

GABRIEL MENDONÇA GRELLET

**Análise comportamental de um indivíduo solitário de *Pontoporia blainvillei* (Cetacea:
Pontoporiidae) no canal do Porto de Santos, SP**

**São Vicente - SP
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Análise comportamental de um indivíduo solitário de *Pontoporia blainvillei* (Cetacea: Pontoporiidae) no canal do Porto de Santos, SP

Trabalho de conclusão de curso apresentado à Universidade Estadual Paulista (UNESP), Instituto de Biociências, Câmpus do Litoral Paulista, como parte dos requisitos para obtenção do Grau de bacharel em Ciências Biológicas, com habilitação em Gerenciamento Costeiro.

Orientadora: Carolina Pacheco Bertozzi

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G825a Grellet, Gabriel Mendonça
Análise comportamental de um indivíduo solitário de *Pontoporia blainvillei* (Cetacea: Pontoporiidae) no canal do Porto de Santos, SP / Gabriel Mendonça Grellet. -- São Vicente, 2025
50 p. : il., tabs.

Trabalho de conclusão de curso (Bacharelado - Ciências Biológicas) - Universidade Estadual Paulista (UNESP), Instituto de Biociências, São Vicente
Orientadora: Carolina Pacheco Bertozzi

1. Golfinho solitário-sociável. 2. Interação humana. 3. Espécie críptica. 4. Outlier. 5. Toninha. I. Título.

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DEDICATÓRIA

Dedico este trabalho ao meu avô Chico e a minha avó Antônia.

Gostaria de agradecer esse trabalho a minha família que apoiou e deu suporte durante toda minha graduação e que me ajudaram tanto a acreditar e a realizar o sonho de me graduar em Biologia com direito a todas as oportunidades de extensão que eu pude ter. Sou quem eu sou por conta delas.

Quero agradecer a minha orientadora Carol, por tanta paciência e carinho comigo ao longo dos últimos sete anos, desde que entrei tão imaturo no laboratório. E que sempre me apoiou com meus projetos científicos e a ingressar em todos os estágios que realizei ao longo da graduação.

E principalmente aos amigos que fiz pelo caminho, durante estes últimos 8 anos.

Aos integrantes da República Xablau, que me acolheram com o maior carinho que já tive direito. Miguel, Leonardo, Gabriel, Carol, Renan, Leonardo, João e Laura, sempre vou tê-los em um lugar de profunda admiração. Vocês foram os irmãos mais velhos que eu nunca tive e que eu precisava. Sinto muito a falta de vocês e das conversas de madrugada no jardim.

Um agradecimento especial ao Henrique, por nunca ter soltado a minha mão.

Á Amanda, Tainá, Maria Fernanda, Giovanna, Evelyn, Victoria, Mariane, Bié, Mugo, Lucas, Gabriel e Esli. Amo muito vocês.

E aos meus grandes camaradas interestaduais de estágios: Gustavo (Piauí), Marina (Rio Grande do Norte), Bianca (Recife), Tauã (Goiás), João (Goiás), Izabela (Bahia), Brenda (Bahia), Luana (Paraná), Bruna (São Paulo), João Miguel (Paraná). Obrigado pela força que vocês me deram ao longo dessa estrada e por sempre terem me acolhido quando precisei de um porto-seguro, sem vocês isso também não teria sido possível.

Solve et coagula.

INTRODUÇÃO GERAL

A etologia é ramo de estudo da Biologia que se fundamenta na compreensão de como os comportamentos são moldados pela interação entre fatores genéticos, fisiológicos, ambientais e sociais, sendo essencial para entender tanto a biologia dos organismos quanto sua relação com o ambiente (Alcock, 2009). A abordagem etológica é especialmente relevante para espécies que apresentam comportamentos complexos de socialização, como é o caso dos cetáceos.

Golfinhos são animais altamente sociáveis, vivendo em grupos que variam em composição, alguns sendo caracterizados por dinâmicas sociais de “fissão-fusão”, na qual indivíduos se associam e se separam com frequência. A formação e tamanho dos grupos estão diretamente relacionados a fatores ecológicos, como disponibilidade de alimento e alterações no habitat (Shane et al., 1986; Connor et al., 2000; Nunny & Simonds, 2019). No entanto, há registros em diversas partes do mundo de indivíduos classificados como “golfinhos solitários-sociáveis” que, embora afastados de seus congêneres, desenvolvem interações com seres humanos, passando por estágios progressivos de socialização (Wilke et al., 2005; Nunny & Simonds, 2019).

No Brasil, foram registrados apenas três casos documentados desse tipo de comportamento, todos em espécies da família Delphinidae. Recentemente, um caso inédito foi registrado, envolvendo uma fêmea juvenil de *Pontoporia blainvillei*, conhecida popularmente como toninha, no canal do Porto de Santos (SP) (Bertozzi et al., 2022). O que filogeneticamente, corrobora com a hipótese de que estes fenômenos comportamentais não seriam isolados somente aos grupos mais diversos e gregários de golfinho, pertencentes a família Delphinidae. Este registro é particularmente relevante, considerando que a toninha, espécie endêmica do Atlântico Sul Ocidental e atualmente o pequeno cetáceo mais ameaçado da região (Secchi et al., 2003; MMA, 2014), é reconhecida por seu comportamento críptico, de difícil observação, e por evitar o contato com embarcações e humanos (Cremer & Simões-Lopes, 2005; Cremer et al., 2022).

A dificuldade de observação da espécie em ambiente natural limita os estudos sobre seu comportamento, que historicamente foram baseados na análise de carcaças (Crespo et al., 1998; Cremer et al., 2022). Tecnologias mais recentes, como bioacústica, telemetria satelital e uso de drones, vêm permitindo avanços, embora ainda restritos a poucas áreas da distribuição da espécie (Sucunza et al., 2018; Paitach et al., 2021; Wells et al., 2021; Paitach et al., 2022).

Dessa forma, a oportunidade de acompanhar um indivíduo vivo, com comportamento atípico e elevado grau de interação, representa uma contribuição relevante tanto para a etologia da espécie quanto para sua conservação.

RESUMO

O presente estudo teve como objetivo analisar o comportamento de um espécime solitário de *Pontoporia blainvillei*, espécie críptica de odontoceto ameaçada de extinção, observado de forma atípica no canal portuário de Santos (SP), por meio de ferramentas etológicas para descrição de estados e eventos comportamentais, bem como à avaliação de estágios de sociabilidade. Para isso, foi elaborado um etograma com base em comportamentos previamente registrados para a espécie e membros da família Delphinidae. A metodologia adotada consistiu na técnica de animal-focal, aplicada à análise de 321 vídeos selecionados — a partir de um total de 610 registros oportunistas obtidos entre julho de 2021 e abril de 2022 —, totalizando 1.197 minutos de observações. Os vídeos tinham em média 3:22 minutos. O tempo total de permanência do animal na superfície foi de 98,6 minutos, com média de oito segundos por vídeo. O estado comportamental mais recorrente foi “Buscando Interação” (n=114), correspondendo a 62,3% do tempo total de superfície. Foram identificados 49 dos 123 eventos comportamentais descritos por Müller (1998), sendo os comportamentos de mergulhos (n=1.218), respirações (n=344); e nados (n=338) aqueles que apresentaram maior frequência numérica. Com destaque a comportamentos incomuns à espécie, como movimentação de cabeça (n=133) e comportamentos aéreos (n=62). A partir de setembro, após possível interação negativa com petrechos antrópicos, constatou-se a cessão do estado “Buscando Interação” e uma redução de seu repertório comportamental observado. Trata-se de um caso inédito e raro para a espécie uma vez que o espécime passou por uma regressão nos estágios de sociabilidade, mas que, apesar de se referir a uma situação excepcional, os achados apresentados fornecem subsídios relevantes para futuras ações de monitoramento, reabilitação e conservação das toninhas.

**Behavioral analysis of a solitary individual of *Pontoporia blainvillei* (Cetacea:
Pontoporiidae) in the Port channel of Santos, SP**

Gabriel Mendonça Grellet^{1*}, Ana Carolina Guimarães Lemes, Amanda Bezerra Silva¹,
Vanessa Lanes Ribeiro², Carolina Pacheco Bertozzi¹

¹Laboratório de Conservação de Organismos Pelágicos (LABCOP)
- São Paulo State University (UNESP São Vicente, SP)

² Instituto Biopesca (Praia Grande, SP)

*Corresponding author: gabriel.grellet@unesp.br

ABSTRACT¹

The present study aimed to analyze the behavior of a solitary specimen of *Pontoporia blainvillei*, a cryptic endangered species of odontocete, in an atypical occurrence in the port channel of Santos (SP, Brazil), through an ethological approach to describe behavioral states and events, as well as to evaluate its sociability stages. An ethogram was prepared based on behaviors previously recorded for the species and members of the Delphinidae Family. The focal-animal sampling was applied to the analysis of 321 selected videos — from a total of 610 opportunistic records obtained between July 2021 and April 2022 —, totaling 1,197 minutes of observations. The videos had an average length of 3:22 minutes. The total surface time recorded was 98.6 minutes, with an average of eight seconds per video. The most recurrent behavioral state was “Seek Human Interaction” (n=114), corresponding to 62.3% of the total surface time. 49 behavioral events were identified, with diving (n=1,218), breathing (n=344); and swimming (n=338) being the most frequent categories. Thus, some unusual categories to the species, such as head movements (n=133) and aerial behaviours (n=62) should also be highlighted. After a possible agonistic interaction with antropogenic gear on September 2021, the state to “Seek Human Interaction” ceased, as of its observed behavioral repertoire decreased along. This is an unprecedented and rare case for the species, since the individual underwent a regression in the sociability stages proposed for solitary-sociable dolphins. Despite this case refers to na outlier individual, the findings presented here provide relevant subsidies for future monitoring, rehabilitation, and conservation actions of franciscanas.

