastern Brazil, we performed a photoidentification comparison between the catalogued individuals of the Cagarras Archipelago (23° 02' S and 43° 12' W) in 2004 and 2006 (n = 26) and the images obtained (n = 179) during the Southeastern Cetaceans Expedition, conducted during months of June and November of 2005. Eight individuals (three females and five dolphins of unknown gender) identified in the Cagarras Archipelago were resighted in the Grande Island (23° 21' S and 44° 15' W), about 100 km southwestwards from Cagarras Archipelago. The observed movements include distances commonly recorded for the species elsewhere and are probably related to search for prey.

Keywords: *Tursiops truncatus*, resightings, Rio de Janeiro state, southeastern Brazil.

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Resumo: Com o objetivo de verificar os deslocamentos do golfinho-nariz-de-garrafa (*Tursiops truncatus*) no estado do Rio de Janeiro, sudeste do Brasil, foi feita uma análise entre os indivíduos catalogados no arquipélago das Cagarras em 2004 e 2006 (n = 26) e as fotografias (n = 179) obtidas durante a Expedição Cetáceos do Sudeste, realizada em junho e novembro de 2005. Oito indivíduos (três fêmeas e cinco golfinhos de sexo indeterminado) identificados no arquipélago das Cagarras (23° 02' S e 43° 12' W) foram reavistados na Ilha Grande (23° 21' S e 44° 15' W), aproximadamente 100 km a sudoeste do arquipélago. Os deslocamentos observados estão dentro das distâncias comumente registradas para a espécie e, provavelmente, são relacionados com a busca de recursos alimentares.

Palavras-chave: *Tursiops truncatus*, reavistagens, deslocamentos, Rio de Janeiro.

Introduction

Coastal populations of the bottlenose dolphin, *Tursiops truncatus* (Montagu, 1821), may show a wide range of movements patterns, which include seasonal migration, stable residency and temporary residence with seasonal or yearly fidelity (e.g., Shane et al. 1986). Once distribution, movements, habitat use and home range for the species are influenced by the coastal habitat heterogeneity and its biological requirements, the environmental conditions may influence the prey distribution and consequently affect dolphins' distribution, abundance and seasonal variations of different bottlenose dolphin populations worldwide (Shane 1980, Ballance 1992, Felix 1997, Bearzi et al. 1997, Harzen 1998, Defran & Weller 1999, Bristow & Rees 2001, Bearzi 2005, Kerr et al. 2005).

Despite the fact that *T. truncatus* is considered the most studied dolphin species, the information about movements and home ranges in the Western South Atlantic Ocean are still scarce. Movements of more than 300 km northwards were registered for six dolphins in the Península Valdés, Argentina (Würsig 1978). In Brazil, movements of five bottlenose dolphins were reported for the southern of Rio Grande do Sul and Santa Catarina States (Möller et al. 1994, Simões-Lopes & Fabián 1999) with distances ranging between 65 and 314 km.

Bottlenose dolphins have been studied through video-identification and behavior observations in the Cagarras Archipelago (CA) since 2004. Dolphins occur in the archipelago in winter and spring seasons, and are typically observed foraging in groups of 15 individuals, but also in groups as large as 30 dolphins (Lodi 2005, and unpublished data). However, their movement patterns, site fidelity, residence and home range remain poorly known.

Aiming to verify the movements of the *T. truncatus* at Rio de Janeiro State coast, this paper reports onto a photoidentification comparison between the catalogued individuals of the CA and the pictures obtained during the Southeastern Cetaceans Expedition (SCE).

Material and Methods

In the CA (23° 02' S and 43° 12' W) dolphins were observed during 30 surveys between August and November from 2004 and 2006. These surveys were conducted using a 10 m boat with a 40 hp diesel engine. Video-identification was made using the following digital camcorders: HI-8 Handycam Sony DCR-TRV330 with optical zoom 25x (2004); DVD Handycam Sony DCR-DVD101 (2005) and mini-DV Handycam Sony DCR-HC26 with optical zoom 20x and enlarger (2x) coupled with the lens (2006).

