

Reporting marine mammal strandings in Uruguay: a characterization of people's perceptions, interests and motivations

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Dauphin de la Plata *Pontoporia blainvillei* (Gervais et d'Orbigny, 1844) échoué sur une plage en Uruguay. Crédit: photographie recadrée de Rafael Tosi (2023), sous licence [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/) / *La Plata dolphin Pontoporia blainvillei* (Gervais et d'Orbigny, 1844) stranded on a beach in Uruguay. Credit: cropped photograph by [Rafael Tosi](https://www.rafaeltosi.com/) (2023), under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/).

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ABSTRACT

In recent decades, human impacts on marine ecosystems have become more evident, shaping public perceptions and wildlife management practices. Marine mammals, often seen as charismatic and flagship species, attract attention due to their conservation status and frequent strandings. In Uruguay, where pinniped and cetacean strandings are common, public awareness and knowledge about stranding response is limited. Coastal citizens who use the coast as a recreational area, are often the first to detect a stranding, so their response (or lack of response), the reporting, and the quality of information mostly depend on them. To address this, a Stranding Network project was launched in 2018, focusing on outreach and data collection. Eight talks were held to educate the public and questionnaires were applied to attendees and to individuals who reported strandings, aiming to understand their knowledge, perceptions and motivations and previous experiences with marine mammals. Results revealed that many attendees had limited prior knowledge but expressed strong interest in learning and participating in the network. Stranding informants, believe that strandings are due to natural causes, such as age or disease, and human activities. These events evoked a range of emotions in people: sadness, compassion, and disappointment towards human actions. However, knowledge gaps about appropriate stranding responses persist, with some individuals reporting actions that could pose risks to both, humans and animals. By evaluating public perceptions and stranding reports, the Stranding Network project aims to improve future communication strategies and activities to optimize response strategies for marine mammal strandings.

KEY WORDS

Cetacean,
pinniped,
awareness,
involvement,
questionnaire.

RÉSUMÉ

Signalement des échouages de mammifères marins en Uruguay: caractérisation des perceptions, des intérêts et des motivations des personnes.

Au cours des dernières décennies, les impacts humains sur les écosystèmes marins sont devenus plus évidents, influençant les perceptions du public et les pratiques de gestion de la faune. Les mammifères marins, souvent perçus comme des espèces emblématiques et charismatiques, attirent l'attention en raison de leur statut de conservation et des échouages fréquents. En Uruguay, où les échouages de pinnipèdes et de cétacés sont courants, la sensibilisation et les connaissances du public sur la réponse aux échouages sont limitées. Les habitants des côtes qui utilisent le bord de mer à des fins récréatives sont souvent les premiers à détecter un échouage, leur réaction (ou absence de réaction), le signalement

MOTS CLÉSCétacé,
pinnipède,
sensibilisation,
implication,
questionnaire.

et la qualité des informations dépendent donc principalement d'eux. Pour y remédier, un projet de Réseau d'Échouages a été lancé en 2018, axé sur la sensibilisation et la collecte de données. Huit conférences ont été organisées pour éduquer le public, et des questionnaires ont été distribués aux participants ainsi qu'aux personnes ayant signalé des échouages, afin de comprendre leurs connaissances, perceptions, motivations et expériences antérieures avec les mammifères marins. Les résultats ont révélé que de nombreux participants avaient des connaissances limitées, mais exprimaient un fort intérêt pour apprendre et participer au réseau. Les informateurs d'échouages estiment que ces échouages sont dus à des causes naturelles, telles que l'âge ou des maladies, et aux activités humaines. Ces événements ont suscité une gamme d'émotions : tristesse, compassion et déception envers les actions humaines. Cependant, des lacunes subsistent concernant les réponses appropriées aux échouages, certains signalant des actions pouvant présenter des risques pour les humains et les animaux. En évaluant les perceptions du public et les signalements d'échouages, le projet du Réseau d'Échouages vise à améliorer les futures stratégies de communication et activités pour optimiser les stratégies de réponse aux échouages de mammifères marins.

INTRODUCTION

In recent decades, human impacts on marine ecosystems and wildlife conservation have become increasingly evident. The way people perceive and value the marine environment and its resources determines their preferences, affects their practices and strategies, and influences the institutions responsible for their management. In this context, understanding attitudes, values, and perceptions is key to assess the forces that lead humans to connect with the marine fauna (Brito *et al.* 2019). Marine mammals are considered charismatic and flagship species, as they attract and raise awareness among the general public and institutions, promoting conservation actions that can also benefit other species and the whole ecosystem (Mazzoldi *et al.* 2019). Most species are affected by increasing environmental changes, as well as anthropogenic threats, causing population declines in some cases (Avila *et al.* 2018). Over time, attitudes toward marine mammals have shifted from utilitarian exploitation to various perceptions, including fear, fascination, and even entertainment (Brito *et al.* 2019). However, a change in perception occurred in the early 1970s with the banning of whaling and the subsequent legal protections afforded to marine mammals (Malakoff 2001). This led to a broader appreciation of their intrinsic value, acknowledgment of their capacity for pain, and recognition of their scientific importance (Bearzi *et al.* 2010; Souza & Brito 2012; Mazzoldi *et al.* 2019). As scientific data collection intensified, a sense of responsibility towards marine mammal welfare and conservation emerged (Souza & Brito 2012; Simmonds 2014).

Strandings especially of large cetaceans, have attracted the attention of the general public and the press for centuries because they are charismatic animals and because of the discomfort caused by the carcasses on the beach (Gómez-Hernández *et al.* 2022), and multiple hypotheses have emerged about the reasons why they strand (Bradshaw *et al.* 2006; Perrin & Geraci 2009). The response to live strandings has been utilitarian in the past (industrial revolution and before), and included killing or harming animals, with no apparent concern for suffering or

pain (Bearzi *et al.* 2010; Simmonds 2014; Mazzoldi *et al.* 2019). When marine mammals are found on the coast, they generate a variety of responses ranging from concern for their welfare and state of health, interest in the environmental phenomena that caused their stranding, or concern for animal suffering. The motivations for responding to strandings may include animal welfare, conservation, research, or cultural influence principles (Moore *et al.* 2007). Improving people's knowledge, especially in coastal areas, is necessary for live stranded animals to safely return to the ocean, thereby avoiding the risk of zoonotic transmission from live animals or carcasses (Kurniawati & Hidayat 2018). The common citizens who use the coast as a recreational area are the first to detect a stranding, so the response (or lack of response), reporting, and quality of information mostly depend on them (Gómez-Hernández *et al.* 2022).

