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Site-fidelity of Guiana dolphins, *Sotalia guianensis*, in a protected marine area in northeastern Brazil

Gessica Rafaelly Dantas da Silva[1], Vitor de Oliveira Lunardi[2], Josivânia Emanuelly Azevedo dos Santos[3], Diana Gonçalves Lunardi[4]

[1]Mestre em Ambiente, Tecnologia e Sociedade, Universidade Federal Rural do Semi-Árido (UFERSA), Doutoranda no Programa de Pós-Graduação em Psicobiologia, Universidade Federal do Rio Grande do Norte, Caixa Postal 1524, 59078-900, Natal, Rio Grande do Norte (RN). gesrafaelly@gmail.com Orcid ID: 0000-0002-6554-2500. [2]Dr. em Ecologia, Professor Associado, Departamento de Biociências, UFERSA, Av. Francisco Mota, 572, 59625-900, Mossoró, RN. lunardi.vitor@ufersa.edu.br Orcid ID: 0000-0003-0977-382X. [3]Mestre em Ambiente, Tecnologia e Sociedade, UFERSA, Doutoranda no Programa de Pós-Graduação em Desenvolvimento e Meio Ambiente, UFERSA, Av. Francisco Mota, 572, 59625-900, Mossoró, RN. emanuelly.josivania@gmail.com Orcid ID: 0000-0002-8777-1056. [4]Dra. em Psicobiologia, Professora Associada, Departamento de Engenharia e Ciências Ambientais. Centro de Engenharias, Programa de Pós-Graduação em Desenvolvimento e Meio Ambiente, UFERSA, Av. Francisco Mota, 572, 59625-900, Mossoró, RN. lunardi.diana@ufersa.edu.br (corresponding author) Orcid ID: 0000-0001-5535-2917.

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A B S T R A C T

The tendency of an animal to return to a previously occupied area is referred to as habitat fidelity. Habitat fidelity patterns have significant implications for cetacean conservation, as knowledge about the spatiotemporal dynamics of individuals is crucial for identifying and managing protected areas. This study investigated habitat fidelity patterns of the Guiana dolphin, *Sotalia guianensis*, an endangered species, using photo-identification techniques over seven years in the Tibau do Sul Coastal Fauna Reserve (REFAUTS), northeastern Brazil. Photo-identification of Guiana dolphins was carried out from 2013 to 2019, during 41 sampling days, using a camera coupled with a 150-600 mm lens. The site fidelity rate (SFR) for each photo-identified individual was calculated by the ratio of the number of years the individual was recorded in the study area to the total number of years of sampling. The SFR was classified into the categories high habitat fidelity: SFR greater than 0.7; intermediate habitat fidelity: SFR between 0.4 and 0.7; and low habitat fidelity: SFR less than 0.4. Of a total of 45 Guiana dolphins photo-identified in the REFAUTS area, two demonstrated high habitat fidelity, 10 demonstrated intermediate habitat fidelity, and 33 demonstrated low habitat fidelity. This study revealed that the REFAUTS area harbors resident Guiana dolphins, but also transient ones, which move through a network of adjacent sub-areas.

Keywords: biogeography, conservation, marine mammals, photo-identification, use of the space.

Fidelidade de habitat de botos-cinza, *Sotalia guianensis*, em uma área marinha protegida no nordeste do Brasil

R E S U M O

A tendência de um animal retornar a uma área previamente ocupada é denominada fidelidade de habitat. Padrões de fidelidade de habitat têm implicações importantes para a conservação de cetáceos, pois o conhecimento sobre a dinâmica espaço temporal de indivíduos é crucial para a identificação e a gestão de áreas protegidas. Neste estudo foram investigados padrões de fidelidade de habitat do boto-cinza, *Sotalia guianensis*, uma espécie ameaçada de extinção, por meio da técnica de fotoidentificação de indivíduos, realizada ao longo de sete anos na Reserva de Fauna Costeira de Tibau do Sul (REFAUTS), nordeste do Brasil. A fotoidentificação de botos-cinza foi realizada de 2013 a 2019, durante 41 dias de amostragem, utilizando uma câmera fotográfica acoplada a uma lente de 150-600 mm. A taxa de fidelidade de habitat (SFR) para cada indivíduo fotoidentificado foi calculada pela razão do número de anos em que o indivíduo foi registrado na área de estudo, pelo número total de anos de amostragem. A SFR foi classificada nas categorias alta fidelidade de habitat: SFR maior que 0,7; fidelidade de habitat intermediária: SFR entre 0,4 e 0,7; e baixa fidelidade de habitat SFR menor que 0,4. De um total de 45 botos-cinza fotoidentificados na REFAUTS, dois demonstraram alta fidelidade de habitat, 10 demonstraram fidelidade de habitat intermediária e 33 demonstraram baixa fidelidade de habitat. Este estudo revelou que a REFAUTS abriga botos-cinza residentes, mas também transientes, que transitam por uma rede de subáreas adjacentes.