Dolphins were individually identified naturally through photographs and/or video captured images of their dorsal fin, which generally lose tissue on the posterior edge. The pattern of scarification (number, shape and position of nicks and notches) on the back edge distinguishes most part of the individuals within a population permitting reliable identification of each individual (Hammond et al. 1990).

The degree of residency of different bottlenose dolphins of the CA was established using a simple Residency Index (RI): number of sightings of the dolphin / total number of surveys (Simões-Lopes & Fabián 1999). The term residence was regarded here as the time spent by an animal in a particular area (Wells & Scott 1990). Adult dolphins accompanied by a calf (less than half the size of the adult) in at least five surveys were considered to be a female. The other dolphins were of unknown gender. The RI was calculated only for the dolphins from CA, where systematic research effort was carried on.

The SCE comprised two phases, when during 56 days of effort more than 2.000 nautical miles were sampled. The first phase occurred from June 6th to 26th of 2005, and the second phase started on November 1st and lasted until December 5th of 2005. Photographs of

dorsal fins were collected with a digital camera Nikon D70 equipped with 70-300 mm lens. In the first phase a ship with 40 m was used, while on the second phase it was used a wooden trawler (15,5 m). The areas sampled during the SCE included mainly waters within the continental shelf of the States of Rio de Janeiro, Espírito Santo and Bahia, with occasional navigation in waters deeper than 200 m (Engel et al. 2007).

Photographs obtained during SCE were enlarged to the largest size possible without distorting details of the back edge of dorsal fins. Functions of the software Adobe® Photoshop (such as overlap of images, manipulation of color, size and position) were used to aid in the comparison with the CA catalog.

Results

Twenty-six individuals were identified in the CA in 2004 (CA# 001 to CA#020) and 2006 (CA#021 to CA#026). The dolphins sighted in the CA in 2005 could not be individually identified because the poor quality of the images taken in this year.

During SCE, nine groups of bottlenose dolphins were sighted (Figure 1), of which 134 photographs of apparent dorsal fins were obtained in Campos Basin (four groups) and 45 photographs in Grande Island (one group). These photographs were only analysed in order to find resightings and not to compile a catalog of individual dolphins.

One group of bottlenose dolphins was sighted near Grande Island (23° 21' S and 44° 15' W) in November 24th of 2005 during the second phase of SCE. This group had more than 20 individuals including calves, and was observed foraging near fishing boats and mariculture. From the dolphins identified in the CA (n = 26), eight (seven in 2004 and one in 2006) were resighted in the group observed near Grande Island. Of the resighted dolphins, three were females and eight were of unknown gender. Distance between the two locations was approximately 54 nautic miles (~100 km) (Figure 1).

From the 20 dolphins identified in 2004 in the CA, 12 (60%) were resighted in 2006 in the archipelago. The RI of the dolphins #001, #011, #012, #013, #017 and #018 in the CA varied from 0.3 to 1.0 in the two years of study, all of them were also observed near Grande Island in 2005. One dolphin (#15) was observed in the archipelago only in 2004 (RI= 0.5). Another dolphin (#021) resighted in Grande Island was observed in eleven surveys of the year 2006 in the CA (RI = 0.9) (Table 1).

Despite the dolphins sighted in the CA in 2005 could not be individually identified, the last sighting in the area was in September 21st, of a group with 15 dolphins, including three calves.

Discussion

Movements of coastal populations of *T. truncatus* may range from short distances (25-65 km) (Ballance 1992) to long distances of up to 670 km (Wells et al. 1990). Movements of 4,200 km were reported for oceanic waters (Wells et al. 1999).

According to Möller et al. (1994) and Simões-Lopes & Fabián (1999), the movements of *T. truncatus* in southern Brazil are probably related to their foraging behaviour, because they occurred mostly during the yearly mullet (*Mugil* sp.) migration, an important prey for this species' diet. However, Möller et al. (1994) do not reject the possibility that these movements are also associated to dispersion related to genetic exchange between groups of adjacent areas. Albeit individual interchanges have been detected, Möller et al. (1994) and Simões-Lopes & Fabián (1999) consider that bottlenose dolphins from Imbé/Tramandaí (Rio Grande do Sul State) and Laguna (Santa Catarina State) belong to distinct subsets of a metapopulation.

