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Site fidelity and residency of common bottlenose dolphins (Cetartiodactyla: Delphinidae) in a coastal insular habitat off southeastern Brazil

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Abstract: The occurrence of common bottlenose dolphins (*Tursiops truncatus*) in the coastal islands of southeastern Brazil is described based on video and photo-identification techniques conducted between 2004 and 2016. Annual and interannual occurrence patterns were determined through the sighting and resighting history of individually identified dolphins. A total of 32 dolphins were individually identified during the 98 surveys, with each animal being registered between one and 47 times. Site fidelity and residency were included as annual and interannual attributes, respectively. The Site Fidelity Index (SFI) ranged from 0.1 to 1.0. The SFI of the majority of the evaluated dolphins was classified as high (≥ 0.7) indicating strong site fidelity. Based on the residency criteria, 59.4% seasonal residents, 31.2% transients and 9.4% migrants and were assigned. The data support the hypothesis that this population is relatively stable, formed by the same animals of unknown origin with seasonal habits and high site fidelity and residency patterns, but with an apparent decline. These data reinforce the importance of the coastal islands off Rio de Janeiro as a critical habitat for the common bottlenose dolphins in southeastern Brazil and highlight the need for local conservation efforts to guarantee the maintenance of this possible small population unit.

Keywords: critical habitat, sighting-resighting data, Rio de Janeiro State, *Tursiops truncatus*

Resumo. Fidelidade de área e residência do golfinho-nariz-de-garrafa-comum em um habitat costeiro insular no sudeste do Brasil. A ocorrência do golfinho-nariz-de-garrafa-comum (*Tursiops truncatus*) nas ilhas costeiras da região Sudeste do Brasil é descrita baseada em técnicas de vídeo e foto-identificação conduzidas entre 2004 e 2016. Padrões de ocorrência anual e interanual foram determinados através da história de avistagem e reavistagem dos golfinhos identificados individualmente. Um total de 32 golfinhos foram identificados individualmente durante os 98 levantamentos sendo cada animal registrado entre uma e 47 vezes. Fidelidade de área e residência foram incluídas como atributos anuais e interanuais, respectivamente. O Índice de Fidelidade de Área (IFA) variou de 0,1 a 1,0. O IFA da maioria dos golfinhos avaliados foi classificado como alto (≥ 0,7) indicando forte fidelidade de área. Com base nos critérios de residência 59,4% residentes sazonais, 31.2% transientes e 9.4% migrantes e foram registrados. Os dados sustentam a hipótese de que esta população é relativamente estável, formada pelos mesmos animais de origem desconhecida, com habitos sazonais e padrões elevados de fidelidade e residência, mas com um declínio aparente. Esses dados reforçam a importância das ilhas costeiras ao largo do Rio de Janeiro como um habitat crítico para os golfinhos-nariz-de-garrafa-comum no sudeste do Brasil e destacam a necessidade de esforços locais de conservação para garantir a manutenção dessa possível pequena unidade populacional.

Palavras chave: Habitat critico, avistagem-reavistagem, Estado do Rio de Janeiro, *Tursiops truncatus*

Introduction

The common bottlenose dolphin (*Tursiops truncatus*) is widespread, with a discontinuous and common distribution in coastal and estuarine waters throughout the occidental South American coast. However, available information is still fragmented in most areas where the species occurs. Pelagic populations, including the continental slope, are still fairly unknown (Lodi *et al*. 2016).

Considerable information concerning the dynamics of a population may be gained through sightings and resightings through long-term studies using unique natural or acquired marks on the trail edge of the dorsal fin of free-ranging cetaceans. This identification technique is one of the many approaches for evaluating abundance, distribution, movement, site fidelity and residency patterns, among others (Mann 2000, Whitehead *et al*. 2000).

