

The Rufford Foundation

Final Report

Congratulations on the completion of your project that was supported by The Rufford Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. The Final Report must be sent in **word format** and not PDF format or any other format. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. Please note that the information may be edited for clarity. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to jane@rufford.org.

Thank you for your help.

Josh Cole, Grants Director

Grant Recipient Details	
Your name	Lucas Milmann de Carvalho
Project title	Habitat use, population structure and isotopic niche of three Balaenoptera species in the Southwestern Atlantic: <i>B. acutorostrata</i> , <i>B. bonaerensis</i> , and <i>B. brydei</i>
RSG reference	24023-1
Reporting period	23 of June 2018 – 23 of June 2019
Amount of grant	£3,931
Your email address	lcmilmann@gmail.com
Date of this report	21/06/2019

1. Please indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
<p>To identify individuals from the historical database of strandings in Rio Grande do Sul state and other locations in Brazil and, if possible, other locations in the Western South Atlantic, confirming classification at the specific level through genetic analysis</p>				<p>The samples were gathered, and the DNA was extracted from all of them. Unfortunately, during the period of my project the Brazilian Government has created new laws for conducting genetic studies abroad (the SISGEN process), which started to be implemented only 3 months after I requested the grant. That was the waiting period to start the licensing process for the samples exporting permit. The entire process, including the CITES licence obtained after SISGEN took 1 year longer than expected. So all licences were ready at the beginning of 2019. The shipment companies were very slow too. However, during June and July I am in Japan with a colleague working at the ICR (International Cetacean Research, attachment 1, 2 and 4). Now we are currently doing the PCR reactions for identification and microsatellite analysis for population structure of whales. Despite the fact that the analysis is still taking place, more than 45 % of the individuals have been identified already through mitochondrial DNA analysis.</p> <p>Also, the manuscript on whales' strandings in Rio Grande do Sul is already written, and as soon as I confirm the remaining eight identifications the manuscript it will be submitted. Also, we manage to identify already unidentified whales from Paraná state, and from Museum Emilio Goeldi, in</p>

<p>To genetically characterize the populations of the genus <i>Balaenoptera</i> in the Western South Atlantic, from strandings in Rio Grande do Sul and other localities of the Western South Atlantic, aiming to contribute to the definition of the population structure of three species;</p>			<p>Amazônia.</p> <p>The genetic analyses are currently taking place, and as soon as we have nuclear DNA analysis we should conclude fully this objective. We are obtaining good preliminary results, and the partnership with ICR will allow a comparison with many different populations, resulting in more robust results.</p> <p>So far, we have confirmed with the analysed individuals that the dwarf minke population in Brazil is more related to the North Atlantic subspecies than to the South Atlantic subspecies. This was suspected, although the current literature groups it with the rest of the South Atlantic. We will write a paper on that as soon as we finish analysis.</p> <p>Results for <i>Balaenoptera brydei</i> are going as expected, confirming the high genetic variability in southwestern Atlantic Ocean. Fortunately, we have double the samples when comparing with the last studies and should be able to sequence more individuals this month, increasing the impact and quality of the information.</p> <p>We also have interesting results for humpback whales, Antarctic minke whale and Omura's whales so far, which should render good publications after we finish the mitochondrial analysis during this month and next month in Tokyo</p>
<p>To obtain knowledge on the partition of resources and spatial distribution of <i>B. acutorostrata</i>, <i>B. bonaerensis</i> and <i>B. brydei</i>, from the analysis of stable isotopes of</p>			<p>We obtained stable isotopes results for a subset of samples and published a paper on dwarf minke whale ecology in <i>Mammalia</i> (attachment 3).</p> <p>More whales are being prepared for analysis to increase the impact of this part of the research. The</p>

<p>individuals stranded in Rio Grande do Sul, other Brazilian sites and possibly the Western South Atlantic;</p>			<p>samples are being processed and sent to the stable isotopes laboratory at Universidade Estadual do Norte Fluminense for analysis. It took longer than planned because some individuals had to be identified through genetic analysis before stable isotopes analysis, and I had a delay with the genetic analysis because of the exporting permits.</p>
<p>Combine stable isotope results and genetic analyses, seeking relationships between genetic lineages and isotopic niche overlapping, generating the first insights about possible stock structuring of these species in the Western South Atlantic.</p>			<p>Although a year has passed since the Rufford grant my PhD project should finish only by March of 2020. In this sense, I still need to combine the results from the genetics (that is being done now) with stable isotopes analysis (that should resume in mid-October). However, I wrote a review manuscript organising everything that is known about distribution, ecology, and stock structure of Balaenoptera whales in eastern South America. This manuscript is in the final review round by the co-authors and will be submitted to <i>Journal of Mammal Review</i> in the weeks to come.</p>