In addition, strandings are an invaluable source of information for increasing and improving the knowledge of these animals (Maldini *et al.* 2005). These events indicate the presence of marine mammals in waters around the world; and they have provided valuable data on marine mammal biology, ecology and health. Globally, stranding studies have focused on spatiotemporal variability, reporting species richness and diversity, while perceptions and attitudes toward marine mammals remain poorly studied, especially concerning strandings. However, in the case of live strandings, they provoke media attention and public action, and the public often takes the wrong actions in an attempt to help. Human assistance interventions are often emotionally driven, with insufficient or conflicting scientific information (Wiley *et al.* 2001). In this sense, it is important to understand people's perceptions and how they can influence decision-making to be successful in the stranding response (Stockin *et al.* 2022). Activities aimed at building environmental awareness, knowledge, attitudes, values, and skills, prepare people to take informed action for environmental protection (Ardoin *et al.* 2020). With proper training and equipment, people can take actions that increase the possibility that stranded marine mammals will survive, at least in the short term (Wiley *et al.* 2001). Further, understanding motivations can help to design

TABLE 1. — Information on the workshop-talks given in 2018, where and when they took place, who organized each of them and how the questionnaire was administered.

Date	Location	Organised by	Attendees		Questionnaire
			Number	Type	
13/02/2018	Faro Limpio, José Ignacio, Maldonado	Faro Limpio, NGO	19	Neighbours; Environmental management students	Survey Monkey
9/03/2018	Aeronaval military base no. 2 C/C Carlos A. Curbelo. Laguna del Sauce, Maldonado	Aeronaval military base no. 2 C/C Carlos A. Curbelo	18	Naval Prefecture; Air force school students; ADES	In paper in hand
13/03/2018	Cabo Polonio National Park, Rocha	Protected Areas National System (SNAP)	23	Rangers; Director of the Park, Laguna de Rocha National Park and Laguna Garzón National Park	Survey Monkey
13/03/2018	Ministry of Education and Culture headquarters, La Coronilla, Rocha	Ngo Karumbé	25	Volunteers of Karumbé; neighbours from La Coronilla	In paper in hand
10/04/2018	Espacio Gorlero, Punta del Este, Maldonado	Municipality of Punta del Este; Socobioma (NGO)	22	Neighbours; Park rangers; NGO volunteers	Survey Monkey

effective stranding response strategies, raising awareness and promoting educational and outreach activities. Strandings generate considerable public interest, reflecting a strong social sensitivity and concern towards the issue. This highlights the importance of addressing public awareness outreach initiatives. In Uruguay, marine mammal strandings are quite common (Del Bene *et al.* 2006), mainly concerning South American sea lions, fur seals, and La Plata River dolphins, due to the proximity of their breeding and feeding areas to the shore. However, people generally do not know where to report dead or live animals on the coast, and unlike other countries, there is no formal Stranding Network in Uruguay. In 2018, two non-governmental organizations (NGO), a representative of the Natural History Museum and researchers from the University, started a Stranding Network project, and since then a database of all stranded marine mammals (dead or alive) for which reports are received is being kept. All live and dead cetaceans found on beaches are considered stranded, while pinnipeds are considered stranded if they are entangled in fishing gear, injured, sick, extremely thin or dead (Geraci & Lounsbury 1993). In 2018 we conducted several outreach activities with the aim of improving response efficiency to marine mammal strandings. The education program was directed to achieve the following behaviour changes in beachgoers and coastal residents:

- a prompt and safe reporting of stranded marine mammals, while minimizing their direct contact with the animals to avoid health risks for both, animals and people;
- improved data collection, to enhance data quality, aiding research efforts;
- foster a sense of responsibility and involvement among coastal communities in individuals who may participate in stranding responses, contributing to broader conservation efforts.

In the process of creating a Standing Network in Uruguay, an evaluation was conducted to evaluate whether citizens have the necessary and adequate information to report strandings and understand the motivations that led people to attend a talk or report a stranding. In this context, the objectives of this project were, first, to evaluate motivations, interests, perceptions, knowledge, and previous experience with marine mammal strandings among attendees to our talks and people

who reported strandings. This would allow to direct future educational programs to address specific knowledge gaps or misconceptions among different groups, helping community conservation strategies. Secondly, the study aimed to characterize talk attendees and people who reported strandings. This characterization is important for optimizing resource allocation for monitoring and stranding response efforts, tailoring outreach initiatives, and measuring outreach impact based on geographic location and recreational activities.

Understanding the audience profile aids in improving content, presentation format, and outreach strategies. Additionally, tracking characteristics over time helps assess outreach effectiveness and identify any gaps that need addressing. This ongoing assessment ensures that the message reaches target audiences and facilitates continual improvement in outreach initiatives.

MATERIALS AND METHODS

QUESTIONNAIRE FILLED OUT BY ATTENDANTS TO THE TALKS
In 2018, eight workshop-talks were held in Montevideo, Maldonado, and Rocha departments, and were attended by a total of 185 people (Table 1; Fig. 1). The talks were open to the general public and were promoted through the social media channels of the organizers and members of the Stranding Network, as well as via direct outreach to contacts. These talks were focused on raising awareness about pinniped species in Uruguay, their conservation issues, and communicating how to respond to live pinnipeds on the beach, as well as the importance of reporting marine mammal strandings, including what kind of information should be reported. After the talk, questionnaires were handed out on-site or were accessed anonymously through a link to electronic questionnaires in “Survey Monkey,” an online free platform, between 24 February 2018 and 7 May 2018. The questionnaire included 10 questions: four were open-ended and six closed-ended (polytomous) (Table 2).

To test whether perceived learning differed by gender and age category, we conducted a two-way analysis of variance (ANOVA). Additionally, we examined the relationships



FIG. 1. — Location of Uruguay in the South American continent (right) and map of Uruguay showing the coastal Departments.

between attendees' gender, age, and occupation with their reasons for attending the talk, prior knowledge, previous experience with live pinnipeds, and interest in joining the Stranding Network. To analyze these associations, we categorized responses as illustrated in Figure 2 and performed Chi-squared tests along with Cramér's V analyses to assess the strength of association.

QUESTIONNAIRE FILLED OUT BY STRANDING INFORMANTS
A questionnaire was sent to 194 stranding informants (identified between 2018 and March 2022). Their contact numbers were anonymized and they were reached *via* WhatsApp for participation, with a link to Google forms. The questionnaire included 14 questions, of which 12 were closed-ended (polytomous and multiple-choice, semi-closed), and two were open-ended (age and occupation) (Table 3). The participation was voluntary and all electronic and non-electronic questionnaires were anonymous. The purpose of the survey and the objectives of the research were explained in all cases.

