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A Conservation Management Plan for Lahille's bottlenose dolphins

Governments Of Argentina, Brazil & Uruguay

INTERNATIONAL
WHALING COMMISSION

A Conservation Management Plan for Lahille's bottlenose dolphins *Tursiops truncatus gephyreus*

This Conservation Management Plan was prepared by the governments of Argentina, Brazil, and Uruguay

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1 Executive Summary

Lahille's bottlenose dolphins (*Tursiops truncatus gephyreus*) are coastal dolphins endemic to Argentina, southern Brazil, and Uruguay. With an estimated total population size of 500 individuals and a declining population trend observed in at least some parts of their range, the conservation status of these dolphins is of grave concern. The primary known threats they face stem from direct mortality due to bycatch, as well as indirect impacts on their population dynamics, attributed to a potential poor health status related to pollution, habitat loss and degradation due to high pressure impressed by growing coastal industrial activities and infrastructure development. Although a framework for collaborative research has been established in the past few years (e.g. IWC Task Team and Gephyreus Project), it is believed that the development of a Conservation Management Plan will enhance and expand coordinated research, policy formulation, and mitigation actions across all three range states. The envisioned short- and mid-term objectives were based on researcher's experience and the successive International Whaling Commission Scientific Committee recommendations in past years and relate to strategic research aimed at bridging knowledge gaps, mitigating known main threats, monitoring such threats, and increasing awareness and capacity building. The overarching long-term goal of this Conservation Management Plan is to revert the declining trend in the population of this subspecies and prevent continued habitat degradation to ensure their viability in the future.

2 Introduction

The western South Atlantic (wSA) hosts two distinct ecotypes of bottlenose dolphins (genus Tursiops): one predominantly inhabiting offshore regions, and the other constrained to open coastal waters, estuaries, and bays. Over the past decade, extensive studies analysing cranial, post-cranial, external morphology, and genetics, have led to the recognition of the coastal populations (ecotype) as a distinct subspecies by the Committee on Taxonomy of the Society for Marine Mammalogy[1] (*Tursiops truncatus gephyreus* Lahille, 1908)(see Costa et al 2016, Prat et al. 2023)— it is noteworthy that for some evidences, this ecotype is further elevated to species status (*Tursiops gephyreus* Lahille, 1908)(see Wickert et al. 2016, Hohl et al. 2020).

Tursiops truncatus gephyreus (hereafter Lahille's bottlenose dolphin) is endemic to the coastal waters of Argentina, southern Brazil and Uruguay (Costa et al. 2016, Wickert et al. 2016, Simões-Lopes et al. 2019). Within this distribution range, they can be found in two distinct subpopulations: one located in Argentina and one another in southern Brazil-Uruguay (Fruet et al. 2014; Figure 1). Currently, both subpopulations are under threat and potentially declining at least in part of their range, with the estimated total abundance of the Argentina subpopulation reaching numbers well below 200 individuals (Vermeulen et al. 2017), and the southern Brazil-Uruguay subpopulation nearing 300 individuals (Fruet et al. in review).

In Southern Brazil, some of these localised dolphin populations exhibit a unique behaviour. For example, a subset of dolphins engages in cooperative fishing with artisanal casting net fishers to catch mullet (Figure 3). This remarkable "human-dolphin cooperation" holds profound social, economic, and cultural value for the local coastal communities. Moreover, it has a far-reaching impact on the broader local ecosystem and is recognized as both a cultural and natural heritage in some municipalities in southern Brazil, notably in Laguna and Tramandaí Inlet (van der Wall et al. 2022).

The primary known threats to Lahille's bottlenose dolphin include direct mortality from bycatch and boat strikes, as well as indirect impacts on population viability associated with pollution, habitat loss

1 https://marinemammalscience.org/species-information/list-marine-mammal-species-subspecies/

and degradation. Currently, the conservation status of Lahille's bottlenose dolphin is listed as "Vulnerable D1" according to IUCN Criteria (Vermeulen et al., 2019a), although this status is under review and may potentially be relisted as "Endangered C2ai" (Fruet et al. in review). Lahille's bottlenose dolphin sits on Appendix II of CITES and was recently included in Appendix I and II of the Convention of Migratory Species (CMS) (Notification 2024/04).

As Lahille's bottlenose dolphins are localized residents restricted to coastal habitat (see Laporta et al. 2016a for review), they are susceptible to growing human-related pressures and are often affected by cumulative stressors, warranting adaptive management strategies. Conservation efforts have been the subject of intensive debate in recent years, particularly since the early 2000s when a noticeable increase in the number of incidental captures and strandings was reported in several coastal areas in southern Brazil (Fruet et al. 2012). Subsequently, several workshops have been conducted among research scientists and other stakeholders from all three countries, igniting enhanced research efforts and collaboration. The first clear results of this effort are visible in the 2016 special issue of the Latin American Journal of Aquatic Mammals (Vol. 11 No. 1-2), dedicated to Lahille's bottlenose dolphins.

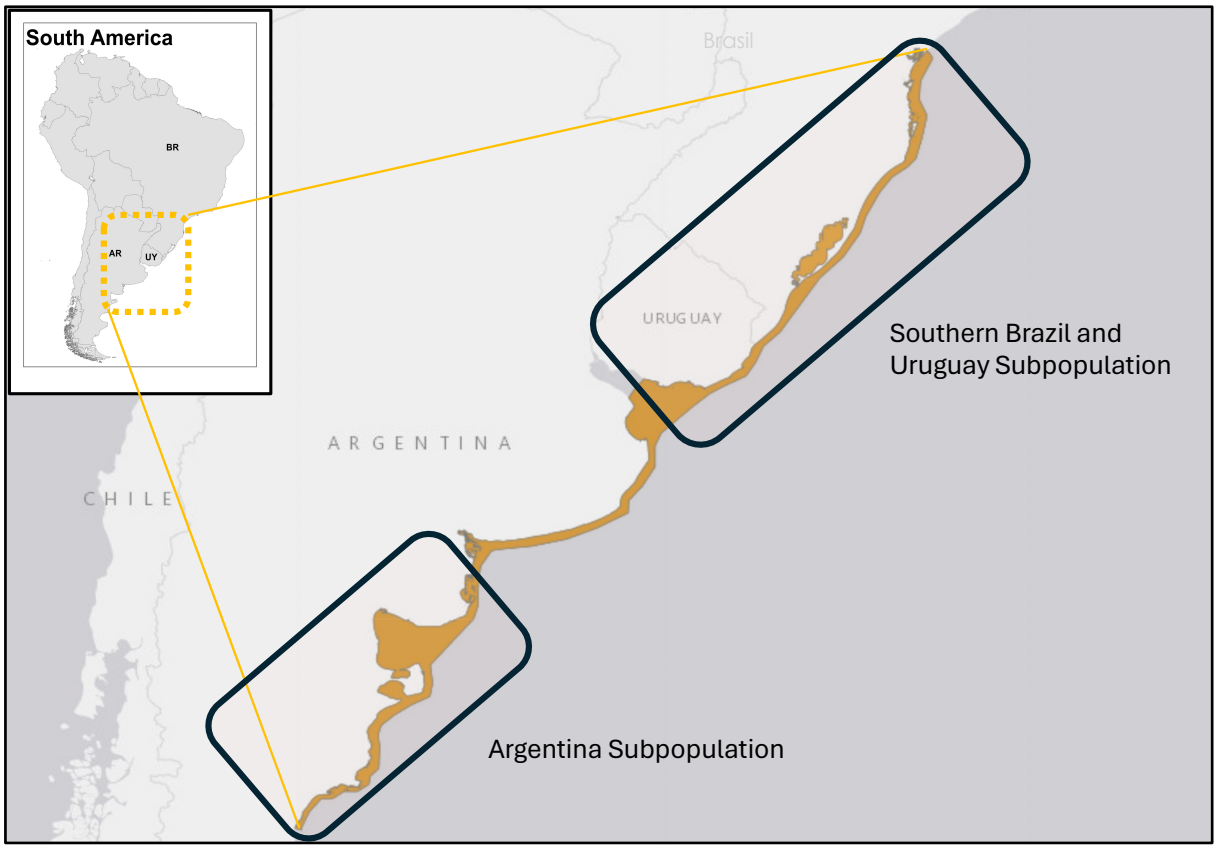

Figure 1. Map of the Atlantic coast of South America indicating the distribution range of Lahille's bottlenose dolphins (orange) with black boxes indicating the known range of the two subpopulations. Figure adapted from IUCN (International Union for Conservation of Nature) 2019. Tursiops truncatus ssp. gephyreus. The IUCN Red List of Threatened Species. Version 2023-1.