2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

Permits for sample exportation:

The mitochondrial and microsatellites analysis of my project took place in Institute of Cetacean Research (ICR), in Tokyo, as stated in the grant request. I am here right now after a lot of delay, because for me to export the whales' samples I had to deal with new government laws to export the samples and other licences for exporting threatened taxa. I worked hard to get the permits but Brazil only started to admit requests for SISGEN licences 3 months after I established the partnership with Japan. In this sense, documents involved a complex partnership to be established between my university and the Japanese institution (ICR) that included signatures from my university Dean and exchange of fiscal letters and contracts between Brazil and Japan. After the partnership and the SISGEN licence was acquired, I had to have a CITES permit both from Japan and Brazil to export endangered species samples. The Brazilian Government was more than slow, and Japanese Government authorities requires all types of documents, including a personal letter from the president of the Brazilian environmental agency stating that all my samples were strandings obtained

legally. My PhD project is the only one I know with letters from such important authorities, and that was only one of the documents required. Japanese Government officials also requested two new expeditions of the Brazilian licence to change the weight of two samples and their address. Every time I had to post the licence back to government by mail and wait for them to receive, expedite a new licence, and send me through postal mail.

After that, the transportation company also had many delays, and I had to travel over from north-eastern Brazil (where I live) to southern Brazil (where the samples were, and my molecular laboratory is) twice to send the samples because they could not organise the shipment. Fortunately, everything was sorted out in the first half of this year after a lot of effort from me and many other colleagues I am resuming analysis in Japan with a lot of good prospects for high impact publications as we have a big data bank here, great scientist in the area, and a very good laboratory.

Time frame:

I understand that this is a 1-year grant, but as stated in the Rufford grant request, this is my PhD project and it should be finished in 9 months (March 2020). Therefore, despite the delay to completely fulfil all the proposed objectives, I am very confident that we will achieve all of them and be obtaining very concrete and innovative results. We will publish different high impact scientific papers, with more species and samples than previously purposed.

3. Briefly describe the three most important outcomes of your project.

3.1.) Scientific Publications:

We have published a paper in *Mammalia* journal entitled: New trophic link and potential feeding area of dwarf minke whale (*Balaenoptera acutorostrata* subsp.) in mid latitude waters of the southwestern Atlantic Ocean (attachment 3). Also, we have elaborated a poster and submitted an abstract entitled “*Balaenoptera* whales in the northern coast of Rio Grande do Sul, southern Brazil: a review of the stranded data from 1991 to 2017” in XVII Reunión de Trabajo de Especialistas en Mamíferos Acuáticos, Peru (attachment 5 and 6). Moreover, an abstract was submitted to be presented in 2019 at Barcelona during World Marine Mammal Conference entitled “A Review of *Balaenoptera* Strandings in the East Coast of South America” (attachment 7). Both abstracts are almost ready to be submitted as full articles to scientific journals, and we still have also the future results from genetics and stable isotopes to be published soon.

3.2) Partnership network:

Through the development of this project an integration of different institutions that collect whales and other marine mammals was established allowing the widest range studies so far conducted in South America and maybe in the world. Some of the institutions included so far are: Universidade Federal do Rio Grande (FURG), Universidade Estadual do Rio Grande do Sul (UERGS), Centro Nacional Patagónico (CENPAT), Grupo de Estudos de Mamíferos Aquáticos do Rio Grande do Sul (NGO GEMARS), Universidade da Região de Joinville (UNIVILLE), Universidade Federal do

Paraná (UFP), Instituto Oswaldo Cruz (FIOCrúz), Museu Nacional do Rio de Janeiro (MNRJ), Associação de Pesquisa e Preservação de Ecossistemas Aquáticos, and Museu Paraense Emílio Goeldi. Moreover, there was also partnerships established among different laboratories for genetic analysis such as from Universidade do Vale do Rio dos Sinos (Brazil) and International Cetacean Research (Tokyo) that will allow a number of future genetic studies involving whales. At last, the laboratory of stable isotopes and pollutants analysis' from Universidade do Norte Fluminense is also involved so we can combine results to infer on stock structure of different whale species. This is very important because the collaboration is ongoing and will not stop at the end of this project, as new projects involving other marine mammal species are being already planned.

