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REVISTA TURISMO y SOCIEDAD

OVERLAPPING USE OF AREAS IN A MARINE WILDLIFE RESERVE ON THE NORTHEASTERN COAST OF BRAZIL

USO SUPERPUESTO DE ÁREAS EN UNA RESERVA DE VIDA SILVESTRE MARINA EN LA COSTA NORESTE DE BRASIL

Para citar el artículo: Freitas, D. C., Santos, J. E. A., Silva, M. M. S., Silva, G. R. D., Lunardi. V. O., & Lunardi, D. G. (2024). Overlapping use of areas in a marine wildlife reserve on the northeastern coast of Brazil. *Turismo y Sociedad*, *XXXV*, pp. 325-345. DOI: https://doi.org/10.18601/01207555.n35.14

Fecha de recepción: 3 de diciembre de 2022
Fecha de modificación: 27 de enero de 2023
Fecha de aceptación: 3 de agosto de 2023

Abstract

In many Brazilian Marine Protected Areas tourism occurs without planning, such as in the Tibau do Sul Coastal Wildlife Reserve (REFAUTS). At REFAUTS, tourists use the area of two small bays to carry out different activities and share these areas with dolphins. Therefore, the aim of this study was to characterize tourist flow at REFAUTS and identify which areas tourists most commonly use. The tourist flow in REFAUTS was measured via a survey conducted between 9:00 am and 4:00 pm and the areas most used by tourists were identified. REFAUTS receives over 1400 visitors per day, mostly between 11:00 am and 3:00 pm, which corresponds to the dolphin's active time in the bays. Different activities such as surfing, kayaking, stand-up paddleboarding, bathing and dolphin watching are practiced in the same area; this overlapping can cause socio-environmental conflicts and negative effects on dolphins. A zoning plan is recommended to determine which areas should be used by tourists and establish areas exclusively for dolphins.

Keywords: dolphin watching, Guiana dolphin, tourism management, tourist flow, Pipa Beach, Marine Protected Area

Resumen

En muchas áreas marinas protegidas de Brasil, el turismo ocurre sin planificación, como en la Reserva de Fauna Costera de Tibau do Sul (REFAUTS). En REFAUTS, los turistas utilizan el área de dos pequeñas bahías para realizar diferentes actividades y compartir espacio con delfines. Por lo tanto, el objetivo de este estudio fue caracterizar el flujo turístico en REFAUTS e identificar cuáles áreas son las más frecuentadas por los turistas. Se midió el flujo turístico en REFAUTS por medio de una encuesta realizada entre las 9:00 a. m. y las 4:00 p. m., y se identificaron las zonas más utilizadas por los turistas. REFAUTS recibe a más de 1.400 visitantes por día, la mayoría entre las 11:00 a. m. y las 3:00 p. m., lo que corresponde al tiempo activo del delfín en las bahías. En una misma zona se practican diferentes actividades, como *surf*, kayak, *stand-up paddle*, baño y avistamiento de delfines; esta superposición puede generar conflictos socioambientales y efectos negativos sobre los delfines. Se recomienda un plan de zonificación para determinar cuáles áreas deben ser utilizadas por los turistas y establecer áreas exclusivas para delfines.

Palabras clave: observación de delfines, Guiana dolphin, gestión turística, flujo turístico, playa de Pipa, área marina protegida

1. Introduction

Marine Protected Areas (MPAs) are one of the most important and powerful management tools for combating extinction of coastal and marine species, degradation of their habitats, increasing anthropogenic exploitation of ocean resources and climate change (e.g., Grorud-Colvert et al., 2021). Over the last two decades, the number and size of MPAs have increased rapidly (Worm, 2017). For example, in 2000, the area covered by MPAs was approximately 2 million km², which is around 0.7% of the ocean's surface. Today, 7.93% of the ocean is protected by MPAs, corresponding to 28.729.400 km² (UN Environment Programme World Conservation Monitoring Centre [UNEP-WCMC] & International Union for Conservation of Nature [IUCN], s. f.). In Brazil, Coastal and Marine Protected Areas cover about 964,153 km², which is equivalent to 26.5% of the marine area (comprising the territorial waters and Exclusive Economic Zone) (Magris & Pressey, 2018; Ministério do Meio Ambiente [MMA], 2018).

Although natural resources conservation is the main objective of MPAs, other goals may be included, for example, tourism development, focusing on increasing revenues (Davis et al., 2019) and sustaining local communities (Rahman et al., 2022). However, in many cases, tourism development is poorly planned and causes numerous problems for natural ecosystems (Chili et al., 2017; Freitas et al., 2016). Several groups of marine species, such as seabirds (Aas et al., 2023), turtles (Hayes et al., 2016), marine mammals (New et al., 2020), fishes (Geffroy et al., 2018), coral reefs (Kennedy et al., 2020) and even seaweed (Barradas et al., 2022), have suffered adverse effects from unplanned tourism.

In order to prevent misuse, all MPAs need a management plan to control tourist activities within their territory. Areas should be zoned for each of the activities practiced therein. Natural area zoning has been used to minimize and resolve socio-environmental conflicts between different users and achieve biodiversity conservation (Day et al., 2019). Zoning in MPAs aims to separate conflicting uses. As such, it is essential to identify the areas of conflict between users and determine zoning that can mitigate these conflicts (Prestrelo & Vianna, 2016).