Individually identified common bottlenose dolphins have been intensively studied in various locations worldwide, and different stocks can be distinguished by their residency patterns. A common trait observed in many of these studies is behavioral plasticity, characterized by the distribution patterns and habitat use for distinct populations (Wells 1991). Throughout their tropical and temperate range, discrete coastal populations exhibit a rich spectrum of movements, which often occur either seasonally or year round (e.g. Shane *et al*. 1986, Wilson *et al*. 2004). Such complex behavioral patterns vary between populations and are probably associated with the different habitat pressures to which each population is subjected (Bearzi *et al*. 1997, Hastie *et al*. 2004, Morteo *et al*. 2017).

In southeastern Brazil, the Cagarras Archipelago, a group of costal islands off the city of Rio de Janeiro, is the only area in which systematic studies are being conducted on *T. truncatus*, since 2004, though common bottlenose dolphins were first recorded in the archipelago in 1993 (Hetzel & Lodi 1993).

The aim of the present study was to quantify the sightings and resightings of individually identified common bottlenose dolphin at the Cagarras Archipelago, as well as at Redonda Island, a Marine Protected Area, based on data collected in 2004 and from 2006 to 2016. The sighting and resighting history of identified animals was analyzed to determine site fidelity and residency patterns of annual and interannual occurrences near the coastal islands off the city of Rio de Janeiro. The objectives evaluated herein meet the goals of the Report of the Working Group on Habitat Use of *T. truncatus* in the Southwest Atlantic Ocean, that include improved habitat use characterization in regions where resident, partially and seasonal resident populations exist, the intensification of individual identification studies, promoting the comparisons between catalogues and further efforts regarding stock identification and structure in coastal areas (Laporta *et al*. 2016).

Material and Methods

Study area: The Cagarras Archipelago (23°02´S 043°12´W; 23°13´S 43°10´W) comprises a small set of coastal islands located around 3.8 km south to Ponta do Arpoador, Rio de Janeiro, southeastern Brazil (Figure 1). The archipelago is composed of the Cagarra, Comprida, Palmas, Filhote da Cagarra Islands and Matias and Praça Onze rocky outcrops. Its waters depth ranges from 2 m to 18 m and its internal area is of approximately 2.39 km^2 (Nautical Chart No. 1501, Diretoria de Hidrografia e Navegação da Marinha do Brasil). Its inner portion is protected from waves and boats destined for tourism, nautical sports, rest and shelter.

The other islands around the archipelago (Figure 1) include Redonda Island (23°04`S - 043°11`W) located 3.3 km south of Comprida Island, and 8.5 km from Ponta do Arpoador, and Rasa Island (23°03'S - 043°08'W) located 4.5 km east of Redonda Island and 9.1 km from Ponta do Arpoador.

On April 13, 2010, a Marine Protected Area (MPA) named the Natural Monument of the Cagarras Islands (*Monumento Natural do Arquipélago das Ilhas Cagarras* - MoNa Ilhas Cagarras) was established by the Federal Law Number 12229, the first MPA in the city of Rio de Janeiro. The MoNa Ilhas Cagarras limits include Cagarra, Comprida, Palmas, Filhote da Cagarra Islands, as well as a 10 m radius of marine area around each island, totaling 87.86 ha. Rasa Island, as a military area and protected by the Brazilian navy, was not included in the MPA, since it is considered a national security area.

Despite its scientific and economic value and its proximity to one of the major urban cities in