Palavras-chave: biogeografia, conservação, fotoidentificação, mamíferos marinhos, uso do espaço.

Introduction

Individuals in a population may differ in the use of habitat in space and time. This is a component of animal behavior that makes it possible to understand some patterns and aspects of movement related to the species' life history (Tschopp et al., 2018). Individuals in a population may visit an area occasionally or frequently, while other individuals may remain in the same area from birth to death (Meager et al., 2018; Pérez-Alvarez et al., 2018). In cetaceans, the animal's tendency to return to a previously occupied area is defined as site-fidelity (Lodi & Tardin, 2018; Meager et al., 2018). The level of site-fidelity that an individual has in a specific area and its patterns of variation reflect a set of extrinsic factors, involving, for example, environmental conditions, habitat quality, distribution of food resources, potential partners, predators, intra and interspecific competition, and population density. The level of site-fidelity is also related to intrinsic components, such as body size, individual experience, sex, and age (O'Brien et al., 2020; Passadore et al., 2018).

In low-productivity marine landscapes and with heterogeneous habitats, individuals increase their fitness following an opportunistic strategy, moving between high-quality habitats, which results in low site-fidelity (Passadore et al., 2018). On the other hand, in seascapes where high-quality habitats exist and resources are predictable, individuals can exhibit high site-fidelity (Caputo et al., 2021). Such patterns of site-fidelity and use of space have important implications for the conservation of these animals. For example, species of dolphins with high site-fidelity are more prone to population declines due to local threats, such as habitat degradation and loss and mortality from human activities (Atkins et al., 2016). Therefore, understanding the patterns of site-fidelity and the use of space are fundamental to assess the effects of human impacts and guide conservation strategies.

The Guiana dolphin, *Sotalia guianensis* (van Bénéden, 1864) is a small cetacean with distribution on the Atlantic Coast of South America and Central America to Honduras (Secchi et al., 2018). The Guiana dolphin does not make large displacements and can remain in the same area throughout the year. Some populations have high site-fidelity associated with inlets, bays and estuaries and reside in these habitats (see Cantor et al., 2012). In Brazil, the main areas of concentration of Guiana dolphins include the coastal areas of Pará (Emin-Lima et al., 2010), Maranhão (Pivari et al., 2020), Ceará (Meirelles et al., 2020), Rio Grande do Norte (Lunardi & Ferreira, 2014), Pernambuco (Araújo et al., 2008), Bahia (Cantor et al., 2012), Espírito Santo (Lima et al., 2017), Rio de Janeiro (Espécie et al., 2010), São Paulo (Mello et al., 2019) and Santa Catarina (Flores et al., 2018). The permanence of Guiana dolphins in certain areas can be related to the availability of food resources, the social organization of populations and/or the degree of interference by human activities (see Hardt et al., 2010; Meirelles et al., 2020; Mello et al., 2019; Nery et al., 2008). Understanding the habitat use pattern for different individuals in a population can help in identifying the critical areas for conservation of this species throughout its distribution range (e.g., Meirelles et al., 2020; Mello et al., 2019).

The Tibau do Sul Coastal Wildlife Reserve (REFAUTS), Rio Grande do Norte, is one of the main areas of concentration of Guiana dolphins in northeastern Brazil, used mainly for feeding and parental care (Lunardi & Ferreira, 2014; Silva et al., 2024). Although the Guiana dolphin has been the subject of several studies on the Brazilian coast, its population parameters are still insufficiently known (Secchi et al., 2018), especially in Rio Grande do Norte, and population studies can contribute to a more comprehensive assessment regarding its conservation status.

Currently, the Guiana dolphin is threatened with extinction, according to the Official Brazilian List of Endangered Species of Fauna (Farro et al., 2025; Ministério do Meio Ambiente, 2022). It is listed as near threatened internationally, considering the complete species distribution, according to the International Union for Conservation of Nature's (IUCN) Red List of Threatened Species (Secchi et al., 2018). In this study, the site-fidelity of Guiana dolphins, *Sotalia guianensis*, was analyzed in the Tibau do Sul Coastal Wildlife Reserve (REFAUTS), northeastern Brazil, to subsidize conservation strategies for this species, threatened with extinction on the Brazilian coast. It is worth mentioning that this is the first long-term study to examine the site-fidelity of Guiana dolphins on the coast of Rio Grande do Norte.

Material and methods

Study area

The REFAUTS (6º13'36.7"S, 35º3'36.7"W) is located in the district of Pipa, municipality of Tibau do Sul, State of Rio Grande

do Norte, Brazil. This Wildlife Reserve was created in 2006, as a protected area for sustainable use and includes a narrow strip of beach and the marine environment, divided into three zones: restricted use zone, controlled use zone, and buffer zone. The Dolphins and Madeiro Bays are part of the restricted and controlled use area of REFAUTS (Figures 1 and 2), while adjacent regions such as the Guaraíras Lagoon, Cacimbinhas Beach, Pipa Central Beach, and Love Beach are part of the buffer zone (Lei nº 616, 2018). The local climate is classified as rainy tropical, with an average annual temperature of 25.9°C (Climate-data.org, 2024) and the region is characterized by the presence of cliffs, dunes, and sandy beaches.