KEYWORDS: Solitary-Sociable Dolphin; Human Interaction; Cryptic species; Outlier

¹O manuscrito foi formatado segundo a revista: *Latin American Journal of Aquatic Mammals (LAJAM)*

1. INTRODUCTION

Dolphins are highly sociable gregarious animals that live in societies, some are determined by “fusion-fission” dynamics, that is, the frequent and constant change in group composition. Thus, depending on the species, the number of individuals in groups can vary from one to hundreds animals. It is believed that food availability and habitat are the most important determining factors for group composition (Shane et al., 1986; Connor et al., 2000; Nunny & Simonds, 2019).

However, cases of “solitary-sociable” individuals are known throughout the world, these are characterized as solitary animals that have little or no contact with other members of the species and in many cases interact with humans, developing different types of behaviors (Eisfeld et al., 2010). Most records are related to the Delphinidae family, notably in the genus *Tursiops* sp. (Nunny & Simmonds, 2019), cosmopolitan and coastal dolphins. Even tough, all theses cases reported, all seamed to follow similar patterns on how those dolphin were described to interact with humans. First, four stages of socialibility for solitary-sociable dolphins were established by Wilke et al. (2005), where in the beginning with the individual keep its distance from vessels and humans and gradually becomes curious and eventually interacts with humans. But, in the last stage, it may even become aggressive to certain inappropriate human interaction.

The historical decimation of dolphin populations in the european waters is most likely the reason behind the high numbers of solitary-sociable dolphins recorded on continent (Müller & Bossley 2002, apud Nunny & Simonds, 2019). Next, the American continent and the Caribbean show the second highest number of recorded cases. However, the records are more diffuse in terms of species (more taxonomic groups recorded), but geographically concentrated in North America (Nunny & Simonds, 2019).

Whilst, in Brazil, there have only been three cases recorded in specialized literature: 1. “Tião”, a male bottlenose dolphin (*Tursiops truncatus*) that inhabited the São Sebastião ferry terminal, on the coast of São Paulo between 1994 and 1995 (Santos, 1997); 2. “Viola”, a male orphaned individual of Guiana dolphin (*Sotalia guianensis*), which inhabited the Santos estuary, on the coast of São Paulo between 1997 and 1999 (Santos et al. 2000); and 3. A male rough-toothed dolphin (*Steno bredanensis*) that inhabited Sepetiba Bay, on the coast of Rio de Janeiro between 2018 and 2019 (Flach & Dias, 2020; Maciel et al., 2020). Even though, all of these reported cases were of different species, they all still belong to representatives of the Delphinidae family that inhabit the Brazilian coast, even if each one of them was in a different stage of sociability. Noting that, interactions with humans were reported in all of them.

Pontoporia blainvillei, popularly known as franciscana dolphins, are the most threatened species of small dolphin (Odontoceti) in the Western South Atlantic (Secchi et al., 2003; MMA, 2014). Endemic to coastal and estuarine waters, its range extends from the state of Espírito Santo (Brazil) to the Gulf of San Matias, in Argentina (Siciliano, 1994; Crespo et al. 1998). However, its distribution is non-continuous along the south american coast (Secchi et al., 2003). Even though the species is known for its coastal habits, their behaviour is characterized as being cryptic, given the difficulty of its observation in their natural environment for its minimal body exposure, rare aerial behaviors, and a tendency to avoid motorized vessels, differing from other coastal dolphins and porpoises species. As also due to its adaptated morphology, small size and a yellowish-grey coloration, helps the species to camouflage in the turbid coastal Waters it inhabits (Bordino et al., 1999; Cremer & Simões-Lopes, 2005; Cremer et al., 2022). All these characteristics make studying its behavior a difficult challenge. Because of that much of the knowledge about the behavior of the species was obtained indirectly from the analysis of carcasses, allowing inferences about some behavioral aspects, such as feeding and reproduction (Cremer et al., 2022).

More recently, the usage of new methodologies and gear, such as satellite telemetry, passive bioacoustics and drones (UAVs), have contributed to increased knowledge of the species behaviour (Sucunza et al., 2018, Paitach et al., 2022). But information is still scarce and restricted to a few areas of the species' distribution (Bordino et al, 1999; Cremer & Simões-Lopes, 2005, Paitach et al, 2021).

On July 26, 2021, the first case of a solitary specimen belonging from a different family other than Delphinidae was reported, a solitary member of *Pontoporia blainvillei* (Bertozzi et al., 2022). An unusual case, considering that the species usually lives in family groups of three to six individuals (Bordino et al., 1999; Di Benedetto et al., 2001; Secchi et al., 2001; Cremer & Simões-Lopes, 2005). The record occurred in the channel port of Santos, SP (23°59'29" S, 46°18'06" W), as for the specimen, a juvenile female, was observed until March 31, 2022.

Considering this unique opportunity to study a rare case of a solitary-sociable dolphin, belonging to a species known for its cryptic habits, this study aimed to analyze the behavior of this solitary specimen of *Pontoporia blainvillei* through recorded footage during its stay in the Port channel of Santos (SP) with an ethological approach, in order to: 1. Classify and describe behavioral events and states of the specimen; 2. Quantify these behaviors; and 3. Identify and qualify the stages of sociability.

2. MATERIALS AND METHODS

2.1. STUDY AREA

The study was the channel of the Santos Port (23°59'29" S, 46°18'06"). The channel is located in the Santos, São Vicente and Bertioga Estuarine System, which is highly dynamic and complex transition zone resulting from the mixing of salt water from the South Atlantic Ocean with the fresh water from the region's rivers (Ruiz, 2021). It has an average width of 400 meters from one bank to the other (Carvalho, 2016) and an average depth of 15 meters (Santos Port

Authority, 2022). Characterized by a high degree of anthropization (Ruiz, 2021), due to factors such as the Santos Port Terminal, harbor clubs, piers and housing around the channel banks.

2.2. DATA SAMPLING

Land-based surveys of this individual, were carried out by a pair of observers at two fixed points, with the aid of binoculars (20x50), over the period of July 26, 2021 until April 28, 2022. The total survey effort was 954h09min, resulting in 277h01min of direct observation. To study the behavior of the solitary specimen of *P. blainvillei*, archival footage obtained during the survey period was used. It was collected opportunistically, independent of the individual being in the camera's sight, from two different observing fixed points: one located on Santa Cruz dos Navegantes beach (right bank side of the channel); and the other at the Pilotage Portuary Pier (left bank side). The recordings were made using the *ad libitum* sampling method (Altmann, 1974; Andriolo & Simões Lopes, 2007). Footage was taken using a DSLR camera (70-200 mm lens), a GoPro camera and observers' smartphones. A total of 610 videos were recorded, corresponding to approximately 1,739 minutes of recording. Then these videos underwent a screening process, where they were classified according to the presence of the specimen throughout the duration of each video and ranked, based on footage quality criteria, such as graininess, stability and brightness, into 4 categories: 0 (unusable); 1 (low quality); 2 (medium); 3 (high). Only videos classified as medium (2) or high (3) quality were used to perform the behavioral analysis of the solitary individual.

2.3. ETHOLOGICAL APPROACH

2.3.1. ETHOGRAM

The classification and description of the specimen's behaviors were based on the duration and functionality of their behaviors into two categories: 1) Events: instantaneous behaviors; 2) States: momentary behaviors, that is, those that have an appreciable duration in time (Altmann, 1974). The behavioral states, which are more effective to be analyzed for cetaceans, were

classified according to their functionality in states such as “Forage”, “Rest”, “Mill”, “Travel”, and “Play” (Andriolo & Simões Lopes, 2007) (Table 1). Events, such as “breaches”, “tail slaps”, amongst others, were described based on the ethogram of Müller et al. (1998) for bottlenose dolphins (*Tursiops truncatus*), with special reference to solitary and sociable dolphins, in which he relates each event with its respective functionalities in specific categories (e.g.: “Aerial Behavior”, “Swims”, “Surfaces and Submergences”) (Table 2).

An ethogram was developed to guide the behavioral analysis of the specimen (Figures, Ethogram, Pages 1,2,3 and 4). Given its atypical behaviors for the species, the ethogram incorporated behavioral definitions from both existing literature on *P. blainvillei* (Bordino et al., 1999; Cremer & Simões-Lopes, 2005) and studies on other delphinid species. Particular emphasis was placed on individual and solitary behaviors (Müller et al., 1998; dos Santos et al., 2012; Baker et al., 2017; Maciel et al., 2020), as these are considered outlier categories for dolphins (Goodwin, 2009). Any behavioral categories that did not fit the behaviors recorded in the field through footage were described and added to the ethogram.

2.3.2. BEHAVIORAL ANALYSIS

In order to quantify the behavioral events and states and identify the specimen's sociability stages, the footage taken from July/2021 to April/2022 was analyzed using an adaptation of the focal animal methodology (Altmann 1974). Behavioral states and surface time were timed, while behavioral events were quantified with a manual counter. The footage was organized and analyzed based on their respective months. Finally, the behaviors were quantified in Excel spreadsheets, used to create graphs and tables. The specimen's sociability was assessed based on the behavioral panorama, according to the standards of Wilke et al. (2005).