2. Overlapping Use of Areas and Conflicts between Users in MPAs

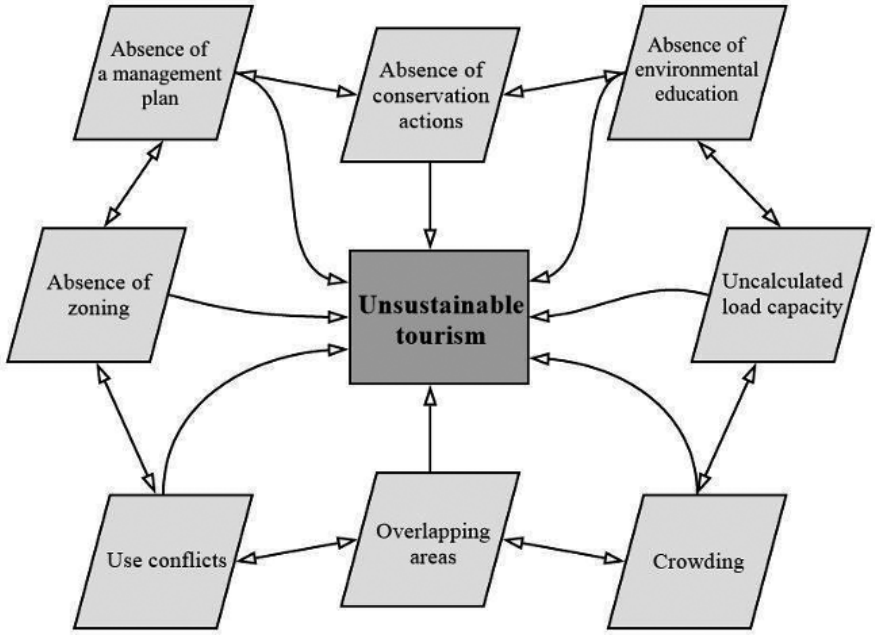
In natural areas with multiple uses, the occurrence of conflicts between stakeholders may become more common. This is because each user is involved in a different activity, with different characteristics and objectives, but using the same physical space. These negative social impacts can be caused by overcrowding (Bentz et al., 2015) and conflicts between groups of users (Moore et al., 2017). Conflicts occur when there is direct or indirect social contact and may involve groups (out-group conflict) or be within the same group (in-group conflict) (Needham et al., 2017). Areas where the number of tourists is not controlled, that is, with indiscriminate access for visitors, may also favor conflicts.

In MPAs that lack area zoning, this overlap is common when the same areas are used for different purposes, which may exacerbate the negative social impacts of tourists who use the area (Prestrelo & Vianna, 2016). Thus, studies on the overlapping use of areas provide essential information for effective management of users, tourists and local residents, and mitigate intergroup conflicts (Muñoz et al., 2019). Determining that there are overlapping uses in a given area may be the first step towards zoning.

Conflicts between groups in marine environments include snorkelers and scuba divers (Needham et al., 2017; Philips et al., 2019), scuba divers and whale watchers (Bentz et al., 2015), scuba divers and fishers (De Andrade & Soares, 2017), motorboats, jet skis and paddleboarding users (Noble et al., 2019). Conflicts can also occur between users and the marine environment (Moore et al., 2017), when wildlife tourism negatively affects the environment or species directly or indirectly involved with the activity (Trave et al., 2017).

This study investigates a Marine and Coastal Protected Area in Brazil that currently suffers from several management problems, including absence of a management and zoning plan, overlapping of different user groups, tourist overcrowding, uncontrolled number of daily tourists, and shortcomings in environmental education and conservation measures. All of these problems indicate unsustainable tourism in this marine area (Figure 1). In order to contribute to understanding the management problems of this protected area, we characterized tourism and highlighted the overlapping use of areas within the reserve involving different and possibly conflicting activities.

Figure 1. Management Problems in Protected Areas that Indicate Unsustainable Tourism



Note. Own elaboration.

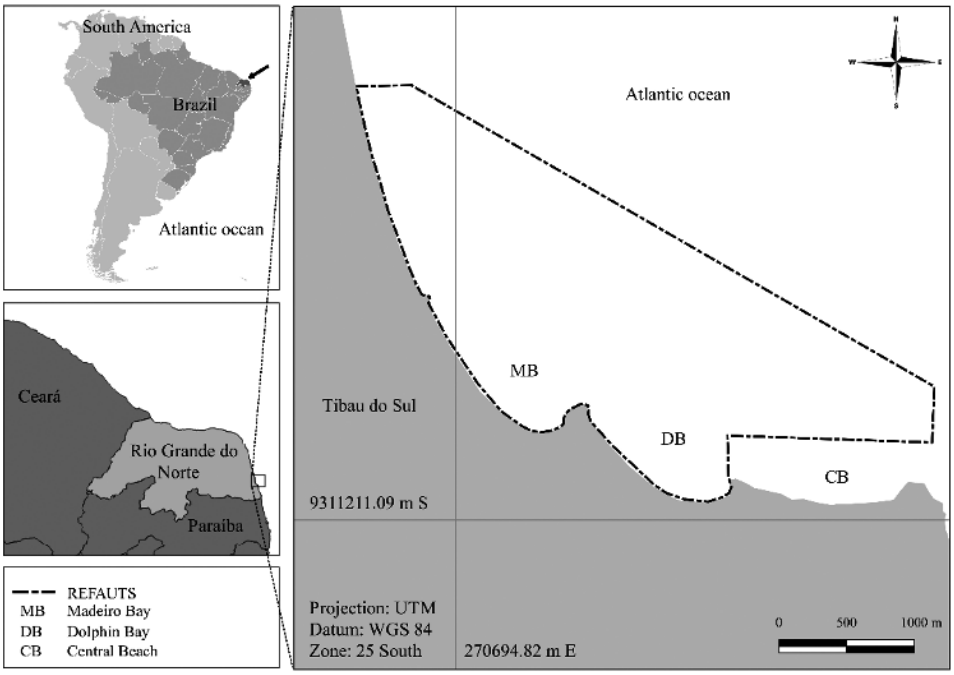
2.1 Study Area

This study took place at the Tibau do Sul Coastal Wildlife Reserve (REFAUTS), an MPA located at Pipa Beach, on the southern coast of Rio Grande do Norte State, Brazil (Figure 2). REFAUTS has been recognized as a sustainable use reserve since 2006 and was created to protect the local marine fauna that use the area, with special attention to the coastal dolphin popularly known as the Guiana Dolphin (*Sotalia guianensis*, van Bénéden, 1864) (Lei nº 616 de 2018). The total area of the REFAUTS is 5.9 km², comprising part of coastal and marine zone, and includes Dolphin and Madeiro bays, a restricted and controlled use zone (modified from Lei nº 616 de 2018). Although it was created 17 years ago, REFAUTS has yet to devise a management plan.