Search and adjustment data

To support the study of site-fidelity, photos of the Guiana dolphins' fin were taken from 2013 to 2019, totaling seven years of data collection. The photo-identification records were made in the restricted use area of REFAUTS, between 8:00 am and 3:00 pm, from a higher fixed point on the beach strip in the Dolphins Bay and in the Madeiro Bay, so as not to interfere with the behavioral pattern of the Guiana dolphins. The photo-identification records were made on days with little or no cloud cover, absence of rain, and winds on the Beaufort scale less than 3. The Guiana dolphin photo-identification was obtained with the aid of a semi-professional camera, coupled with a 150-600 mm telephoto-zoom lens and a monopod. The same effort was made to photo-identify all the Guiana dolphins present inside the Dolphins and Madeiro Bays. The number of sampling days varied in the month (minimum: min = 1; maximum: max = 4) and the year (min = 2; max = 9), depending on the financial resources available to subsidize the expeditions to the study area.

The photos of the dorsal fin of dolphins were transferred to a computer and classified and analyzed according to the methodology described by Santos and Rosso (2008), taking into account the quality of the images and the presence of marks or notches. Photos of calves' dorsal fins were not considered in the analyses, as they generally do not have marks and are difficult to be identified. Guiana dolphins swimming close to adult individuals and approximately ½ of the body size were classified as calf (Lunardi & Ferreira, 2014). The photo-identification consisted of the photographic record of long-term morphological aspects, such as scars and deformations, so that these animals are recognized individually in time and space (Bertulli et al., 2018; Zeng et al., 2020). We considered as ‘capture’ the individual's first photo-identification record during the study period and as ‘recapture’, the individual's subsequent records (see Urian et al., 2015). The identification of Guiana dolphins was carried out by two previously trained researchers, with the aid of the free PhotoScape® software.

A Pearson correlation was used to test whether the sampling effort employed was representative. In this analysis, the proportion of capture and recapture was calculated, compared to the accumulated number of catches for each sampling day. To increase the reliability of the results obtained in this analysis, all results of correlation coefficients were tested using the Monte-Carlo permutation test, using 9,999 permutations (Hammer, 2024). All tests performed in this study were based on a significance limit of p less than 0.05.

In this study, the term site-fidelity is used as the tendency for an animal to occupy an area and return to that area after a certain period (Tschopp et al., 2018). Due to the consistency of annual sampling, instead of monthly, we chose to calculate the Site Fidelity Rate (SFR) by the ratio of the number of years the individual was recorded in the study area to the total number of years of sampling. SFR was classified into the following categories (see Lodi and Tardin, 2018) (i) high site-fidelity: SFR greater than 0.7; (ii) intermediate habitat fidelity: SFR between 0.4 and 0.7; and (iii) low habitat fidelity: SFR less than 0.4. The individuals that had low SFR were classified as 'occasional visitors'; individuals that had an intermediate SFR, as 'regular visitors'; and individuals that had a high SFR, as 'visitors very faithful to the site'.

Results

Between 2013 and 2019, in 41 days of sampling and 164 h of effort, 12,406 photos of the dorsal fin of the Guiana dolphin were taken, and 1,283 photos (10.4%) were classified as suitable for analysis. The high number of discarded dorsal fin photos is mainly due to several subsequent photos of the same individual on the same sampling day. Of the 1,283 pre-selected photos, 1,063 photos (i.e., 82.8%) were selected, whose dorsal fin had marks and/or notches. From the analysis of the photos of tagged individuals, 45 captures and 43 recaptures were identified (Figure 3, Table 1 and Table 2).

