SC/68B/SM/11

Lahilles bottlenose dolphins: conservation status update, working in progress and follow up on the previous SC66b/SM recommendations

Pedro F. Fruet, Fabio Daura-Jorge, Rodrigo Cezar Genoves, Pedro Volkmer de Castilho, Paula Laporta, Juliana C. Di Tullio, Els Vermeulen, Leonardo Berninsone, Mariano Coscarella, Mauricio Failla and Miguel Iniguez

INTERNATIONAL WHALING COMMISSION

Lahille's bottlenose dolphins: conservation status update, working in progress and follow up on the previous SC66b/SM recommendations

Pedro F. Fruet[1,2,3] Fábio Daura-Jorge[4]; Rodrigo Cézar Genoves[1,2,3], Pedro Volkmer de Castilho[5], Paula Laporta[6,7], Juliana C. Di Tullio[1,2,3]; Els Vermeulen[8], Leonardo Berninsone[9], Mariano Coscarella[10,11] Mauricio Failla[12] and Miguel Iñíguez[12]

[1] Museu Oceanográfico "Prof. Eliézer C. Rios", FURG, Brazil.
[2] KAOSA, Rio Grande, Brazil.
[3] Laboratório de Ecologia e Conservação da Megafauna Marinha – ECOMEGA. Instituto de Oceanografia, FURG, Brazil.
[4]Laboratório de Mamíferos Aquáticos (LAMAQ), Departamento de Ecologia e Zoologia, UFSC, Brazil.
[5] Laboratório de Zoologia, Departamento de Engenharia de Pesca e Ciências Biológicas, UDESC, Brazil.
[6] Yaqu Pacha Uruguay - Organización para la Conservación de Mamíferos Acuáticos en Américal del Sur. Punta del Diablo, Rocha, Uruguay
[7]Centro Universitario Regional del Este, Universidad de la República. Rocha, Uruguay
[8] Mammal Research Institue Whale Unit, Department of Zoology and Entomology, University of Pretoria, South Africa
[9] AquaMarina - Centro de Estudios en Ciencias Marinas, Buenos Aires, Argentina.
[10] Marine Mammal Lab, Centre for the Study of Marine Systems (CESIMAR-CENPAT-CONICET, National Research Council), Puerto Madryn, Chubut, Argentina.
[11]Universidad Nacional de la Patagonia, Bvd. Puerto Madryn, Chubut, Argentina.
[12]Fundación Cethus, Buenos Aires, Argentina

Corresponding Author: Pedro F. Fruet (pfruet@gmail.com)

INTRODUCTION

The Lahille's bottlenose dolphins (*Tursiops truncatus gephyreus*) is endemic to the Southwestern Atlantic Ocean (SWA), with a restricted and fragmented coastal distribution ranging from southern Brazil to Central Argentina. Two Evolutionarily Significant Units (ESUs) are recognized: one comprising bottlenose dolphins from Central Argentina and a second ranging from southern Brazil to Uruguay, comprised by at least five Management Units (MU) (Figure 1). There are no abundance estimates available for the entire subspecies or ESU's, but some MUs are very small (<100 animals) and constituted by dolphins exhibiting strong site fidelity and year-round residency—two estuarine and three coastal (Fruet *et al*. 2014). By-catch in the gillnet fishery is recognized as the main threat for these local communities, but other agents such as skin-diseases, boat strikes, chemical pollution, and underwater noise also impact dolphins along its distributional range.

Concerns regarding the conservation of Lahille's bottlenose dolphins have been discussed in previous SC meetings, and the Commission has set a series of recommendations. At SC/66b, the Scientific Committee had recommended *an updated assessment of population status of the Argentine population (BSA-ESU) of this subspecies*, while at SC67b, the Scientific Committee had recommended: *i) immediate action to reduce the level of bycatch in the Southern Brazil MU's*;

ii) continued monitoring and photo-identification work on the populations throughout the subspecies' range to refine survival estimates and to assess trends in abundance and the prevalence and etiology of the chronic skin infections; and iii) that the conservation status of the subspecies be prioritized for assessment in the future.