3.3) Human Development:

Through this project I was able to develop new skills, such as laboratory experience in molecular analysis and knowledge on stable isotopes. Moreover, I have received a student from Paris Sud in my house for three months (Andrea Tribulatto). During that time, I taught him some basic principles of ArcGIS mapping and R software. Moreover, together we elaborated a review on *Balaenoptera* stranding to be published soon in *Journal of Mammal Review* including him as a co-author. Also, I was able to provide a scholarship to a technician (Renan Scabruzzi) in southern Brazil to conduct genetic experiments and DNA extraction of whales samples and other marine mammals samples that will result and already resulted in different publications (for example, attachment 8). Finally, directly using the money from the grant I was able to go to the molecular laboratory from International Cetacean Research in Tokyo and also to bring an undergraduate student (Anna dos Santos Bonatto) from Universidade Estadual do Rio de Janeiro. Together we learning new molecular methods and also are having the chance to gain experience and discuss conservation with some of the most experienced researchers in the world (e.g. Luis Pastene, Mutsuo Goto). This is a priceless experience and may be one of the highlights from my whole PhD. Some new and long-lasting partnerships and studies will arise from this visit and we can apply the new techniques in Brazil.

4. Briefly describe the involvement of local communities and how they have benefitted from the project (if relevant).

My non-governmental organization and I have many projects directed toward fisheries management and other management issues. As this project bring us visibility, it helps the other projects we have. Although that is a very indirect benefit, we also try to pass the information obtained to the public and involve as many students from public and private universities as possible.

5. Are there any plans to continue this work?

As previously mentioned, this project should have its results presented by March, 2020. However, I believe different papers with the result from genetic analysis and stable isotopes will be published after that period bringing the first insights of *Balaenopteridae* whales' stock structure in the southwestern Atlantic Ocean. Moreover, we are already conducting more beach surveys and sampling from

stranded animals that were not included in this sample set and should be analysed due to our recently established network. Also, considering the results we already have there is the possibility of combining data we have on morphometrics from Brazil and Japan with genetical analysis to discuss and infer about the taxonomy of two different species of whales from southwest Atlantic Ocean: *Balaenoptera brydei* and *Balaenoptera acutorostrata* subsp. This last step will be done after the end of my PhD project.

Unfortunately Brazil is facing a very complicated moment for science due to a current political crisis, with a lot of budget loss for scientific projects and scholarship cuts (see more at <https://www.nature.com/articles/d41586-019-01079-9> and <https://science.sciencemag.org/content/363/6425/330/tab-figures-data>). However, I feel that another Rufford small grant could provide me condition to focus primary on the next steps of my project for years to come. I have also an invitation from my advisor to join the Post PhD programme from my university without scholarship. Unfortunately I cannot keep myself without incentive, but I feel that with another small grant from Rufford the research I can continue with our even without a scholarship from my university, considering that I am a permanent researcher from a non-government organization called Grupo de Estudos de Mamíferos Aquáticos do Rio Grande do Sul (www.gemars.org.br).

6. How do you plan to share the results of your work with others?

The preliminary results have been shared with the scientific community through presentations on scientific meetings and articles. It is important to notice that only a small portion of the scientific articles have been published because I will be acquiring most of the data in the next months. In this sense, I expect to publish several papers in the near future with data from PhD thesis acknowledging the support from Rufford Small Grants.

Considering the general public, the results have been shared through our webpage (www.gemars.org.br) and social media such as Facebook and local newspaper (e.g. <https://www.facebook.com/gemarsong/photos/a.924571817609853/1957087654358259/?type=3&theater>), and local periodic [Attachment 9]). This Facebook publication is just an example of the many reports we give on strandings and whales' ecology, and it has reached more than 9000 persons.

7. Timescale: Over what period was The Rufford Foundation grant used? How does this compare to the anticipated or actual length of the project?

I have asked Rufford the grant for three main activities, and I have spent the resources for the molecular analysis in the stipulated time. However, due to problems to obtain the permits for samples exportation I have only spend the money for the second activity 2 months ago when I bought the airplane tickets to Tokyo, and not 1 year ago as I first predicted. The money for the third activity, the stable isotopes analysis, is being spent this month to send the samples from south Brazil to south-eastern Brazil and during July, August and September for analysis. This resource is still

in my account because I had to first identify my whales through molecular analysis to see what samples to send to stable isotopes. Therefore, this last resource is being spend with delay comparing with the original plan, although the value is still suitable and the money still crucial for the development and completion of my PhD project.