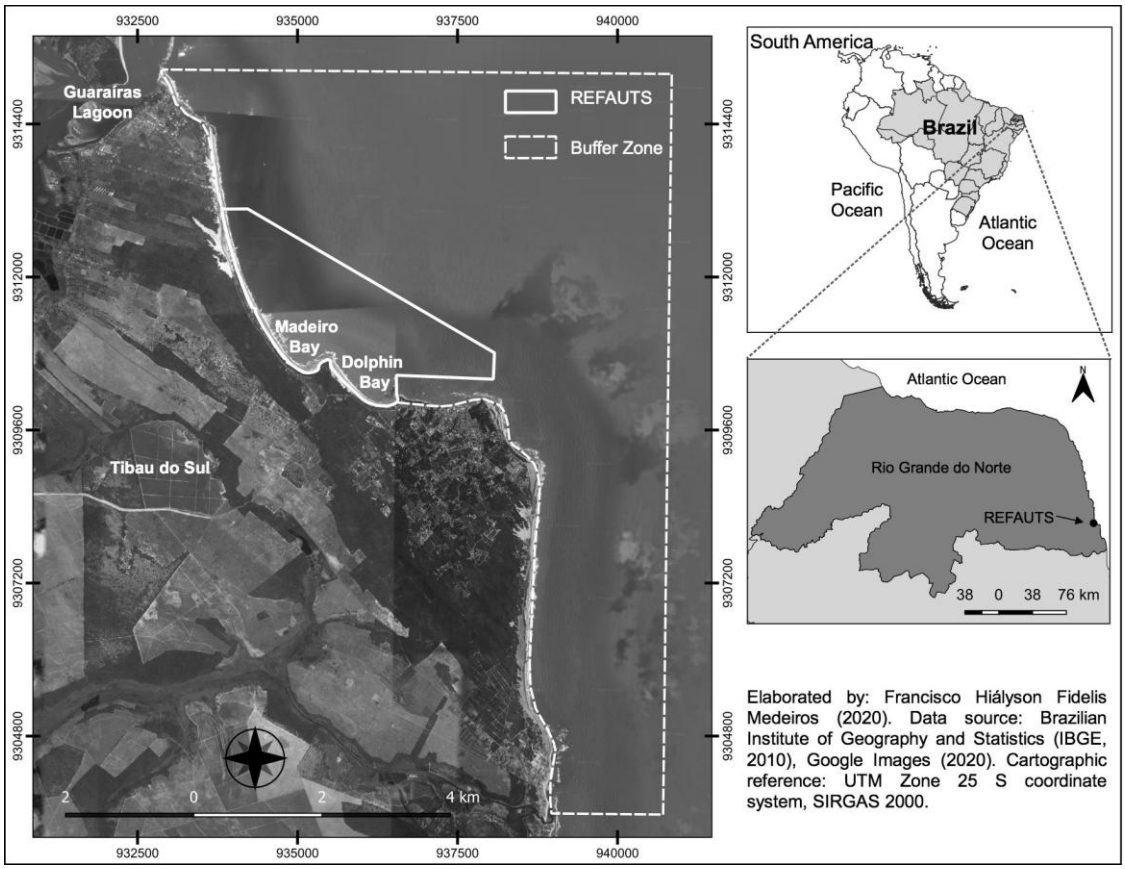


Figure 1. Madeiro and Dolphins Bays inside the restricted and controlled use zones at Tibau do Sul Coastal Wildlife Reserve (REFAUTS), and its buffer zone highlighted in white dots, located in the municipality of Tibau do Sul, State of Rio Grande do Norte, Brazil, South America.

Figure 2. Dolphins Bay (A) and Guiana dolphins, *Sotalia guianensis* (B, C) in the Tibau do Sul Coastal Wildlife Reserve (REFAUTS), northeastern Brazil, photographed by Vitor de Oliveira Lunardi.

The average number ± standard error ($\overline{x}$ ± SE) of capture per day of sampling was equal to 1.1 ± 0.2 (min = 1; max = 6). From the analysis of the cumulative curve of new photo-identified individuals, it is clear that it has not reached the stationary phase (Figure 3). The average number ($\overline{x}$ ± SE) of recapture per day of sampling was equal to 1.0 ± 0.2 (min = 0; max = 5). In 2013, no recapture was recorded, while in 2019, 13 recaptures were recorded (Table 1).

In this study, no correlation was detected between the capture number (photo-identification of new individuals) and a cumulative number of new photo-identified individuals over the sampling period (Pearson's correlation coefficient: r = -0.22088, p = 0.1652; Monte-Carlo permutation test p = 0.1668). There was also no correlation between the number of captures and the number of recaptures (Pearson's r = -0.24138, p = 0.1283; Monte-Carlo permutation test p = 0.114). However, a positive correlation was observed between the cumulative number of new photo-identified individuals and the number of recaptures (Pearson's r = 0.41719, p = 0.0065; Monte-Carlo permutation test p = 0.0049).

Of a total of 45 photo-identified individuals at the REFAUTS, two Guiana dolphins showed high site-fidelity, with SFR greater than 0.7, and, therefore, were classified as 'visitors very faithful to the site'. Also, another 10 individuals had an intermediate site-fidelity, with SFR ranging from 0.4 to 0.7 and were classified as 'regular visitors', and 33 individuals had a low site-fidelity, and were classified as 'occasional visitors' (Figure 4).

Of the 45 photo-identified Guiana dolphins, 23 were recorded in just one year in the study area, while another 22 were recorded in at least two or more years. The Guiana dolphins named R4 and R8 were recorded in five years of sampling (Figure 5). The Guiana dolphin R1 was registered for the first time in 2013, soon after, in 2014 and 2015, and later in 2019, while the R15 was registered for the first time in 2014 and, subsequently, only in 2019, in an interval of five years (Table 2, Figure 6).

For photo-identified Guiana dolphins at the REFAUTS, the time interval between capture and the last recapture varied from one to six years (Figure 5). However, of all the photo-identified individuals who returned to the study area (n = 22), half of them had an interval between capture and last recapture of 1 or 2 years ($\overline{x}$ ± SE = 1.4 ± 1.9 years). Most photo-identified Guiana dolphins were registered in just one (n = 23 individuals) or two years (n = 10) of study, while a minority was registered in three (n = 5), four (n = 5), or five years (n = 2) of study.