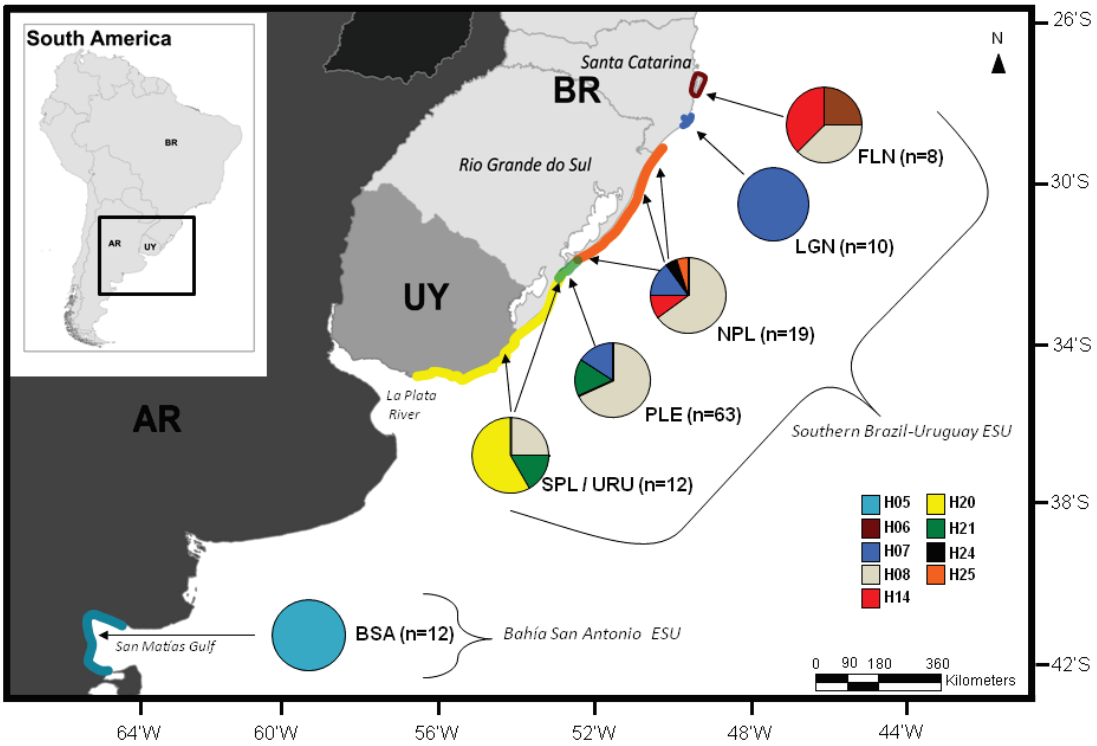

Figure 1: Modified from Fruet *et al.* (2014) showing the restricted distribution of the Lahille´s bottlenose dolphin and the proposed Evolutionarily Significant Units (ESUs) and Management Units (MUs) (color counter lines) with the respective frequencies of mitochondrial control region haplotypes (pie charts). Arrows indicate the main sampling locations. FLN, Florianópolis; LGN, Laguna; NPL, north Patos Lagoon; PLE, Patos Lagoon estuary; SLP/URU, south Patos Lagoon/Uruguay; BSA, Bahía San Antonio, Argentina.

Taking into account the recommendations made by the Scientific Committee, this paper aims to keep the scientific committee updated on the conservation status and ongoing research with the subspecies. Specifically, we listed the following objectives: 1) inform this forum about updates on the conservation status of the subspecies at an international, national and regional level and 2) present the progress related to the recommendations listed by the Scientific Committee, briefly informing about the work in progress and/or planned.

1) THE CONSERVATION STATUS OF LAHILLE'S BOTTLENOSE DOLPHINS: AN UPDATE

1.1. *International Union for the Conservation of Nature – IUCN*

After being recognized as a subspecies by the Society for Marine Mammalogy, which was supported by the IWC Scientific Committee, the conservation status of Lahille's bottlenose dolphin was assessed for the first time by the IUCN in 2019. In brief, due to the low number of individuals for the entire subspecies and evidence of decline at least part of its range due to

bycatch in fisheries and other unknown factors, the species was listed as **VULNERABLE** under **criterion D1** (Vermeulen *et al*. 2019a). Below, we reproduce the IUCN assessment information. Assessment details can be found visiting the IUCN Red List at https://www.iucnredlist.org/species/134822416/135190824.