In 2017 the Lahille's bottlenose dolphin was recognized in its own taxonomic unit within the context of a global review of the bottlenose dolphin's taxonomy by the Scientific Committee of the International Whaling Commission (IWC 2018). Given its poor conservation status, an IWC "Lahille's bottlenose dolphins Task Team" was subsequently established in 2021 and resulted in the formulation and reiterated dissemination of a series of recommendations aimed at enhancing research and conservation

efforts for Lahille's bottlenose dolphins by the Scientific Committee of the IWC (e.g. IWC, 2020, 2021, 2022). The primary objectives of the Task Team are to facilitate, guide, and coordinate: 1) the implementation of conservation strategies set for the subpopulations in southern Brazil/Uruguay, and 2) further investigate the potential factors contributing to population declines in certain areas of Argentina and Uruguay. This would include, but not be limited to, full consideration, support and harmonization with existing agreements, strategies and activities developed under other forums, and ongoing local-level initiatives. The Task Team would seek to bring together appropriate experts from range states and beyond to instigate specific targeted field investigations or conservation efforts, provide advice, and/or potentially mobilize financial support for priority activities. This could involve the formulation of a conservation management plan (CMP) under an IWC SC/68b/SM. Building on this initiative, an international network has emerged, facilitating increased collaboration among research groups. Research efforts are now being coordinated among various research groups to gather indispensable data, with the Task Team regularly updating the IWC Scientific Committee on research and conservation advancements. Clear evidence of such efforts can be seen in the recently developed 5-year action plan for the Lahille's bottlenose dolphins by non-governmental organizations (Fruet et al. 2023), following the Smalls Cetaceans Subcommittee workplan (IWC, 2022). This action plan is organised under five strategic lines, including 1) Scientific Research and Conservation, 2) Legislation and Policy, 3) Communication, Outreach and Awareness, 4) Institutional Strengthening and Education and 5) Citizen Science.

Building on this momentum, the establishment of a formalised and consolidated framework to coordinate research and management efforts among various stakeholders across all three range states will undoubtedly improve conservation outcomes for Lahille's bottlenose dolphins. This can be achieved through the development of a Conservation Management Plan (CMP). A CMP seems appropriate due to its ability to strategically coordinate and prioritize efforts, and by providing a comprehensive framework tailored to the specific conservation needs and challenges of the subspecies. By emphasizing adaptive management and continual assessments, a CMP will enable adaptive responses to evolving threats and environmental changes, ultimately leading to improved conservation outcomes for Lahille's bottlenose dolphins.

2.1 Overall Objectives of the CMP

This CMP aims to enhance collaboration and coordination among stakeholders across the range states, aiming to advance the conservation of Lahille's bottlenose dolphins throughout their distribution.

Short- and medium-term objectives are specified as follows:

- By 2026: Establish a consolidated framework to coordinate research and management efforts among stakeholders.
- By 2026: Establish and enhance existing research and monitoring programs to improve scientific knowledge on the Lahille's bottlenose dolphin, including population trends, genetics, ecology, and health.
- By 2028: Significantly improve mitigation efforts targeting both direct and indirect impacts of human activities, including:
    - Implementing mitigation measures to reduce bycatch;
    - Enhancing habitat protection and restoration within recognized core areas;

    - Addressing habitat degradation and implementing strategies to reduce critical pollution.

- By 2028: Amplify engagement with diverse stakeholders (e.g., governments, scientists, the private sector, artisanal fishers, and the general public) to increase awareness and foster capacity-building.

The long-term objective of this CMP is to reverse population declines of Lahille's bottlenose dolphins throughout their range and enhance habitat quality, ensuring the sustained viability of these populations into the future.

3 Legal Framework

3.1 International Conventions and Agreements

- Appendix I and II of the Convention for Migratory Species (CMS)
- Appendix II of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- Lahille's bottlenose dolphin Task Team – International Whaling Commission (IWC)
- International Union for Conservation of Nature (IUCN) Red List "Vulnerable"
- IUCN Important Marine Mammal Areas (IMMA)
  Southern Brazil and Uruguay coastal ecosystems
  Marine Mammal coastal corridor in northern Argentina
  Northern Patagonian Gulfs and Valdes Front

3.2 National Legislation and Management Arrangements

3.2.1 Brazil (listed chronologically)

- Federal Law (Law 7,643, dated 12/18/1987).
- In Imbé city, Rio Grande do Sul, Municipal Law No. 049 of January 31, 1990, designates the Lahille's Bottlenose Dolphin as Natural Heritage of the Municipality.
- In Laguna, Santa Catarina, Municipal Law No. 521 of November 10, 1997, designates the Lahille's Bottlenose Dolphin as a Natural Heritage of the Municipality.
- In 2012, a protection area was established in the Patos Lagoon Estuary and adjacent marine system, prohibiting boat-based gillnet fisheries to reduce incidental catch (Article 8 of the Inter-ministerial Regulation 12/2012- Brazil 2012). The area extends 30 km parallel to the coast (15 km to the north and 15 km to the south of the mouth of the estuary) and spans two kilometers from the coast. It also covers a two-kilometres radius around the jetties and five kilometers of the estuarine area closest to the mouth of the estuary, where fishing nets and *T. t. gephyreus* are mostly concentrated (Di Tullio et al. 2015).
- Municipal Decree N° 3922/2013 prohibits the recreational use of jet skis in the main concentration areas of the Laguna Management Unit and regulates the speed and space for jet sky displacement.
- In the state of Rio Grande do Sul, increasing threats led the subspecies to be listed as "Vulnerable" in its list of Endangered Fauna species (State Decree 51,797 of September 8, 2014).
- In Tramandaí city, Rio Grande do Sul, a Municipal Law No. 3952 of January 12, 2016, prohibits the recreational use motor vessels, nautical sports, and jet skis in the Tramandaí Inlet.
- Municipal Law Nº 1.998 of June 18, 2018, prohibits the use of gillnets in the core areas for the Lahille's Bottlenose Dolphin MU in Laguna.

- Ministry of Environment Ordinance 375, dated August 1, 2019, approves the National Action Plan for the Conservation of Marine Cetaceans Threatened with Extinction - PAN Marine Cetaceans. This plan covers seven taxa threatened with extinction, establishing its general objective, specific objectives, covered species, execution timeline, implementation methods, supervision, review processes, and establishes the Technical Advisory Group.
- Ministry of Environment Ordinance 148, dated June 7, 2022, amends the List of Endangered Species to include Lahille's bottlenose dolphin as Endangered.
- In Rio Grande do Sul State, a state Law No. 15.546 of November 4, 2020, designates the human-dolphin cooperation as a Cultural Heritage in the state of Rio Grande do Sul.
- In Rio Grande city, Rio Grande do Sul, Municipal Law No. 8820 of June 8, 2022, designates the Lahille's Bottlenose Dolphin as Natural Heritage of the Municipality.
- In 2023, the Institute of National Historical and Artistic Heritage (*Instituto do Patrimônio Histórico e Artístico Nacional*, Iphan), initiated the process to recognize the "cooperative fishing with dolphins in Southern Brazil" as a national intangible cultural heritage, to safeguard the human-dolphin cooperation in the municipalities of Laguna (SC) and Tramandaí/Imbé (RS).

3.2.2 Uruguay

- **Act N°9481** (year 1935), declares the conservation and exploitation of all wild zoological species shall be under the control and regulation of the State (Art 1).
- Act N° 19.128 the territorial sea and the exclusive economic zone of Uruguay its declared as a "**Whale and Dolphin Sanctuary**"
- Decree N° 238/998 **Illegal hunting of pinnipeds and cetaceans is prevented** by the prohibition of persecution, hunting, fishing of all species of pinnipeds and of cetaceans in waters under national jurisdiction.
- Act N°16.466 (year 1994) **Environmental Impact Assessment** and regulatory decree N° 349/05, declares of general and national interest the protection of the environment against any type of depredation, destruction or contamination, as well as the prevention of negative or harmful environmental impact and, if necessary, the restoration of the environment damaged by human activities.
- Act N°17.234 (year 2000) **Creation of the National System of Protected Areas** and regulatory Decree N° 52/05 Declares the creation and management of a National System of Natural Protected Areas of general interest.
- Act Nº 19175 (year 2013) Conservation, research and sustainable development of hydrobiological resources and ecosystems and regulatory decreet (N° 115/018) regulates fisheries, being able to regulate exclusion, and other type of measures that avoid interaction between marine mammals and fisheries. As well, declares that it shall be the responsibility of the DINARA, in coordination with the DINABISE/MA, to ensure the conservation, management, sustainable development and responsible use of marine mammals (Art 104).