Discussion

Population studies of small cetaceans frequently use motorized boats to monitor and take photos of these animals' dorsal fins (e.g., Caputo et al., 2021; Culloch et al., 2020). However, in this study, the photos of the dorsal fin of dolphins taken were from a fixed point located on the beach strip in the Dolphins Bay and in the Madeiro Bay, where it was possible to monitor the dolphins in the bays. This is a low-cost methodology, as there are no expenses with a boat rental or maintenance and fuel purchase. This methodology also does not contribute to any type of behavioral change in small cetaceans, unlike those using motorized boats (see Maciel et al., 2023b; Marega-Imamura et al., 2018).

The sampling effort and the methodology used in population studies of small cetaceans influence the stabilization of the cumulative curve of new individuals and the time required to stabilize this curve can vary between populations, depending on their size and the areas they occupy (Mello et al., 2019; Pivari et al., 2020). In this study, the cumulative curve of new photo-identified individuals has not reached the stationary phase, suggesting that part of the individuals in this population has not yet been photo-identified and that the study area may be a subarea, among other adjacent subareas. To reach the stationary phase, the next step will be to increase the sampling effort and also carry out sampling in adjacent subareas where Guiana dolphins occur in Rio Grande do Norte, such Guaraíras Lagoon, Tabatinga Beach, and Formosa Bay.

At the REFAUTS, although the groups of Guiana dolphins vary from 2 to 19 individuals, these are commonly registered in small groups, of two or three individuals (Lunardi & Ferreira, 2013). A different reality is reported for the Cananéia estuary, in the state of São Paulo (SP), which has an aggregation record of up to 60 individuals (Santos and Rosso, 2007) and an estimated population of more than 400 individuals (Mello et al., 2019). Large aggregations of Guiana dolphins can contribute to more individuals being registered and for the cumulative curve of new individuals to stabilize in short time intervals (see Mello et al., 2019).