IUCN ASSESSMENT JUSTIFICATION

"Lahille's bottlenose dolphin, a subspecies of the Common Bottlenose Dolphin (*Tursiops truncatus*), occurs in low numbers only in southern Brazil, Uruguay and Argentina. Lahille's bottlenose dolphins are mainly resident to localized areas and restricted to coastal habitat resulting in a vulnerability to increasing pressures from human activities. Bycatch, pollution and prey depletion are the main known threats to the subspecies. There is evidence that the subspecies is declining in at least part of its range due to bycatch in fisheries and other unknown factors, although robust data on population dynamics is limited. Genetic variability of the subspecies is low at both nuclear and mtDNA markers. The abundance of Lahille's bottlenose dolphins has been estimated for most parts of the subspecies' range. The sum of available abundance estimates suggests a maximum total population size of 600 individuals. With an estimated 60% of mature individuals (Taylor et al. 2007), the total number of mature individuals in the subspecies can be estimated at 360, well below the threshold to be listed as Vulnerable under criterion D1".

1.2 National Red List of Threatened Species and Action Plan—Brazil

After recognized by international conservation bodies as a different taxonomic entity, the conservation status of Lahille's bottlenose dolphin was assessed in 2018 during the last evaluation of the threatened species of Brazil. The National Center for Research and Conservation of Aquatic Mammals – CMA/ICMBio held the "Workshop to Assess the Conservation Status of Aquatic Mammals, Second Cycle (2016-2020)", in Santos (SP), between 14 and 18/05/2018. Fifty-nine species of aquatic mammals were evaluated applying the IUCN criteria, of which 12 were considered threatened. Following a similar rationale of the IUCN assessment mentioned above, Brazil classified the species as **ENDANGERED** (in Brazil, Lahille's bottlenose dolphin is treated as species, *T. gephyreus*).

Following the Red List update, CMA/ICMBio held the Workshop to update the National Action Plan for the Conservation of Marine Cetaceans (PAN Cetacós Marinhos - Portaria ICMBio 375 de 2019), between 1 and 5/10/2018, in Brasília-DF. Forty-two specialists attended the Workshop, representing different sectors, such as state environmental agencies, federal agencies, research institutions, productive sectors (linked to fishing and oil and gas production), and civil society. During the Workshop, the participants defined ten specific objectives and 81 actions. The expectation is that, over the next five years, the articulators and collaborators will be able to carry out the defined actions, in order to revert or mitigate the main threats to the conservation of the species considered and to improve their conservation status. Below, we listed specific actions that directly or indirectly should improve the research and conservation of Lahille's bottlenose dolphins (**Table 1**).

1.3 National Red List of Threatened Species —Argentina

The conservation status of Lahille's bottlenose dolphin was assessed in 2018-2019 during the last

evaluation of the threatened mammal species of Argentina (Red list of mammalian species of Argentina), following the subspecies designation recognized by the Society for Marine Mammalogy and supported by IWC. Based on a review process that applied the IUCN criteria, *T. truncatus* off Argentina was classified as Vulnerable (Vermeulen et al. 2019b). Nevertheless, the local population of *T. t. gephyreus* was classified as **ENDANGERED (EN)** (Vermeulen *et al*. 2019b). During the classification it was recommended to set a research program to resolve the taxonomic status of *Tursiops spp.* in Argentina, estimate its abundance and to assess the effect of pollution on reproduction and survival. Important to note a proposal to establish a Protected Area at the Estuary of Río Negro that has been discussed exhaustively at the province of Río Negro parliament since 2009 but not adopted yet.

Table 1. Some objectives and actions set in the Brazilian National Action Plan for Endangered Species of Marine Cetaceans (2019-2024 – Portaria ICMBio 375 de 2019) that could impact directly or indirectly the conservation of *T. gephyreus*.