3. RESULTS

3.1. FOOTAGE DATA

610 videos were collected in eight of the ten months during the surveillance efforts period (07/2021 to 04/2022). No footage was recorded during the months of February and April 2022, due to inappropriate environmental conditions for the surveys (02/2022) and the disappearance of the specimen from the study area (04/2022). The month with the highest number of videos (n=293) and the longest total recorded time (932:42 min) was August/2021, while the month with the lowest number (n=7) and total recorded time (10:36 min) was October/2021 (Table 3).

From those 610 videos recorded during this period, only 430 had at least one sighting record of the specimen in their content, which led to a total average of 73.8% of videos with the presence of the animal. January/2022 was the month with the best percentage of sightings per video, where 88.9% of the videos made during the month had at least one record of the animal, even though it was one of the months with the lowest number of videos recorded (n=9). While in August/2021, the month with the most recorded footage and sightings of the specimen, also had one of the worst percentages of footage with sightings, where approximately 33.1% of the total videos recorded during the month did not show any sign of the animal (Table 3).

To better analyze the behavioral repertoire of this specimen, all the video footage was filtered based on the presence of the individual and the quality criteria early mentioned. Thus, a total of 321 videos were selected for analysis (1,197 min), with an average of 40 videos analyzed per month. This represents an average of 61.8% usefull of the videos recorded throughout the survey period. The analyzed videos were on average 3:22 minutes long (Table 3).

Finally, in total, 98.6 minutes of the animal were recorded on the surface, with the average time recorded per video of eight seconds. However, it is worth highlighting the drastic decrease in

the average surface time per video over the months, from in September/2021 onwards (Table 3).

3.2. ETHOGRAM: BEHAVIOUR CATALOG

The solitary individual ethogram was made in portuguese, in order to be accessed for brazilian marine conservation institutions. It contains the description and illustrations of the 4 “Stages of Sociability for Solitary Sociable Dolphins” defined by Wilke et al. (2005), containing a brief description of each stage and a short list of common behaviors to be observed in each of these stages. It also lists six behavioral states: 1. Forage; 2. Mill; 3. Play; 4. Rest; 5. Seek Human Interaction; 6. Travel; and 7. Unknown (Unidentified Behaviors) (Table1). All states were recorded throughout the study in at least one recording. The list contains both the description of each behavioral state, as well as guide illustrations for analysis (Figures, Ethogram, Page 1).

Finally, the ethogram contains all behavioral events recorded throughout the study for the solitary specimen (Table 2). The ethogram developed by Müller et al (1998) was used as a basis, since it has a special mentions on solitary behaviors for *Tursiops sp.* dolphins. Therefore, some adaptations were necessary and some behaviors were used as synonyms and merged due to the morphological differences between *Tursiops sp* and *P. blainvillei*, which causes them to present the same behavior (function), but with different displays, as is the case with the following events: “Bow” (A1) and “Headup” (A2); “Arched Dive” (I1) and “Forward Progress Submergence” (I5); “Steep Dive” (I15) and “Back Up” (I16); and “Veering Turn” (J5) and “Turn at Oblique Angle” (J6). The names of the events were kept in English to avoid loss of meaning due to translation and to achieve greater precision in their definition. We also sought to adopt the classification of event categories by their respective functions, proposed by the authors, grouping them into 12 categories: A. Aerial behaviors; B. Arcs; C. Contact behaviors; D. Head movements; E. Pectoral fin movement; F. Breathing; G. Beats; H. Stationary behavior;

I. Surface and submersion behaviors (Dives); J. Swimming; K. Caudal movement; L. Formations (Figures, Ethogram, Pages 2, 3 and 4).

3.3. BEHAVIORAL ANALYSIS

3.3.1. BEHAVIORAL STATES

The behavioral state that presented the longest duration recorded for the entire surveyance period was “Seeking Human Interaction”, where the animal actively sought to approach people, or structures of anthropogenic origin such as vessels and piers, specifically interacting only with the vessels and structures of Santos’ Port Pilotage, totaling 48.8 minutes (2930 seconds), corresponding to 62.3% of the total surface time sampled, also being the state with the highest record frequency (n=114). In sequence, the other behavioral states that presented the longest durations, with approximately 13% of the total duration time, were the states of “Mill”, with 10.2 minutes recorded (612 seconds); and “Rest” with 10.1 minutes (607 seconds) (Table 4).

However, even the states rarely observed (low occurrence) in the analysis are also extremely relevant in this study, such events as “Forage”, “Play” state, a behavioral state that not only presented the lowest frequency of occurrence among the other states, but also presented the shortest total duration (Table 4).

3.3.2. BEHAVIORAL EVENTS

From the 123 events described by Müller et al. (1998), the specimen presented 49. Among these 123 described events, which are agrouped them into 12 categories, only “Formation” (L) and “Contact” (C) events were not recorded, since the animal was a solitary individual and remained so during the surveillance period, with no registered encounters with individuals of the same or different species of dolphins (Table 5).

Thus, the most recorded event categories throughout the analysis were: 1. Surface and Submergences (Dives) (n=1540); 2. Respirations (Breathing) (n= 409); and 3. Swims (n=391)

(Table 4). However, even behavioral events with low numerical occurrence, such as head movements (n=168), aerial movements (n=68) and pectoral fin movements (n=40) (Table 5) stand out for its high frequencies, specially during the behavioral state of “Seeking Human Interaction”. Moreover, the most recorded behavioral events (adapted from Müller et al., 1998), were: 1. Arched Forward Dive (Dives; n=923); 2. Drop Foresection Submergence (Dives; n=526); and 3. Chuffing (Respirations; n=357); 4. Rafting (Stationary; n=249); 5. Subsurface Swim (Swims; n=226) (Figures, Ethogram, Pages 2,3 and 4).

3.3.3. *BEHAVIORAL CHANGE*

From September (09/2021) onwards, after a reported event on 09/03/2021 where the animal likely presented a harmful interaction with anthropic gear, a dramatic change in the frequency of the behavioral states was stated. The solitary individual abruptly stops “seeking human interaction” and begins to present “Rest” and “Mill” as the main frequent states on the following months until its disappearance in April (04/2022) (Figure 1). Remaining longer in the middle of the port channel, no longer approaching the Pilotage pier, where the incident occurred. In addition, it also drastically reduced its repertoire of behavioral events in the following months. Before September (09/2021), the specimen presented ≥ 33 different types of behavioral events and after the incident in September, it began to present ≤ 11 types of events, reducing more than half of its repertoire (Figure 2). Prevailing only behavioral categories of “Diving”, “Swimming” and “Stationary behaviors” events.

4. DISCUSSION

All states listed and described in the ethogram for the solitary individual were behavioral definitions adapted from behaviors already described for *Pontoporia blainvillei* (Bordino et al., 1999; Cremer & Simões-Lopes, 2005), as well as other dolphin species (dos Santos et al., 2012; Baker et al., 2017; Maciel et al., 2020). The occurrence of “Play” state behaviour was an unprecedented record in *P. blainvillei* (Bordino et al., 1999; Cremer & Simões-Lopes, 2005),

happened in only one occasion on September 1, 2021, where the animal would have interacted with a drifting (unidentified) material in the canal, which closely resembled a plastic bag, in a non-harmful and non-obvious manner (Table1; Figures, Ethogram, Page1).

While, for the most frequent behavioral events, such as “diving”, “breathing” and “swimming” were behaviours essential to the survival of any marine mammal, performed at the water's surface, in a short interval in which the animal emerges and submerges from the surface to perform gas exchange (Fahlman et al., 2019; Fahlman, 2024).

Given that the recordings were made opportunistically by observers as the specimen approached the Pilotage pier, the results, especially during the first sampled months, demonstrate a clear bias in the sampling method. Opportunistically recorded footage may not accurately reflect the true behavioral patterns or their energetic costs for the specimen. Nevertheless, the data collected in this study provide valuable insights into unusual behaviors of a rarely observed species, particularly regarding considerable frequencies and nature of interaction behaviors. Notably, events such as “Aerial Behaviour”, “Head Movements”, “Slaps”, that occurred along the behavioral state of “Seeking Human Interaction”, characterized by the animal actively approaching people and boats, stands out as highly atypical for a species known for its cryptic habits, with no prior records of such events and state (Bordino et al., 1999; Cremer & Simões-Lopes, 2005), further highlighting the uniqueness of this solitary specimen's occurrence

And although all the footage was obtained opportunistically, the sampling metrics suggest a refinement in survey efforts over time regarding this solitary individual, especially considering that *P. blainvillei* is a species with cryptic habits and is notoriously difficult to observe due to its morphological characteristics—particularly in the murky estuarine waters, such as the ones of Santos' channel (SP).

274 This polluted estuarine environment of the port channel, characterized by high primary
275 productivity (Eston, 1985; Sousa et al., 1998), may also help explain certain physical conditions
276 observed in the specimen, such as a greater concentration of diatom algae on its skin, which
277 resulted in a yellowish coloration compared to the species' typical grayish tone. This
278 phenomenon has been previously reported in other cetaceans, including orcas (Hooper et al.,
279 2018; Gaydos et al., 2023) and small dolphins (Norman et al., 2004; Van Bressem et al., 2015).
280 Despite this alteration, the occasional occurrence of the "Foraging" behavioral state, recorded
281 a few times ($n = 11$), indicates that the animal was actively feeding within the monitored area.
282 This suggests that, although displaying atypical behaviors for the species, that the specimen
283 showed no signs of physiological distress or health impairments associated with its unusual
284 behavioral patterns. Which also indicates that it was executing its life habits in that same area.