3.2.3 Argentina

- National law Nº 22.241 for the conservation of wild species.
- Law Nº 25.577, forbidding the killing of cetaceans in national waters.
- United Nations Convention on the Law of the Sea (UNCLOS), approved by National Law Nº 24.543/1995.
- CITES, approved by National Law Nº 22.344.
- Convention on Biological Diversity, approved by National Law Nº 24.375.
- Provincial Law N° 4115 (Río Negro); full protection of marine mammals in provincial waters.
- Provincial Law XI- 4 (ex 2381) (Chubut); full protection of marine mammals in provincial waters.

4 Governance

4.1 Coordination of a CMP (CC/68A/08.3/02)

- The Governments of Argentina, Brazil and Uruguay will appoint a coordinator for the CMP of Lahille's bottlenose dolphins.
- A Steering Committee will be established.
- A Scientific Advisory Board will be established through a nomination process overseen by the Steering Committee.
- An Advisory Board for Public Awareness and Capacity Building (PACB) will be established through a nomination process overseen by the Steering Committee.

4.2 Timeline for a CMP

1. CMP draft – February/March 2024
2. CMP workshop – 7 & 8 March 2024
3. CMP reviewed, finalised, and agreed upon by countries – March/April 2024
4. CMP reviewed by SWG CMP, Scientific and Conservation Committees – April/May 2024
5. CMP updated if comments are received – May/June 2024
6. CMP final version submission to IWC – July 2024
7. CMP final approval at Commission meetings – September 2024
8. Initiate implementation of the CMP – October 2024

5 Science

5.1 Biology, Status and Environmental Parameters

5.1.1 Population structure, distribution, and trends

Lahille's bottlenose dolphins are found in two genetically and geographically isolated subpopulations. The Argentina subpopulation extends from the southern part of the Buenos Aires province to the Chubut province (Vermeulen et al. 2017). Meanwhile, the southern Brazil-Uruguay subpopulation extends from the state of Parana to the coast of Uruguay (Wickert et al., 2016). The geographical gap between these two subpopulations is attributed to the Río de la Plata Estuary and the northern coast of the Buenos Aires province (Vermeulen et al. 2017) (Figure 2).

The Argentina subpopulation is formed by a unique Management Unit (MU), called Bahía San Antonio, while the southern Brazil-Uruguay subpopulation is formed by five different MUs (Fruet et al. 2014; Figure 2):

- Southern Patos Lagoon-Uruguay Management Unit (SPLU)
- Patos Lagoon Estuary Management Unit (PLE)
- Northern Patos Lagoon Management Unit (NPL)
- Laguna Management Unit (LGN)
- Florianópolis Management Unit (FLN)

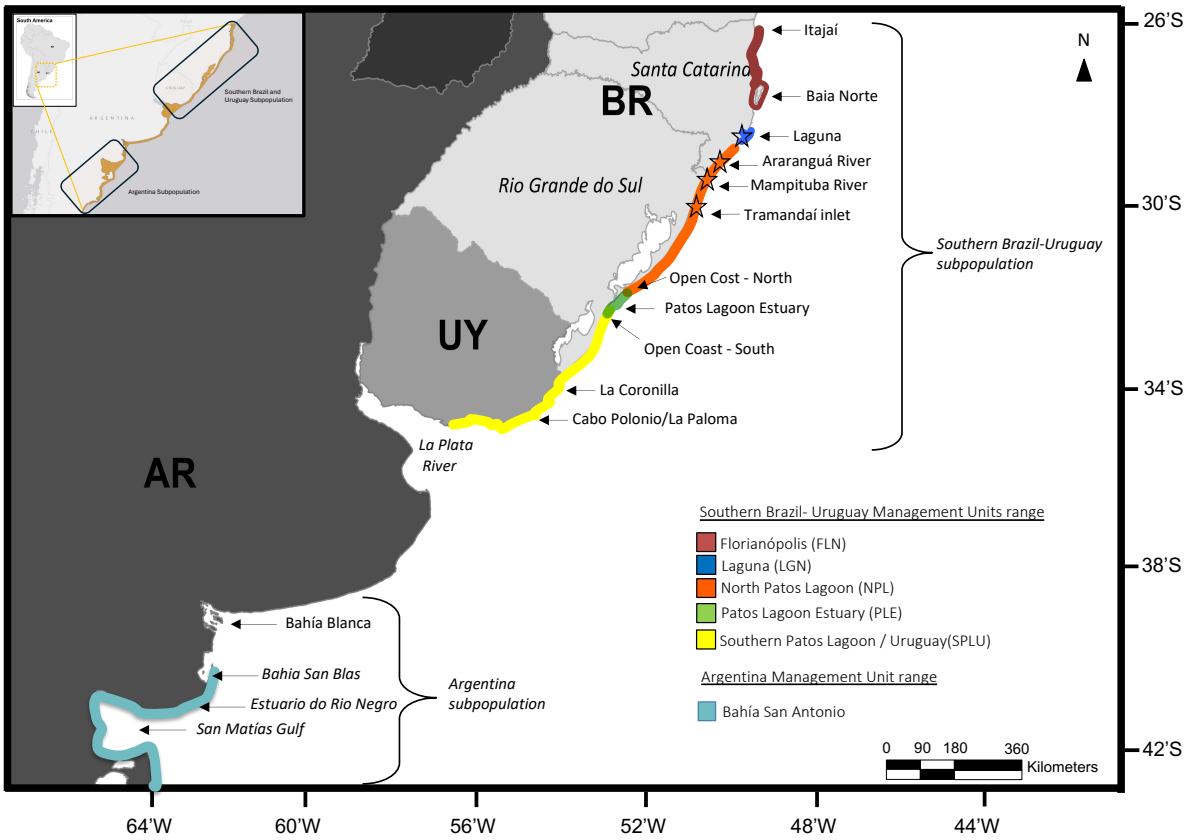

Figure 2. Map of South America indicating the distribution and the range of the different Management Units within both subpopulations of Lahille's bottlenose dolphins. Stars denote localities with current human-dolphin cooperative fishing. Arrows indicate sampling sites.

Mark-recapture abundance estimates of Lahille's bottlenose dolphins have been conducted across much of its range. When combining the available abundance estimates from both subpopulations, current data indicate a maximum total population size of fewer than 500 individuals (Vermeulen et al., 2019a; Fruet et al., under review). Detailed abundance estimates are provided below for each subpopulation.

Argentina subpopulation

In the 1970s, data from the northern province of Buenos Aires in Argentina suggested an estimated abundance of approximately 100 resident Lahille's bottlenose dolphins. This estimate was inferred from the number of uniquely identified individuals observed between San Clemente del Tuyu and Miramar (Bastida and Rodriguez 2003). However, surveys conducted during the 1990s in the same study area failed to record any individuals, leading to the conclusion that these dolphins had completely disappeared from the region (Bastida and Rodriguez 2003, Vermeulen et al. 2017). No other coastal areas were identified where occurrence or abundance had substantially increased over time, dismissing any hypothesis of a distribution shift (Vermeulen et al. 2017). Possible explanations for this disappearance are linked to overfishing and other drastically increased anthropogenic pressures on the marine environment during that period, such as pollution and habitat degradation (Bastida and Rodriguez 2003). However, empirical data supporting this hypothesis are lacking.

Presently, Lahille's bottlenose dolphins are only found in the southern part of the province of Buenos Aires, specifically in Bahía Blanca and Bahía San Blas. Although precise abundance estimates for this

region are unavailable, photo-identification data from the period 2010-2016 suggest that the numbers do not exceed 50 individuals (Vermeulen et al. 2017). In the province of Río Negro, abundance was estimated at 83 (95% CI = 73 to 112) Lahille's bottlenose dolphins in Bahía San Antonio between 2009 and 2011, using mark-recapture data (Vermeulen and Bräger 2015). These dolphins are known to range along the entire coast of the San Matias Gulf (Failla et al. 2016, Coscarella et al. 2016, Vermeulen et al. 2017). A population viability analysis indicated that numbers were estimated to be declining at a rate of 1.1% per year during the study period of 2009 to 2011 due to a low recruitment rate related to a limited number of reproducing females (Vermeulen and Bräger 2015). Although there are no abundance estimates for Bahía Blanca, preliminary observations suggest that dolphins are recorded year-round (Petracci et al., 2023).