The relationship between the involvement with the Stranding Network and interest in being part of the Stranding Network, offers insights into how current participation levels may influence future interest in being part. To investigate this, we analyzed the association between these categorical variables. We also examined whether the reason for reporting a stranding, the level of involvement, and the interest in joining the Stranding Network were associated with the informants' age group or occupation. Additionally, we analyzed whether the reason for reporting a stranding was linked to the level of involvement and interest in joining the network. To evaluate the strength of these associations, we categorized responses as shown in Figure 3 and performed both a Chi-squared test and Cramér's V analysis.

SOURCES OF REPORTS

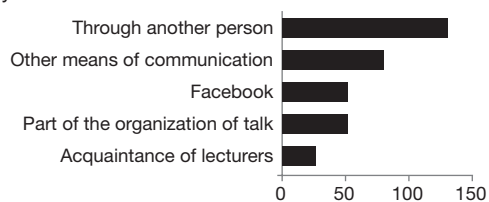
Records of strandings were classified into different categories based on the source:

- direct contacts (DIR): record provided by a known person, or ourselves;

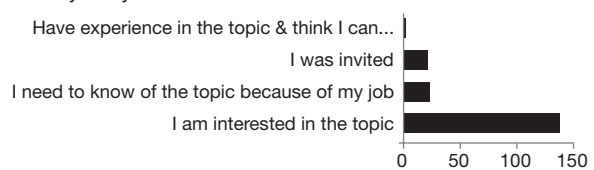
TABLE 2. — Questionnaire applied to the attendees to the talks about Pinnipeds. Abbreviations: **A**, open-ended; **C**, close-ended; **TQ**, type of question.

Question	Options	TQ
1 Age	—	A
2 Specify your occupation, NGO, group, organization	—	A
3 How did you hear about the talk?	– Facebook – other means of communication – through another person – I am an acquaintance of the lecturers – I am part of the organization of the talk	
4 For what main reason did you attend the talk?	– I am interested in the topic – I need to know about the topic because of my work – I was invited – I had nothing to do – I have experience in the subject and I think I can contribute	C
5 Do you consider that the information provided in the lecture was:	– very instructive/interesting – moderately instructive/interesting – not very important	C
6 Would you like to go more in depth on any topic? Which one? Do you have suggestions?	—	C
7 How much did you know about the subject beforehand?	– I knew the subject very well – moderately well – little knowledge – did not know anything at all	C
8 How much you think you learned from the lecture?	Qualify from 1 to 10	C
9 Have you had any experience with a live pinniped found on the beach or shore? How did you proceed?	—	A
10 Are you interested in being part of the stranding network?	– Yes – No – Not sure	C

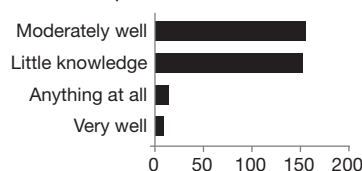
A How did you hear about the talk?



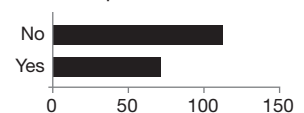
B Why did you attend the talk?



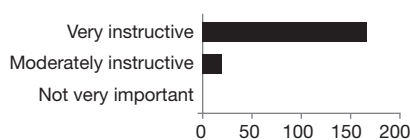
C How did you know about the topic?



D Are you had any experience with a live Pinniped on the beach?



E The information provided in the talk was:



F Are you interested being part of the stranding network?

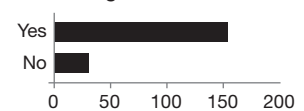


FIG. 2. — Responses of attendees to the talks given in 2018 to a questionnaire on their participation in the talk, knowledge, interest and experience.

– indirect report (IND): record provided by a third person and communicated to us by a direct contact or posts found in social media;

– unknown person (UK): record provided by an unknown person directly to us (voluntary report);

– park rangers (NPR): record provided by National Park rangers;

– life-guards (LG): record provided by a safeguard;

– non-governmental organization (NGO): record provided by organizations: Socobioma or Karumbé;

– press sources (P);

– beach cleaning services (BC): records provided by beach cleaners;

– reports uploaded to the iNaturalist Uruguay database (iNat).

TABLE 3. — Questionnaire applied to people who reported strandings between 2018 and 2021. Abbreviations: **A**, open-ended; **C**, close-ended; **TQ**, Type of question.

Questions	Options	TQ
1 How would you evaluate your level of involvement with the stranding network?	– Reported once – Reported 2 to 4 times – Reported more than 5 times – Not only did I report, I also took samples and/or measurements	C
2 Age		A
3 Occupation		A
4 How did you find out where to report stranded marine animals?	– I am an acquaintance or direct friend of someone in the SN – Indirect link with the SN (I know someone who knows them) – I saw information in social network – I belong to an NGO that is part of the Network – I saw information on billboards or poster – Other:	C
5 Why did you report the stranding(s)? (Choose the most important reason)	– I am interested in contributing to scientific knowledge and research – I am interested in helping the animal survive – To contribute to the conservation of the species – To get the animal removed from the beach – Other:	C
6 In which area(s) did you report stranding(s)? (Check all that apply)	– Montevideo – Canelones – Maldonado – Rocha – San José – Colonia	C
7 Do you know what data are important to report when you record a marine mammal stranding?	– Yes – No – Not sure	C
8 In your opinion, what is the reason for the presence of a LIVE sea lion on the beach?	– It is an orphan animal in need of help – It must be sick or injured due to human causes – It must be a consequence of pollution in the ocean or Rio de la Plata – There is nothing to worry about, it is a normal occurrence – Other:	C
9 What can be done in the presence of a LIVE marine mammal on the shore? (Check all that apply)	– Nothing, it cannot be saved – Take it somewhere where it can be helped – Depends on the animal and the situation – Euthanize it – Better not to approach, just in case – Call DINARA or Naval Prefecture – I don't know – Other:	C
10 What do you feel when you see a DEAD animal on the beach? (Check all that apply)	– It makes me sick or disgusted/ I don't want to approach – It makes me feel very sad – It gives me compassion or a feeling of protection – It makes me angry – I am surprised and amazed – I feel disappointment for human inappropriate actions – It gives me impotence – I feel it as a disconnection with nature – I am indifferent – I want to take the skull/a tooth/ a whale's plate	C
11 Why do marine mammals strand DEAD (you can check more than one option)	– No clue – Due to natural causes (storms, strong currents, climate change, disorientation or loss, inexperience, etc.) – Consequence of human activities (pollution, noise/seismic activity, bycatch and interaction with fisheries) – Old age or disease – Malnutrition, lack of food – Other:	C
12 Are you interested in knowing what information taken from stranded animals is used for?	– Yes – No	C
13 Are you interested in being part of the Stranding Network?	– Yes, I could measure the animal, take photos and record the location of the stranding	C

Table 3. — Continuation.