8. Budget: Please provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Two airplane tickets to Tokyo for molecular analysis and airplane tickets to south Brazil for organization and shipment of the samples.	2586	2733	+147	The tickets to Tokyo were cheaper than previously estimated. However there was two more airplane tickets used by me to go to my laboratory in southern Brazil and organize the samples for shipment.
Bulk tissue C, Hg, and N analysis	654		-654	Both the sending of the sample, material for analysis and technician expenses were not yet computed. That is because I need to identify the samples with the genetic analysis to see how many samples can be identified and that should be send
Kit Invitrogen for DNA extraction and other expenses for molecular analysis	691	621	-70	The responsible for the UNISINOS Laboratory help me buying a portion of the primers, and extraction kits, as well as some of the samples' sequencing made in Korea. Therefore, my cost was only 132, 85 pounds. My second fee on this item (E 489, 02) is related to four months scholarship to a technician, so we could speed the process of extracting the samples and in Brazil.
TOTAL	3931	3354	-577	*Apart from the scholarship fee given to my technician to help with the extraction and handling of samples, I can

				account for everything with the fiscal note. However, if you think is suitable, I can ask the technical that received the scholarship to sign a document confirming the quantity of money he received.
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Note: Project to be completed by 2020 and the remainder of the balance to be used over that time.

9. Looking ahead, what do you feel are the important next steps?

- To finish mitochondrial DNA analysis in Tokyo (July 2019).
- To finish Stable Isotopes analysis (September 2019).
- To finish to write the articles and publish the results in social and scientific media.
- To defend the PhD project (March 2020).
- To continue to sample tissue and bone from stranded whales' (ongoing activity for me and my group).
- To combine all the results with morphometrics to infer on the taxonomy of whales (post PhD project for 2020).

10. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did The Rufford Foundation receive any publicity during the course of your work?

The Rufford logo was used during the presentation of a poster in the Latin American meeting for experts in aquatic mammals and it will be used in Marine Mammal World conference this year in Barcelona. I also have used the logo on my non-profit organisation social media. Moreover, I am giving a presentation to in Tokyo National University in about my project where the Rufford logo will be exposed this month. Finally, whenever I present my project during the next months for the conclusion of my PhD project I will use the logo.

11. Please provide a full list of all the members of your team and briefly what was their role in the project.

PhD Julio Baumgarten (advisor) – Julio has helped during the establishment of the partnership between Universidade Estadual de Santa Cruz and International Cetacean Research, which was essential to export the samples. Moreover, he is my connection for the public scholarship.

PhD Larissa Rosa de Oliveira (co advisor) – Larissa helped to establish the connection with Universidade do Norte Fluminense where the first part of the stable isotope analysis was performed and to where the next round of samples is being sent for analysis. She has also provided me all the logistical help I need during the samples DNA extraction in her laboratory at UNISINOS.

PhD Paulo Ott (co advisor) – Paulo is the former director of my Non-Government Organization and has taught me most of what I know in biological sciences, including how to collect whales' samples for the last 12 years. He has been the responsible for beach survey projects in southern Brazil since 1991, and one of the most engaged persons in making our results accessible to the public. To this day he is providing new whales samples from southern Brazil, as I am living in north-eastern Brazil where my current University is. He also is the co-author of every article I have published until today, providing help beyond comparison.

Renan Scabruzzi – Renan is graduated in Biochemistry and is also a technician in the molecular laboratory at Universidade do Vale do Rio dos Sinos in southern Brazil. There he was fundamental to adjust extractions protocols as well as to help with the analysis. He received four months of scholarship (explained in the budget) and at this time he still helping whenever a new sample lands in the laboratory, as well as to prepare bone samples for shipment to stable isotopes 'analysis in south-eastern Brazil.

Andrea Tribulatto – Andrea has just graduate in University Sud Paris, and in his last semester he got to know my project through the Rufford foundation website. After contacting me, I received him in my house for three months for internship (**attachment 3**, and **attachment 4**). During this time he has helped me to gather data on published strandings in eastern South America, resulting in an Abstract submission to World Mammal Conference 2019, and hopefully a future article in Mammal Review with him as a co-author.

Anna dos Santos Donatto – Anna is an undergraduate at Universidade Federal do Rio de Janeiro and has skills on genetic analysis. Her role in my project is to provide help during the activities in Tokyo. The Rufford grant was used to pay for her ticket and mine.