OBJECTIVE	ACTION	EXPECTED IMPACT ON GEPHYREUS (for actions with broad context)
1 – To reduce cetacean bycatch, intentional killing and entanglement.	1.8 Evaluate the effectiveness of Normative Instruction INI/MMA 12/2012 for the reduction of bycatch	Article 8 defines an exclusion fishery zone within Patos Lagoon Estuary and surrounding coastal areas, where there is the largest population of the species and the highest bycatch numbers reported
	1.11. Propose the inclusion of specific fisheries control and inspection operations in critical areas and periods of incidental capture of *S. guianensis* and *T. gephyreus*, integrating different governmental spheres	Enforcement of the Article 8 of the INI 12/2012 norm in the Patos Lagoon Estuary and surrounding coastal areas. In addition, it should reduce the bycatch in Laguna population
	1.15 Propose local fisheries regulation in areas of occurrence of *S. guianensis* and *T. gephyreus*	Expansion of regulation for coastal areas other than Patos Lagoon Estuary and Laguna
3 – To promote the improvement of the health and well-being of marine cetaceans	3.9 Develop and implement a health monitoring program for marine cetacean populations	The two largest (but small) populations in southern Brazil are subject to relatively high levels of PCBs and DDTs. Laguna population has a high incidence of individuals with chronic dermatitis
	3.11 Identify and evaluate pollutant biomarkers of exposure and effect in marine cetaceans	
	3.13 Monitor the prevalence of skin lesions that may indicate the health status of individuals, as well as their diagnosis	
5 – To reduce pollution of marine environments and contamination of marine cetaceans	5.2 Identify and quantify pollutant compounds emerging in PAN target species	
6 – To reduce the occurrence of vessel collisions with cetaceans	6.6 Articulate with the competent bodies the definition of routes and standardization of vessel traffic in the priority areas of the National Action Plan	Patos Lagoon Estuary is defined as one priority area
8 – To elaborate mechanisms in order to understand and reduce the effect of habitat degradation on marine cetaceans	8.12 Expand knowledge on population parameters of *S. guianensis*, *T. gephyreus* and *Eubalaena australis* that are needed to allow a robust assessment of their conservation status	
9 – To monitor the effects of climate change on the occurrence and population dynamics of marine cetaceans	9.3 Create and ensure the continuity of long-term research programs, focusing on the effects of climate change on marine cetaceans	The longest running monitoring projects with systematic data collection in Brazil are focused in *Tursiops gephyreus*

1.4 Priority Conservation Species List-Uruguay

In Uruguay, the conservation status of the subspecies was not evaluated so far as there is no National Red List of Threatened Species for mammals. However, it is important to mention that Lahille's bottlenose dolphin is included in the Priority Conservation Species List elaborated by de National System of Protected Areas of the National Direction of Environment of the Ministry of Housing, land use and environment from Uruguay. The subspecies has also been considered as a conservation focal object in the Cerro Verde and Coronilla Islands protected area (Decret N°285/2011), one of the principal study areas of this subspecies in the country.

2) **PROGRESS ON PREVIOUS RECOMMENDATIONS LISTED BY THE SCIENTIFIC COMMITTEE**;

2.1 At SC/66b, the Scientific Committee had recommended an updated assessment of the status of the Argentine population (BSA-ESU) of this subspecies

No significant progress was made towards updating the current population status of the Argentine Lahille's dolphins. A regular survey program focusing on the better-studied population at Bahía San Antonio is still required. Surveys are not carried out in the area since 2012. However, a new project was developed to study the population ecology of bottlenose dolphins in Bahía Blanca Estuary, southwestern coast of the Province of Buenos Aires, the only remaining area with frequent occurrence of the subspecies where no scientific data is yet available. A pilot study was due to initiate in March (but was put on hold due to COVID-19 pandemic) with the aim to examine the possibility to establish a long-term monitoring program in the area and to obtain a local abundance estimate using mark-recapture. Additionally, biopsies will be taken to investigate the dolphins' connectivity with the population in Bahia San Antonio, as well as those in Uruguay and southern Brazil. The project already has funding and is planned to start as soon as the situation around COVID-19 allows.

At the Estuary of Río Negro (ERN), photo-identification efforts have been carried out between 2007 and 2018 (Failla *et al*., 2017). During the same period, samples from stranded individuals, as well as museums and private collections, have been collected in Bahía Blanca, Bahía San Blas and the ERN.

Recently, a new cetacean monitoring and biopsy sampling program started in Golfo San Jorge (central Patagonia), where Lahille's bottlenose dolphins have also been reported. This program is expected to establish a network with Argentinean colleagues to stimulate inter-site comparison of data with the ongoing efforts in Brazil and Uruguay (see below).