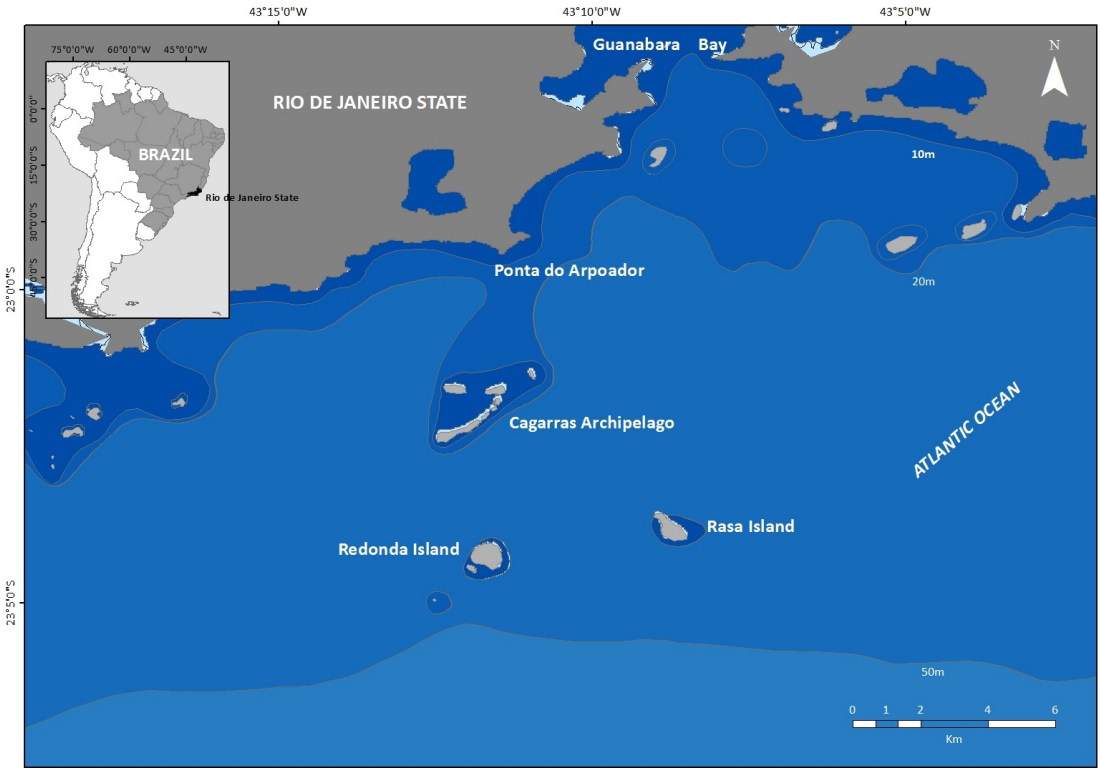

Figure 1. Study area showing the Cagarras Archipelago, Redonda and Rasa Islands, off the coast of the city of Rio de Janeiro, southeastern Brazil.

Brazil, Rio de Janeiro, the Cagarras Archipelago biodiversity has been described only recently (Moraes *et al*. 2013).

Sampling protocol: Weekly boat-based surveys were conducted in favorable weather (Beaufort scale ≤ 2) between 2004 and 2016, with the exception of 2005 (August to November in 2004, 2006 and 2010, August to October in 2007, 2008 and 2009, August to December in 2011 and 2012). Since historic data about common bottlenose dolphins indicate this species is present at the Cagarras Archipelago during austral winter and spring (Barbosa *et al*. 2008; L. Lodi, unpublished data), sampling efforts were concentrated during these seasons. However, some surveys were also conducted during others seasons to evaluate if seasonal patterns were altered (e.g. March to June in 2013 and January to December in 2014 to 2016).

Search efforts focused on the interior of the Cagarras insular complex and aimed to cover this area homogeneously. The greater frequency of sightings has been reported within the insular complex (Barbosa *et al*. 2008). Thus, search protocol was not random due to the reduced area of the archipelago, and efforts were concentrated within the insular complex. For all surveys, common bottlenose dolphins were already present in the inner area of the archipelago when the team arrived and remained there until the team left. Surveys in adjacent areas (radius 1 km) of the archipelago were also conducted, but no common bottlenose dolphins were sighted.

Once dolphins were sighted, boat speed was reduced and the course was set to approach but not intercept the group. Rapid or erratic changes in the speed or direction of the boat were avoided in order to minimize disturbances. Dolphins were followed until all animals were filmed (vídeo camera Sony Hi-8 Handycam DCR-TRV330, 320 pixels, 400 lines resolution with 25X optical zoom and 750X digital zoom) and photographed (digital SLR câmeras Canon 40D and 7D, with 70 to 300 mm lenses). The data were recorded by a single observer (LL).