285 The drastic change in the specimen's behavior is key to interpreting its sociability stages.
286 Initially, the solitary individual actively sought interaction, a behavioral state that fits the "Stage
287 3" (Wilke et al., 2005) definition, where the dolphin becomes familiar with a limited number
288 of people, frequently approaching boats, crew members, and anthropogenic structures while
289 displaying aerial and "spy" behaviors such as "spy-hops" and "glances" with its head and eyes
290 above water. It is believed that direct physical contact was avoided only due to precautionary
291 measures advised by the voluntary research team, although non-contact stimuli like vocal
292 "calls" and tapping on the water surface still occurred. This preventive approach may have been
293 crucial in preventing the progression to "Stage 4", which is associated with aggressive
294 behaviors and even potential casualties (Wilke et al., 2005; Nunny & Simmonds, 2019).
295 Subsequently, the sudden shift in behavior, marked by the cessation of intentional approaches
296 and a reduction in interactive behaviors, limited mostly to "Diving" and "Swimming", suggests
297 a regression in sociability from September onwards, aligning it with "Stage 1" (Wilke et al.,

2005), where the animal remains in the area (Santos port channel) but exhibits resting behaviors while avoiding human interaction.

This represents the fourth case recorded in the literature in Brazil for this type of phenomenon (Santos, 1997; Santos et al., 2000; Flach & Dias 2020). But a regression in its sociability appears to be a unique report, considering that the sociability stages of a solitary dolphin tends to gradually advance when it is possible to follow the specimens (Wilke et al., 2005; Nunny & Simmonds, 2019). In addition to being the first recorded case of solitary *P. blainvillei* and the unique progression of sociability that this specimen presented, this change could be interpreted as an indication of both the ontogenetic development (Mann & Smuts, 1999; Kuczaj II et al., 2012) of the cryptic behaviors characteristic of its species (Bordino et al., 1999; Cremer & Simões-Lopes, 2005), as well as its capacity for learning and assimilation, a latent characteristic that attests to the cognitive capacity of the odontoceti group (Mercado et al., 1998; Kuczaj II & Yeater, 2006; Marino, 2004; Marino et al., 2007; Herman, 2010; Kuczaj II et al., 2012).

In summary, this was a unique case among solitary sociable dolphins, since it is the first case report for this species (*Pontoporia blainvillei*), as it also proposes a new interpretation of the solitary-sociability stages progression, first proposed by Wilke et al. (2005), since the dolphin seems to have underwent a regression in its sociability. Despite focusing on an exceptionally atypical case, this study highlights the species' behavioral plasticity and provides a valuable foundation for future survey and rehabilitation initiatives aimed towards the conservation of this endangered species.

5. ACKNOWLEDGMENTS

This work was only possible thanks to the joint efforts to monitor the specimen by the NGOs Instituto Biopesca, Instituto Gremer and the National Center for Research on Aquatic Mammals

(CMA-ICMBio), and the funding provided by the Pro-Rector of Research through the PIBIC scholarship.

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461 **7. TABLES**

462 **TABLE 1.** Descriptions of the behavioral states exhibited by the solitary individual of *P.*
463 *blainvillei*.

Unit	Code	Name	Description
Behavioral States	FO	<i>Forage</i>	Indications of searching for and capturing prey, or any feeding behaviors.
	MI	<i>Mill</i>	Erratic, non-directional movements, without pattern, with sudden changes in direction, or short periods of sprinting, without spatial progression.
	PL	<i>Play</i>	Interactions with objects that do not serve obvious purposes.
	RE	<i>Rest</i>	Slow, static activity in the absence of other identifiable activity, with long periods of diving.
	SE	<i>Seek Human Interaction</i>	Animal seeks physical contact or closeness with humans, remaining on the surface most of the time.
	TR	<i>Travel</i>	Regular, directional movement, including 'zigzags' and meandering movements.
	U	<i>Unknown</i>	Activity cannot be defined.

465

466 **TABLE 2.** Behavioral events exhibited by the solitary individual of *P. blainvillei* based on
467 Müller et al. (1998) descriptions.

Behavioral events based in Müller et al. (1998)		
Unity	Type	Name
Behavioral events	A - Aereal	<i>Bow</i>
		<i>Breach</i>
		<i>Back Breach</i>
	B - Arch	<i>Body Thrust</i>
		<i>Dorsal Arch</i>
		<i>Lateral Arch</i>
		<i>Vertical Arch</i>
	D - Head Movements	<i>Chinup</i>
		<i>Beak Up</i>
		<i>Glance</i>
		<i>Head Nod</i>
		<i>Head Shake</i>
		<i>Head Thrust</i>
		<i>Spyhop</i>
		<i>Head Turn</i>
		<i>Mouth Open</i>

E- Pectoral Fins	<i>Pectoral Extension</i> <i>Pectoral Parallel Extension</i>
F - Breathing	<i>Chuffing</i> <i>Squeeze Breath</i> <i>Subsurface Exhalation</i>
G - Slaps	<i>Inverted Tail Slap</i>
H - Stationary	<i>Floating</i> <i>Ventral Float</i> <i>Lean</i> <i>Rafting</i> <i>Roll</i>
I - Surfaces and Submergences	<i>Arched Forward Dive</i> <i>Drop Foresction Submergence</i> <i>Fin/Tailstock Submergence</i> <i>Flat Foresction Surfacing</i> <i>Lateral Dive</i> <i>Leveling Off Surface</i> <i>Parallel Surfacing</i> <i>Paused Surface</i> <i>Sinking Submergence</i> <i>Steep Dive</i>
J - Swims	<i>Glide</i> <i>Half-Circle Turn</i> <i>Veering Turn</i> <i>Inverted Swim</i> <i>Lateral Swim</i> <i>Subsurface Swim</i> <i>Sharking</i> <i>Back Head Swim</i>
K - Tail Movements	<i>Fluke Up</i> <i>Sideswipe</i> <i>Tailout</i> <i>Inverted Tailout</i>
Unknown	<i>Unidentified</i>

468

469

470 **TABLE 3.** Sample summary metric of the recorded footage during the survelance of the
471 solitary specimen of *Pontoporia blainvillei*.

Videos	Sample summary								Mean	Total	Unit
	JUL/21	AGO/21	SET/21	OUT/21	NOV/21	DEC/21	JAN/22	MAR/22			
Total Number	153	293	51	7	36	27	9	34	76	610	<i>n</i>
Total Time	298:26	932:43	66:47	10:36	64:46	37:04	27:00	301:44	217:23	1739:06	min
Sightings	115	196	38	5	22	22	8	24	54	430	<i>n</i>
Sighting (%)	75,16	66,89	74,51	71,43	61,11	81,48	88,89	70,59	73,8	-	%
Total sighting time	267:23	890:41	58:33	09:44	44:03	30:26	26:09	254:36	197:42	1581:35	min
Analised videos	72	147	27	5	22	17	7	24	40	321	<i>n</i>
Usefull videos (%)	47,06	50,17	52,94	71,43	61,11	62,96	77,78	70,59	61,8	-	%
Mean analised time	01:26:22	04:46:55	01:10:16	01:56:48	02:00:08	01:31:53	03:29:34	10:36:30	03:22:18	26:58:26	min
Total analised time	103:38	702:57	31:37	09:44	44:03	26:02	24:27	254:36	149:38	1197:04	min
Surface time	1693	3612	209	7	124	76	39	158	740	5918	s
Mean surface time per vídeo	15	18	6	1	6	4	5	7	8	62	s

472

473 **TABLE 4.** Total time and occurrence of behavioral states exhibited by the solitary individual
474 of *P. blainvillei*.

States	Acronyms	Total Time (s)	Total Time (%)	Ocurrence (<i>n</i>)	Ocurrence (%)
Forage	FO	140	2.98	11	3.23
Mill	MI	612	13.01	43	12.61
Play	PL	7	0.15	1	0.29
Rest	RE	607	12.90	81	23.75
Seek Human Interaction	SE	2930	62.29	114	33.43
Travel	TR	17	0.36	9	2.64
Unknown	U	391	8.31	82	24.05

475

TABLE 5. Total number of behavioral event category records.

Event Categories (Müller et al., 1998)	<i>n</i>	%
A – Aerial Behavior	68	2.1
B – Arches	64	1.9
D – Head Movements	168	5.1
E – Pectoral Fin Movements	40	1.2
F- Respirations	409	12.4
G – Slaps	3	0.1
H – Stationary Behavior	313	9.5
I - Surface and Submergences	1540	46.6
J - Swims	391	11.8
K – Fluke Movements	79	2.4
U - Unidentified	230	7.0

479 8.1. ETHOGRAM

Etograma indivíduo solitário de *Pontoporia blainvillei* (Cetacea: Pontoporiidae) no canal do Porto de Santos, SP (Brasil)

Estágios de sociabilidade para golfinhos solitários sociáveis
Wilke et al. (2005)

Estágio 1	Estágio 2	Estágio 3	Estágio 4
 Um golfinho solitário aparece e permanece em uma nova área de vida, podendo se restringir a uma parte menor e mais protegida. Às vezes há uma área de descanso exclusiva dentro desta mesma área, muitas vezes um ancoradouro embarcação ou boia. Podendo seguir barcos de pesca, ou inspecionar equipamentos de pesca, mas não se aproxima dos humanos.	 O golfinho se habitua a sua nova área de vida, passando a seguir regularmente barcos, mas ele ainda mantém distância das pessoas. Comportamentos comuns: "Bowriding" e comportamento exploratório dirigido a objetos inanimados como cordas, correntes e boias.	 O golfinho torna-se familiar a presença de uma ou mais pessoas, interagindo nesta fase com um número limitado de pessoas. Comportamentos comuns: Nadar nas proximidades, mergulhos lado a lado, comportamento de toque, como "Pull", comportamento aéreos e "Spy Hops".	 A presença do golfinho torna-se amplamente conhecida, tornando-se uma atração turística local. Durante esta fase, comportamento humano inadequado pode provocar comportamentos perigosos. Comportamentos comuns: Comportamentos de dominância, agressividade e sexuais direcionados aos humanos.