Questions	Options	TQ
	– Yes, I would like to know more about the marine fauna in Uruguay. – I don't know, it depends on how – No – I am interested in coordinating and collaborating	
14 What kind of studies would you be most interested in having done with the dead stranded animals? (You can check more than one option, but choose the ones you consider most important)	– Determine cause of death – Genetic studies (population structure or kinship) – Contaminants – Analyze diet, or trophic ecology – Anatomical studies – Growth or body condition – Don't agree with the use of carcasses for research. – Monitor strandings frequency and abundance along the coastline – Look for pathologies or parasites – Anthropogenic impacts – Other:	C

RESULTS

TALK ATTENDEES GENERAL DESCRIPTION

Of the 185 people who attended the talks held in 2018, 115 responded to the questionnaire (57%) between March to May 2018. Of these respondents, 52.6% were females and 47.4% were males. Age ranged from 11 to 75 years old, with an average of 34 years old (± 13.63) (Fig. 4A). The majority of respondents (56.4%) were between 21 and 30 years old, while those older than 51 were less frequent (12.8%). Most attendees learned about the talk through someone else (39%) or other means of communication (23%) (Fig. 2A). Their motivation for attending was mainly because they were interested in the topic (75%); some people attended for work-related reasons or because they were invited by someone else (Fig. 2B).

TALK ATTENDEES EXPERIENCE, LEARNING AND PREVIOUS KNOWLEDGE

The majority of attendees to our talks indicated they had moderate or limited knowledge of the subject (Fig. 2C), and they self-assessed learning from the talk averaged 8.4 out of 10 (± 1.28), reflecting that learned something from the talk. Of the 185 respondents, 36.2% had prior experience encountering live pinnipeds on the coast, and even fewer (14 people) had taken active steps to help or protect the animals (Fig. 2D). Actions mentioned included “keeping tourists away”, “notifying an NGO”, “sending the animal to an NGO”, “placing the animal in a different area of the beach”, “putting up signs with indications”, “setting up fences”, “providing information”, “contacting the Municipality”, “calling the Governmental management Institution (Dirección Nacional de Recursos Acuáticos, DINARA)”, and “preventing people from disturbing the animal”. Five people who found stranded pinnipeds responded that they did nothing, and 26 did not specify what they did. It should be noted that three inappropriate actions were mentioned: “feeding the animal, taking the animal home and then releasing it, and moving an animal from one area to another”.

Regarding the talk itself, 90% of the respondents indicated that they “received very instructive and interesting information”, while the remaining 10% responded that “the information was moderately instructive”. Also, a high percentage of the people expressed interest in joining a Stranding Network (83%) (Fig. 2F). Finally, those attending the talks made some suggestions regarding the work of the Stranding Network and topics to be addressed in future talks (Table 4). Some example topics were related to the response to the presence of live stranded pinnipeds, the inclusion of more general conservation information, and details about other animal species (Table 4).

The self-evaluation of how much they have learned with the talk was not significantly different among age-groups, sex nor the interaction between both variables (ANOVA Age group: F-ratio [F] = 1.288, degrees of freedom [df] = 4, p-value [p] = 0.297; Sex: F = 0.143, df = 1, p = 0.794; interaction: F = 0.120, df = 4, p = 0.974). Neither the sex, the reason for attending the talk, nor previous experience with live pinnipeds were associated with the interest in joining the Stranding Network (Cramér's V = 0.255, p = 0.353; V = 0.303, p = 0.435; V = 0.116, p = 0.938). Occupation showed a moderate, non-significant association with the reason for attending the talk (Cramér's V = 0.489, p = 0.144), while sex was not related with people's prior knowledge (Cramér's V = 0.432, p = 0.059). Lastly, the reason for attending the talk was not associated with attendees' previous knowledge (Cramér's V = 0.282, p = 0.388).

STRANDINGS INFORMANTS GENERAL DESCRIPTION

Of the 194 stranding informants who received the questionnaire, 134 individuals (69%) completed it between February 20 and April 17, 2022. The majority (57%) of respondents were between 41 and 60 years old, while 33% were under 40 years old (Fig. 4B). Regarding their occupation, 74 different activities were mentioned, which could be grouped into six categories: those related to animals and/or the coastal environment (biologists, oceanographers, biology students, veterinarians, lifeguards and park rangers, 46.2%); high school and University teachers of different subjects (14.4%); professionals (medicine, design, comput-



FIG. 3. — Responses to questions posed to stranding reporters about their involvement and motivations.

ing programmer or systems analyst, tourism, marketing, journalism and communication, 17.3%); dependent jobs (employees, administrators, 12.5%), independent jobs and various trades (labourer, artist, business owner, mechanic, transportation, 10.6%); and retired people (3.8%). Some people mentioned more than one occupation.

The majority of stranding informants (45%) were friends or direct acquaintances of a member of the Stranding Network project, while others learned about the project through an indirect link (24%) or via social media (22%) (Fig. 3A). Some people heard about the network through other means, such as the lifeguard brigade or an NGO. Regarding the closeness with the Stranding Network project, one third of the respondents reported between two and

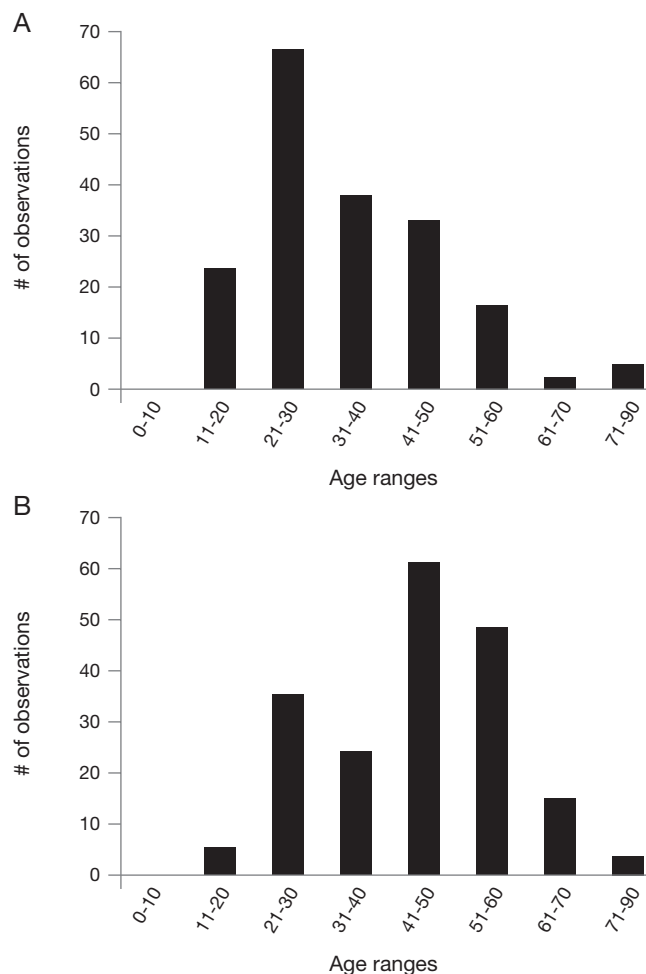


FIG. 4. — Age distributions of: **A**, respondents to the questionnaires applied to talks given in different coastal locations in Uruguay in 2018; **B**, strandings reporters in 2020-2022.