To ensure equal video and photo probability for all dolphins, every sighted animal regardless of the presence of distinctive marks on the dorsal fin was filmed and photographed.

Data analyses: Adult individuals were identified based on the profile shape of their dorsal fins and the presence of nicks and scars, using the video-identification technique proposed by Lodi *et al*. (2009) during the 2004 and 2006 to 2008 boat surveys. In subsequent years, the photo-identification technique was used (Würsig &

Jefferson 1990).

The best image of each individual (in which the dorsal fin was in focus and perpendicular to the cameras) was compared with the best photographs taken of previously identified individuals and these were then compiled into a catalogue of all identified individuals from the study area. The photographs were compared using Darwin©2.0 software package (Eckerd College Dolphin Research Group). A single trained operator (LL) made all the dorsal fin analysis and an independent reviewer was used to confirm the photo-identification catalogue's identification reliability.

Site fidelity is defined as the tendency of an animal to occupy an area or return to a previously used area for a certain period of time (White & Garrot 1990). Site fidelity herein was determined by examining the sighting frequency (number of sightings for each individual), number of years observed and mean monthly sighting rate. Resightings were quantified using the Site Fidelity Index (SFI), defined as the ratio between the number of records of identified individuals and the total number of surveys (adapted from Simões-Lopes & Fabian 1999). SFI were classified into the following categories: High = SFI ≥ 0.7; Intermediate = 0.4 ≤ SFI < 0.7; Low = SFI < 0.4. Significant differences in SFI among years were tested using the non-parametric Kruskal-Wallis test, since data did not meet parametric assumptions (Zar 1984). Analyses were conducted on the R Studio software, v.1.0.136.

Residency is generally defined based on the amount of time an individual spends in a certain geographic area (Wells & Scott 1990). Residence patterns were assigned to individual dolphins based on their sighting/resighting histories, adapted from Dinis *et al*. (2016). The term resident was used to designate dolphins that were seen regularly during the study period in the study area for two or more consecutive years. Dolphins seen more than once but in non-consecutive years were considered migrants. Transient dolphins were defined as those seen only in one of the years in the study area (once or multiple times in the same year).

The term group was used as the sampling unit and was defined as all dolphins sighted within 100 m radius of each other (Wells *et al*. 1987). All individuals were classified into four age categories based on their behavior and size estimates following Wells (1991), Bearzi *et al*. (1997), Mann (2000), Quintana-Rizzo & Wells (2001) and Shane (2004): (a) neonate - < 1/3 of adult size, presence of fetal folds, immature swimming, stereotyped surface respiration, frequent and non-coordinated head-butting against the water, (b) calf - ½ of adult size, typical dislocation behind the dorsal fin of the presumed mother, (c) juvenile – 2/3 of adult size, and (d) adult – approximately 3 m in length. Neonates, calves and juveniles were considered immature.

Results

To examine site fidelity and residency, data collected from 202 surveys dedicated to searching for common bottlenose dolphins conducted in 2004 and 2006 to 2016 were evaluated. Despite the increased the sampling effort conducted in the study area between 2011 and 2014 common bottlenose dolphins were not registered in the study area (Table I). The number of monthly field expeditions varied between one and five, averaging three per month. The lack of regularity in the expeditions was due to by unfavorable environmental conditions. Both catalogued and new individuals were observed in Cagarras Archipelago and also near Redonda and Rasa Islands in 2015 and 2016.

Group size (N = 60) ranged from 1 to 30 individuals, with a mean overall group size of 12.2 (SD = ±7.6, median 12.5, mode 5). The largest means group size occurred in 2004 and the smallest in 2016 (Table I). Group size did not vary between the morning and the afternoon counts. The mean number of immature individuals in the groups varied between 7.8 (2004) and 1.0 (2016). Neonates were observed in 17 groups (28.4%), usually during the spring (94%). Calves and/or juveniles were observed across all the study. Table I shows that most adult dolphins have been identified and we believe individual identification was successful.