In the province of Chubut, 53 bottlenose dolphins were uniquely identified in the 1970s (Würsig and Würsig 1977). Aerial strip transect surveys conducted between 1999 and 2007 yielded an estimated abundance of 34 individuals (CV=0.20) (Coscarella et al. 2012). It is important to note that both figures should be considered as maximum estimates for the Lahille's bottlenose dolphins in the region, as the counts may encompass both *T.t. truncatus* and *T.t. gephyreus*, which coexist in the area. Additionally, photographic identification has indicated the movement of individuals between the provinces of Rio Negro and Chubut, suggesting that some individuals may be represented in both regional datasets (Coscarella et al. 2016).

These combined data indicate the existence of a very small and likely declining subpopulation of Lahille's Bottlenose Dolphins in Argentina, likely comprising fewer than 200 individuals.

Southern Brazil - Uruguay subpopulation

The southern Brazil-Uruguay subpopulation comprises at least five MUs characterized by moderate asymmetrical gene flow (Fruet et al. 2014). One of these MUs has a continuous distribution along the coast of Uruguay and southern Brazil, while the remaining four are exclusively located in Brazil. Among the latter, two are closely associated with estuaries (Patos Lagoon Estuary and Laguna), while the other two freely roam along the shoreline near Northern Patos Lagoon and Florianópolis but exhibit some degree of site fidelity in bays and river mouths, specifically in the Itajaí River, North Bay, Mampituba River and Tramandaí Inlet (Figure 2).

Recently, a systematic monitoring effort was implemented through the collaborative efforts of multiple research groups from Brazil and Uruguay, known as the "*Gephyreus Project*". This initiative aimed to gather concurrent data across multiple sites (six) covering the ranges of all MUs from 2019 to 2022. To estimate abundance and survival rates within different MUs and in a metapopulation context, the collected data were used to fit mark-recapture models within a Robust Design and Multistate framework (Kendall et al., 1997; Brownie et al., 1993). The results for abundance and survival probability of each MU are listed in Annex I. Assuming a metapopulation context for these MUs and combining the best estimates from all MUs, the best total estimate for Lahille's bottlenose dolphins in the subpopulation of southern Brazil-Uruguay is currently around 292 (CI95%: 200-384). A recent Population Viability Analysis (PVA) simulations have indicated that, given the current conditions (specifically, consistent habitat quality and no changes in bycatch rates), this subpopulation is predicted to decrease by approximately 23% within a single generation, which spans 21.1 years (see Taylor et al. 2007). In this scenario, there would be no probability of this subpopulation becoming extinct within 3 generations (63 years), but three management units would have a high probability of extinction: Florianópolis (FLN, 41%), Laguna (LGN, 36%) and south of Patos Lagoon/Uruguay (SPLU, 65%). In a pessimistic scenario of reduced habitat quality and increased bycatch rates, there would be a 3% probability of extinction for the entire subpopulation in 3 generations, and all management units would have some risk of extinction: Florianópolis (FLN, 98%), Laguna (LGN, 98%), north of Patos Lagoon (NPL, 33%), Patos Lagoon estuary (PLE, 4%) and south of Patos Lagoon/Uruguay (SPLU, 99%) (Fruet et al. 2023b).

5.1.2 Feeding ecology

Lahille's bottlenose dolphin has a diverse diet, consuming a wide variety of fish and cephalopod species. In Argentina, their diet includes species like the pouched lamprey (*Geotria australis*) and the Southwest Atlantic butterfish (*Stromateus brasiliensis*) (Coscarella and Crespo 2009, Romero et al. 2014).

In Brazil, their diet primarily consists of teleost fish, including species like Atlantic white-croaker (*Micropogonias furnieri*), southern king croaker (*Menticirrhus spp.*), mullet (*Mugil liza*), banded-croaker (*Paralonchurus brasiliensis*) and demersal-pelagic species such as swordfish (*Trichiurus lepturus*) (Pinedo 1982, Secchi et al. 2016, Milmann et al. 2016). However, it presents some degree of plasticity in foraging habits and in feeding according to spatial and temporal patterns of prey availability (Secchi et al., 2016; Genoves et al., 2020). Temporal changes in the contribution of the main prey of Lahille's bottlenose dolphin have been observed, possibly due to the lower availability of the same prey caused by overexploitation by commercial fishing (Secchi et al., 2016). While they have also been documented consuming coastal squids (family Loliginidae), octopus (*O. vulgaris*), crustaceans (order Anomura) and shrimps, these items make up a smaller portion of their diet (see Laporta et al. 2016b for review).

In Uruguay, data on the diet of Lahille's bottlenose dolphin is scarce, primarily consisting of descriptions of prey found in the stomach contents of a limited number of individuals (Mermoz, 1977; Moreno et al., 1984; reviewed in Laporta et al., 2016b).

In Bahía Samborombón and northern Patagonia, Argentina, there have been reports of Lahille's bottlenose dolphins falling prey to Killer Whales (*Orcinus orca*) (Lichter 1992; Vermeulen unpublished data).

More recently, Campos-Rangel et al. (2021) evaluated historical changes in the foraging ecology of Lahille's bottlenose dolphin along its distributional range. Stable isotopes of carbon (δ 13 C) and nitrogen (δ 15 N) were analysed in bone samples from specimens deposited in scientific institutions from Brazil, Uruguay and Argentina, collected in two periods: 1903–1980 and 1981–2016. The authors found that Lahille's bottlenose dolphins from Uruguay showed a stability in nitrogen isotopic values but increasing carbon isotope values through decades. This increasing trend was consistent with a lower use of the Río de la Plata estuarine waters by the species reported for the last decades. In these areas, the species also showed a high proportion of demersal fish species such as Atlantic white-croaker, stripped weakfish (*Cynoscion guatucupa*), Southern king weakfish (*Macrodon atricauda*), southern king croaker, banded-croaker, and mullet with the lowest proportion. For Argentinean dolphins, red porgy (*Pagrus pagrus*) and Brazilian flathead (*Percophis brasiliensis*), followed by stripped weakfish were the most important prey items. Atlantic white-croaker had a lower contribution, while the remaining fishes Brazilian menhaden (*Brevoortia aurea*), southern king weakfish, mullet and Odonthestes sp. showed a minimal contribution to the diet of these dolphins (Campos-Rangel et al. 2021).

Finally, Argentinean and Uruguayan dolphins showed a partial and a total isotopic niche segregation during Periods I and II, respectively, probably reflecting a spatial/ecological structuring in this region (Campos-Rangel et al. 2021).

5.2 Critical Habitats Associated with the Lahille's bottlenose dolphin

Lahille's bottlenose dolphins primarily occur in very shallow coastal waters (e.g., Vermeulen 2017), including estuaries, bays, and lagoons, occasionally ranging far up into rivers (e.g., Simões-Lopes et al.

2019; Bastida and Rodriguez 2003, Failla et al. 2016). When in open coastal areas, sightings mainly occur near the shore break, within 3 km from the coast (Di Tullio et al. 2015; Lodi et al. 2016). Sighting data indicate that they typically stay within waters less than 30 meters deep (Vermeulen et al. 2017), although they often display along-shore movements (Simões-Lopes and Fábian 1999, Laporta 2009, Laporta et al. 2016b, Coscarella et al. 2016). In Brazil and Uruguay, Lahille's bottlenose dolphin is parapatric with the common bottlenose dolphin (*T. t. truncatus)*, but they are sympatric in the province of Río Negro and Chubut, Argentina (Vermeulen et al. 2017).