Estados Comportamentais

Bordino et al. (1999); Cremer & Simões-Lopes (2005); dos Santos et al. (2012); Baker et al. (2017); Maciel et al. (2020).

1. **Forage** ou **Forrageamento** – Indicações de procura e captura de presas, ou quaisquer comportamentos alimentares.

2. **Mill** ou **Locomoção Frenada** – Movimentos erráticos não direcionais, sem padrão, com mudanças bruscas de direção, ou curtos períodos de arranco, sem progressão espacial.

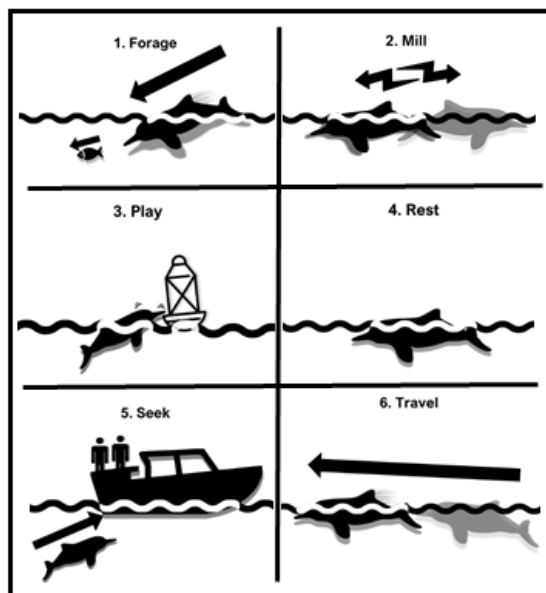
3. **Play** ou **Brincar** – Interações com objetos que não servem a propósitos óbvios.

4. **Rest** ou **Descanso** – Atividade lenta e estática na ausência de outras atividades identificáveis, com longos períodos de mergulho.

5. **Seek Human Interaction** ou **Buscando Interagir** – Todas as atividades onde o golfinho não necessariamente interage, mas busca se aproximar ativamente de embarcações ou pessoas

6. **Travel** ou **Locomoção Direcional** – Movimento regular e direcional, incluindo 'zig-zags' e movimentos meandantes.

7. **Unknown** ou **Não Identificada** – Estado não pode ser definido ou identificado.



Eventos Comportamentais registrados pelo espécime solitário
Müller et al. (1998).

Eventos Comportamentais baseados em Müller et al. (1998)			
Unidade	Tipo	Nome	Descrição
Eventos Comportamentais	A - Aéreo	<i>Bow</i>	Ascensão aérea seguida de reentrada com a distância de seu comprimento corporal até de seu ponto de saída, com exposição da seção anterior do corpo, assumindo uma posição de arco côncavo.
		<i>Breach</i>	Elevação, de parte da porção anterior do animal acima da superfície, e sua queda lateral de maneira plana e ruidosa.
		<i>Back Breach</i>	Elevação, de parte da porção anterior do animal acima da superfície, e sua queda no sentido de seu dorso de maneira plana e ruidosa sob seu dorso.
	B - Arco	<i>Body Thrust</i>	Rápida alternância de arcos côncavos e convexos com o corpo do animal à partir de uma posição dorsal sob a superfície ou em sua interface.
		<i>Dorsal Arch</i>	Um movimento da nadadeira dorsal breve e orientado para cima, quando o animal se encontra em posição dorsal.
		<i>Lateral Arch</i>	Investida lateral de um animal totalmente arqueado na lâmina d'água em posição lateral, expondo a porção lateral de seu ventre. Esse comportamento pode ocorrer repetidas vezes e envolver 'splashes' de água.
		<i>Vertical Arch</i>	Em uma postura equilibrada, o animal em posição vertical expondo sua seção anterior na superfície com a cabeça erguida, se curva em forma de arco ligeiramente convexo.
	D - Movimentos Cabeça	<i>Chinup</i>	Uma breve exposição do rosto acima da superfície da água em diferentes ângulos direcionados para cima, à partir de uma elevação da cabeça. O animal emerge com o rosto elevado, ou eleva-o depois de chegar a superfície.
		<i>Beak Up</i>	O animal sacode seu rosto para cima e para baixo na superfície.
		<i>Glance</i>	Uma breve exposição do olho acima da superfície com o animal em posição dorsal, esteja ele estacionário ou em movimento.
		<i>Head Nod</i>	Movimento da cabeça para cima e para baixo performed pelo animal em posição dorsal, articulação do movimento vem à partir do pescoço.
		<i>Head Shake</i>	Movimentos alternados da cabeça de um lado para o outro.
		<i>Head Thrust</i>	Uma arrancada abrupta da cabeça para frente ou para trás, que endireita seu o arqueamento corporal.
		<i>Spyhop</i>	Uma breve elevação vertical, ou próximo a posição vertical, do corpo do animal, com a exposição de sua porção anterior de cabeça erguida, seguido de seu afundamento e retorno a água.
		<i>Head Turn</i>	O animal elevado sobre a superfície e gira em semicírculo em seu próprio eixo.
		<i>Mouth Open</i>	O animal mantém sua boca aberta.
	E - Nadadeiras Peitorais	<i>Pectoral Extension</i>	Exposição da nadadeira peitoral na superfície, com o animal em posição lateral.
		<i>Pectoral Parallel Extension</i>	Exposição de ambas as nadadeiras peitorais na superfície pelo animal em posição ventral.
	F - Respirações	<i>Chuffing</i>	A liberação abrupta de ar pelo orifício respiratório que soa como um chiado 'chu' (onomatopéia).
		<i>Squeeze Breath</i>	Uma breve expulsão de ar audível que soa como ar escapando de um balão.
		<i>Subsurface Exhalation</i>	A liberação de ar pelo animal submerso, que forma um fluxo de pequenas bolhas, ou uma ou duas bolhas grandes.
	G - Batidas	<i>Inverted Tail Slap</i>	Movimento onde o lado dorsal da nadadeira caudal é trazida de forma plana contra a superfície da água enquanto animal está em posição invertida (ventre para cima).

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484 **PAGE 2.** Lists behavioral events based on descriptions made by Müller et al. (1998),
 485 categorized by their respective functions, in this case behaviors: Aerial (A); Arches (B); Head
 486 movements (D); Pectoral fin movements (E); Respirations (F); and Slaps (G). The names of the
 487 events were kept in English for greater accuracy in the definition.

Eventos Comportamentais	H - Comportamento Estacionário	<i>Floating</i>	Posição estacionária onde o animal expõe sua porção anterior em posição dorsal na superfície.
		<i>Ventral Float</i>	O animal está estacionário na superfície em posição ventral, expondo-o.
		<i>Lean</i>	Uma leve rotação ao longo do longo eixo do corpo do animal partindo de uma posição dorsal movendo-o em direção à posição lateral por poucos instantes.
		<i>Rafting</i>	Flutuação sob a superfície com eixo do corpo reto na posição dorsal e exposição intermitente da seção anterior na superfície; o rosto é raramente visível.
		<i>Roll</i>	Rotação lateral acentuada ao longo do eixo do animal em posição dorsal. O movimento é geralmente contínuo de dorsal para lateral com a nadadeira dorsal paralela à superfície da água. A rotação geralmente é apenas para um lado.
	I - Emerção e Submersão	<i>Arched Forward Dive</i>	Movimentos de investida em avanço progressivo (para frente) sobre a superfície geralmente seguida por uma reentrada limpa em posição dorsal em um contínuo um arco côncavo pronunciado. A elevação do eixo horizontal varia com a velocidade e o momento; nadadeiras peitorais geralmente permanecem submersas e essenciais para descida da seção anterior.
		<i>Drop Foresction Submergence</i>	Um abrupto mergulho da superfície para debaixo d'água através da curvatura na seção mediana, com a descida acentuada da seção anterior. A nadadeira dorsal é levemente elevada à medida que o pedúnculo caudal se move para cima e torna-se paralelo à superfície à medida que o animal avança.
		<i>Fin/Tailstock Submergence</i>	Exposição da nadadeira dorsal e do pedúnculo caudal na lâmina d'água antes de se mover para debaixo d'água. O animal expõe apenas a nadadeira dorsal e o pedúnculo caudal. A seção anterior não é visível, o orifício respiratório nunca fica exposto e o pedúnculo caudal geralmente apresenta um arqueamento côncavo pronunciado.
		<i>Flat Foresction Surfacing</i>	Exposição da seção anterior e nadadeira dorsal à superfície em posição dorsal e eixo horizontal reto. O animal se move continuamente debaixo d'água para a superfície e endireitando momentaneamente o arqueamento de sua seção anterior antes da submersão.
		<i>Lateral Dive</i>	Submersão em posição lateral em forma de arco côncavo. O animal pode girar lateralmente a partir de uma posição dorsal para qualquer lado ao longo de seu eixo horizontal
		<i>Leveling Off Surface</i>	Elevação da seção caudal de um arco côncavo até uma posição paralela à superfície. A seção anterior é exposta sob a lâmina d'água em um ângulo ligeiramente oblíquo e permanece fixa; a elevação geralmente ocorre durante uma ligeira pausa no avanço progressivo.
		<i>Parallel Surfacing</i>	Subida vertical através da coluna de água até à superfície na posição dorsal, expondo simultaneamente as costelas e nadadeira dorsal.
		<i>Paused Surface</i>	Uma breve pausa no avanço progressivo durante a exposição do orifício respiratório na superfície antes de submergir. Respirações pausadas geralmente ocorrem em velocidades de natação mais lentas.
		<i>Sinking Submergence</i>	Mergulho vertical através da coluna de água a partindo da superfície ou da lâmina por um golfinho em posição dorsal sem avanço progressivo.