Dolphin watching is a common practice at the REFAUTS, and largely involves tourist boats that visit Dolphin and Madeiro bays (Lunardi et al., 2017). The Guiana dolphin is the target species for observation at REFAUTS. This animal is listed as vulnerable to extinction in Brazil (Instituto Chico Mendes de Conservação da Biodiversidade [ICMBio], 2018) and near threatened worldwide (Secchi et al., 2018). The Guiana dolphin occurs in both bays and is one of the main REFAUTS tourist attractions. The conservation of these bays is closely linked to conservation of the species itself, because Guiana dolphins use these areas mainly for food, socialization, and parental care (Lunardi & Ferreira, 2013), which makes the region a critical habitat for conservation of the species in the country (Lunardi et al., 2017).

In addition to dolphin watching, REFAUTS welcomes other tourists who engage in various activities, such as surfing, kayaking, stand-up paddleboarding, and bathing, among others (Table 1, Figure 3). Tourists and Guiana dolphins sometimes occupy the same space within the bays, which poses a risk to both. The presence of many tourists within the same area, engaged in different activities, may also negatively influence user satisfaction (Hurtado et al., 2021) and discourage their return (Stemmer et al., 2022), which could cause economic problems for the local community. The pressure exerted by tourists and their activities, in addition to noise (Perez-Ortega et al., 2021) and the close proximity of boats (Freitas et al., 2021), may compromise the conservation of this small cetacean at REFAUTS.

Figure 2. Tibau do Sul Coastal Wildlife Reserve (REFAUTS), Brazil



Note. The black polygon corresponds to the restricted and controlled use zone.

Boat-free zones may be effective in mitigating anthropogenic disturbance in cetacean areas (Tyne et al., 2015). The creation of an exclusive area for Guiana dolphins in REFAUTS is of utmost importance for them to remain in the Dolphin and Madeiro bays. However, in order to implement this proposal, it is necessary to estimate which REFAUTS areas are used by tourists and which activities are most often performed. Thus, given the importance of REFAUTS for protecting the Guiana dolphin, and the urgency to implement a complementary plan for environmental zoning in Dolphin and Madeiro bays, the aim of this study was twofold. The first was to characterize tourist flow at REFAUTS by determining the number of individuals visiting the reserve per day and the times of most intense use. The second was to identify which areas tourists most commonly use. The overlapping area use observed may support the proposed environmental zoning for REFAUTS, which will

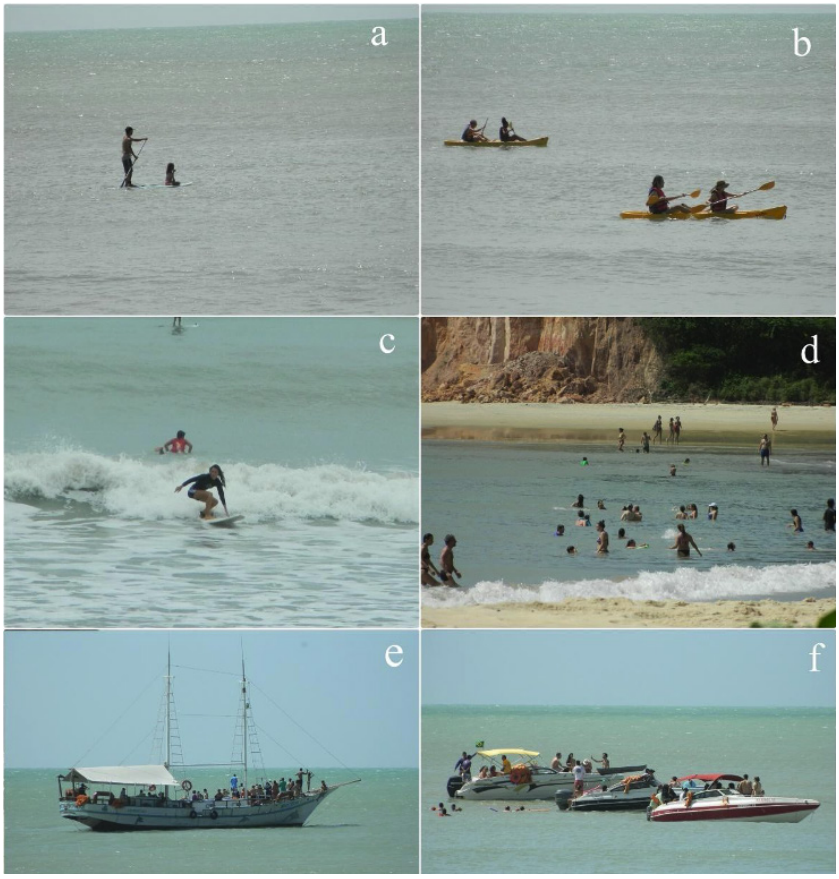
improve the conservation of Guiana dolphins and the sustainability and safety of tourist activities in the area, safeguarding wild species, tourists and the local community.

Table 1. Main Tourist Activities Carried out at Tibau do Sul Coastal Wildlife Reserve (REFAUTS), Brazil

Tourist activities	*Activity description*
Dolphin watching	Tourists on commercial boats observing the Guiana dolphins
Surfing	Professional or apprentice surfers
Kayaking	Kayakers observing the Guiana dolphin and/or the natural landscape
Stand-up paddleboarding	Users observing the Guiana dolphin and/or the natural landscape
Bathing	Swimming and/or wading

Note. Own elaboration.

Figure 3. Tourists Visiting the Tibau do Sul Coastal Wildlife Reserve (REFAUTS), Brazil



Note. Activities include (a) stand-up paddleboarding, (b) kayaking, (c) surfing, (d) bathing (e) and (f) tour boats. Photos: Freitas, D. C (a, b, d, e, f) and Silva, G. R. D (c).

3. Methods

3.1 Data Collection

Data collection occurred in August, October and December 2016 and May, July and November 2017, between 9:00 am and 4:00 pm, the period of most intense tourist flow in Dolphin and Madeiro bays (Lunardi et al., 2017). The REFAUTS exhibits tourist flow year-round, with some seasonal variations, characterizing the low and high tourist season in the reserve. Tourism also intensifies on national holidays, weekends and school vacation. For this study, May, August, October, and November comprised the low tourist season, while July and December were the high tourist season. A total of 10 expeditions were made to each of the bays, with visits lasting five days in both the low and high season, totaling 20 days of data collection. A total of 440 surveys were performed in the bays (220 in each). Data were collected simultaneously by four previously trained researchers on all days of the week in order to include both weekends and weekdays in the sample. This collection team ensured that tourists' activities and Guiana dolphins were recorded at the same time.