Throughout most of their range, Lahille's bottlenose dolphins maintain definable, long-term, multi-generational home ranges (Daura-Jorge et al. 2013, Fruet et al. 2015, Giacomo and Ott 2016, Laporta et al. 2016b, Vermeulen et al. 2016, Serpa et al. 2024). They have a distinct reproductive season, with most births occurring during late spring and summer (see Fruet et al. 2016 for a review). They exhibit great behavioural plasticity, with variations in behaviour observed both within and between populations. They live in complex societies, typically forming small groups that tend to associate by chance for short periods or to engage in specific behaviors, despite their long-term multi-generational home ranges and relatively small population sizes (e.g. Daura-Jorge et al. 2012, Vermeulen 2018, Menchaca et al. 2019). Group size usually ranges from three to six individuals, depending on the locality (see Domit et al. 2016 for review), with some locations reporting a maximum group size of around 50 animals, as observed in Bahía San Antonio, Argentina (Vermeulen et al. 2015). In some localities of southern Brazil, particularly in Laguna and Tramandaí inlet, they are known for engaging in a traditional cooperative fishing tactic with artisanal net casting fishers to catch migratory mullet in murky waters (Simões-Lopes et al. 1998, Ilha et al. 2018). This seemingly mutualistic interaction gives rise to a variety of ecological, economic, and social implications, involving numerous cultural practices that are essential for the conservation of dolphins and their habitats (van der Wal et al. 2022).

5.3 Attributes of the Population to be Monitored

Critical populations attributes to be monitored for evaluating the effectiveness of the CMP include

- Bycatch rates: Continue systematic assessment of mortality patterns and trends through regular beach and artisanal fleet monitoring programs, along with associated data collection.
- Population trends: Assess abundance, survival, reproductive rates, populations trend, and populations viability through photographic mark-recapture data collection and analysis.
- Health: Implement standardized necropsy protocols, process tissue samples for pathological and ecotoxicological analysis, and conduct visual assessments of body conditions using photographic datasets and applying photogrammetry techniques.

Other attributes to be closely monitored include:

- Distribution and movement patterns: Conduct systematic field surveys, including boat-based and aerial observations.
- Genetic population structure, diversity and adaptability: Gather and process biopsy samples to assess effective population size, boundaries and connectivity among Management Units, and other characteristics such as structure and diversity, especially in areas with low occurrence.

6 Threats, Mitigation Measures and Monitoring

6.1 Identification of Threats

Lahille's bottlenose dolphins face heightened vulnerability due to their small population size, strong site fidelity, and restricted coastal distribution. Each subpopulation raises conservation concerns. The Argentina subpopulation stands out due to its small size, historical contraction in distribution, apparent genetic isolation, and low genetic diversity, exemplified by a single and unique mtDNA haplotype (Fruet et al. 2014). Conversely, the Southern Brazil – Uruguay subpopulation is projected to decline by approximately 23% within a single generation if the current environmental conditions and bycatch situation persist without changes.

Argentina subpopulation

In various regions along the Argentinean coast, researchers have detected significant levels of heavy metals in bottlenose dolphins (Marcovecchio et al. 1990; 1994; Moreno et al. 1984), potentially associated with the decline of this subpopulation (Vermeulen and Bräger 2015). This decline is primarily attributed to a low recruitment rate resulting from a reduced number of reproducing females. It is suggested that adult mortality may not be the immediate threat to Lahille's bottlenose dolphins in Argentina; instead, the observed declines might be more closely associated with decreased reproductive success (Vermeulen and Bräger 2015, see also Vermeulen et al. 2017). However, further long-term data are needed to validate this hypothesis. While there are very few records of incidental capture in fishing gear or mortality due to boat collisions (Crespo et al. 1994, 1997, 2008), there have been no significant increases in adult mortality over the past three decades in this subpopulation (Coscarella et al. 2012; Vermeulen et al. 2017). Another potential threat to this subpopulation includes reduced prey availability, caused by environmental degradation and overfishing, especially in areas such as Buenos Aires and Chubut (Bastida and Rodriguez 2003, Coscarella et al. 2012). However, insufficient data are available to thoroughly discuss these hypotheses.

Southern Brazil-Uruguay subpopulation

Incidental capture of Lahille's bottlenose dolphins in Uruguay was occasional, with only a few studies reporting a total of nine individuals caught despite systematic bycatch monitoring efforts (Pilleri and Gihr 1972; Praderi 1985, 2000; Domingo et al. 2006; Laporta et al. 2006; Franco-Trecu et al. 2009; Passadore et al. 2015). It was concluded that this is likely a result of the differential spatial use between Lahille's bottlenose dolphins and the fisheries (Fruet et al. 2016). However, an increase in the number of dolphins with injuries caused by entanglement in fishing gears has been observed since 2019 (Fruet et al. 2020), alongside the sighting of fishing nets within a 300-meter radius of the coastline, clearly violating the prohibition set by the National Directorate of Aquatic Resources. Over the past four years (2019-2023), a minimum of two Lahille's bottlenose dolphins have been found dead ashore exhibiting signs of bycatch, such as deep knife cuts indicative of entangled nets, and another two dolphins have sustained severe injuries from incidental capture, including fluke amputation and injuries to the fluke and caudal peduncle, with both still alive. Bycatch must be acknowledged as an emerging threat in Uruguay.

Concern arises from contamination linked to agricultural effluents, evidenced by pollutant levels found in various marine organisms in areas like Canal Andreoni (Lercari and Defeo 1999, Sauco et al. 2010), an area where Lahille's bottlenose dolphins are frequently sighted. Additionally, reduced prey availability, stemming from overfishing and the degradation of benthic ecosystems due to these fishing practices, as well as the establishment of a deep-water port along the coast of the Rocha department (Laporta et al. 2016c), pose additional potential threats.

On the other hand, within Brazil, incidental mortality in fishing gear, especially coastal gillnets and beach-seine, poses the major current threat to Lahille's bottlenose dolphins (see Fruet et al. 2016 for review). Bycatch rates in the Patos Lagoon Estuary are reportedly the highest throughout the distribution of the subspecies (Fruet et al. 2014, Fruet et al. 2016). Evidence of fishery interaction, including amputation or deep knife cuts on the caudal peduncle, net marks on flippers and rostrum,

and entanglement in nets, has been found in the carcasses of 21 individuals found on coastal beaches near the Patos Lagoon Estuary between 2002 and 2006, accounting for 46% of overall Lahille's bottlenose dolphin mortality in the area. The number of dolphins incidentally caught per year ranged from two to nine (average = 3.4; SD=1.6), exceeding the potential biological removal (ranging between 0.128 and 1.6 individuals/year) for the Patos Lagoon Estuary MU, potentially leading to a population decline if these levels persist (Fruet et al. 2012). Nonetheless, the Patos Lagoon Estuary MU abundance has remained stable over the last decades (Fruet et al. 2015; 2022b), possibly because bycatch primarily affects immature males, delaying its effects on population dynamics. Additionally, bycatch could affect coastal dolphins not computed in the abundance estimate, as dolphins from three MUs overlap in their home ranges in this area. Therefore, the apparent stability of the Patos Lagoon Estuary MU should be interpreted with caution. In Laguna MU, before the implementation of a fishing exclusion area, there were signs of an increasing level of bycatch, reaching 50% of observed mortality (Bezamat et al. 2018).

Although still incipient, findings from recent studies in southern Brazil indicate that individual levels of PCBs in bottlenose dolphins from the Patos Lagoon Estuary MU and Laguna MU frequently exceed thresholds for the risk of reproductive and immunologic impairment and physiological effects established for the species (Righetti et al. 2019, 2023). Additionally, there is a growing number of reports of skin lesions in Lahille's bottlenose dolphins, which may be associated with water contamination and signs of failure in immune functions (e.g., Van Bressem et al. 2007, Reif et al. 2009). The first case of "lobomicosis-like disease" (also known as lacaziosis; LLD) in southern Brazil was recorded in the early 1990s in a dolphin from the Laguna MU (Simões-Lopes et al. 1993). More recent data indicate an increase in the prevalence of LLD in the Laguna MU as well as in Lahille's bottlenose dolphins from other coastal MUs in southern Brazil (Moreno et al. 2008). Specifically in the Laguna MU, LLD was detected in 5.6% of individuals between 2006-2009, increasing to 13.9% in 2013-2014 (Van Bressem et al. 2015). Histopathological and immune-histochemical studies identified the pathogenic agent as *Paracoccidioides brasiliensis* (Sacristán et al. 2016). The potential implications of these skin diseases are not yet fully understood.