2.2 At SC67b, the Scientific Committee had recommended:

i) Immediate action to reduce the level of bycatch in the Southern Brazil MU's

Patos Lagoon Estuary Management Unit

The Brazilian Institute of Environment and Renewable Natural Resources (IBAMA - Federal) and Environmental Policy (PATRAM - Local) carried out inspections during the 2018 and 2019 fishing season (late spring and summer) along the bottlenose dolphin protection area at Patos Lagoon Estuary (PLE) and surrounding areas to prevent artisanal gillnetting fisheries from

operating in the area (Article 8/ INI 12/2012). A total of nine operations were carried out by PATRAM during this period, a part of their regular monthly survey along the area. Three flagrant occurrences were referred to the Federal Police and some artisanal fishers were fined and arrested. Data from IBAMA indicated a minimum of 10 operations in the area. Some artisanal fishers have been fined, but specific data on confiscations and fines have not yet been accessed. These inspections are part of specific actions designed to improve compliance of Article 8 of INI12 / 2012. However, they seem to be insufficient, as during photo-identification field trips, carried out in the same period and area, still recorded an intense fishing effort. The inspections seem to have a short-term effect on the behavior of the fishers (i.e. the fishing effort decreases in the days following the operations but returns to high levels as the police remain absent in the area for long periods). In addition, the mortality pattern of bottlenose dolphins in the coastal areas remained stable relative to previous years (2002-2018), with bycatch records indicating that the problem persists. It is also important to report a record made by the Environmental Policy during an operation carried out in the adjacent coastal zone of PLE in 2019 to inspected beach seine fisheries catching endangered fish species—a fishery strategy allowed to operate inside the protected area. During that operation, called "Operação VIOLA (PATRAM / 6 ° BPM)", more than 10 tons of Brazilian guitarfish (*Pseudobatos horkeliiviola*) were confiscated, and it was recorded the capture of sea turtles and one female Lahille's bottlenose dolphin that died trapped in the fishing net (**Figure 2**). Fishermen were arrested.

Compliance with the protection area is of fundamental importance to ensure the conservation of the largest Lahille's bottlenose dolphin population in Brazil. PVAs simulations have demonstrated that the removal of a few mature female individuals from this Management Unit by fishing or other anthropic activities—such as a fatal boat strike of a female dolphin recorded in 2020 inside PLE (**Figure 3**)—can cause a rapid decline that is unlikely to be reversed in the future (Fruet, 2016).

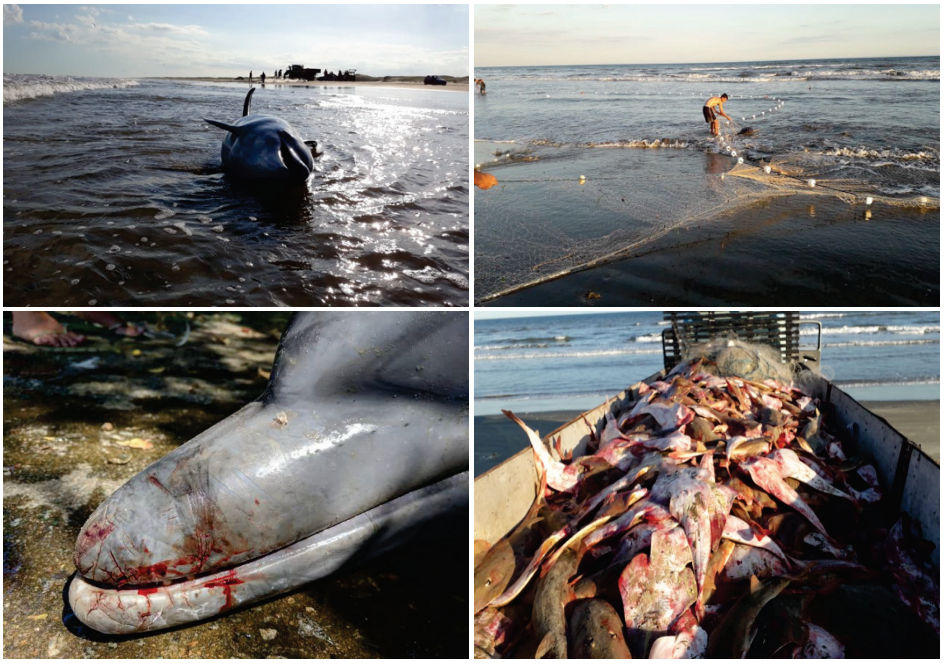

Figure 2. A female Lahille's bottlenose dolphins caught inside the protected area for bottlenose dolphins in southern Brazil during artisanal beach seine fisheries targeting a threatened fish species, the Brazilian guitarfish (*Pseudobatos horkeliiviola*). Photograph credits: Patrulha Ambiental do Rio Grande do Sul – PATRAM/Brigada Militar.