The individual identification data were collected on 29h41min of digital videotape, of which 8h02min (27.2%) contained useful information, as well as approximately 4,700 photos, of which 1,300 (27.6%) were adequate for dolphin identification. The number of identified dolphins varied from 3 to 20 between years. The percentage of newly identified animals decreased over the years, with 20 dolphins identified in 2004 (62.5% of the total), 9 (28.1%) from 2006 to 2008 and 3 (9.3%) in 2015. The cumulative curve of newly identified dolphins showed a consistent increase until 2006, when it reached an asymptote, increasing again in 2015 with the reappearance of the dolphins (Figure 2). The trend of the discovery curve suggests that an

Table I. Summary of annual sampling effort, with results of the individual identification of common bottlenose dolphins and group characteristics at the Cagarras Archipelago, Redonda and Rasa Islands, southeastern Brazil.

Year	Number of surveys	Sampling effort (min.)	Total groups	Sighted groups per survey	Mean number of identified dolphins ± SD	Mean number of immatures ± SD	Mean group size ± SD	Group size range
2004	11	3,960	11	1	11.5 ± 0.7	7.8 ± 2.3	21.4 ±3.3	18-30
2006	12	2,659	12	1	11 ± 2.4	5.8 ± 1.4	17.3 ± 1.5	15-19
2007	10	2,108	10	1	10.7 ± 2.6	5.9 ± 1.3	16.6 ± 3.6	10-21
2008	10	2,015	9	0.9	4.5 ± 0.8	0	4.4 ± 0.8	3-5
2009	11	2,678	4	0.4	5.5 ± 1.7	5.5 ± 1.7	5.5 ± 1.7	4-7
2010	11	2,542	5	0.4	3 ± 0	1.6 ± 0.5	5	5
2011	20	5,560	0	0	0	0	-	-
2012	21	4560	0	0	0	0	-	-
2013	10	5,103	0	0	0	0	-	-
2014	35	9,450	0	0	0	0	-	-
2015	25	11,064	4	0.1	3.5 ± 1.9	2.6 ± 0,5	7.7 ± 4.5	1-10
2016	26	7,290	5	0.2	3.2 ± 1.5	1.0 ± 0	3.8 ± 1.7	2-6
Total	202	58,989	60				12.2±7.6	

appropriate sampling effort was executed, and that a relatively small number of dolphins use the area. The sighting frequency range of identified individuals between the years is shown in Table II.

Table III provide the total number of sightings and the annual history of each of the 32 identified dolphins throughout the study (N = 457). In 2015 and 2016, the SFI analysis was considered from July to December for standardization (leveling) of the data with previous years. During the first six months of the year dolphins were not sighted, reinforcing their seasonal occurrence in the study area. Individual sighting histories varied greatly. Records (including sightings and resightings) varied between one and 47 (mean = 14.2, SD = ±12.7, mode = 6, median = 8) for the entire period.

The SFI of individual dolphins and the annual averages are present in Table III. Most dolphins were resighted during at least two different occasions. Large numbers of resightings were recorded for most identified dolphins in 2006, 2007 and 2008. The SFI of most animals during these years was high, a strong evidence of fidelity to the area. The highest mean SFI occurred in 2008, followed by 2007, with the lowest index occurring in 2015 and 2016, when common bottlenose dolphins returned to the archipelago after 4 years of absence (Figure 3). Individual SFI along the years varied significantly ($F = 52.6$, $df = 7$, $p < 0.001$).