Carlos Eduardo Rezende and **Ana Paula M. Di Benedetto** – Both researchers are responsible for the Stable Isotopes Laboratory at Universidade do Norte Fluminense. They helped me perform the first stable isotopes analysis and are co-authors of my first article on this topic. Now they are researching on how to sample bones for the next round of analysis and will also be very important on the last phase of analysis and to help writing some of my PhD chapters.

Dr. Luis Pastene and **Mutsuo Goto** – Both researchers are receiving us in Tokyo, teaching me and Anna a lot and helping with the molecular analysis. They also have added a great number of samples from several places to our dataset.

12. Any other comments?

The Rufford grant has been essential for the development of my project. For that I have not enough words to thank you. Unfortunately, I had a delay because of issues involving the exporting of samples. Despite that, I am confident that not only the project will reach the purposed objectives achieved but that will result in high impact publications. I will keep advertising Rufford foundation until the completion

of my PhD project and will acknowledge the Rufford grant in all publications that result from this project.

I hope the report is ok, that my delay is not a deception for you, and that we have the chance to keep working together through one more small grant so I can keep focused on my research, and also developing my activities as a researcher from my NGO without have to look for another income, despite the lack of sponsorship from Brazilian government agencies.





ENCALHE

Baleia morre em praia do Rio Grande do Sul

Espécie é comum no Litoral Norte gaúcho

O encalhe de uma baleia no Balneário Presidente, em Imbé, gerou comoção nos veranistas na manhã de ontem. Mais de cem pessoas acompanharam a retirada e enterro do animal da espécie Baleia-de-Bryde, que apareceu morto na beira da praia na altura da guarita 127, ainda na madrugada. O mamífero foi avistado por salva-vidas por volta das 6h. Era um macho adulto, com cerca de 13 metros, pesando quase 30 toneladas.

A ocorrência foi atendida por diversas instituições que auxiliaram na remoção da baleia, como o Corpo de Bombeiros, o Comando Ambiental da Brigada Militar, a Secretaria de Meio Ambiente de Imbé e o Centro de Estudos Costeiros, Limnológicos e Marinhos (Ceclimar). "É triste ver um animal bonito como esse apodrecendo na beira da praia",

afirmou a aposentada Maria Inês da Costa, 68. Veranista da região, ela relembrou alguns casos semelhantes ocorridos em outros veraneios. "Infelizmente não é tão incomum esses animais aparecerem mortos na praia", lamentou.

A veranista não está errada. Conforme o presidente do Grupo de Estudos de Mamíferos Aquáticos do Rio Grande do Sul (Gemars), Paulo Ott, no ano passado uma baleia da mesma espécie apareceu morta em Cidreira. No ano interior, outro exemplar foi encontrado morto no Parque da Itapeva, em Torres.

De acordo com o professor do Departamento de Zoologia da Ufrgs e pesquisador do Ceclimar, Ignacio Benites Moreno, as causas mais comuns de morte do mamífero no Litoral são choques com embarcações ou capturas acidentais em redes. "Esta-

mos coletando informações, para determinar a causa da morte mas foi difícil porque o animal já estava em estado avançado de decomposição", relatou. Duas retroscavadeiras removeram a baleia até próximo das dunas, onde foi enterrada.

Ao contrário de espécies conhecidas no Sul do país, como a Jubarte e a Baleia Franca, a Baleia-de-Bryde não migra entre o inverno e o verão para as águas geladas próximo ao continente antártico. A espécie permanece em regiões tropicais e subtropicais, sendo mais comum sua presença nas praias gaúchas.

Segundo o presidente do Grupo de Estudos de Mamíferos Aquáticos do Rio Grande do Sul (Gemars), Paulo Ott, já foram re-

gistrados dez casos de encalhes no Litoral Norte desde 1994, quando as pesquisas sobre a espécie começaram. O exemplar que encalhou no Balneário Presidente foi o 11°. Em mais de 70% dos casos, os mamíferos pararam na beira da praia entre os meses de dezembro e janeiro. O primeiro registro foi em dezembro de 1994, ao lado da plataforma de Tramandai.