Figure 3. A record of a fatal boat strike of a subadult female Lahille's bottlenose dolphin inside the Patos Lagoon Estuary, southern Brazil. March 2020. Photo credit: Rodrigo Genoves.

Laguna Management Unit

The Santa Catarina Institute of Environment (IMA) recently held a Workshop to define a State Action Plan for the conservation of the Lahille's bottlenose dolphin population in Laguna (Portaria Nº 214/2019). This plan aims to support efforts to: 1. Reduce the gillnet by-catch events; 2. Regulate boat traffic and reduce noise pollution; 3. Monitor the dolphins' population parameters and dolphins' health conditions; 4. Monitor and propose actions to improve and guarantee the habitat quality; 5. Involve society in conservation actions. In addition, a Municipal Law (Nº 033/2018) prohibited gillnet fishery in the core area of dolphins' home range to avoid by-catch. However, inspection efforts are still insufficient, and unnatural mortalities continue to occur. Systematic beach monitoring in the last two years reported four unnatural deaths, two likely by by-catch and two likely by boat collision (**Figure 4**). An ongoing project in the area has been using static acoustic monitoring stations to better understand the habitat use and ranging behavior of dolphins. This effort aims to better assess the effectiveness of the recent fisheries restrictions and then to propose complementary measures for the reduction of by-catch events.

Figure 4. Two records of human induced mortality of bottlenose dolphins off Laguna. Left: dolphin calf stranded on the banks of the lagoon with a fractured mandible and maxilla and their respective radiography in dorsal view of the lesion. Right: adult male caught in an artisanal gillnet (July 1, 2018).

ii) Continued monitoring and photo-identification work on the populations throughout the subspecies' range to refine survival estimates and to assess trends in abundance and the prevalence and etiology of the chronic skin infections;

Monitoring in Patos Lagoon Estuary and Laguna MUs is ongoing as part of the long-term research started in these areas in the late 1970 and early 1980, respectively. Currently, this systematic monitoring occurs throughout the year and consists of boat-based surveys for photo-identification and biopsy sampling.

Patos Lagoon Estuary Management Unit

Despite continuity in photo-identification surveys in the last two years (n_{2018}=22; n_{2019}=33), no progress was made towards mark-recapture analysis for refining and assess trends in abundance and survival. It is planned, however, to have a broad analysis regarding this issue finalized at the end of 2020, using a temporal series of 15 years of data (2005-2020). It is also intended to explore the potential effects of the protected area implemented in 2014 on these parameters. There is one ongoing study focusing on the analysis of the prevalence of skin diseases in the resident dolphins of Patos Lagoon. A set of photographs taken in 2019 has been screened in order to typify skin infections and estimate their respective prevalence. LDD and skin tattoo lesions have already been recorded on a preliminary analysis. Freshly stranded carcasses presenting skin lesions are being sampled for histopathology and PCR.

Laguna Management Unit

For Laguna, recent studies estimated a series of population parameters using 7 and 10 yr. of photo-identification data to estimate adult survival and abundance (2007-2009 and 2013-2016) and calf survival and female reproductive parameters (2007–2009 and 2013–2017), respectively. Adult survival was relatively high (0.949 ± 0.015 SE), and abundance fluctuated slightly over the years from 54 (95% CI = 49–59) to 60 (95% CI = 52–69) individuals, with no evident population trend (Bezamat *et al*. 2018). Calving was found to be seasonal, with most births occurring in late spring/summer. The average crude birth rate was 0.09, and the estimated fecundity was 0.17. The mean inter-birth interval was 2 (for all calves) or 2.5 years (for surviving calves only). Survival to 1 and 2 years estimated by the Kaplan–Meier method was 0.78 (95% CI 0.65–0.92) and 0.65 (95% CI 0.51–0.83), respectively—which represents a survival rate in the second year of 0.83 (Bezamat *et al*. 2020). A population viability analysis recently conducted predicted the population trajectories within 100 years under different levels of by-catch. It found that the current scenario yielded a declining population (r=-0.014) with a high probability of extinction (PE=0.71). If by-catch increases, the population is doomed to extinction. Only a zero-bycatch management plan would make the difference between a declining and increasing population (Bezamat *et al*. *in prep.*). No progress was made on the analysis of data regarding the prevalence of skin infections.