four strandings, and 23.5% were more involved, taking measurements or samples from the animals. Approximately 18.5% of people reported more than five strandings, while 25% reported only once (Fig. 3B). The main motivation for reporting a stranded animal was “a desire to contribute to knowledge and research” (63.5%). Others did it “to contribute to the conservation of species” (16%) or “to help animals to survive” (13%). The option mentioned that was not included in the questionnaire was “to improve the life quality of the animals” (Fig. 3C). Sixty-seven percent of the respondents answered they knew what data to record when reporting a stranding, although 26% were unsure (Fig. 3D).

The Cramer's V analysis reflected a moderate, significant association between the reason for reporting a stranding and informants' interest in joining the Standing Network ($V = 0.291$, $p = 0.033$), as well as a moderate, marginally significant association with informants age ($V = 0.292$, $p = 0.074$). However, the reason for reporting strandings showed a weak, non-significant association with involvement with the Stranding Network (Cramér's $V = 0.228$,

TABLE 4. — Suggestions given by attendees to the talks in 2018, about the Stranding Network and topics of interest for future research.

About the Stranding Network

- Raising awareness about the creation of the Stranding Network
- Establishment of procedures and organization of assistance
- Conducting meetings and organizing an institutional network
- Offer volunteers to set up the Network
- Develop a practical guide on the do's and don'ts of strandings
- Institutional response to strandings

Suggested topics for future talks

- Conduct this same talk more frequently
- Deepen on how to act in case of stranding
- Further discussion on the sale of sea lions
- Zoonosis in animals in the beach associated with strandings
- Care of the “environment” and respect for the ecosystem
- More information on the characteristics of these animals
- Reasons and seasons in which pups and adults appear on the beach
- Make it clear that this is normal and that it is not necessary to act
- Rehabilitation and release
- Conflict with fishermen
- More knowledge about coastal fauna and flora
- Animal care in strandings
- Showing and allowing the public to touch skulls
- How to proceed with first aid and recovery of Pinnipeds and penguins
- How to deal with orphaned pups
- Sea lion conservation and interaction with humans
- Responsible Pinniped Watching Tourism

$p = 0.434$). Involvement also had weak associations with interest in joining the Stranding Network (Cramér's $V = 0.233$, $p = 0.192$), occupation (Cramér's $V = 0.195$, $p = 0.743$), and age (Cramér's $V = 0.203$, $p = 0.841$). Age also showed a weak, non-significant association with both, the reason for reporting a stranding (Cramér's $V = 0.292$, $p = 0.074$) and interest in joining the Stranding Network (Cramér's $V = 0.290$, $p = 0.105$). Similarly, informants' occupation had a weak, non-significant association with the reason for reporting (Cramér's $V = 0.220$, $p = 0.537$) and with people's interest in joining the Stranding Network (Cramér's $V = 0.238$, $p = 0.332$).

STRANDINGS INFORMANTS' PERCEPTIONS, KNOWLEDGE AND INTERESTS

When asked the reason for the presence of live sea lions on the beach, 54% of the people answered “there is nothing to worry about, it is a normal event”. A smaller percentage of people (17%) think that “the animals are sick or injured due to human causes”. Among the other options, the following were added: a variety of non-human causes, “it depends on the animal”, “the animal is in trouble”, all of the above, and “I don't know” (Fig. 3E). For the majority of the respondents what can be done in these events depends on the animal and the situation, while some people would “call DINARA or the Naval Prefecture”. Five people mentioned they would try to help by carrying the animal to the water, feeding it, try to move the animal, and wetting it. The following options were added by some respondents: “Avoid other people from approaching”, “communicate with the

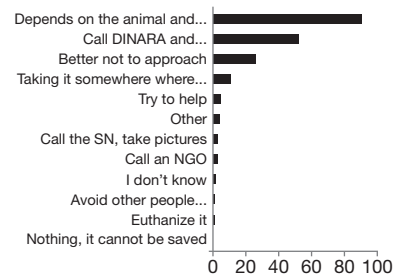
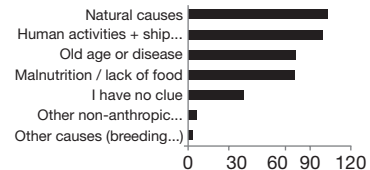
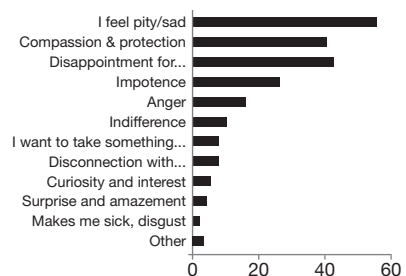
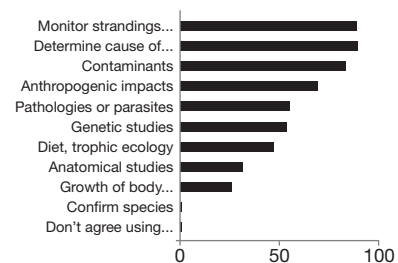
A What can be done in the presence of a live marine mammal on the coast?**B Why marine mammals strand dead?****C How do you feel about a dead stranded animal on the beach?****D What kind of studies would you be interested in being carried out with stranded animals?**

FIG. 5. — Responses of stranding reporters related to perception and knowledge about marine mammal strandings in Uruguay in 2022.

Stranding Network and take pictures”, and “call NGO/rescue center” (Fig. 5A). The results indicate that 97% of the respondents were interested in knowing what information taken from stranded animals was used for, and 75% expressed interest in getting involved, either by learning more about the Stranding Network project or by contributing to data collection through taking photos, recording the geographic location and measuring animals. Fifteen percent of people were not sure if they wanted to get involved and 7% said they did not (Fig. 3F).