Infrastructural, port (especially dredging), and industrial activities in estuarine environments can be considered another potential threat for Lahille's bottlenose dolphin in Brazil. These activities may include, for example, nearshore and offshore wind farms for renewable energy production in the surrounding areas of the Tramandaí Inlet, where one of the last remaining cases of human-dolphin cooperation occurs (Van der Wall et al., 2022), and the Patos Lagoon Estuary, which is the area with the highest abundance of Lahille's bottlenose dolphin.

In addition, the depletion of fish stocks may pose an additional threat, as suggested by changes in the subspecies' diet in the Patos Lagoon Estuary and adjacent coastal areas, shifting from the Atlantic white-croaker (*Micropogonias furnieri*) and southern king croaker (*Menticirrhus sp*.) to the Atlantic cutlassfish (*Trichiurus lepturus*) (Secchi et al. 2016).

Finally, collisions between Lahille's bottlenose dolphins and boats are also a source of concern (Fruet et al. 2020). Although there have been relatively few documented fatal or sublethal injuries, recreational fast boats, as well as various fishery boats and ships, share the same core areas used by Lahille's bottlenose dolphins. Increases in vessels speed, density or usage areas have the potential to increase the risk of collisions, posing a significant conservation threat to this endangered dolphin.

The main threats to Lahille's bottlenose dolphins are summarized in table 2.

Table 2. Summary of actual and potential threats to the Lahille's bottlenose dolphins.

Actual/Potential Threat	Target pop / MU	Cause or related activity	Is there evidence of impact?	Possible Impact on population (may be an educated guess)	Priority for Action	Relevant Actions
Direct lethal threats						
Bycatch	SB/U	Fishing activities	Yes	High	High	General: RES-001, RES-002, RES-003, RES-004, RES-005, MON-002, MON-004, PACB-001, PACB-003, PACB-004 Specific: MIT-001, MIT-003, MON-001, PACB-002
Sub-lethal threats						
Chemical pollution	All	River runoffs, farming, mining, organic waste	Yes	High	High	General: RES-001, RES-002, RES-003, RES-004, RES-005, MON-002, MON-004, PACB-001, PACB-003, PACB-004 Specific: MIT-002, MON-003
Prey depletion	All	Fishing activities	No	High	Moderate	General: RES-001, RES-002, RES-003, RES-004, RES-005, MON-002, MON-004, PACB-001, PACB-003, PACB-004 Specific: MIT-002, MON-003, PACB-002
Boat collisions	All	Fast boats (mainly jet skis)	Yes	Moderate	Moderate	General: RES-001, RES-002, RES-003, RES-004, RES-005, MON-002, MON-004, PACB-001, PACB-003, PACB-004 Specific: MIT-002, MON-003
Coastal and marine developments	All	Wind farms, port construction and operations, oil exploitation, urban development	Yes	High	Moderate	General: RES-001, RES-002, RES-003, RES-004, RES-005, MON-002, MON-004, PACB-001, PACB-003, PACB-004 Specific: MIT-002, MON-003
Noise pollution	All	Boats and port activities	No	Moderate	Moderate	General: RES-001, RES-002, RES-003, RES-004, RES-005, MON-002, MON-004, PACB-001, PACB-003, PACB-004 Specific: MIT-002, MON-003

6.2 Mitigation Measures and Monitoring

1. **Lethal threat**: Bycatch

To mitigate bycatch, the proposal suggests a review of artisanal fishing dynamics to improve understanding its relation to bycatch risk (MIT-001). Simultaneously, efforts aim to assess the effectiveness of low-cost mitigation methods in reducing bycatch in small-scale fisheries (MIT-001). Furthermore, there is a vision to develop bottom-up strategies through workshops with artisanal fishers, researchers, and stakeholders, to identify usage conflicts and advocate for integrated regional legislation and policies to conserve Lahille's bottlenose dolphins (MIT-003). Continuous monitoring and investigation of mortality patterns and population trends (MON-001, MON-002) will evaluate the effectiveness of these mitigation measures.

2. **Sub-lethal threats**: chemical pollution, prey depletion, boat collisions, coastal and marine development, noise pollution

To mitigate sub-lethal threats like chemical pollution, prey depletion, boat collisions, coastal and marine developments, and noise pollution, the plan is to collaborate with stakeholders to improve habitat quality and protection. This involves regulating activities, including establishing and making effective the existing protected areas, to minimize direct and indirect impacts on Lahille's bottlenose dolphins and their habitats in core areas (MIT-002). Specifically targeting boat collisions, efforts will focus on identifying hotspots where interactions occur between Lahille's bottlenose dolphins and fast boats. With this information, engagement with policymakers and stakeholders will aim to improve regulation (e.g., zoning, speed restrictions) (MIT-002). To monitor the effectiveness of these mitigation measures, close monitoring of mortality and physiological health is planned. This includes processing photographs to assess visual health and analysing tissue samples for pathological and ecotoxicological assessments (MON-003).

7 Actions

7.1 Summary and Implementation of Actions (Full name of actors/institutions are listed in Annex II, page 31)

STRATEGIC LINE: Scientific Research for management advises and filling knowledge gaps (RES)												
RES #	**Assoc threat**	**Action**	**Specific Action**	**Aims**	**Methodology**	**Region**	**Period**	**Actors**	**Deliverables**	**Evaluation**	**Budget**	**Priority**
RES#001	All	Assess Distribution and Movement patterns	Map the distribution of LBD in Brazil and Uruguay	To evaluate the distribution and density of LBD	Conduct seasonal aerial surveys (n=4) (helicopter), assess stranding patterns, and analyse citizen science data.	southern Brazil and Uruguay	2yrs	FURG, GEMARS, ICMBio, Instituto Caipora Kaosa, NEMA UDESC, Uergs, UFRGS, UFSC, UNESC, Univali, Yaqu Pacha UY	Reports, social media, scientific publications, GIS maps	IWC SC	€35.000 per survey	High
			Investigate the disappearance of LBD in Argentina	To evaluate current occurrence of LBD along the province of Buenos Aires	Conduct seasonal aerial surveys (n=4).	Province of Buenos Aires	2yr	CESIMAR, CIMAS, Fundación Cethus, GEMARS	Reports, social media, GIS maps	IWC SC	€10.000 per survey	High
RES#002	All	Assess Population Viability	Update Population Viability Analysis	To refine estimation of population parameters and feed a PVA model to estimate extinction risk of LBD under a series of scenarios, considering the effects of bycatch and pollution.	Conduct boat-based surveys for photo-id across 6 sampling sites. Conduct integrated mark-recapture analysis, provide epigenetic age determination, review literature and undertake PVA modelling.	southern Brazil and Uruguay	4yrs	FURG, GEMARS, ICMBio, Kaosa, NEMA, NMMF, UERGS, UFRGS, UFSC, UNESC, UNIVALI, Yaqu Pacha UY	Reports, social media, scientific publication, trends in abundance, IUCN Risk Assessment	IWC SC	€20.000 per year	High
			Estimate population abundance in Argentina	To generate new abundance estimation for Bahia San Antonio and provide the first estimate for other regions	Seasonal boat-based surveys for photo-id, followed by mark-recapture analysis.	Argentina	4yrs	CESIMAR, CIMAS, Fundación Cethus,	Reports, GIS maps, social media, scientific publication	IWC SC	€15.000 per year	Very High
RES#003	All	Assess population genetics and genomics	Investigate population structure	Estimate genetic diversity and adaptability, determine effective population size, re-evaluate population structure, assess gene flow and delineate boundaries of LBD Management Units.	Conduct boat-based surveys for biopsy sampling in areas with limited sample size. Gather samples from both living animals and strandings. Perform DNA extraction, sex determination, mtDNA sequencing, and nDNA genotyping. Analyse the collected data.	All areas	4yrs	CESIMAR, CIMAS, Fundación Cethus, FURG, GEMARS, ICMBio, Kaosa, Mundo Marino UERGS, UFRGS, Yaqu Pacha UY	Report, maps (Management Units boundaries), genetic database.	IWC SC	€15.000 per year	High