PAGE 3. Lists of behavioral events based on the descriptions made by Müller et al. (1998), categorized by their respective functions, in this case behaviors: Stationary (H); and Surfaces and Submergences (I). The names of the events were kept in English for greater precision in the definition.

Eventos Comportamentais	I - Emerção e Submersão	<i>Steep Dive</i>	Movimento partindo cabeça do animal, da superfície para debaixo d'água com a exposição do pedúnculo caudal. A porção anterior mergulha suave ou abruptamente pela curva em sua seção média na posição dorsal. O pedúnculo caudal pode ser arqueado ou reto; a extremidade do pedúnculo caudal pode arquear ligeiramente sem expor a nadadeira caudal.
	J - Natação	<i>Glide</i>	Um breve avanço progressivo na posição dorsal sem movimentos de propulsão caudal. O corpo do animal aparenta ficar totalmente estendido sob seu eixo dorsal (horizontal).
		<i>Half-Circle Turn</i>	Uma rápida reorientação em 180° da posição dorsal do animal durante um avanço progressivo.
		<i>Veering Turn</i>	Uma abrupta mudança na direção para qualquer um dos lados de seu curso original em avanço progressivo pelo animal submerso em posição dorsal sem uma aparente perda de velocidade em seu movimento.
		<i>Inverted Swim</i>	Avanço progressivo com o ventre para cima.
		<i>Lateral Swim</i>	Avanço progressivo em que o corpo do animal está rotacionado a 90° a partir da posição dorsal, orientando uma de suas nadadeiras peitorais para cima e a outra para baixo. Nesta posição, a nadadeira peitoral superior é frequentemente exposta na superfície.
		<i>Subsurface Swim</i>	O animal faz um avanço progressivo em qualquer posição enquanto está debaixo d'água.
		<i>Sharking</i>	A nadadeira dorsal é a única parte do corpo exposta continuamente visível à medida que o animal avança na lâmina d'água a qualquer velocidade.
		<i>Back Head Swim</i>	O animal se reorienta para uma posição invertida, emergindo e jogando a cabeça para trás com força suficiente para se reposicionar.
	K - Movimentos Caudais	<i>Fluke Up</i>	Exposição da nadadeira caudal na superfície enquanto animal está estacionário ou em movimento. A nadadeira pode não estar plana.
		<i>Sideswipe</i>	Forte liberação da cauda em posição dorsal. A porção cauda se curva em um arco convexo e torciona a nadadeira caudal para cima.
		<i>Tailout</i>	Exposição da porção caudal do animal na superfície enquanto ele está em posição dorsal.
		<i>Inverted Tailout</i>	O animal expõe seu pedúnculo caudal na superfície enquanto está em uma posição invertida (ventral).
	Não Identificado	<i>Não Identificado</i>	Evento comportamental impreciso, não identificado em decorrência de dificuldades em visualizar o animal e seu contexto.

PAGE 4. Lists behavioral events based on the descriptions made by Müller et al. (1998), categorized by their respective functions, in this case behaviors: Surfaces and Submergences (I); Swims (J); Fluke movements (K); and Unidentified. The names of the events were kept in English for greater precision in the definition (for exception of the unidentified category).

8.2. PLOTS

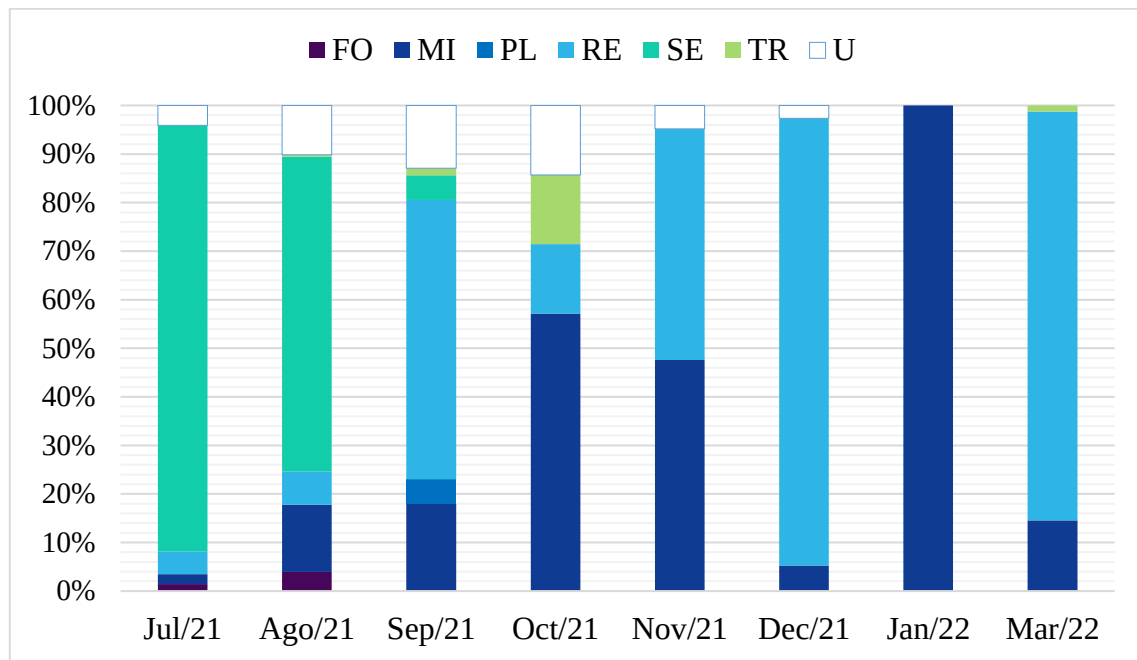


FIGURE 1. Percentage of behavioral states per month sampled. FO-Forage; MI-Mill; PL-Play; RE-Rest; SE-Seek Human Interaction; TR-Travel; and U-Unknown.

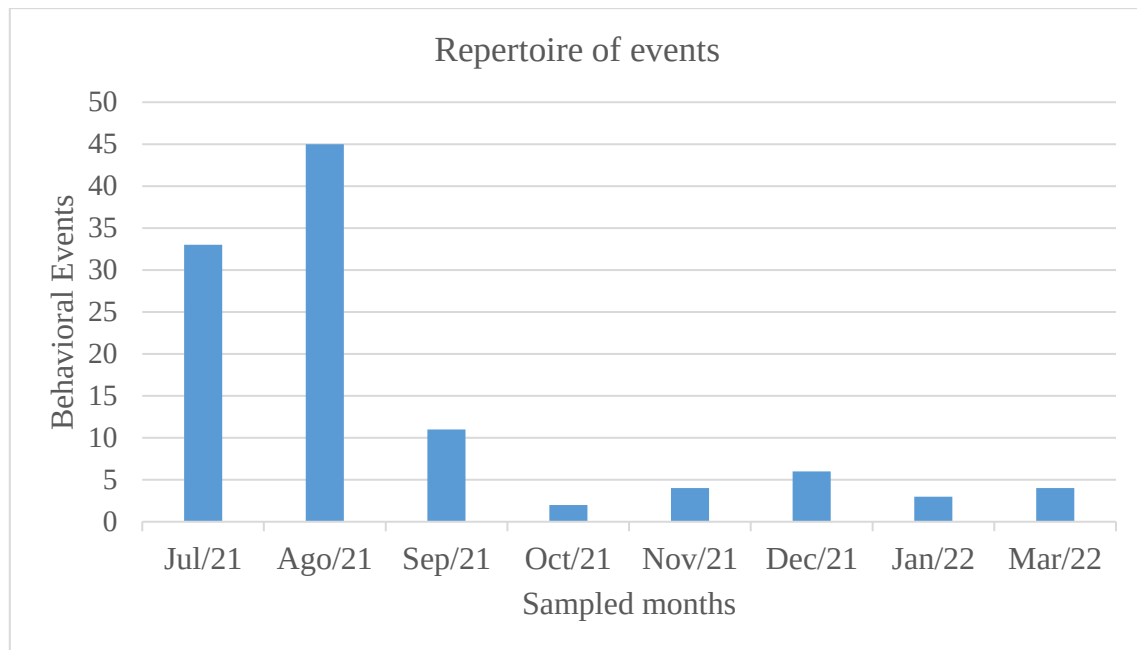


FIGURE 2. Repertoire (n) of behavioral events per month sampled.

NORMAS

Latin American Journal of Aquatic Mammals Author Guidelines

Revised Nov 2023

Scope of LAJAM

The **Latin American Journal of Aquatic Mammals (LAJAM)** publishes articles on the research, management and conservation biology of aquatic mammals in Latin America. Articles on theory or techniques broadly applicable to aquatic mammals will also be considered, even when the research has taken place outside Latin America.

Submission of manuscripts

- Manuscripts should be submitted online at <https://lajamjournal.org/index.php/lajam/submission/wizard> using the OJS/PKP platform.
- Upon submission, authors are highly encouraged to provide names and contact details of potential referees which may or may not be contacted at the Editor's discretion.

LANGUAGE

- Manuscripts must be written in either American or British English; however, authors must be consistent throughout the manuscript.

TYPES OF SUBMISSIONS

LAJAM publishes the following types of manuscript: *Articles, Notes, Protocols, Reviews, Book Reviews, Comments and Opinions.*

- **Articles** report results of original research. Manuscripts should be organized in a logical sequence with sections corresponding to Title page, Abstract and Keywords, Introduction, Materials and Methods, Results, Discussion, Acknowledgments and

References. Articles should normally not exceed 7,500 words of text, not including references, figures and tables.