3.1.1 Tourist Flow Censuses

To evaluate tourist activity, the number of individuals and type of activity performed were assessed. These surveys were performed by scan sampling from a fixed point on the beach of each of the bays every 20 min, using binoculars and a camera. The number of tourist boats that visited Dolphin and Madeiro bays was also counted. With the aid of binoculars, the arrival and departure time of each boat was recorded.

Dolphin and Madeiro bays were divided into nine subareas, based on depth and space, in order to identify which subareas are most used by each tourist group. It is important to note that to establish the imaginary subareas, previously known reference points along the coast were used. To determine which subareas within the bays are most used by the Guiana dolphins, surveys were performed every 20 min, from a fixed point on the beach, with the aid of binoculars. The size of each group was recorded, based on data collected in the nine subareas established for the bays.

3.2 Data Analysis

Data were analyzed using descriptive statistics to obtain mean values, standard errors, and frequencies. For analysis of the 440 tourist flow surveys (surfing, kayaking, standup paddleboarding, bathing) and Guiana dolphins obtained for the two bays (22 surveys per day, 10 data collection days in each bay), we considered the highest value obtained in the morning between 9:00 am and 11:59 am and the highest in the afternoon between 12:00 pm and 4:00 pm. Next, the arithmetic mean of the morning and afternoon values was calculated and summed. The resulting value was considered the mean number of tourists and dolphins per day in the bays. To ascertain when the flow of tourists and dolphins is highest in the REFAUTS, we used the same approach described above (the highest morning and afternoon values), obtaining the mean values and their respective standard errors. To determine tourist boat flow, the means and respective standard errors, medians, and the minimum and maximum values of the tours were calculated daily.

We used Past® software, version 3.16, to compare the number of tourists from the different groups and Guiana dolphins in the Dolphin and Madeiro bays. To that end, we tested data normality (Shapiro-Wilk) for each of the groups of tourists and dolphins, and when this assumption was verified, we performed the parametric student's t- test. Data on the number of Guiana dolphins in the bays did not show normality, and the nonparametric Mann-Whitney U test was therefore applied.

A drawing of the two bays was made, showing the nine subareas used for the tourist surveys, their occupation by tourists visiting the REFAUTS and Guiana dolphins and their preferences for certain subareas. This drawing is a didactic representation and does not present the actual format of the bays. For analysis of the preferred subareas, the mean frequency was calculated based on the total number of records of each group of tourists engaged in different leisure and sports activities, and the number of Guiana dolphins in each subarea of the REFAUTS. These frequencies were then classified into three levels of use (1 – 20%, 21 – 30% and > 31%), which made it possible to visualize the results more objectively.

4. Results

4.1 Tourist Flow at REFAUTS

REFAUTS received an average of 1401 ± 153.3 (± SE) tourists per day in the Dolphin and Madeiro bays during the data collection period. Dolphin Bay received 598.8 ± 48.0 tourists and the main activities were bathing and standup paddleboarding. Madeiro Bay received 802.2 ± 105.3 tourists per day and the most common activities were surfing and kayaking to observe the landscape and/or the dolphins.

4.1.1 REFAUTS Tourists

Standup paddleboarders were more common in Dolphin Bay (7.9 ± 2.1), followed by bathing (218.3 ± 27.9). An average of 9.6± 1.9 and 160.5± 27.1 tourists per day engaged in kayaking and surfing, respectively, in Madeiro Bay (Table 2).

A comparison of the number of standup paddleboarders, kayakers, surfers, tour boats and Guiana dolphins between Dolphin and Madeiro bays showed that only the number of surfers was significantly higher in Madeiro Bay (standup paddleboarders: t= 0.42338, p= 0.67704; kayakers: t= -0.54633, p= 0.59155; surfers: t= -5.2118, p= $5.88E^{-05}$; tour boats: t= 0.3748, p=0.71219; Guiana dolphins: t= -1.0213, p= 0.30713).

Table 2. Tourist of Tibau do Sul Coastal Wildlife Reserve (REFAUTS), Brazil

	Tourist of REFAUTS			
	Standup paddle-boarders	Kayakers	Surfers	Bathers
Dolphin Bay	7.9 (± 2.1)	8.9 (± 1.9)	5.1 (± 1.1)	218.3 (± 27.9)
Madeiro Bay	7.0 (± 2.1)	9.6 (± 1.9)	160.5 (± 27.1)	195.4 (± 21.1)