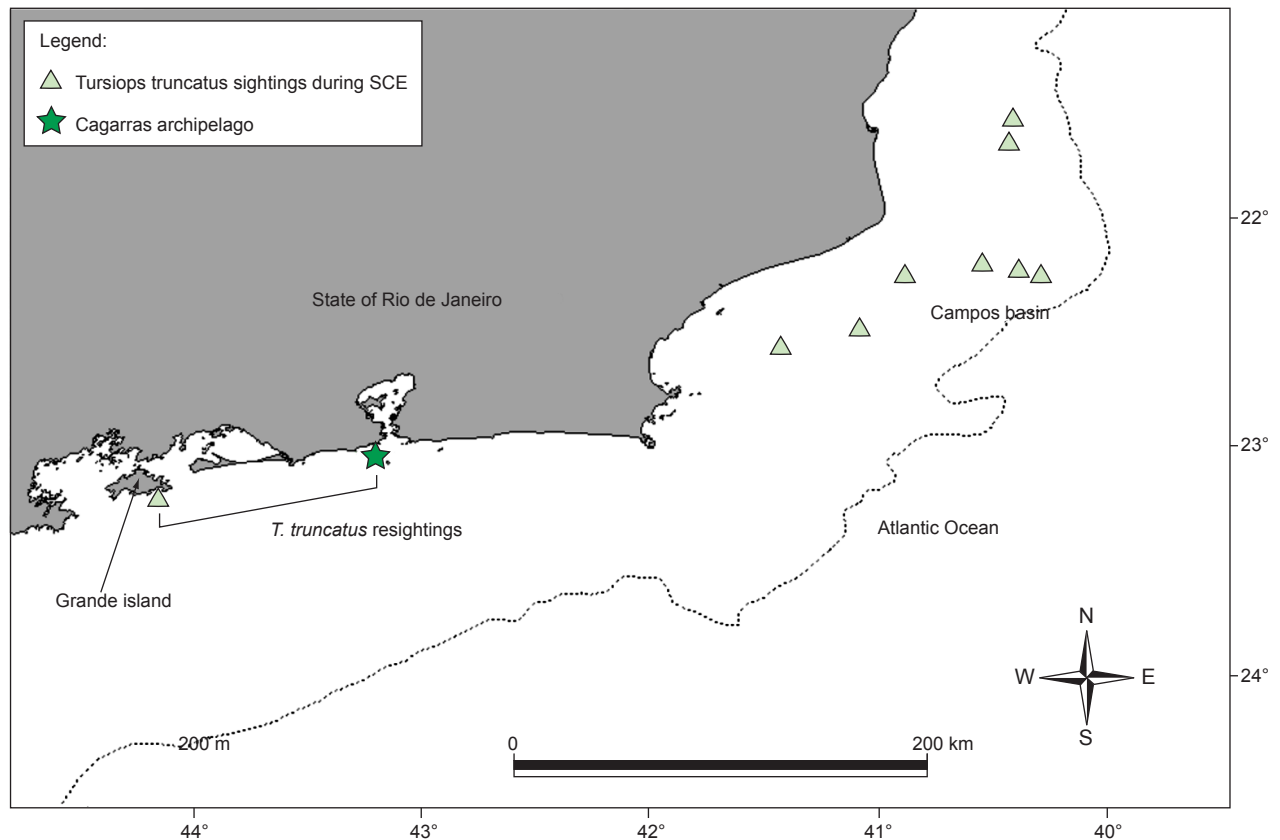
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Figure 1. Sightings of *Tursiops truncatus* during the Southeastern Cetaceans Expedition and locality of resightings along the coast of the state of Rio de Janeiro, Brazil.

Figura 1. Avistagens de *Tursiops truncatus* durante a Expedição Cetáceos do Sudeste e local das reavistagens ao longo da costa do estado do Rio de Janeiro, Brasil.

The high RI (0.7 to 1.0) obtained for some individuals in the CA suggests that many dolphins were resident in the winter and spring in the archipelago, while others were more transient.