- **Notes** are brief reports of original research. They should normally not exceed 3,500 words in the body text, not including references, figures and tables. Notes do not have formal sections or headings (except for Acknowledgments and References) and they do not have an Abstract or Keywords.
- **Protocols** are technical short papers of recommended standardized methods for collecting data of aquatic mammals (i.e. on morphology, behavior, genetics, etc.). Protocols should be well illustrated and should normally not exceed 4000 words in the body of the text, not including references, figures and tables.
- **Reviews** address topics of general interest to the Latin American aquatic mammal community. They should be concise (i.e. summarize the topic), rather than present detailed information. Reviews will be considered for publication only after invitation by, or agreement with, LAJAM Editors.
- **Book Reviews** are short reviews of recently published books dealing with aquatic mammals in Latin America. Authors should inquire with the Editor-in-Chief prior to preparing a book review to ensure that there is no duplication of effort.
- **Comments** are short critiques of papers previously published in LAJAM. Authors of the original paper being discussed will be invited to reply to these critiques. Comments on papers published elsewhere but of relevance to aquatic mammal research in Latin America will also be considered.
- **Opinions** are invited contributions on selected topics of relevance to Latin American aquatic mammals. Non-invited opinions will be considered after agreement with LAJAM Editors.
-

Publication format

- Manuscripts should be prepared in Microsoft Word or a similar program (.doc, .docx and .rtf formats accepted).
- Manuscripts should have line numbers inserted continuously starting with the title page.
- All parts of the manuscript, including tables, and figure captions, should be typewritten, double-spaced with margins at least 2.5 cm (1in) wide.
- Number all pages of the manuscript beginning with the title page and include continuous line numbers on each page.
- All text should be typed using Times New Roman font size 12. Headings (e.g., **Introduction**) should be in bold. If additional sub-headings are required, these should appear in italics (e.g., *Data analysis*).
- The Latin abbreviation such as 'et al.' should not italicized, however 'e.g.' and 'i.e.' should be italicized and should be followed by a comma.

TITLE PAGE

- Should contain a concise and informative title, and a list of authors' names. Author affiliations and addresses should be numbered.
- The **Corresponding author** should be identified with an asterisk (*) and provide their email address.

ABSTRACT

- The abstract should be in English and should summarize the objective of the study, the methods used, the main results, the conclusions and their significance, and not exceed 350 words.
- Up to six Keywords (in English), that are not used in the title, should be provided.

BODY OF THE MANUSCRIPT

- Should contain the **Introduction, Materials and Methods, Results, Discussion, Acknowledgments, and References.**
- Measurement units should conform to the Système International d'Unités (SI). Abbreviations must be defined the first time they appear in the text. Acknowledgements must be brief and should include permit and/or grant number(s) under which the work was conducted. Tables and figures should be placed after References.

IN-TEXT CITATIONS

- Reference to papers containing more than two authors should appear as: Di Benedetto et al. (2001).
- References should appear in chronological order (*e.g.*, DeMaster et al., 1992; Palacios & Mate, 1996; Dalla Rosa et al., 1999; Van Bressemer et al., 2006; 2007).
- References from the same year should be cited followed by letters as: Vaz-Ferreira (1975a, b).

REFERENCES

- References should be double-spaced and listed alphabetically in the APA 7th Edition format, with full journal titles and each author's last name starting with a full capital followed by lowercase for the rest of the name.
- For users of bibliographic software, the APA 7th Edition template can be downloaded from https://endnote.com/style_download/apa-7th-american-psychological-association-7th-edition/
- Include a DOI for works that have a DOI whenever possible. Country of publication should be spelled out.

Journal Articles

General Format: Author, A. A., & Author, B. B. (Year). Article title. *Journal Title*, volume(issue), page numbers. DOI or URL

Gerpe, M. S., Rodriguez, D. H., Moreno, V. J., Bastida, R. O., & Aizpun, J. E. (2002). Accumulation of heavy metals in the franciscana (*Pontoporia blainvillei*) from Buenos Aires

Province, Argentina. *Latin American Journal of Aquatic Mammals*, 1(1), 95-106.
<https://doi.org/10.5597/lajam00013>

Palacios, D. M., & Mate, B. R. (1996). Attack by false killer whales (*Pseudorca crassidens*) on sperm whales (*Physeter macrocephalus*) in the Galapagos Islands. *Marine Mammal Science*, 12(4), 582-587. <https://doi.org/10.1111/j.1748-7692.1996.tb00070.x>

Books

General Format: Author, A. A., & Author, B. B. (Date). *Title in sentence case: Subtitle* (edition, if not the first). Publisher. URL or DOI (if electronic)

Lord, R. D. (2007). *Mammals of South America*. Johns Hopkins University Press.

Edited Books

Miller, J., & Smith, T. (Eds.). (1996). *Cape Cod stories: Tales from Cape Cod, Nantucket, and Martha's Vineyard*. Chronicle Books.

Würsig, B., Thewissen, J. G. M., & Kovacs, K. M. (Eds.). (2017). *Encyclopedia of marine mammals* (3rd ed.). Academic Press. <https://doi.org/10.1016/C2015-0-00820-6>

Book chapters

Ponnampalam, L. S., Keith-Diagne, L., Marmontel, M., Marshall, C. D., Reep, R. L., Powell, J., & Marsh, H. (2022). Historical and current interactions with humans. In H. Marsh (Ed.), *Ethology and behavioral ecology of Sirenia* (Vol. 6, pp. 299-350). Springer Nature Switzerland. https://doi.org/10.1007/978-3-030-90742-6_7

Aragones, L. V., LaCommare, K. S., Kendall, S., Castelblanco-Martinez, N., & Gonzalez-Socoloske, D. (2012). Boat- and land-based surveys for sirenians. In E. M. Hines, J. E. Reynolds III, L. V. Aragones, A. A. Mignucci-Giannoni, & M. Marmontel (Eds.), *Sirenian conservation: Issues and strategies in developing countries* (pp. 179-185). University Press of Florida.

Theses

General Format: Author, A. A., & Author, B. B. (Year). *Title of dissertation/thesis* (Publication No.) [Doctoral dissertation/Master's thesis, University]. Database. URL

Silva, K. G. (2004). *Os pinípedes no Brasil: ocorrências, estimativas populacionais e conservação* [Doctoral dissertation, Fundação Universidade Federal do Rio Grande].

Gonzalez-Socoloske, D. (2013). *Aspects of the feeding ecology of the Antillean manatee (Trichechus manatus manatus) in the wetlands of Tabasco, Mexico* [Doctoral dissertation, Duke University]. DukeSpace. <https://hdl.handle.net/10161/7100>

Technical & Research Reports

Citations of *non peer-reviewed reports* from known international or national institutions (e.g. UNEP, IUCN, IWC, CMS, NOAA) and *publications not available in the public domain* (e.g. working documents, contract reports) should also be included in the list of References. Citation of such reports should be as follows:

General Format: Author, A. A., & Author, B. B. (Date). *Title of report* (Publication No.). Publisher. DOI or URL

Nelson, M., Garron, M., Merrick, R. L., Pace, R. M., & Cole, T. V. (2007). *Mortality and serious injury determinations for baleen whale stocks along the United States eastern seaboard and adjacent Canadian Maritimes, 2001-2005* (Document No. 07-05). U.S. Department of Commerce, Northeast Fisheries Science Center. <http://www.nefsc.noaa.gov/nefsc/publications>

Conference abstracts

Citation of *conference abstracts* are allowed but should be avoided if possible. It may be permitted if there are no peer review sources available on the topic. Citation of conference abstracts (if applicable) should also be included in the References. Full conference dates (including days) is preferable if available. The format should be as follows:

General Format: Author, A. A., & Author, B. B. (Date). *Title of contribution* [Paper presentation]. Conference Name, Location. DOI or URL

Gonzalez-Socoloske, D., Carvalho, C. C., & Marmontel, M. (2019, December 9-12). *Characterization of side scan-sonar images produced by Amazonian River dolphins* (Inia

geoffrensis) to reduce potential confusion during surveys of Amazonian manatees (*Trichechus inunguis*) [Paper Presentation]. World Marine Mammal Conference, Barcelona, Spain.

Olivera-Gómez, L. D., Jiménez-Domínguez, D., & Morales-Vela, B. (2021, May 2-6). *Seguimiento satelital de manatíes en sistemas fluviolagunares del sur del Golfo de México* [Paper Presentation]. XXXVII Reunión Internacional para el Estudio de los Mamíferos Marinos, Sociedad Mexicana de Mastozoología Marina, La Paz, Baja California Sur, Mexico.

Websites

Internet citations should be presented in the Reference list and should include the full URL as well as the date the site was visited, according to the following example:

General Format: Author, A. A., & Author, B. B. (Date). *Title of page*. Host site. URL

IUCN. (2022). *IUCN Red List of Threatened Species*. <https://www.iucnredlist.org>

Marmontel, M., de Souza, D. A., & Kendall, D. (2016). *Trichechus inunguis*. *The IUCN Red List of Threatened Species* 2016, e.T22102A43793736. <https://doi.org/10.2305/IUCN.UK.2016-2.RLTS.T22102A43793736.en>

PERSONAL COMMUNICATIONS, PERSONAL OBSERVATIONS AND UNPUBLISHED DATA

Citation of personal communications, either oral or written, is permitted but should be used with discretion. Reference to personal observations or unpublished data should be cited in the text as follows: (E. Secchi, U. of Rio Grande, pers. comm., 15 August 2018), if one of the authors you can use (R. Ramos, pers. obs.), or (M.C.O. Santos, unpub. data).