As informações sobre a Baleia-de-Bryde ainda são escassas. De acordo com Ott, a identidade genética da espécie da costa brasileira foi desvendada recentemente, e divulgada a partir de um estudo publicado em 2015, por pesquisadores chilenos e brasileiros, entre eles o próprio presidente do Gemars. Inclusive, o mamífero enterrado ontem também será usado para estudos. "As amostras de tecido coletadas farão parte de uma análise que visa entender as relações das baleias-de-Bryde da costa gaúcha com outros exemplares do Atlântico Sul, incluindo a costa brasileira e africana" relatou Ott.



Morte da baleia causou comoção na beira-mar do balneário Presidente

Balaenoptera whales strandings in Southern Brazil from 1991 to 2017: habitat use and ecology patterns.

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Borges Martins^{1,6}, Julio Baumgarten² & Paulo Henrique Ott^{1,7}.

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INTRODUCTION

The ecology and distribution of most baleen whales are still poorly known in Brazilian waters. In this sense, stranding data, despite some caveats, can be useful to understand patterns of species distribution and detect some population trends. In this scenario, a 26-years marine mammal stranding database was used to evaluate the composition and spatial-temporal patterns of *Balaenoptera* whales in southern Brazil.

METHODS & RESULTS

A stretch of 270 km on the coast of the State of Rio Grande do Sul (from 29°20'S to 31°21'S) was surveyed year-around (Fig. 1) and civilian calls were verified between 1991 and 2017. Whales were identified, measured and sex verified whenever possible. Among the 44 balaenopterids recorded, three species of *Balaenoptera* were identified (*B. acutorostrata* n=24; *B. brydei* n=11; and *B. physalus* n=1). In addition, eight whales (17.8%) were not identified to a specific level due to advanced decomposition.

DISCUSSION

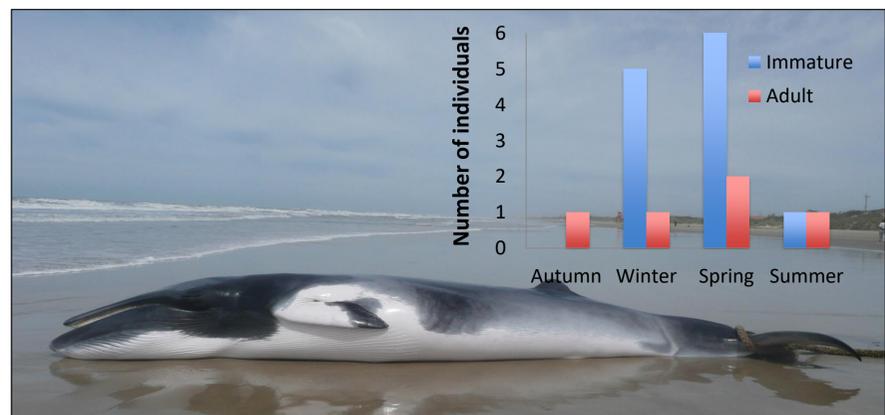
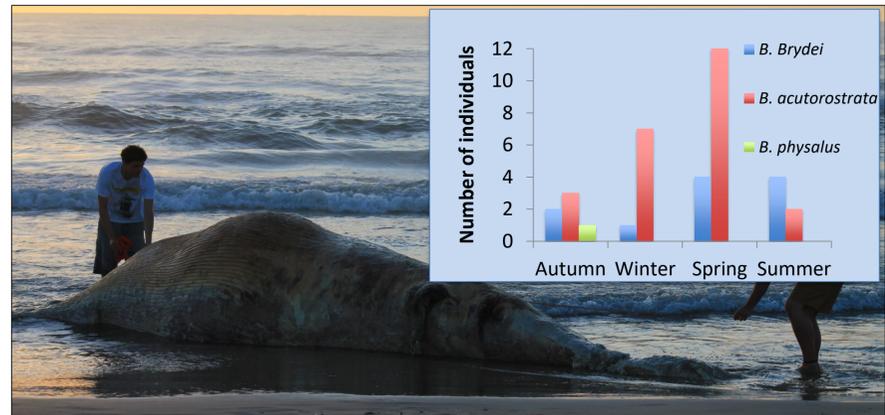
Both *B. acutorostrata* and *B. brydei* were found year-around in the region, although strandings of *B. acutorostrata* were mostly recorded during the winter/spring (91.0%, Fig 1) and of *B. brydei* during spring/summer (72.7%, Fig. 2). Therefore, although *B. brydei* appear to remain in Brazilian waters during the entire year, the results suggest the existence of seasonal inshore-offshore or latitudinal movements, as documented in South Africa (Best, 2001). Moreover, the greater number of strandings of juveniles compared to the adults of *B. acutorostrata* (ratio 2.4:1) and the occurrence of the formers in different seasons suggest that some immature individuals may not leave this region, as previously suggested by other studies (e.g. Milmann et al. 2018). Additionally, the only record of *B. physalus* was in June 2002. To complete the study, the species identities of all whale carcasses will be confirmed using molecular techniques.