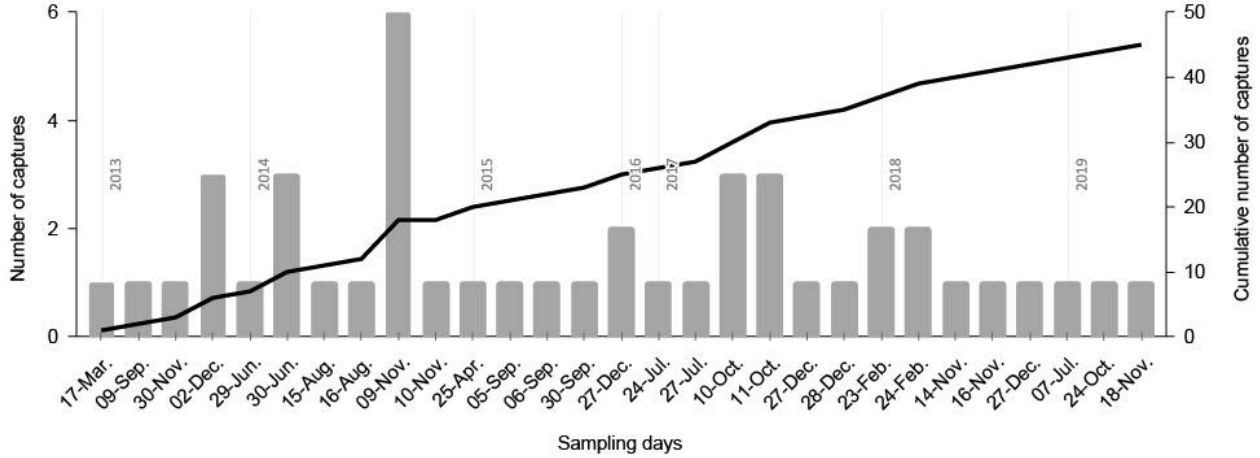
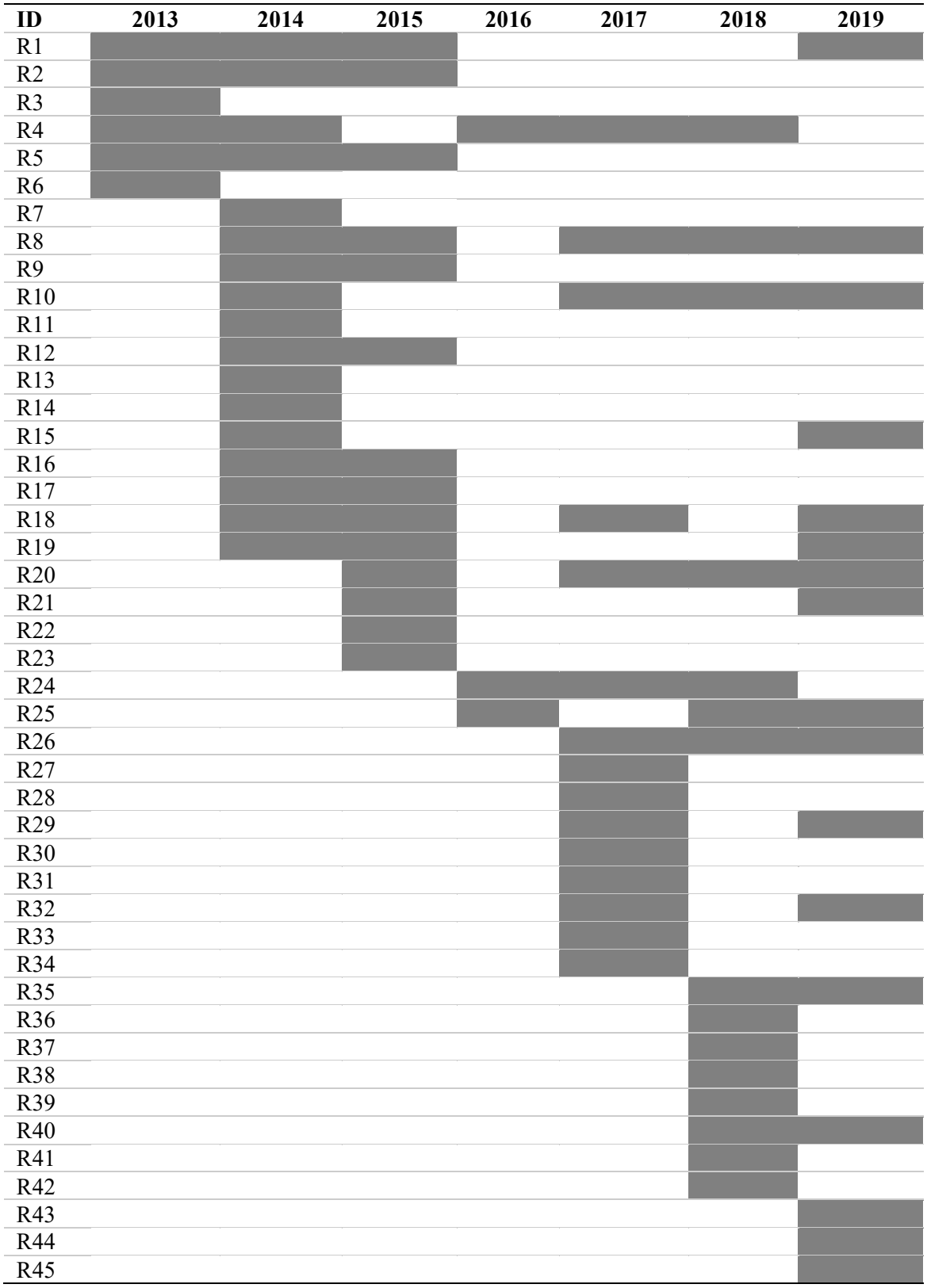


Figure 3. The number of captures (photo-identification of new individuals) per sampling day and the cumulative number of captures of Guiana dolphins, *Sotalia guianensis*, at the Tibau do Sul Coastal Wildlife Reserve (REFAUTS), from 2013 to 2019.

Table 1. The number of captures (new photo-identification) and recaptures (photo-identification of a previously registered individual) of Guiana dolphins, *Sotalia guianensis*, at the Tibau do Sul Coastal Wildlife Reserve (REFAUTS), from 2013 to 2019.

Year	Month	Days of sampling	Capture	Recapture
2013	March	1	1	0
	September	1	1	0
	November	1	1	0
	December	1	3	0
2014	June	2	4	2
	August	2	2	2
	November	2	7	0
2015	April	1	1	2
	July	1	0	1
	September	3	3	4
	October	2	0	2
2016	December	2	2	1
2017	January	1	0	1
	July	4	2	3
	October	2	6	0
	December	2	2	2
2018	February	2	4	4
	November	3	2	4
	December	1	1	2
2019	July	2	1	5
	September	3	0	6
	October	1	1	1
	November	1	1	1
TOTAL		41	45	43

Table 2. Annual registration of 45 photo-identified Guiana dolphins, *Sotalia guianensis*, at the Tibau do Sul Coastal Wildlife Reserve (REFAUTS). Gray rectangles indicate that the individual was registered that year. ID: identification code of the individual.



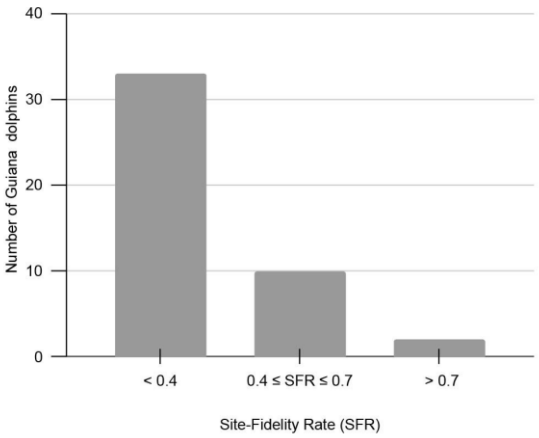


Figure 4. Site-Fidelity Rate (SFR) of photo-identified Guiana dolphins, *Sotalia guianensis*, at the Tibau do Sul Coastal Wildlife Reserve (REFAUTS), from 2013 to 2019.