According to the majority of the respondents, the most common reason for strandings were natural causes (old age or disease, predation, fighting during the breeding season, 185 mentions), followed by human activities (totalling

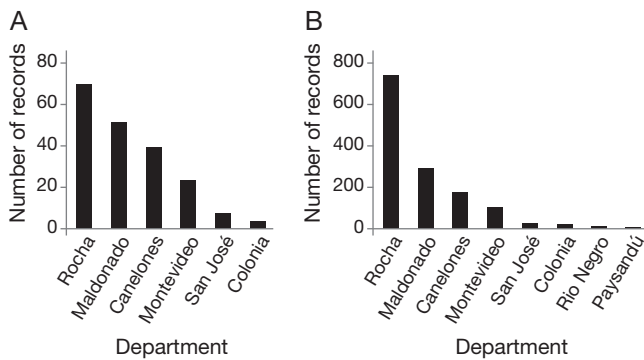


FIG. 6. — Results related with the geographic precedence of strandings reports between 2018–2022 along the coast of Uruguay, according to: **A**, responses from people who reported strandings; **B**, number of records by department in the Strandings Network. Departments are ordered from east to west.

98 mentions). Seven people said they had no clue of the reason for strandings. Other possible causes provided by the respondents (not included in the multiple choice) included human-related (collisions with vessels, shootings) as well as natural causes (predation, fightings during breeding season) (Fig. 5B). On average, respondents selected three (out of five) options of this question, obtaining 330 responses in total. The most mentioned feelings generated by dead marine mammals were “sadness” (56 mentions), “compassion and protection” (43 mentions), and “disappointment for human actions” (40 mentions) (Fig. 5C). Some people also expressed feelings of “impotence”, “anger”, “indifference”, “disconnection with nature”, and “a desire to take something from the animal (such as a tooth, or a baleen plate)”. Some interviewees marked more than one option, totalling 221 responses. Additionally, some respondents expressed “curiosity and interest in knowing what happened”, while others felt “a sense of ambivalence between anger and sorrow” (Fig. 5C).

In terms of the topics that respondents were most interested in, 90 selected “monitoring stranding frequency and abundance” and 90 selected “determining the cause of death”, 84 selected “contaminant studies” and 70 selected “anthropogenic impacts” (Fig. 5D). Only one person selected the option “I don’t agree using carcasses for research”. It is important to note that the respondents could choose multiple options of interest, resulting in a total of 551 (Fig. 5D). Interviewed people and the data stored in the database both suggested that the number of strandings is not evenly distributed across the coast (Fig. 6A, B). According to the data stored in the database (2018–2022), the number of strandings recorded decreased from the east (oceanic zone) to the west (estuarine zone) of the Uruguayan coast. The highest number of strandings were reported in Rocha department (55.6%), followed by Maldonado (21.6%), Canelones (12.7%), Montevideo (7.2%), San José (1.5%), and Colonia (1.2%) (Fig. 1). Some reports were also received from the Uruguay river littoral, specifically from Rio Negro and Paysandú departments (< 0.2%) (Fig. 6B).

TABLE 5. — Number of marine mammal strandings recorded, number of notifications received, and number of multiple notifications received by the Strandings Network between 2018 and 2022.

Year	# strandings reported	# notifications received	# multiple notifications of strandings
2018	133	126	3: twice
2019	240	228	15: 14 twice, 1 triple
2020	549	821	5: 3 twice, 1 triple, 1 quadruple
2021	507	562	45: 37 twice, 5 triple, 1 quadruple, 1 six X, 1 seven X
2022	560	645	56: 38 twice, 13 triple, 2 quadruple, 1 five X, nine X
Total	1989	2382	124

SOURCES OF REPORTS

Between 2018 and 2022 a total of 1989 strandings were recorded in Uruguay, with 2382 notifications received, 124 (5.2%) of which were multiple (i.e., more than two notifications received for the same stranded animal) (Table 5). In the first two years, less than 250 notifications were received, while since 2020 we received more than 500, reaching 560 in 2022. Reports increased notably over time likely driven by the outreach and educational activities initiated in 2018. This trend was sustained through direct contacts established during that period, strengthened by commenting our project with acquaintances. In subsequent years, we bolstered these efforts through continued activities, including additional talks, posters, radio segments, and a strong presence in social media, all of which helped to expand public engagement. Regarding the informants to the Stranding Network project during this period, the majority of reports come from known people, followed by NGOs, unknown people, and indirect contacts. The first two years (2018–2019) saw the highest number of reports from NGOs, which declined in subsequent years, and by 2020, direct contacts greatly increased (Fig. 7). The proportion of reports from direct contacts, beach cleaning services, and iNaturalist increased over time, while indirect contacts and unknown people remained relatively constant (Fig. 7).

Between 2018 and 2022 a total of 397 informants reported at least one stranding to the Stranding Network project, 152 of them reported more than once. The most frequent informants were two NGOs: Karumbé and SOCOBIOMA (which together reported 518 records), followed by members of the Stranding Network, and data provided by park rangers of the Cabo Polonio National Park.

DISCUSSION

Marine mammal strandings are challenging and attract public and press attention. Responses can be dangerous and are highly demanding (Geraci & Lounsbury 1993; Simmonds 2014). This study provides information on people’s perspectives, interests, attitudes and perceptions. Despite their significance,

marine mammal conservation studies often overlook public input (Patankar 2019). Citizens' quick responses or reporting to authorities can significantly increase the likelihood of survival of live stranded animals through proper and safe handling (Kurniawati & Hidayat 2018). In the case of dead animals, it can increase the probability of obtaining high-quality samples (i.e., fresh). In this sense, understanding public emotional and behavioural attitudes toward strandings not only aids conservation efforts but also informs the design of response strategies to such events (Moore *et al.* 2007; Bearzi *et al.* 2010).

The lack of response to the survey of many people could have biased the distribution of answers (the non-response error, Dillman *et al.* 1998); however, we believe we have minimized this error by designing a short and simple survey with neutral questions. Furthermore, we assume that people who answered the questionnaires were the most interested in the topic and committed, as they not only took the time to attend a talk, but also dedicated additional time to respond to the questionnaire. Therefore, probably these individuals would better understand the message and act accordingly. Nevertheless, the target audience is the broad and diverse group of anyone who might encounter a marine mammal stranding. Therefore, it is challenging to reach all these people. A key goal for the coming years will be to develop effective outreach strategies to connect with this whole audience.

CHARACTERIZATION OF PEOPLE ATTENDING TALKS AND WHO REPORTED STRANDINGS

The age of attendees at talks tended to be younger than those who reported actual strandings. This suggests a possible correlation between age and reporting behavior, with middle-aged individuals potentially having more time or interest in reporting strandings, while younger individuals may be more inclined to attend informational talks. A similar trend was reported in a study of a stranding event on the Adriatic Sea coast of Italy, where the average age of individuals interviewed was 43 years old (Bearzi *et al.* 2010). Attendees at talks about marine mammal strandings were typically invited by direct acquaintances or individuals indirectly connected to the Stranding Network. The reported locations of strandings in both the interviews and the records database decreased from east to west along the coast, potentially influenced by factors such as the distribution of pinniped colonies (Oceanic coast, off Maldonado and Rocha departments), differences in beach characteristics between oceanic (Maldonado and Rocha) and estuarine areas (Canelones, Montevideo, San José and Colonia), and variations in population density and tourism activity, which is higher from Montevideo to the east (INE 2022) may contribute to higher reporting rates in those areas.