REFERENCES

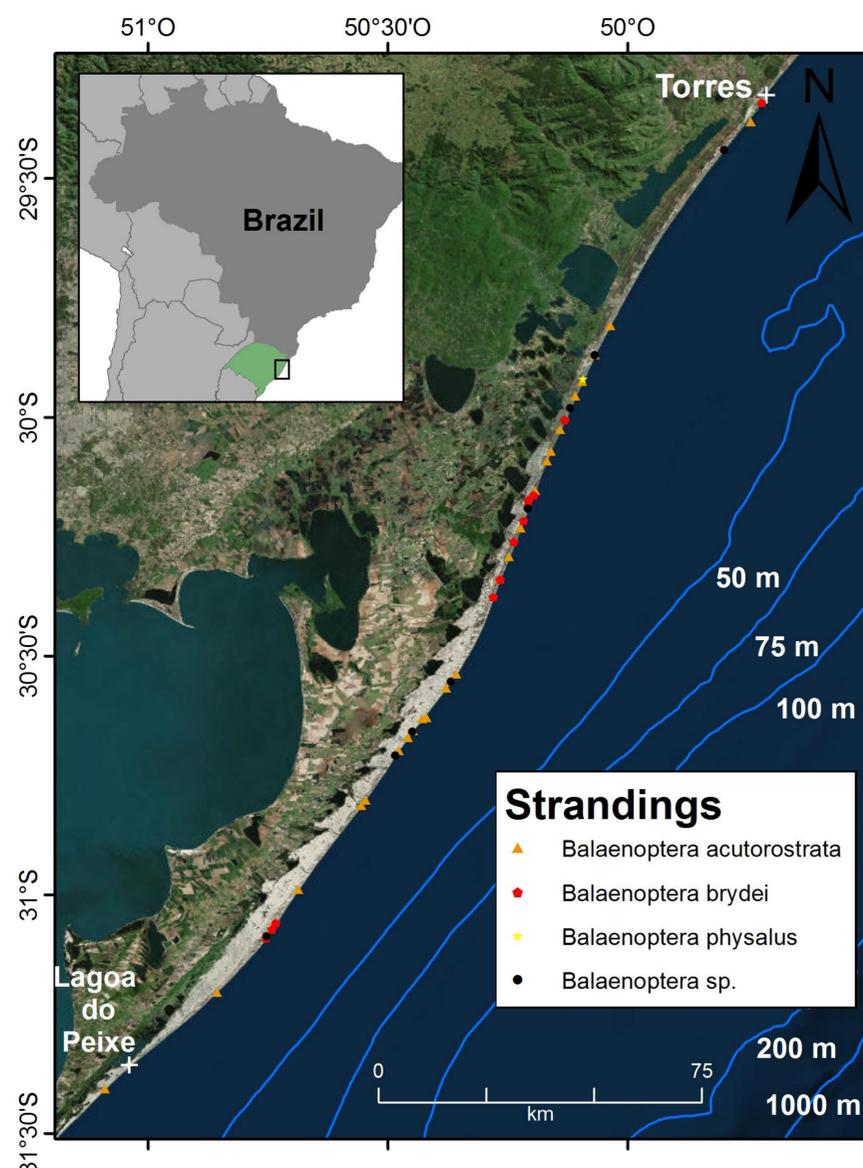
Best, P. B. 2001. Distribution and population separation of Bryde's whale *Balaenoptera edeni* off southern Africa. *Marine Ecology Progress Series* 220:277-289.
Milmann L., et. Al. 2018. New trophic link and potential feeding area of dwarf minke whale (*Balaenoptera acutorostrata* subsp.) in mid latitude Waters of southwestern Atlantic Ocean. *Mammalia*. 4p.

ACKNOWLEDGEMENT

We would like to thank all students and investigators that helped during the surveys and collection of the specimens.



Figures (from the top): 1) *Balaenoptera brydei* stranded in Southern Brazil (Photo: G. Mazzoti), and the stranding patterns divided accordingly to seasons; 2) Immature male of *Balaenoptera acutorostrata* stranded in Southern Brazil (Photo: R. Machado), and the stranding distribution of both adults and juveniles along seasons in Southern Brazil; 3) Map of the surveyed area and stranded whales between 1991 and 2017.