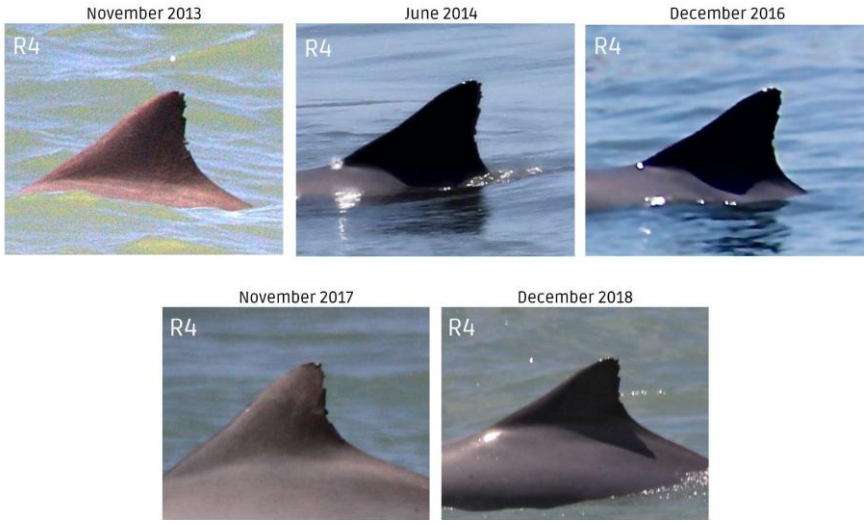


Figure 5. Images of the dorsal fin of the Guiana dolphin R4, registered in November 2013, June 2014, December 2016, November 2017 and December 2018, at the Tibau do Sul Coastal Wildlife Reserve (REFAUTS), Tibau do Sul, Rio Grande do Norte.

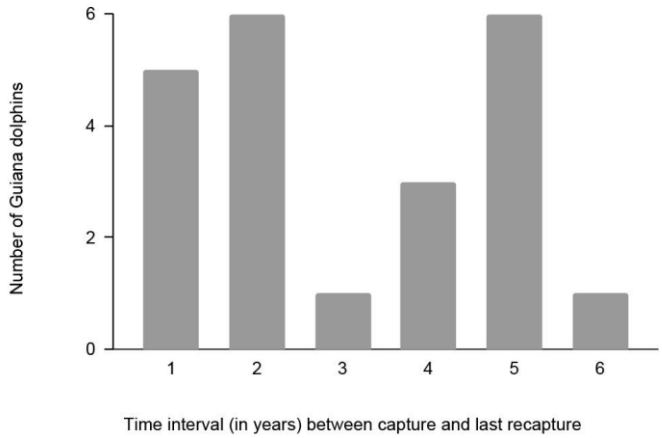


Figure 6. Time interval (in years) between capture and last recapture of Guiana dolphins, *Sotalia guianensis*, at the Tibau do Sul Coastal Wildlife Reserve (REFAUTS).

Individuals from the same population may have different degrees of site-fidelity (Lodi & Tardin, 2018; Meager et al., 2018; Meirelles et al., 2020). In fact, the Guiana dolphins had different degrees of site fidelity at the REFAUTS, where the occasional visitors were the majority of the photo-identified individuals, while others were regular visitors or very faithful to the site. The rate of capture and recapture may reflect the site-fidelity of Guiana dolphins in two different situations at the REFAUTS: some individuals use this area more consistently, for a longer period, probably in search of a protected area, for feeding and parental care, while other individuals visit it occasionally, depending on the availability of resources.

The variation in the degree of site-fidelity by the Guiana dolphins at the REFAUTS suggests that this population has a fluid-structure. Site-fidelity may be associated with the availability of food resources, reproduction, parental care, and topographic characteristics of the Dolphins and Madeiro Bays, which favor the capture of prey in an environment protected from strong winds and sea currents. The Guaraíras Lagoon, located in an adjacent area, represents an important source of ichthyofauna (Costa & Camara, 2012) for the Dolphins and Madeiro Bays.

It was estimated that at least 12 (26.7%) photo-identified Guiana dolphins at REFAUTS were registered in three, four, or five years of the study. Of these, two individuals were registered over five years. Photo-identified Guiana dolphins using the same area for years were previously described in other studies, corroborating the information that some individuals have relatively small individual home ranges (review in Nery et al., 2008; see also Secchi et al., 2018). In Babitonga Bay, in the state of Santa Catarina, 16 (30%) photo-identified Guiana dolphins were recorded for three years in a row and one lived in this area for at least eight years (Hardt et al., 2010). In Sepetiba Bay, in the state of Rio de Janeiro, a 12-year study identified 22 (10.1%) photo-identified Guiana dolphins were resighted for the last time more than five years after the first sighting, being one individual registered in all years of the study (Nery et al., 2008).