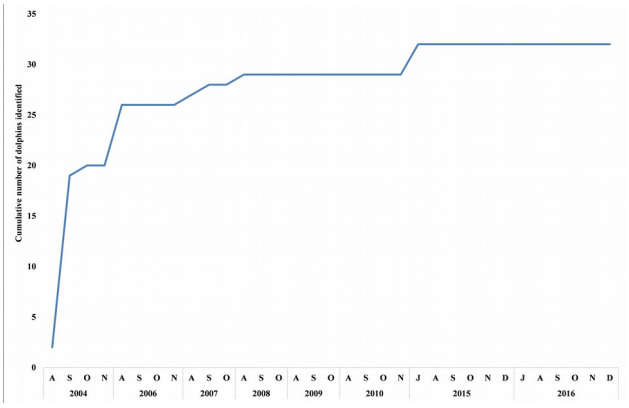

Figure 2. Cumulative curve of common bottlenose dolphin identification in coastal islands off Rio de Janeiro between 2004 and 2006 to 2016.

Table II. Sighting frequency range, mean and standard deviation of identified individuals between 2004 and 2016. No individuals were sighted for the years 2011 to 2014.

Year	Frequency range	Mean	±SD
2004	3-11	6.2	2.4
2006	1-12	7.3	3.7
2007	1-10	7.2	3.0
2008	7-9	8.2	0.8
2009	2-4	2.8	0.9
2010	5	--	--
2015	1-3	2.1	0.6
2016	1-3	2.0	0.5

A long-term residency pattern was detected by resightings of two dolphins (AC#001 and AC#012) for 7 to 8 years in the study area. The maximum interval between resightings was ten years for one individual (AC#002).

Discussion

Common bottlenose dolphin site fidelity and residence near the coastal islands off the coast of the city of Rio de Janeiro is different from the well-known resident populations already identified within the Southwest Atlantic Ocean, such as those found in estuarine regions, river mouths and coastal lagoons from southern Brazil, Uruguay and Argentina (e.g. Daura-Jorge *et al.* 2013, Fruet *et al*. 2015, Giacomo & Ott 2016, Laporta *et al*. 2016, Lodi *et al*. 2016, Simões-Lopes & Fabian 1999, Vermeulen & Cammareri 2009). Animal behavior within different habitats indicates the ecological function of such areas. Open coastal locations, except in upwelling areas, often exhibit an aggregated and ephemeral prey distribution in comparison to estuarine habitats that are able to supply sufficient food to maintain a resident community (Bearzi *et al*. 1997, Hastie *et al*. 2004, Shane *et al*. 1986).

The pattern of seasonal occurrence at the Cagarras Archipelago differs from what has been observed in other insular coastal ecosystems, in which common bottlenose dolphins occur during all seasons, albeit with fluctuations in individually recognized individuals, sighting frequencies and/or relative abundance (Bearzi *et al*. 1997, Flores & Fontoura 2006, Oviedo & Silva 2005, Shane 2004, Wedekin *et al*. 2008). Although results of the cumulative curve are extremely dependent on the capturability probabilities (Morteo *et al*. 2012) in this study the majority of adult group members that presented nicks and notches on their dorsal fin were captured.

The evidence of a non-structured social network seems to be coupled with seasonal use of the insular protected area for calf rearing, nursing and/or reproductive strategies (Lodi & Monteiro-Neto, 2012, Lodi *et al*. 2014). The data obtained with regard to the presence of immature individuals in the groups support the idea that the archipelago may be used during a particular time of the year as a calf-rearing area. The archipelago is the best-protected group of islands off the coast of the city of Rio de Janeiro.