Though the majority of individuals could not have their gender identified, the three identified females (#17, #18, #21) in the CA presented a high level of residence in the archipelago in 2004 and 2006. This result agrees with previously reported for other areas such as Sarasota, Florida (Wells 1991) and Laguna, southern Brazil (Simões-Lopes & Fabián 1999). Wells (1991) states that adult males tend to range farther than adult females and possibly when they leave the community home range, they serve as a vector for genetic exchange between populations or sub-populations.

In the present work, we identified movements of eight dolphins along a 100 km stretch of coast in the southeastern Brazilian coast. Open coastal habitats present a patchy and fragmented prey distribution when compared to estuarine systems, which provide enough nutrient resources to maintain a resident population. Distribution patterns inside a certain geographical area may reflect the oceanographic differences which directly or indirectly may affect the prey abundance and movement and, consequently, dolphin's habitat use and movements. The fact that dolphins were observed foraging in both areas (CA and Grande Island) suggests that movements of *T. truncatus* in the study area may be linked to the distribution and abundance of feeding resources, offering new foraging areas to the dolphins to search for food.

We did not find any resighting of dolphins sighted far from the coast (e.g., Campos Basin), suggesting that oceanic and coastal populations of *T. truncatus* may exist, with distinct ecological characteristics (Connor et al. 2000). However, a larger sampling effort is needed to study this matter.

Due to the complex social structure and behavioral flexibility, more information about occurrence, movements, home range and residence would represent important tools for conservation purposes, besides providing important data about population structure/interchange.

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Table 1. Residence Index (RI) for photo-identified bottlenose dolphins in the Cagarras Archipelago in the years of 2004 and 2006. Numbers indicate how many surveys the dolphins were sighted. * Dolphins resighted near Grande Island in November 24th, 2005.

Tabela 1. Índice de Residência (IR) de golfinhos-nariz-de-garrafa no arquipélago Cagarras nos anos de 2004 e 2006. Os números indicam os levantamentos que os golfinhos foram avistados. * Golfinhos reavistados próximo a Ilha Grande em 24 de novembro de 2005.

ID	2004 (n = 11 surveys)				RI 2004	2006 (n = 12 surveys)				RI 2006
	Aug. (n = 1)	Sep. (n = 5)	Oct. (n = 2)	Nov. (n = 3)		Aug. (n = 3)	Sep. (n = 2)	Oct. (n = 2)	Nov. (n = 5)	
CA#001*	-	5	-	3	0.7	3	1	2	3	0.7
CA#002	-	1	-	2	0.2	1	-	-	-	0.08
CA#003	-	3	-	-	0.2	-	-	-	-	0.0
CA#004	-	1	2	3	0.5	-	-	-	-	0.0
CA#005	-	5	2	3	0.9	-	-	-	1	0.08
CA#006	-	3	-	3	0.5	-	-	-	-	0.0
CA#007	-	3	-	1	0.3	-	-	-	-	0.0
CA#008	-	3	-	-	0.2	2	2	2	3	0.7
CA#009	-	5	1	1	0.6	3	1	2	3	0.7
CA#010	-	2	1	1	0.3	-	-	-	-	0.0
CA#011*	-	2	-	2	0.3	2	1	1	5	0.7
CA#012*	-	-	2	3	0.4	3	2	2	5	1.0
CA#013*	1	5	1	3	0.9	3	2	2	5	1.0
CA#014	-	5	-	1	0.5	1	1	-	1	0.4
CA#015*	-	3	1	2	0.5	-	-	-	-	0.0
CA#016	1	5	2	3	1.0	-	-	-	-	0.0
CA#017*	-	5	-	2	0.6	2	-	2	5	0.7
CA#018*	-	4	1	3	0.7	3	2	2	5	1.0
CA#019	-	4	1	1	0.5	-	-	-	-	0.0
CA#020	-	3	-	-	0.2	1	1	2	3	0.5
CA#021*	-	-	-	-	-	3	2	1	5	0.9
CA#022	-	-	-	-	-	3	1	2	5	0.9
CA#023	-	-	-	-	-	3	1	1	2	0.5
CA#024	-	-	-	-	-	2	-	1	2	0.4
CA#025	-	-	-	-	-	2	1	-	-	0.2
CA#026	-	-	-	-	-	2	-	-	1	0.2

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