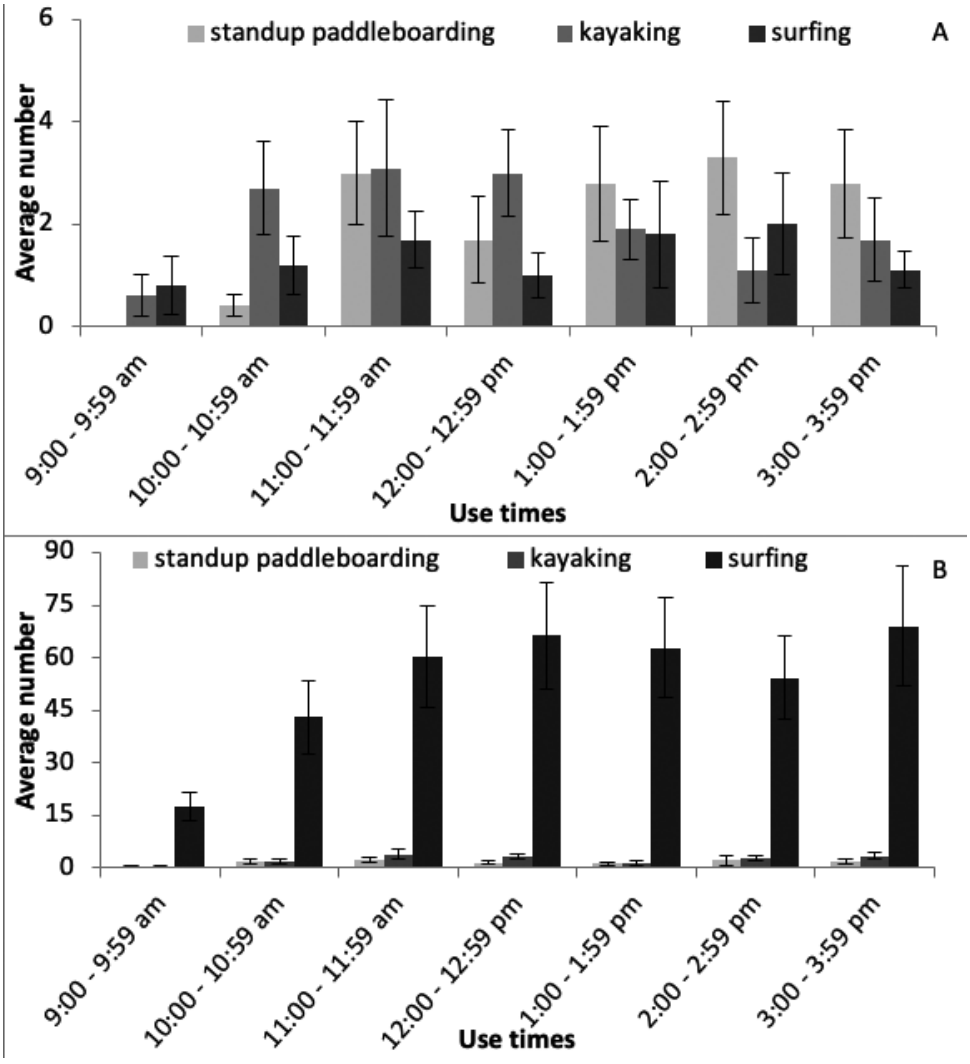
Note. Average number (± standard error) of tourists per day.

4.1.2 REFAUTS Activity Times

Standup paddleboarders, kayakers and surfers used the Dolphin and Madeiro bays predominantly between 9:00 am and 4:00 pm, with tourist flow highest between 11:00 am and 3:00 pm in both bays (Figure 4).

REFAUTS tourists engaged in bathing between 9:00 am and 4:00 pm in both bays, but more frequently between 11:00 am and 3:00 pm (Figure 5).

Figure 4. Mean Number of Tourists Involved in Standup Paddleboarding, Kayaking and Surfing in Dolphin Bay (A) and Madeiro Bay (B), Tibau do Sul Coastal Wildlife Reserve (REFAUTS), Brazil



Note. Black whiskers represent the standard error.

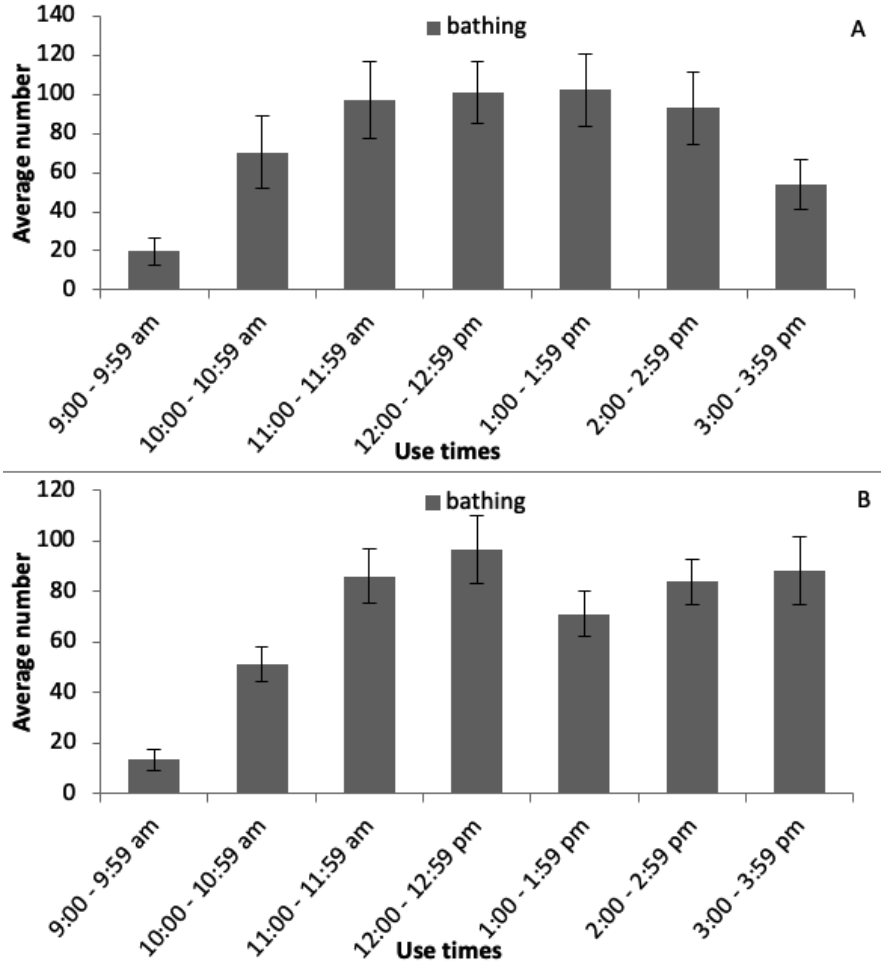
4.1.3 Tourist Boats

In this study, the mean ± SE number of boat tours per day recorded over 20 days in Dolphin and Madeiro bays was 30.9 ± 3.5 and 29.1 ± 2.9, respectively (Table 3).

The dolphin watching tours in the REFAUTS predominantly occur between 9:00 am and 4:00 pm, with the largest flow of tourist boats between 11:00 and 11:59 am, in both Dolphin and Madeiro bays (Figure 6).

In Dolphin and Madeiro bays, each tourist boat conducted an average 2.8 ± 0.3 and 2.6 ± 0.3 tours per day, respectively, with one boat conducting eight tours in a single day (Figure 7).