Southern Patos Lagoon/Uruguay Management Unit

Photo-identification of Lahille's bottlenose dolphins were retaken along Rocha Department coast, Uruguay, in late 2019 as part of a broad, transnational project that includes coordinated sampling effort along Brazil and Uruguay—Gephyreus Project (see below). Photo-id effort has been employed from land (since September 2019) and boat (since March 2020). Preliminary results show an increase in the number of recaptured individuals between Uruguay and Southern Brazil since the last update made in 2017, where at least 21 matches were reported between both areas (Laporta *et al*. 2017).

Studies on the acoustics of this subspecies started along Rocha Department coast in 2017, and their whistles repertoire were analyzed in a regional scale with multiple Brazilian localities (Lima *et al*. 2020). Currently, due to COVID-19 pandemic, surveys have been suspended until the situation allows.

Finally, in April and May 2019, the first two records of Lahille's bottlenose dolphins with signs of bycatch in recreational/subsistence nets deployed from the beach in Valizas (Rocha Department) were reported. One of them was a juvenile individual.

iii) The conservation status of the subspecies be prioritized for assessment in the future.

Although significant progress has been noted in the last years regarding the conservation status assessment of Lahille's bottlenose dolphins, a significant amount of data is being generated and certainly will provide the chance to improve and refine their conservation status in the near future. One key point in this regard is that today we have an international, multi-institutional research network established in southern Brazil and Uruguay that function in a coordinated manner for the research and conservation of Lahille's bottlenose dolphin. This project, called "Gephyreus Project", is coordinating simultaneous photo-identification sampling effort at six sites along the distribution range of the subspecies in order to understand the Southern-Brazil/Uruguay ESU from a metapopulation dynamics perspective. It is expected to estimate, using an integrated approach, the abundance, survival, and transition between areas of *T. t. gephyreus* for the entire SB-U ESU, as well as for its five defined Management Units (Fruet *et al*. 2014). This effort is a 3-yr project which commenced in 2018. Therefore, detailed information on population parameters of the entire SB-U ESU ware estimated to be available at the end of 2021/early 2022. These data, combined with additional information being collected in each locality, can be used to review and refine the conservation status of the subspecies.

CONCLUSIONS

- Conservation status of the entire subspecies was assessed and now is classified as Vulnerable by the IUCN;

- At regional levels:

  - **Argentina**
    - Lahille's bottlenose dolphin is now classified as Endangered;
    - Lack of basic data precluded progress towards updating the population trends;
  - **Brazil**
    - Lahille's bottlenose dolphin is now classified as Endangered;
    - Significant progress was made in relation to public policies for the conservation of Lahille's bottlenose dolphin, including:

- The inclusion of the species in the National Action Plan for the Conservation of Endangered Marine Cetacean (2019-2024), where a set of actions have the potential to benefit its conservations;

- The establishment of specific rules to reduce bycatch at Laguna MU;

- The elaboration of a State Action Plan (by the Santa Catarina State government) to reduce threats to Laguna MU;

- There was progress regarding inspections against illegal fisheries in Laguna and Patos Lagoon Estuary MUs, but it still insufficient to reduce bycatch in these areas;

- **Uruguay**

  - The recreational/subsistence gillnet fisheries in Uruguay is a source of human-induced mortality of Lahille's bottlenose dolphins in the coast of Uruguay;

  - The subspecies is in the Priority Conservation List and defined as a focal conservation object in a protected area.

  - Photo-identification studies have been retaken in Uruguay and will continue at least until 2022.

- **Regional (Southern Brazil-Uruguay)**

  - The international, multi-institutional research initiative started in southern Brazil-Uruguay (Projeto Gephyreus) is promising and has the potential to provide robust data on population dynamics for Southern Brazil-Uruguay ESU in 2022 for future in depth assessments.