The behavior of small cetaceans moving between areas is often associated with seasonality in the availability of prey (Espinoza-Rodríguez et al., 2019), but it can also be related to reproductive activities (Nery et al., 2008). There is an indication that females move less frequently than males and have high site-fidelity to their birth areas - behavior associated with reproductive success and care for their offspring, performed exclusively by females (Gibson & Mann, 2008). Dolphins living in coastal areas are commonly pairs of females with calves (Diaz-Aguirre et al., 2020). And, males usually have larger living areas than females and show seasonal spatial variation in habitat use. These can search for coastal areas for breeding but then can return to adjacent areas in the open sea (Connor et al., 2017). In fact, the REFAUTS is a nursery area for the threatened Guiana dolphin on the northeast coast of Brazil (Silva et al., 2024).

Studies of site-fidelity of small cetaceans have important implications for environmental conservation, as species with high site-fidelity are more prone to population declines due to local threats, such as degradation and loss of habitat and mortality caused by humans (Atkins et al., 2016). At REFAUTS, the Guiana dolphin occupies the same habitat as motorized boats, tourists in kayaks, surfers, and bathers (Freitas et al., 2024; Lunardi et al., 2017; Silva et al., 2021). It is likely that, during data collection at REFAUTS, tourist boats influenced the record of Guiana dolphins and contributed to their displacement during attempts at photo-identification.

As REFAUTS is a Wildlife Reserve for sustainable use, tourist visitation is permitted, subject to compliance with rules laid down in Municipal Law nº 616, of 25 September of 2018 (Lei nº 616, 2018). However, thousands of people visit the Dolphins and Madeiro bays annually, with the observation of Guiana dolphins an important tourist attraction during these visits (Lunardi et al., 2017). Tourist boats can have negative impacts on small cetacean populations, especially when tourist activities are not properly monitored and managed (Pérez-Jorge et al., 2016). Negative impacts, resulting from the presence of boats, can, in the long run, cause damage to cetaceans; both at the individual and population level (e.g., Maciel et al., 2023b; Toledo et al., 2017). Therefore, it is necessary to establish environmental zoning plans for tourist activities carried out at REFAUTS, promote the proper management of its territory, both on the beach and in the coastal area, and ensure that the Guiana dolphins are not negatively impacted by this activity (Freitas et al., 2021; Freitas et al., 2024; Santos et al., 2025; Silva et al., 2021).

Understanding the pattern of site-fidelity of small cetaceans contributes to the development of management strategies for marine protected areas. It is necessary to achieve a dynamic balance

between human activities developed in marine protected areas and the conservation of cetaceans. Studies carried out with dolphins around the world point to tourist activities carried out in the coastal zone as a source of disturbance for small resident populations. These activities, when carried out in a disorderly manner, can cause changes in the behavior and spatial distribution of dolphins, in response to the source of disturbance in the area (Culloch et al., 2020; Maciel et al., 2023b; Tardin et al., 2020).

Environmental changes can affect the social structure and interfere in the pattern of habitat use by small cetaceans, especially considering species that occupy small areas and are dependent on habitat and highly vulnerable to environmental changes (see Maciel et al., 2023a). In São Marcos Bay, in the state of Maranhão, one of the most important port areas in Brazil, the overlapping of the area occupied by the Guiana dolphin and port activities has caused this small cetacean to abandon this area, which is now registered only in adjacent areas (Moura et al., 2019).

Conclusions

1. This study highlights that the Tibau do Sul Coastal Wildlife Reserve (REFAUTS) harbors both local resident and transient Guiana dolphins. Also it corroborates the premise that the REFAUTS is an important sub-area of concentration of this endangered species on the Brazilian coast, probably integrating a complex that includes other adjacent sub-areas such as Guaraíras Lagoon, Tabatinga Beach, and Formosa Bay, in Rio Grande do Norte, among which individuals in the population are likely to transit.

2. The REFAUTS harbors at least 12 Guiana dolphin regular visitors, out of a total of 45 individuals identified in this study, who seek food and shelter in their waters protected from strong winds and sea currents. Promoting conservation strategies for endangered species, such as the Guiana dolphin, requires knowledge of their areas of preferential use.

3. Although the Dolphins and Madeiro Bays of REFAUTS and the Guaraíras Lagoon are protected by law, the other adjacent sub-areas of concentration of Guiana dolphins, such as Tabatinga Beach and Formosa Bay, are not. In this sense, studies of site-fidelity of Guiana dolphins can support the proposal of an expansion of the protected marine area, to promote the conservation of this threatened species throughout its area of occurrence.

4. The implementation of a continuous monitoring program for this subpopulation of Guiana dolphins may even be carried out from the beach strip, considering that the methodology used in this study proved to be viable, efficient, and low cost.

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