Figure 5. Mean Number of Tourists Involved in Bathing in Dolphin Bay (A) and Madeiro Bay (B), Tibau do Sul Coastal Wildlife Reserve (REFAUTS), Brazil



Note. Black whiskers represent the standard error.

4.2 Guiana Dolphin Group Size

We observed an average of 2.5 ± 0.1 Guiana dolphins per survey in Dolphin Bay. The number of dolphins recorded in Madeiro Bay was 1.8 ± 0.1. The largest number of dolphins recorded in Dolphin and Madeiro bays was 9 and 11, respectively, in a single survey. In 28.2 and 36.4% of the surveys, no dolphins were recorded in Dolphin or Madeiro bays, respectively. Most of the groups observed in Dolphin Bay were composed of three Guiana dolphins, while in Madeiro Bay, the groups largely contained only two individuals (Figure 8).

Table 3. Tours Taken over 20 Days of Data Collection in Dolphin and Madeiro Bays, Tibau do Sul Coastal Wildlife Reserve (REFAUTS), Brazil

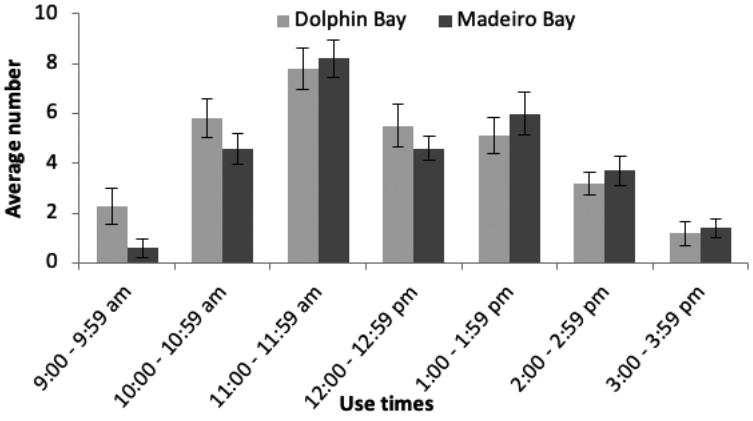
	Boat tours			
	Total	Average/day (± SE)	Minimum and maximum in one day	Median
Dolphin Bay	309	30.9 (± 3.5)	10 and 49	34
Madeiro Bay	291	29.1 (± 2.9)	9 and 43	30

Note. Own elaboration.

4.3 Subarea Use by Tourists and Guiana Dolphins

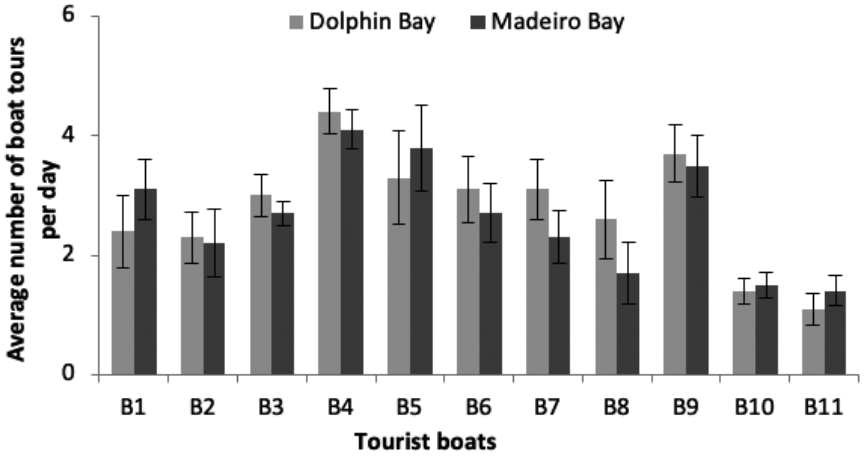
Tourists visiting the REFAUTS used the entire reserve, and the same areas were used by individuals engaged in different activities. The shallow areas closest to the coast were most used by bathers. Stand-up paddleboarders and kayakers were observed more in the intermediate areas, along with Guiana dolphins and tourist boats. Surfers most used areas near the cliffs where there is a higher incidence of waves. A schematic view of the two REFAUTS bays is presented, showing the tourist groups in the areas and their respective activities. Areas most used by the boats and Guiana dolphins are also shown (Figure 9).

Figure 6. Average Number of Dolphin Watching Boats, Based on 20 Days of Data Collection in Dolphin and Madeiro Bays, Tibau do Sul Coastal Wildlife Reserve (REFAUTS), Brazil



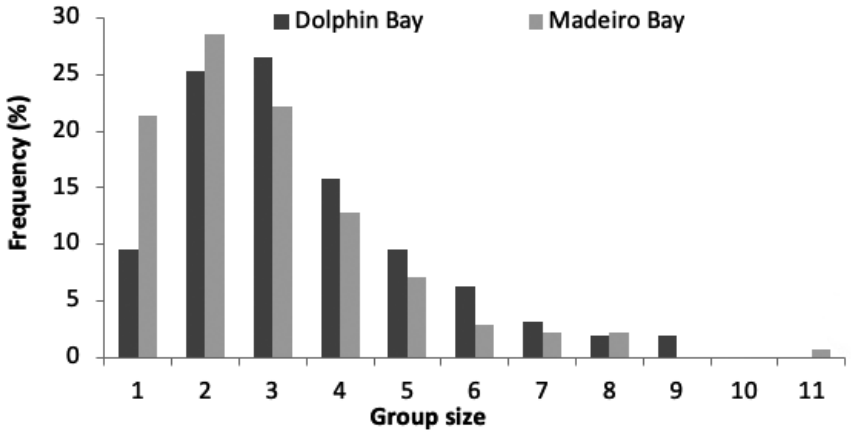
Note. Black whiskers represent the standard error.

Figure 7. Daily Number of Boat Tours in Dolphin and Madeiro Bays, Tibau do Sul Coastal Wildlife Reserve (REFAUTS), Brazil



Note. Black whiskers represent the standard error. B_n: boats licensed for dolphin watching in REFAUTS.

Figure 8. Frequency of Groups of Guiana Dolphins in the Dolphin and Madeiro Bays Based on 20 Days of Collection in the Tibau do Sul Coastal Wildlife Reserve (REFAUTS), Brazil



Note. Own elaboration.