TABLES

- Tables should be included as part of the main manuscript and placed after the References.
- Each table should be presented in a separate page, with table captions at the top of the page.
- Tables should be numbered sequentially and cited in the text as Table 1, Table 2, etc. The maximum permitted width of any table is 17.5 cm.

FIGURES

- For initial submission, figures should be included as part of the main manuscript after the Tables.
- Each figure and caption should be placed in a separate page. Figures should be numbered sequentially and cited in the text as Fig. 1, Fig. 2, etc.
- If multiple images/panels are used in one figure, they should be labeled as A, B, etc. in the upper left hand corner of each panel. The intext citation can specify the panel as Fig. 1A, Fig. 3C, etc.
- After acceptance, authors need to provide high-quality files in a format suitable for publication (*i.e.*, .tif for raster images and .eps for vector graphics).
 - **Maps** should be prepared using appropriate mapping software and should have a coordinate system (see instructions below on how to report geographic coordinates) with readable labels along the longitude and latitude axes. Maps generated with Google Maps, Google Earth, MapQuest, etc. are not acceptable for publication in LAJAM. Maps should include appropriate scale bars (not more than $\frac{1}{3}$ the length of the map, with logical scale increments such as multiples of 5, 10, 15 or 50) and a north arrow.
 - **Images** should be sized to single-column width (width 8.5 cm) and the maximum allowable width is 17.5 cm. Resolution should be 300 dpi or higher. Axes should be labeled and should include appropriate measurement units. Lettering should be in Arial, Helvetica or a similar sans serif font with a minimum size of 10 pt. Figures composed of multiple parts should be labeled (*e.g.*, A, B, C, D).
 - All **figures, tables**, and their captions should be self-explanatory. For table footnotes use superscript lowercase letters; asterisks can be used to indicate statistical significance.

EQUATIONS

- Should be prepared using the Equation Editor included with Microsoft Word. Ensure that superscripts and subscripts are easily discernible.
- Use italics for letters indicating parameters (*e.g.* $y = a + bx$).
- Results of statistical tests should be given as follows: (ANOVA, $F(3,2) = 5.67$, $p = 0.03$); (t-test, $t(3) = 2.43$, $p = 0.09$).

COMMON AND SCIENTIFIC NAMES

- The full scientific name must be given (in parentheses, after the common name) the first time a species is mentioned (*e.g.*, The blue whale (*Balaenoptera musculus*)...). After that, unless the paper deals directly with taxonomy, common names should be used instead of the scientific name.
- Genus name should be abbreviated in subsequent references to the scientific name (*e.g.*, Three sightings of *B. musculus*...). When a sentence begins with a scientific name, the genus name should be spelled out (*e.g.*, *Balaenoptera musculus* sightings occurred far offshore).
- Scientific and common names used should follow the Society for Marine Mammalogy List of Marine Mammal Species and Subspecies (<https://marinemammalscience.org/science-and-publications/list-marine-mammal-species-subspecies/>). Regional common names may be used if the internationally recognized common name is referred to at least once. For example,

boto for the Amazonian River dolphin. The geographical location should not be used as part of the common name of the species unless it is an accepted common name. For example, “Guiana dolphins” is acceptable, but not “Uruguayan seal lions”.

CAPITALIZATION

- Capital letters should be used when referring to recognized geographic names (*e.g.*, Antarctic, South Atlantic Ocean, Northern Hemisphere), and to institutions or people’s names (*e.g.*, IWC Scientific Committee, Chairman, Vice-Chairman) or where named after a person (*e.g.*, Blainville’s beaked whale, Commerson’s dolphin).
- Capital letters should not be used for generic names (*e.g.*, western South Atlantic, sub-Antarctic, humpback whale).

NUMBERS, DATES AND MAP REFERENCES

- Numbers under 10 should be spelled out (*e.g.*, three humpback whales).
- Decimal points should be indicated by full stops, not commas.
- Zeros should be included: *e.g.*, 0.86.
- There should be a space between numbers and abbreviated units: *e.g.*, 114 cm, 16 kg. But, percentages should be used as follows: 3% of humpback whales, with no space.
- Dates should be as follows: 15 January 2020.
- Time should be cited in the international standard notation (hh:mm:ss or hh:mm, *e.g.*, 09:00h or 17:27:33h).
- Geographic coordinates should be in the form: 32°05’ S, 52°08’ W or 32°05’03" S, 52°08’55" W.

HYPHENS

- Should be used in compound adjectives preceding a noun (*e.g.*, age-specific survival rates, length-specific model), but not when part of the compound adjective consists of a numeral (*e.g.*, 8cm long testis).

ABBREVIATIONS

- Capital abbreviations do not require full stops (*e.g.*, IWC, FMA, MSYR, 25°S, CV, SD, SE, etc.).
- Metric units are required, however, widespread nautical units (*i.e.*, knots and nautical miles) are allowed.
- Commonly used abbreviations for quantities have no full stop (*e.g.*, 10 cm, 15 m, 3 nmi, 15 kt, 25°C, etc.).

ITALICS

- Should be used for references to titles of books and periodicals (*e.g.*, *Moby Dick*, *Marine Ecology Progress Series*); names of vessels (*e.g.*, *Ary Rongel*, *Atlântico Sul*); scientific names of organisms (*e.g.*, *Coprosma foetidissima*); foreign words or abbreviations not part of everyday English (*e.g.*, *i.e.*); local names for habitats or other descriptions (*e.g.*, *várzea*, *igapó*); and trade names (*e.g.*, *Garmin*).

QUOTATIONS

- Single quotation marks should be used.
- The style and punctuation of the original quotation should be used.
- Omitted sections should be indicated by three full stops '...'. Spelling or other obvious errors may be followed by [sic] as to indicate the error is authentic.

Policies

Manuscripts submitted for publication in LAJAM must:

(1) not have been previously published or submitted simultaneously to any other publication outlet;

(2) be original;

(3) have been approved by all authors and institutions involved;

(4) meet animal ethics guidelines; and

(5) have obtained permits for research and sample collection as required by institutional, national, or international regulations.

- Papers describing experiments on animals need to certify that no animals were harmed in conducting the research.
- Authors need to indicate whether institutional, national or international guidelines for animal experiments were followed.
- These statements should be included at the beginning of the Acknowledgments section.
- Whenever permits are required to carry out scientific research, the corresponding permit numbers (including any CITES permits for sample export) should be mentioned in the Acknowledgments.

EDITORIAL PROCESS

- The Editorial Board recognizes that English is not the first language for most authors.
- Although a manuscript written in poor English may not be rejected, authors are strongly encouraged to have their manuscript checked by a native English speaker before submitting.

PEER REVIEW

- All submitted manuscripts will be reviewed by at least two anonymous referees. Referees would normally return their reviews within four to six weeks.
- Depending on the outcome of the reviews, a manuscript may be rejected or it may be considered conditionally acceptable after minor or major revision.

REVISION AND RESPONSE LETTER

- Authors are asked to prepare a revised version of the manuscript addressing the reviewers' comments in three to five weeks.
- Authors should also prepare a response letter containing a point-by-point description of how comments were addressed.
- Authors are encouraged to highlight their changes in order to facilitate the assessment of revised manuscripts.

EDITORIAL DECISION

- After assessing the revised version, the Editor might make a final decision on acceptance, or might return the manuscript for reviewers for additional checks. The Editor may also make additional editorial suggestions to the authors to ensure that formatting and style conform to LAJAM's guidelines.
- Upon acceptance, the author will be asked to provide a final version of the manuscript, with separate files for manuscript body and figures (as stand-alone, high quality files) within two weeks.

PRODUCTION OF PAGE PROOFS

- Proofs will be returned to authors within three weeks. Authors should revise the PDF proofs very carefully and return any corrections within three days.
- No other alterations to the content of the manuscript will be allowed.
- A second set of proofs might be produced if necessary for the author's final approval.

PUBLICATION

- Accepted manuscripts will be available online prior to their incorporation into an issue.
- When the issue is published online, manuscripts receive page numbers but the DOIs remain the same.
- There are **no page charges** for articles published in LAJAM.

PARECER FINAL DO TRABALHO DE CONCLUSÃO DE CURSO

Discente: GABRIEL MENDONÇA GRELLET

Título: "Análise comportamental de um indivíduo solitário de *Pontoporia blainvillei* (Cetacea: Pontoporiidae) no canal do Porto de Santos (SP)"

Orientador: Profa. Dra. Carolina Pacheco Bertozzi

Curso/Habilitação: Bacharelado em Ciências Biológicas/Gerenciamento Costeiro

COMISSÃO EXAMINADORA	CONCEITO
Profa. Dra. Carolina Pacheco Bertozzi	APROVADO
Profa. Dra. Marta Jussara Cremer	APROVADO

PARECER:

O TRABALHO DE CONCLUSÃO DE CURSO DO DISCENTE GABRIEL M. GRELLET POSSUI TEMÁTICA DE RELEVÂNCIA E APRESENTA CONTEÚDO ADEQUADO, CUMPRINDO COM OS REQUISITOS.

CONCEITO FINAL:

A Comissão Examinadora abaixo assinada conclui que o discente **Gabriel Mendonça Grellet** obteve o seguinte conceito:



APROVADO



REPROVADO

São Vicente, 27 de junho de 2025.

Carolina P. Bertozzi
Profa. Dra. Carolina Pacheco Bertozzi

P/ Carolina P. Bertozzi
Profa. Dra. Marta Jussara Cremer