Balaenoptera whales in the northern coast of Rio Grande do Sul, southern Brazil: a review of the stranded data from 1991 to 2017

Lucas Milmann^{1,2}, Larissa Rosa de Oliveira^{1,3}, Daniel Danilewicz^{1,4}, Janaina Wickert^{1,8}, Rodrigo Machado¹, Federico Sucunza^{1,4,5}, Marcio Borges Martins^{1,6}, Julio Baumgarten² & Paulo Henrique Ott^{1,7}.

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Abstract

The ecology and distribution of most baleen whales are still poorly known in Brazilian waters, despite the history of whaling and the recent increase in research effort. Currently, most of the balaenopterid populations are recovering from hunting, but are facing new threats due to anthropogenic changes in the marine environment. Stranding data, despite some caveats, can be useful to understand patterns of species distribution and detect some population trends. In this scenario, a 26-years marine mammal stranding database was used to evaluate the composition and spatial-temporal patterns of *Balaenoptera* whales in southern Brazil. A stretch of 270 km on the coast of the State of Rio Grande do Sul (from 29°20'S to 31°21'S) was surveyed year-around and civilian calls were verified between 1991 and 2017. Whales were identified, measured and sex verified whenever possible. Among the 44 balaenopterids recorded, three species of *Balaenoptera* were identified (*B. acutorostrata* n=24; *B. brydei* n=11; and *B. physalus* n=1). In addition, eight whales (17.8%) were not identified to a specific level due to advanced decomposition. The large number of strandings of *B. acutorostrata* and *B. brydei* recorded may be related to their greater abundance and/or more coastal distribution in relation to other species of the genus in the area. Both species were found year-around in the region, although strandings of *B. acutorostrata* and *B. brydei* were mostly recorded during the winter/spring (91.0%) and spring/summer (72.7%), respectively. Therefore, although *B. brydei* appear to remain in Brazilian waters during the entire year, the results suggest the existence of seasonal inshore-offshore or latitudinal movements, as documented in South Africa.

Moreover, the greater number of strandings of juveniles compared to the adults of *B. acutorostrata* (ratio 2.4:1) and the occurrence of the formers in different seasons suggest that some immature individuals may not leave this region, as previously suggested by other studies. Additionally, the only record of *B. physalus* was in June 2002, whereas *B. bonaerensis* was not registered during the entire period. To complete the study, the species identities of all whale carcasses will be confirmed using molecular techniques.

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Title:

A Review of *Balaenoptera* Strandings in the East Coast of South America

Abstract:

The genus *Balaenoptera* comprises seven species and 15 subspecies with conservation status ranging from “Endangered” to “Least Concern” and “Data Deficient”. Despite data from whaling and offshore cruises, much of information related to seasonal distribution and ecology of these whales in the southwestern Atlantic Ocean (SWAO) comes from analysis of beached carcasses. A review of published and unpublished confirmed records on *Balaenoptera* strandings along the east coast of South America (from ~12°N to 55°S), comprising six countries (Argentina, Brazil, Chile, Suriname, Uruguay, Venezuela) and the Falkland/Malvinas Islands was used to evaluate spatio-temporal ecological and habitat use patterns of these whales. A total of 196 strandings from the seven species were documented from 1865 to 2018. Records varied largely across species: *B. edeni/brydei* (n=81), *B. acutorostrata* (n=45), *B. bonaerensis* (n=23), *B. borealis* (n=19), *B. physalus* (n=18), *B. musculus* (n=9), and *B. omurai* (n=1). As expected, most of the species occur in higher numbers during winter and spring migration season to/from low latitudes. When all records were gathered, the permanence of *B. edeni/brydei* and some individuals of *B. acutorostrata* in the Brazilian coast year-round became more evident than previously. Moreover, analysis of a greater number of studies brought strength to different theories, such as a possible sexual segregation (especially of pregnant females) and a calving area of *B. bonaerensis* in mid-latitude waters of the SWAO. Also, a hypothesis of a larger calving area (from ~17°S to 35°S) than previously expected for *B. acutorostrata* emerged from the compiled data. Finally, although stock structure and taxonomy still need to be better resolved for different species, the information about *Balaenoptera* strandings are now comprehensively organized and exposed considering a greater dataset than any previous review in the east coast of South America.

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