RES#004	All	Evaluate health	Assess physiological health	To investigate the health status of two resident populations of LBD	Conduct a feasibility study and capture-release expeditions (n=2), with a focus on collecting different tissue samples, processing them, conducting lab work, and analysing the resulting data.	Patos Lagoon and Laguna	4yrs	CRAM, FURG, Kaosa, NMMF, UDESC, UFSC	Project plan, reports, scientific publications public engagement , outreach materials	IWC SC	€ 7.500 feasibility study/ € 55.000 per capture-release expedition	Very High
			Conduct a health risk assessment of resident populations	To predict the potential impact of exposure to POPs on survival and reproduction	Perform biopsy sampling and necropsies, analyse POPs, assess prevalence of skin diseases, measure DNA damage and evaluate water quality to detect pathogenic organisms within the context of a One Health Assessment.	All areas where LBD are resident to restricted coastal or estuarine areas in southern Brazil / Uruguay	4yrs	GEMARS, Kaosa, UERGS, UERJ, UFRGS UFSC	Reports, social media, scientific publication	IWC SC	€30.000 per year	High
RES#005	All	Assess behavioural specializations	Assess the role of cultural practices involving dolphin-fisher cooperation on the population dynamics of dolphin and the local fishery	To evaluate the risks and consequences of the decline of this animal culture on local dolphin populations and fisheries	Conduct systematic land and boat-based surveys (photo-id, drone, bioacoustics) to uncover the ecological drivers, describe behavioural mechanisms, monitor the dynamic of dolphin-fishers cooperation, and quantify the consequences of such cooperative tactic for both predators, dolphins, and humans.	All areas where dolphins and fishers cooperate	4yrs	UDESC, UFRGS, UFSC, UNESC	Reports, social media, scientific publications	IWC SC	€18.000 per year	High

STRATEGIC LINE: MITIGATION MEASURES (MIT)												
MIT #	**Assoc threat**	**Action**	**Specific Action**	**Aims**	**Methodology**	**Region**	**Period**	**Actors**	**Deliverables**	**Evaluation**	**Budget**	**Priority**
MIT#001	Bycatch	Mitigate bycatch	Continuously monitor the dynamics of artisanal fishing and associated risks for LBD conservation	To understand the artisanal fisheries dynamics and their correlation with bycatch risk	Conduct interviews and fleet characterization, and tracking (GPS) artisanal fishery activities.	southern Brazil and Uruguay	4yrs	CURE-UDELAR, FURG, GEMARS, ICMBio, Kaosa, MMA NEMA, NMMF, UERGS, UFRGS, UFSC, UNESC, UNIVALI, Yaqu Pacha UY	Report, GIS maps	IWC-CC	€ 20.000 per year	Very High
			Assess effectiveness of cost-effective bycatch mitigation methods for LBD	To evaluate the effectiveness of low-cost mitigation methods in reducing LBD bycatch in small-scale fisheries	Trial cost-effective mitigation methods (e.g., upcycled air-filled plastic bottles), to evaluate their effects on target catch. Use passive acoustic monitoring to assess LBD occurrence and behavior near fishing gear, and test simple remote electronic technologies (*e.g.*, GPS logger).	southern Brazil and Uruguay	4yrs	FURG, GEMARS, ICMBio, Kaosa, MMA, NEMA, NMMF, UERGS, UFRGS, UFSC, UNESC, Yaqu Pacha UY	Reports, social medias, scientific publication, trends in bycatch, BMI/IWC reports	IWC-CC	€ 7.500 per year per site	High
MIT#002	Chemical pollution, boat collisions, prey depletion, noise pollution	Improve habitat quality	Coordinate the regulation of recreational vessels in areas where human-dolphin cooperation occurs	Mitigate the impact of recreational vessels on human-dolphin cooperation	Engage with policymakers and stakeholders to implement measures such as zoning and speed restrictions.	southern Brazil	4yrs	GEMARS, UFRGS, UERGS, UFSC, UDESC, UNESC, ICMBio, IBAMA, MMA	Meeting reports	IWC-CC	€7,000	High
			Enhance habitat quality and protection of core areas of LBD	Implement regulations to control activities, such as establishing protected areas, aimed at minimizing both direct and indirect impacts on LBD and their habitats within core areas.	Identify hotspots of overlap between LBD and threats. Engage with stakeholders to define and implement mitigation measures to reduce direct and indirect impacts on LBD and their habitat.	All areas	4yrs	CESIMAR, CIMAS, Fundación Cethus FURG, GEMARS, ICMBio, Kaosa, Mundo Marino, UERGS UFRGS, Yaqu Pacha UY	Meeting reports	IWC-CC	€5,000 per year	High
MIT#003	Bycatch	Integrate artisanal fishers, researchers, and stakeholders to propose strategic LBD conservation actions	Regional and local workshops	Formulate bottom-up strategies for identifying conflicts and mitigating bycatch of LBD, as well as for promoting integrated regional legislation and policy to conserve LBD	Promote meetings and mapping artisanal fishers uses.	southern Brazil and Uruguay	4yrs	CURE-UDELAR, FURG, GEMARS, ICMBio Kaosa, UERGS, UFRGS, UNESC, Yaqu Pacha UY	Reports	IWC-CC	€40,000.00	High

STRATEGIC LINE: MONITORING (MON)												
MON#	**Assoc threat**	**Actions**	**Specific actions**	**Aims**	**Methodology**	**Region**	**Period**	**Actors**	**Deliverables**	**Evaluation**	**Budget**	**Priority**
MON#001	Bycatch	Monitor bycatch rates	Monitor mortality patterns and trends along SB-U	To sustain systematic monitoring of bycatch rates	Capacity building for data collection, including monthly beach surveys, data compilation, GLGs age estimation and data analysis.	southern Brazil and Uruguay	4yrs	FURG, GEMARS, ICMBio, Instituto Caipora, Kaosa, NEMA, UDESC, UERGS, UFRGS, UFSC, UNESC, UNIVALI, Yaqu Pacha UY	Reports, scientific publications, GIS maps	IWC SC	€ 8.000 per year	Very high
MON#002	All	Monitor population trends	Monitor trends in abundance, survival, and reproductive rates	Ensure continuous population monitoring over time to enable ongoing evaluation of effectiveness of conservation measures	Establish systematic population monitoring programs based on photographic mark-recapture and ensure capacity building for the continuation of these programs. Ensure regular data processing to assess population parameters over time and evaluate the effectiveness of conservation measures.	southern Brazil and Uruguay	4yrs	FURG, GEMARS, ICMBio, Kaosa, UDESC, UERGS, UFRGS UFSC, UNESC, UNIVALI, Yaqu Pacha UY	Reports, scientific publications	IWC SC	€ 20.000 per year	Very high
MON#003	Chemical pollution, prey depletion, boat collisions, noise pollution, coastal and marine developments	Monitor health	Implement standardized necropsy protocols	Continuously evaluate cause of death of stranded animals in a standardized manner	Produce standardized protocols for necropsies, build capacity to conduct necropsies, and collect tissue for pathological and ecotoxicological research.	All areas	4yrs	CESIMAR, CIMAS, Fundación Cethus, FURG (CRAM and ECOMEGA), GEMARS, ICMBio, Kaosa, Mundo Marino, UERGS, UERJ, UFRGS, UNESC, UNIVALI, Yaqu Pacha UY	Reports, protocol, scientific publications	IWC SC	€ 8.000 per year	High
			Conduct regular health assessments	Monitor health of LBD over time	Use photographs obtained for mark-recapture analyses to monitor skin diseases, scarring, and other visual cues related with anthropogenic activities. Collect tissue samples for health and pollution level assessments.	All areas	4yrs	CESIMAR, CIMAS, Fundación Cethus, FURG, GEMARS, ICMBio, Kaosa, Mundo Marino, UERGS, UFRGS, Yaqu Pacha UY, UERJ	Reports, scientific publications	IWC SC	€ 15.000 per year	High
MON#004	All	Develop a data management system for data generated under the CMP	To develop and implement an integrated database to consolidate data generated by different CMP research actions	Ensure that data generated by different CMP research projects are maintained and made available for future use.	Design the database in collaboration with institutions responsible for developing the research projects. Develop and implement a data management system featuring different modules for each data type (photo-id, tracking data, etc.), using a web-based interface.	All	2yr	CESIMAR, CIMAS, Fundación Cethus, FURG (CRAM, ECOMEGA), GEMARS, ICMBio, Kaosa, Mundo Marino, UERGS, UFRGS, UNESC, UNIVALI, Yaqu Pacha UY	Data management system, website for hosting the system	IWC SC	€12,000.00	Medium