5. Discussion

5.1 Tourist Flow at REFAUTS

REFAUTS receives a large number of tourists daily (more than 1400 people), without controlling the number of individuals allowed inside the reserve. Neither residents nor

tourists are required to pay any entry fees, contributing to their indiscriminate influx and increasing the chances of overcrowding. In addition, within REFAUTS there are no information boards that warn tourists that they are in a marine protected area, and there is no physical delimitation of the reserve's limits. These factors contribute to tourists' lack of knowledge about them being within a coastal and marine fauna protection area (Silva et al., 2021).

In both bays, tourists can engage in the same activities (surfing, kayaking, stand-up paddleboarding, bathing and dolphin watching). Dolphin Bay received more stand-up paddleboarders and bathers and Madeiro Bay received more kayakers and surfers. The greater presence of surfers in Madeiro Bay can be explained by the powerful waves there, while in the neighboring bay there are no waves appropriate for surfing. In both bays there are surf schools, however in Dolphin Bay most of these schools are geared towards children. Tourists involved in the same activity in the same area may result in interpersonal conflicts (Philips et al., 2019), even more so if the area is small.

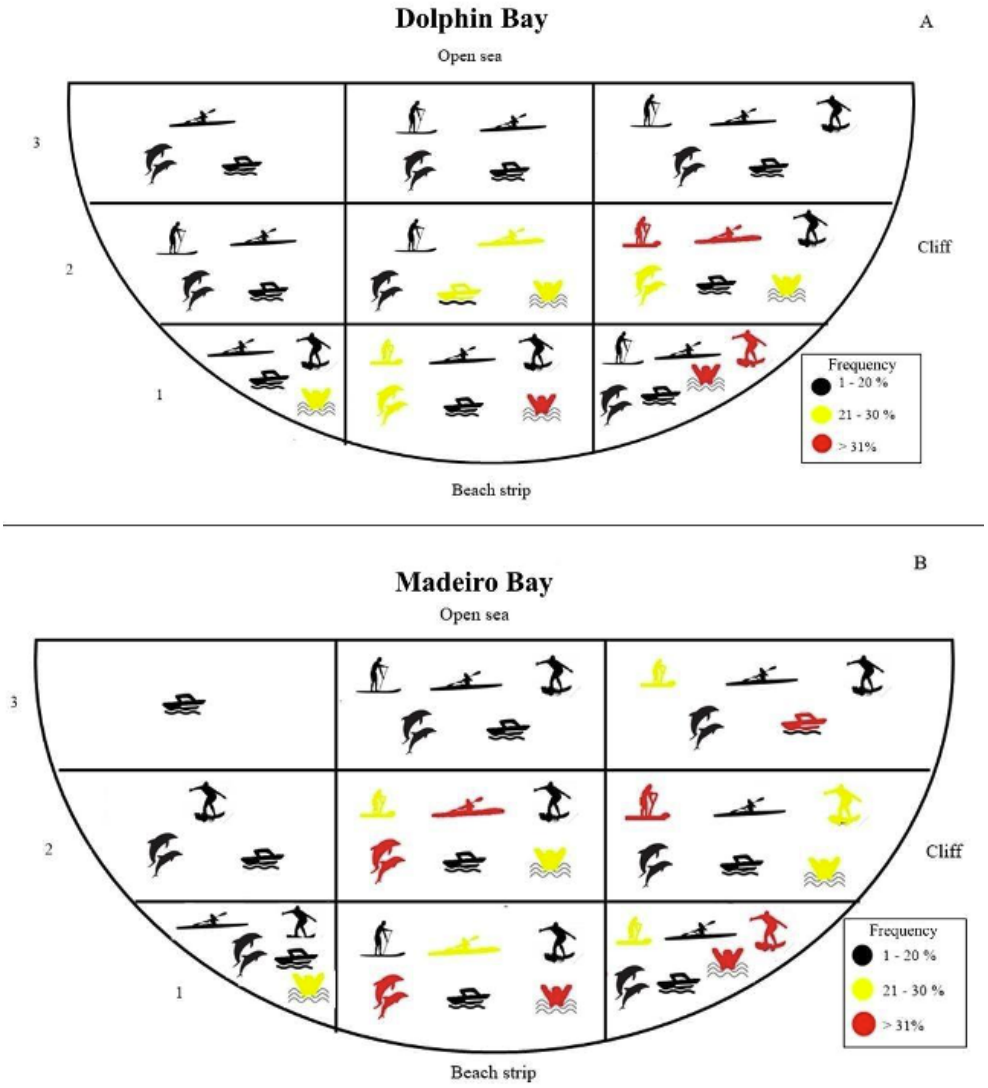
5.1.1 REFAUTS Activity Times

REFAUTS is open 24 hours a day, 7 days a week but the greatest tourist flow takes place between 11:00 am and 3:00 pm in both bays, which coincides with the period used by the dolphins. Guiana dolphin uses the two REFAUTS bays to perform essential behaviors for its survival, such as feeding and calves parental care (Lunardi & Ferreira, 2013). At REFAUTS almost all physical space and during most of the day (9:00 am to 4:00 pm) there is human presence in the bays, with no exclusive use period for dolphins during the day. The zoning areas can be an efficient strategy for dolphins' protection in REFAUTS. This management tool has been implemented in other protected areas with positive results. For example, in New Zealand to protect bottlenose dolphins (*Tursiops truncatus*) (Guerra & Dawson, 2016) and Hector's dolphin (*Cephalorhynchus hectori*) (Gormley et al., 2012).

5.1.2 Tourist Boat

In total, 11 boats were transporting tourists to observe the Guiana dolphin in its natural habitat in the REFAUTS bays at the time of data collection for this study. To perform boats at REFAUTS, operators need to obtain a license from Tibau do Sul city hall. Nowadays, the law allows up to 14 boats to take tours within the limits of the reserve (Lei Municipal nº 665 de 2019). Daily at REFAUTS, an average of 30 tours are carried out to observe the Guiana dolphin and on average, each of the 11 boats makes three tours a day. This large number of boats and the great demand of tourists to make the tour favors that several boats are simultaneously inside the same bay. The time of greatest tourist flow occurred between 11:00 and 11:59 am, this period of intense flow had already been reported in another study in the same area (Lunardi et al., 2017).