The motivation for attending talks on marine mammal strandings primarily stems from a genuine interest in the topic, which is also evident in the high number of social media and media publications about it in Uruguay (Appendix 1). This interest extends to concerns for stranded animal welfare and public perception involvement, as observed in various studies elsewhere (e.g., Bearzi *et al.* 2010; Kurniawati & Hidayat 2018; Mazzoldi *et al.* 2019; Stockin *et al.* 2022). Attendees

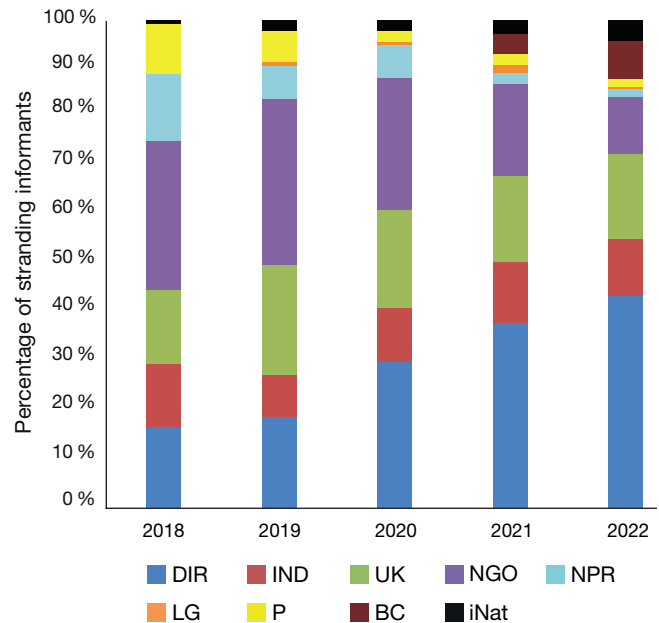


FIG. 7. — Percentage of sources of information of strandings on the coast of Uruguay, to the Stranding Network project between 2018–2022. Abbreviations: **BC**, beach cleaning Council service; **DIR**, direct contact; **iNat**, iNaturalist (Uruguay); **IND**, indirect contact; **LG**, life guards; **NGO**, nongovernmental organism; **NPR**, National Park ranger; **P**, press; **UK**, unknown person.

expressed curiosity and a desire to learn about a variety of topics concerning marine mammal biology and health, highlighting the importance of engaging stakeholders in the Stranding Network.

KNOWLEDGE AND PREVIOUS EXPERIENCE WITH STRANDINGS
Attendees at the talks admitted they had little to moderate previous knowledge about marine mammals and how to respond to strandings. While some demonstrated appropriate actions, such as reporting the animals and advising others to keep distance, others engaged in inappropriate actions such as taking stranded animals' home. This reflects what happens in practice, where some people take no action, while others actively protect the animals or undertake appropriate actions. Many attendees to the talks lacked information on when and how to act when encountering live animals and were uncertain where to report live or dead animals. Similar findings have been observed in Bahía Todos Santos in northern Mexico (Gómez-Hernández *et al.* 2022), emphasizing the importance of education and outreach efforts to promote responsible behavior around wildlife. Clear guidelines and protocols for responding to encounters with wild animals are also crucial.

In contrast, stranding reporters demonstrated some knowledge about how to respond to live stranded marine mammals, even though a few incorrect actions were mentioned. It is important to consider that less than half (46.2%) of the respondents' occupations were related to marine fauna or the coast, which means that a large percentage of them may not have the knowledge or experience in the subject. People motivated by a desire to contribute to species conservation and help animals,

took the initiative to report strandings and often provided additional information such as pictures. It is important to take these motivations and interests into account when planning future environmental education activities and citizen science projects. However, one-third of the informants lacked clarity or completely ignored important data to report during stranding events, with some reports missing critical information such as pictures, the animal's size, or geographic coordinates. This highlights the need for targeted environmental education activities to enhance understanding and improve data collection practices among stranding reporters. Definitely, a clear explanation of what information is necessary to send, the do's and don'ts in the case of live animals, and how to take useful and informative pictures, will be the key information to develop targeted educational outreach and recruitment of stranding volunteers. Also, it will be very important to continue disseminating that is normal to find healthy seals and sea lions on the beach.

FEELINGS TOWARD STRANDED ANIMALS

The informants of strandings recognized both natural and anthropogenic factors contribute to such events. Additionally, they exhibit a deep sensitivity, mentioning emotions such as sadness, compassion, disappointment towards detrimental human actions, among others. Similarly, respondents witnessing a sperm whale stranding in Italy attributed causes to both, anthropogenic (44%) and natural factors (21%), while also expressed feelings of compassion or care towards the animals (Bearzi *et al.* 2010). These reactions highlight the innate human trait of compassion towards other beings. To effectively minimize animal pain and suffering, the acquisition of data and expertise is crucial (Simmonds 2014), underscoring the importance of knowledge, information and experience in this domain.

Campaigns organized in recent decades by animal rights movements and environmental organizations played an important role in gaining public appreciation. They have shifted public perception of cetaceans, fostering compassion and care over fear and antipathy (Bearzi *et al.* 2010). This change is evident in Uruguay, where the presence of southern right whales (*Eubalaena australis* (A. Desmoulins, 1822)) along the coasts of Maldonado and Rocha (Fig. 1) attracts the attention of tourists and media annually. Many outreach activities are conducted and social media reports, including sightings of whales and bottlenose dolphins, further contribute to the growing public appreciation of marine mammals (Appendices 2; 3). Despite media representations of marine mammals, such as books, articles, documentaries and films (Bearzi *et al.* 2010), there remains a notable gap in knowledge regarding appropriate responses to strandings and reporting procedures. For example, 90% of reported live pinnipeds on beaches in Uruguay are cases of healthy animals, merely resting ashore (Lourdes Casas, SOCOBIOMA pers. comm.), indicating a need for better education on distinguishing cases requiring rehabilitation.

People often perceive marine mammal strandings as abnormal and seek help, but may take inappropriate actions such as inciting animals into the water or getting too close. Instances of incorrect actions towards live and dead dolphins have occurred, along with direct contact with dead animals without

proper equipment in other regions, such as Java (Kurniawati & Hidayat 2018). Additionally, the lack of reporting on these strandings hampers coordination and guidance on proper procedures, impacting the collection of valuable information or samples from these animals (Kurniawati & Hidayat 2018). Overall, surveys indicate that marine mammal strandings evoke diverse emotions in people, and perceptions of the reasons behind these events are often multifaceted.