The dolphins that occur at the Cagarras Archipelago may be not be an aggregation of individuals from different populations in a specific area, but a relatively stable group formed by the same animals with the same seasonal and coastal habits, forming a possible population unit of unknown origin (Lodi *et al*. 2014). This hypothesis gains strength due to the long intervals between resightings of transient individuals, the return of 5 seasonal residents (AC#001, AC#002, AC#012, AC#18 and AC#023) after 4 years of absence in the study area and 3 new individuals identified in 2015. This suggests that common bottlenose dolphins use the Cagarras Archipelago, Redonda and Rasa Islands as part of a still unknown, more extensive, range. However, it is quite possible that additional individuals may still be identified in the future due to the dynamic nature of bottlenose dolphin fission-fusion society (Mann 2000). With regard to social interactions in the study area, within the stable group dyadic associations are fluid and mostly of short duration, similar to well-known coastal bottlenose dolphin societies (Lodi *et al*. 2014). Understanding the nature of this common bottlenose dolphin possibly small population unit clearly demands continued research efforts.

Movements of common bottlenose dolphin along the coast of Rio de Janeiro state are poorly understood. No correspondences were found between individuals identified at Cagarras Archipelago, and those catalogued (N=90) off the state's coast through in March and April 2014 and March 2017 (L. Lodi, unpublished data). Eight individuals from the Cagarras Archipelago catalogue were resighted in November 2005 in a group of more than 20 animals at Jorge Grego Island (23°21´ S, 44°15`W), approximately 100 km south in a straight-line distance between the two sightings (Lodi *et al*. 2008). More recently (July, 2017), two catalogued individuals were observed opportunistically 3.5 km southwest off Rasa Island (23°05`S, 043°09´W). These are the only records of the common bottlenose dolphins that use the coastal islands of Rio de Janeiro in different

Table III. Individual identification code, total records (sightings + resightings), annual occurrence and Site Fidelity Indices (SFI) of common bottlenose dolphins identified at the Cagarras Archipelago, Redonda and Rasa Islands in 2004, 2006-2010 and 2015-2016. The number of surveys is expressed in parenthesis. No individuals were sighted for the years 2011 to 2014.

ID. Code	Total Records Sigh. +Resig.	Site Fidelity Index per Year (No.surveys)								
		2004	2006	2007	2008	2009	2010	2015	2016	Total
		(11)	(12)	(10)	(10)	(11)	(11)	(13)	(20)	(98)
AC#001	47	0.7	0.7	1.0	1.0	0.1	0.4	0.07	0.1	0.4
AC#002	6	0.2	0.1	-	-	-	-	-	0.1	0.05
AC#003	6	0.2	-	0.3	-	-	-	-	-	0.05
AC#004	6	0.5	-	-	-	-	-	-	-	0.04
AC#005	12	0.9	0.1	-	-	-	-	-	-	0.1
AC#006	6	0.5	-	-	-	-	-	-	-	0.05
AC#007	6	0.5	-	-	-	-	-	-	-	0.05
AC#008	12	0.2	0.7	-	-	-	-	-	-	0.1
AC#009	16	0.6	0.7	-	-	-	-	-	-	0.1
AC#010	4	0.3	-	-	-	-	-	-	-	0.03
AC#011	22	0.3	0.7	0.9	-	-	-	-	-	0.2
AC#012	40	0.4	1.0	1.0	-	0.3	0.4	0.2	0.05	0.3
AC#013	32	0.9	1.0	1.0	-	-	-	-	-	0.3
AC#014	9	0.5	0.2	-	-	-	-	-	-	0.08
AC#015	6	0.5	-	-	-	-	-	-	-	0.05
AC#016	11	1.0	-	-	-	-	-	-	-	0.1
AC#017	34	0.6	0.7	0.8	0.8	0.1	-	-	-	0.3
AC#018	40	0.7	1.0	1.0	-	0.1	0.4	0.2	-	0.3
AC#019	6	0.5	-	-	-	-	-	-	-	0.05
AC#020	18	0.2	0.4	-	0.9	-	-	-	-	0.1
AC#021	19	-	0.9	0.8	-	-	-	-	-	0.1
AC#022	19	-	0.9	0.8	-	-	-	-	-	0.1
AC#023	33	-	0.5	0.9	1.0	0.3	-	0.1	0.1	0.3
AC#024	12	-	0.4	0.7	-	-	-	-	-	0.1
AC#025	3	-	0.1	0.1	-	-	-	-	-	0.02
AC#026	5	-	0.2	0.2	-	-	-	-	-	0.04
AC#027	7	-	-	0.7	-	-	-	-	-	0.06
AC#028	5	-	-	0.5	-	-	-	-	-	0.04
AC#029	7	-	-	-	0.7	-	-	-	-	0.06
AC#030	5	-	-	-	-	-	-	0.1	0.07	0.04
AC#031	2	-	-	-	-	-	-	0.1	-	0.01
AC#032	1	-	-	-	-	-	-	0.01	-	0.009
Total Records	457									
Mean ± SD	14.2±12.7	0.5 ±0.2	0.5 ±0.3	0.7±0.3	0.8±0.1	0.2±0.1	0.4	0.1±0.05	0.08±0.02	0.11±0.10