Figure 9. Use of Subareas by Guiana Dolphin and Tourists at Tibau do Sul Coastal Wildlife Reserve (REFAUTS), Brazil



Note. Guiana dolphins ( ), and tourists involved in stand-up paddleboarding ( ), kayaking ( ), surfing ( ), bathing ( ) and dolphin-watching ( ) in Dolphin (A) and Madeiro Bay (B) at REFAUTS. Frequency was calculated by the total number of records of each tourist group and Guiana dolphins. The depth of the bays is represented by 1, low depth; 2, intermediate depth; 3, high depth.

REFAUTS tourist boats have low compliance with current maritime transport legislation (Lei Municipal nº 349 de 2007) moving at high speeds and remaining for a long time inside the bays (Freitas et al., 2021). These data are concerns regarding the safety and permanence of dolphins in the reserve. Several studies have reported adverse effects in cetaceans due to intense tourist activity (Kassamali-Fox et al., 2020; Pérez-Jorge et al.

2016), mainly from noise emitted by tour boats (Li et al., 2018). Dolphins use acoustic communication to search for food, and the intense noise caused by boats can reduce or interrupt this essential activity (Pellegrini et al., 2021). Added to those negative impacts, there is still the risk of ocean contamination caused by oil leaks and food/trash discarded by passengers (New et al., 2015).

5.2 Guiana Dolphin Group Size

REFAUTS' Guiana dolphins exhibit fission-fusion dynamics with group sizes being highly variable (Lunardi & Ferreira, 2014). The dolphins' groups recorded in Dolphin Bay averaged 2,5 individuals and in Madeiro Bay the group size averaged 1.8 individuals. This result seems to demonstrate that the dolphins use the two bays similarly.

The Guiana dolphin shows parental care and females, in general, give birth to only one calf at a time with a gestation lasting between 11–12 months (Flores et al., 2018). So, the population growth rate is slow. REFAUTS has been identified as a critical area for the conservation of the Guiana dolphin in Brazil (Lunardi et al., 2017) with dolphins showing fidelity to the area and females using the reserve to take care of their calves (Silva et al., 2024).

5.3 Subarea Use by Tourists and Guiana Dolphins

We observed that in both REFAUTS bays, tourists engage in different activities sharing the same space. This overlap can compromise the physical integrity of tourists and promote greater occurrence of social and environmental conflicts. For example, the presence of boats may pose a risk to tourists involved in other activities, such as kayaking and bathing. At REFAUTS it is possible to perceive a separation between some groups of tourists, for example, most of the time, bathers are found in shallower areas, and surfers prefer areas with the biggest waves. It is necessary to make this spontaneous zoning into law. The implementation of zoning must be preceded by public consultation of all parties involved.

Overlapping use of areas could be minimized by implementing environmental zoning, which would reduce conflicts between tourists and has already proven to be an efficient measure in other places with similar problems (Basterretxea-Iribar et al., 2019). Another essential measure is the creation of an exclusive area for the dolphins (see Guerra & Dawson et al., 2016), where the entry of boats and other tourists using the REFAUTS marine area is prohibited. In addition, designing and implementing a program to supervise and monitor all tourist activities in the REFAUTS is essential for the long-term maintenance of tourism and conservation of key species. Environmental zoning and tourism planning can be effective mechanisms in promoting cetacean conservation.

The REFAUTS is a critical area for the conservation of the Guiana dolphin, whose population has declined significantly in Brazil (Azevedo et al., 2017). Thus, an area protected by law is an effective mechanism in promoting conservation. Several studies have discussed the so-called "paper parks", which are legally recognized as protected areas but do not enforce the laws (Karim & Uddin, 2019). Tourists visiting REFAUTS do not pay fees to enter the reserve, but if they were charged an entry fee, the number of people could be

better controlled and the financial resources obtained could help carry out conservation measures. REFAUTS tourists agree to the limitation on the number of people entering the reserve and are willing to pay a fee to access REFAUTS (Silva et al., 2021).

Since tourism is the main direct and indirect source of income for the residents of Pipa, it is vitally important to include the local community in Guiana dolphin conservation. Environmental education for those involved in tourism, whether the local community or tourists visiting the REFAUTS, should be encouraged. The conservation of Guiana dolphins and their habitat can guarantee the continuity of tourism in the area, given that this species is one of the main attractions of this reserve. The results presented may contribute to the implementation of the REFAUTS management plan. This document must contain the maximum capacity that the reserve can receive daily and environmental zoning stipulating an exclusive area for the Guiana dolphin.

6. Conclusion

The large number of tourists who visit REFAUTS per day can cause short and long-term negative effects. These include (i) overcrowding, which causes discomfort to people and resident animals alike; (ii) personal conflicts within the same group or between groups of tourists engaged in different activities; and (iii) negative pressure on Guiana dolphins. These problems can decrease the chances of visitors returning to the reserve. Tourism in REFAUTS occurs without any kind of supervision or monitoring. Tourists use the same areas as dolphins for different activities, which can lead to inter and intragroup conflicts. Overlapping use of REFAUTS areas can be minimized by implementing environmental zoning in both bays, which should be based on consultations with all social stakeholders, such as tourists, business and boat owners, local community, and non-governmental organizations. The implementation of environmental zoning, charging a fee to enter REFAUTS and constant enforcement can minimize the problems currently faced in this reserve, especially in terms of effective management, supervision and monitoring of tourist activities, and measures aimed at protecting the Guiana dolphin.

7. Acknowledgments

The authors are grateful to Virgínia H. F. Paixão and Deborah L. M. da Costa for assistance in data collection. We are also grateful to Ana C. Luchiari and Rovena C. G. J. Engelberth for the essential contributions they made to the manuscript.

8. Funding

This study was funded by the Coordination for the Improvement of Higher Education Personnel (CAPES) – Funding Code 001, The National Council for Scientific and Technological Development (CNPq) and the Dean of Research and Postgraduate Studies (PROPPG) – Funding Grant 19/2018, of the Federal University of the Semi-Arid Region (UFERSA).

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