RECOMMENDATIONS

- Continue with coordinated sampling effort in southern Brazil and Uruguay population (or ESU) to estimate its total abundance, understand movement patterns of individuals between areas, and estimate population parameters for the respective Management Units;

- Intensify enforcement against illegal fishing in protected areas in Laguna and Patos Lagoon Estuary, southern Brazil, in order to reduce incidental catches;

- Include a ban on the use of setnets and beach seine along the bottlenose dolphin protection area in the Patos Lagoon Estuary and surroundings (Article 8 norm 12/2012);

- Urgent need retaken dedicated research efforts in larger Argentina (especially province of Rio Negro);

LITERATURE CITED

Bezamat C, Castilho PV, Simões-Lopes PC et al. (2020) Reproductive parameters and factors influencing calf survival of bottlenose dolphins that engage in a unique foraging cooperation with fishermen. Mar Biol 167(5). https://doi.org/10.1007/s00227-019-3611-4

Bezamat C, Simões-Lopes PC, Castilho PV and Daura-Jorge FG (2019) The influence of cooperative foraging with fishermen on the dynamics of a bottlenose dolphin population. Marine Mammals Sci 35(3). https://doi.org/10.1111/mms.12565

Failla M, Seijas VA and Vermeulen E. (2017) Occurrence of bottlenose dolphins (Tursiops truncatus) of the Río Negro Estuary, Patagonia, Argentina and their mid–distance movements along the Northeast Patagonian coast. *Latin American Journal of Aquatic Mammals* 11:170–177.

Fruet PF (2016) Estrutura genética, dinámica e viabilidade populacional do boto (*Tursiops truncatus*) do estuario da Lagoa dos Patos, Brasil. PhD Thesis. Universidade Federal do Rio Grande (FURG), Brasil/Flinders University of South Australia (Cotutelle program). 178pp.

Fruet PF, Secchi ER, Daura-Jorge FG, Vermeulen E, Flores PAC, Simões-Lopes PC, Genoves RC, Laporta P, Di Tullio JC, Freitas TRO, Dalla Rosa L, Valiati VH, Beheregaray LB, Möller LM (2014) Remarkably low genetic diversity and strong population structure in common bottlenose dolphins (*Tursiops truncatus*) from coastal waters of the Southwestern Atlantic Ocean. *Conservation Genetics* 15: 879 – 895.

Laporta P, Fruet PF, Genoves R, Di Tullio J, Menchaca C and Secchi ER (2017) Movements of bottlenose dolphin between southern Brazil and Uruguay: an update. II International Workshop on the research and conservation of Tursiops in the Southwest Atlantic Ocean. 6Th to 8th April 2017, Rio Grande, RS, Brazil.

Lima IMS, Venuto R, Menchaca C, et al. (2020) Geographic variation in the whistles of bottlenose dolphins (Tursiops spp.) in the southwestern Atlantic Ocean. *Marine Mammal Science*. https://doi.org/10.1111/mms.12690

PAN MAMIFEROS (2015), 1 Plna de Acción Nacional para reducir la interacción de mamíferos marinos con pesquerías en la Replúbica Argetnina, 2015.

SAREM (2019). Tursiops gephyreus. En: SAyDS–SAREM (eds.) Categorización 2019 de los mamíferos de Argentina según su riesgo de extinción. Lista Roja de los mamíferos de Argentina. Versión digital: http://cma.sarem.org.ar.

SAREM (2019). Tursiops gephyreus. En: SAyDS–SAREM (eds.) Categorización 2019 de los mamíferos de Argentina según su riesgo de extinción. Lista Roja de los mamíferos de Argentina. Versión digital: http://cma.sarem.org.ar.

Vermeulen E, Bastida R, Berninsone LG, Bordino P, Failla M, Fruet PF, Harris G, Iñíguez M, Marchesi MC, Petracci P, Reyes L, Sironi M and Bräger S (2018) A review on the distribution, abundance, residency, survival and population structure of coastal bottlenose dolphins in Argentina. Latin American Journal of Aquatic Mammals 12(1-2): 02-16. https://doi.org/10.5597/lajam00233.

Vermeulen E, Fruet PF, Costa A, Coscarella M and Laporta P (2019a) *Tursiops truncatus* ssp. *gephyreus*. *The IUCN Red List of Threatened Species* 2019: e.T134822416A135190824. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T134822416A135190824.en. [Downloaded on 11 March 2020.]

Vermeulen E, Failla M, Loizaga de Castro R; Romero MA, Svendsen G, Coscarella MA, Cáceres-Saez I, Bastida R, Dassis M (2019b).*Tursiops truncatus*. En: SAyDS–SAREM (eds.) Categorización 2019 de los mamíferos de Argentina según su riesgo de extinción. Lista Roja de los mamíferos de Argentina. Versión digital: http://cma.sarem.org.ar.