GETTING INVOLVED

As with the talk attendees, most stranding informants expressed interest in joining the Stranding Network, some of them eager to learn and contribute by taking photos, measurements, and recording locations. Their interests spanned across ten potential research themes with stranded marine mammals, indicating motivation for learning about diverse subjects. These findings highlight the importance of the growing interest in getting involved with strandings, and that citizen participation in rescues must be balanced with their skills in handling marine mammals.

Training according to established protocols is crucial for the community (Kurniawati & Hidayat 2018), a step yet to be accomplished in Uruguay. We are currently forming a formal and institutional marine fauna stranding network, aiming to coordinate actions among authorities, researchers, NGOs, park rangers, lifeguards, and coastal communities. This network will facilitate decision-making according to the different situations and species, develop protocols, and standardize data collection and biological sample procedures.

Our results suggested that demographic variables (such as age, sex and occupation) and other variables (such as reason for attending and previous experience) showed limited influence on people's interest in joining the Stranding Network. Although occupation showed a moderate, but non-significant association with the reason for attending the talk, this factor was not associated with prior knowledge about stranding responses. These results are consistent with previous findings that occupational background or environmental knowledge may not necessarily predict future conservation involvement (Kollmuss & Agyeman 2002). Rather, motivations to engage in conservation efforts and driving participation, may be influenced by factors beyond demographic characteristics (Kollmuss & Agyeman 2002; Barr & Gilg 2007). Furthermore, these motivations to attend the talks were independent of people's knowledge, highlighting the public's interest in learning about stranding response, regardless of their initial familiarity with the subject. This emphasizes the role of outreach programs in capturing and developing a general curiosity about marine conservation. Overall, the lack of strong associations may suggest that conservation interest and behavioral intentions are likely influenced by factors outside the scope of this study, such as personal values, and lifestyles, environmental attitudes, external factors (institutional, economic), or social influences (Kollmuss & Agyeman 2002; Barr & Gilg 2007). Future studies should explore what drives individuals to move from interest to active participation in conservation networks.

The self-evaluation of learning from the talks did not vary significantly across age groups or between sexes, suggesting

that the educational content delivered during the talks was accessible and impactful across diverse demographic groups. This finding aligns with studies on environmental education that underscore the importance of inclusivity and the importance of environmental education in broad audiences (e.g. Ardoin *et al.* 2020; Amin *et al.* 2023). Given that self-assessed learning was uniform across groups, future efforts could focus on specific skills or information that might increase interest in active participation among them.

Concerning strandings informants, middle-aged people (ages 31-50) reported strandings primarily to contribute to scientific knowledge and research. This may reflect generational differences in conservation values and awareness of the long-term impact of their actions, and they may also value the role of science, increasing their motivation to support science-based conservation efforts (Kollmuss & Agyeman 2002). However, neither age nor occupation influenced informants' involvement or interest in joining the network. While reasons for reporting strandings showed a moderate association with informants' interest in joining the Stranding Network, other factors such as their occupation and previous involvement with the Stranding Network exhibited weak, non-significant associations. This suggests that firsthand experience with strandings is not the primary motivator for participation, rather people desire to be involved. This highlights the importance of intrinsic motivations and educational outreach in fostering engagement with conservation efforts (Barr & Gilg 2007). Interest in conservation can arise from people's values, awareness, and a willingness to contribute, regardless of prior experience. However, a gap between environmental attitudes and ecological behaviors (actions and activities) persists due to social, economic, moral (values and emotions) and subjective norms (Tarfaoui & Zkim 2016).

These findings suggest that motivations to report strandings or engage with the Stranding Network might not be easily explained by these factors. Outreach strategies could therefore benefit from focusing on broader educational efforts that appeal to diverse audiences, regardless of age or occupation, in order to increase participation and foster long-term involvement in conservation activities (Kollmuss & Agyeman 2002). Additionally, further research exploring other potential influencing factors, such as personal values or environmental awareness, may provide deeper insights into the drivers of pro-environmental behavior in the context of marine mammal conservation. The number of stranded marine mammals notifications, including multiple reports of the same animal from various individuals, has been increasing over time. Some cases have been reported by as many as nine different people in 2021 and 2022. However, it's important to acknowledge that not all strandings are reported, as not everyone is aware of or willing to report to the Stranding Network. The rise in reports is likely attributed to our educational efforts (talks, engagement with beach-cleaning services, lifeguards, National Park rangers, social media campaigns, and printed posters). These diverse and evolving sources of reports to the Stranding Network indicate changes in communication and engagement among different stakeholder groups in marine mammal stranding response efforts.

CONCLUSIONS

Despite limitations, including reliance on self-reported data and the inability to track individual progress due to anonymity, the study provides valuable insights into factors that influence public engagement in marine mammal conservation efforts. Moving forward, it would be beneficial to develop longitudinal studies or follow-up assessments that can more directly measure learning retention and behavioral changes over time. Additionally, incorporating structured questions to capture motivations and attitudes in more detail would allow for a richer analysis of the pathways to involvement.

The results reflect the importance of the Stranding Network dual role: serving as both a scientific research platform and as an educational tool. By raising public awareness and knowledge about marine mammals, it enables a better understanding of marine mammal habitats, health, and conservation challenges, potentially leading to increased reporting. The current educational activities, including public talks, workshops, and social media campaigns, are directly assisting in achieving these goals. For example, our talks emphasized the importance of timely reporting and the correct steps to take when encountering stranded animals, which has led to an increase in both the quantity and quality of reports since 2018. Furthermore, our outreach initiatives have created new contacts and expanded our network of informed individuals who are actively contributing to stranding responses. By reinforcing these key messages through continued outreach and community engagement, we believe the program is effectively advancing the desired behavior changes and supporting broader conservation goals. Future efforts should focus on continuously evaluating the education and outreach program and assess if it is achieving the desired impact of increased reporting and more appropriate responses. Collaboration between researchers and the public is essential for marine mammal protection. Moreover, the study highlights the potential of stranding events for conducting social sciences surveys, education, and outreach activities, capitalizing on people's interest and motivation.

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APPENDICES

APPENDIX 1. — Online press articles reporting strandings 2018-2022. Last consultations on 25 March 2025.

2018

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APPENDIX 2. — Online press notes on live cetaceans sightings. Last consultations on 25 March 2025.

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APPENDIX 2. — Continuation.

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APPENDIX 3. — Examples of online media publications informing cases of inappropriate behaviors of people on stranded marine mammals. Last consultations on 25 March 2025.

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