Figure 3. Common bottlenose dolphins at the Cagarras Archipelago in July 2015, after four years without records in the study area. Photography by Liliane Lodi.

areas. Group size of common bottlenose dolphins found at Cagarras Archipelago and Redonda and Rasa Islands was small (median 12.2) and similar to those found in studies of other coastal areas (Bearzi *et al*. 1997, Merriman *et al*. 2009). Large groups observed in coastal areas off Rio de Janeiro were estimated as comprising 40-80 individuals (L. Lodi, unpublished data), consistent with reports of larger groups being found in offshore waters (e.g. Canãdas & Hammond 2006, Forcada *et al*. 2004). Nevertheless, morphological characteristics and color pattern observed for the dolphins occurring at Cagarras Archipelago are in line with those of the oceanic ecotype, i.e. larger size, robust body, darker coloration with distinct dorsal cape and visible spinal blaze (light blaze), falcate dorsal fin, tip and posterior edge of the dorsal fin and caudal peduncle may be whitish in larger individuals (caused by intraspecific teeth scarification and abundant in some individuals) (e.g. Simões-Lopes & Daura-Jorge 2008, Cremer *et al*. 2009).

Lodi *et al*. (2014) reports that the "Cagarras common bottlenose dolphins" are a possible small population unit formed by the same animals with an apparent population decline. Abundance estimates obtained by mark-resights and POPAN ranged from 38 (2004) to 4 individuals (2010) and 22 (2004) to 5 individuals (2010), respectively, and is characterized by low survival probabilities (64%). Vermeulen & Bräger (2015) reviewed the available literature and found an increasing numbers of costal common bottlenose dolphins populations worldwide reported as vulnerable or in decline due to direct and indirect human interferences. Small animal populations confined to restricted geographic areas are often a priority for conservation purposes (Smith *et al*. 2006). The available information on local potential threats include overfishing, organic pollution from adjacent land activities, intense boat traffic and increasing human recreational activities (see Lodi & Monteiro-Neto 2012 and references therein, Moraes *et al*. 2013).

Proposed conservation measures mentioned in the Report of the Working Group on the Distribution of *Tursiops truncatus* in the Southwest Atlantic Ocean recommended the compilation of available information regarding the species occurrence inside the existing Marine Protected Area to implement and/or reinforce conservation measures, and develop zoning plans in areas where resident and seasonally

resident populations are known to occur (Lodi *et al*. 2016). The use of the area by boats and recreational activities is of particular concern, since most of the observed groups include neonates, calves and juveniles. The data gathered herein constitute the first attempt to better understand common bottlenose dolphin site fidelity and residence, obtaining baseline data in the elaboration of the management plan at the MoNa Ilhas Cagarras, imperative in achieving its conservation, in light of the close geographical proximity of this protected area to a large metropolis such as Rio de Janeiro city, suffering all the pressures of urban development.

The ecological and socioeconomic importance of dolphins as charismatic megafauna, as well as their potential as a flag species within the studied area, may be applied as an additional support to strengthen the efforts for the conservation regarding the Cagarras Archipelago and Redonda Island.

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