STRATEGIC LINE: PUBLIC AWARENESS AND CAPACITY BUILDING (PACB)												
PACB #	**Assoc. threat**	**Action**	**Specific Action**	**Aims**	**Methodology**	**Region**	**Period**	**Actors**	**Deliverables**	**Evaluation**	**Budget**	**Priority**
PACB#001	All	Raise awareness for the conservation of LBD	Use citizen science to promote LBD conservation in partnership with local communities	Increase social engagement on the conservation process through a citizen science approach and awareness campaigns	Refine the existing mobile app for use in citizen science, and conduct training sessions for locals to collect data on dolphins and identify illegal fisheries.	All areas	4yrs	CESIMAR, CIMAS, CURE-UDELAR, Fundación Cethus, GEMARS, Instituto Caipora, Kaosa, UERGS, UFRGS, UNESC, UNESC, UNIVALI, Yaqu Pacha UY	Reports, Mobile app, social media, Web Citizen Science database	IWC SC and CC	€ 8.000 per year	High
			Promote environmental education based on ocean literacy using the LBD as a flagship species	Promote environmental Education for local fishery communities focusing on the human dimension in conservation of LBD and their ecosystem.	Capacity building in marine science and conservation for teachers, including short course for young people; development of didactics material for teachers, field activities and artistic-educational activities.	All areas	2yrs	CESIMAR, CIMAS, CURE-UDELAR, Fundación Cethus, FURG, GEMARS, ICMBio, Kaosa, MMA, Mundo Marino, NEMA, NMMF, UDELAR, UDESC UERGS UFPR, UFRGS, UFSC, UNESC, Yaqu Pacha UY	Reports, Social and traditional media, Certificates	IWC CC	€ 16.000 per year	High
			Increase public outreach regarding LBD	To raise public awareness for the conservation of LBD and their habitat	Create short videos (n=6), distribute them via social media platforms, and promote them. Develop materials such as booklets and cups to distribute during courses, workshops, and meetings. Distribute these products to conservation influencers and decision-makers.	All areas	2yrs	CESIMAR, CIMAS, Fundación Cethus FURG, GEMARS, ICMBio, Kaosa, Mundo Marino, UERGS, UFRGS, Yaqu Pacha UY	Short-videos, reports, and boost in social and traditional media	IWC CC	€ 8.000 per year	High
PACB#002	Prey depletion / bycatch	Build capacity	Capacity building to provide support to mitigate illegal fisheries	To provide training sessions for inspectors to address illegal fisheries activities in areas where conflict between fisheries and LBD occur	Regular workshops with inspectors and decision makers.	southern Brazil	4yrs	IBAMA, Kaosa, MMA, UFSC, UFRGS, UNESC	Reports, Social media, certificates	IWC SC	€ 6.000 per year	Very High
PACB#003	All	Reinforce the values and relevance of cultural heritage	Training and local engagement initiatives aimed at conserving of cultural heritage of dolphins-fisher cooperation	Utilize the dolphin-fisher cooperation to further engage artisanal fishers in raising awareness for the conservation of Lahille's bottlenose dolphins among both the local and general public	Promote educational and outreach actions to train the local community in disseminating the ecological, economic, and cultural values associated with this interaction.	southern Brazil	4yrs	UDESC, UERGS, UFRGS, UFSC, UNESC	Reports, social media, scientific publications and propositions of local laws and heritage recognitions	IWC SC	€ 3.500 per year	Very High

PACB#004	All	Engage with other international conventions	Strengthen relationships with other international conventions e.g., CMS	To improve the conservation of LBD on an international level	Develop a CMS concerted action on LBD by 2025 and strengthen the work done under IMMAS in relation to LBD.	All areas	4yrs	National delegations	Concerted actions, reports	IWC SC and CC	-	High

7.2 Reporting Process

This Conservation Management Plan (CMP) will undergo assessment every 2 years and review in detail every 4 years, conducted through either virtual or in-person meetings. The coordinator will submit a biannual report to the IWC SC, CC and the SWGCMP. The first review will be done in 2028.

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9 Annex I

9.1 Biology, Status and Environmental Parameters-Continuation

Southern Patos Lagoon-Uruguay Management Unit

The southern Patos Lagoon and Uruguay Management Unit (MU) extends across the coastline of Uruguay and southern Brazil (Fruet et al. 2014), with sightings of at least 26 individuals observed along the entire coastline between the Rocha Department and surrounding coastal areas of the Patos Lagoon Estuary (Laporta 2009). Mark-recapture analyses conducted from 2019 to 2022 suggest this MU currently comprises 52 individuals (CI95%: 37-66), with an adult survival probability of 0.69 (CI95%: 0.58-0.79). However, this latter estimate may be underestimated due to the likely presence of transient individuals not resident in the area. Abundance estimates from 2008, also obtained through mark-recapture approach but from open population models, suggested an abundance around 63 individuals (CI95%: 54-74), considering only the northern part the Uruguayan coastline, from La Coronilla beach to Cerro Verde, and the Islas de La Coronilla protected area (approximately 50 km2; Laporta et al. 2016a). Differences between the two estimates should be interpreted with caution as there are considerable differences between the two periods in terms of sampling effort and geographical coverage. Historical declines in the numbers of Lahille's bottlenose dolphins in Uruguay are inferred from a decrease in sighting frequency in the La Plata River estuary (Lázaro and Praderi 2000).

Patos Lagoon Estuary Management Unit

The highest concentration of Lahille's Bottlenose Dolphins within its entire range is located within the Patos Lagoon Estuary and its adjacent coastal areas. The population is estimated to be around 90 individuals, with slight year-to-year variations in abundance as revealed by the long-term systematic mark-recapture monitoring of this local population. Additionally, metapopulation mark-recapture data estimates suggest a regional abundance ranging between 89 individuals (CI95%: 50-129) and 129 individuals (CI95%: 56-203), depending on the sampling periods conducted between 2018 and 2023. Adult survival within this MU was estimated at 0.94 (CI95%: 0.92-0.97). Long-term systematic mark-recapture data suggest a relatively stable population size over the last 2o years (Fruet et al 2016; 2022).

Northern Patos Lagoon Management Unit

Within the metapopulation framework, mark-recapture data estimated between 36 (CI95%: 26-47) and 98 (CI95%: 58-138) Lahille's Bottlenose Dolphins for the Northern Patos Lagoon MU, depending on the sampling periods conducted between 2018 and 2023. These estimates originated from the analysis of data collected at three different sites: around the open coast areas north of Patos Lagoon Estuary, the Tramandaí inlet and the Mampituba River. The adult survival probability for this MU was estimated at 0.66 (CI95%: 0.60-0.73), which might be underestimated due to it being a more open system, thus including the effect of transient individuals, non-residents in the area.

Laguna Management Unit

The second-largest known MU of Lahille's Bottlenose Dolphin in Brazil is found in the Laguna estuary. Abundance estimates for this region within a metapopulation framework suggest an abundance ranging between 53 (CI95%: 50-57) and 65 individuals (CI95%: 57-74) within this MU, depending on the sampling periods conducted between 2018 and 2023. In comparison to historical abundance estimates (Simões-Lopes and Fabian 1999, Daura-Jorge et al. 2013), it appears that this unit has remained relatively stable over the past few decades. The adult survival probability within this MU was estimated at 0.93 (CI95%: 0.89-0.97).

Florianópolis Management Unit

In North Bay, mark-recapture data within a metapopulation framework estimated abundance ranging from 8 (CI95%: 4-11) to 28 (CI95%: 22-34) individuals, depending on the sampling periods conducted between 2018 and 2023. Additionally, adult survival probability was estimated at 0.67 (CI95%: 0,46-0.88), which might also be underestimated due to the presence of transient individuals. Between August 2008 and April 2010, a photo-identification study identified 10 Lahille's Bottlenose Dolphins in the Itajaí River mouth, located approximately 100 kilometres further north. Abundance estimates for this area, based on mark-recapture data, yielded a count of 10 individuals (CI95%: 10-17; Demassiano and Barreto 2010). It is important to highlight that these two areas share a significant proportion of individuals, perhaps representing the same unit.

Abundance estimates of Lahille's Bottlenose Dolphins have not been conducted in open coastal areas beyond these long-term studied regions. However, it is believed that the population density in these locations is exceptionally low.

10 Annex II

10.1 List of Institutions

CESIMAR= Centro para el Estudio de Sistemas Marinos/Consejo Nacional de Investigaciones Científicas y Técnicas, Argentina.

CIMAS = Centro de Investigación Aplicada y Transferencia Tecnológica en Recursos Marinos "Almirante Storni", Argentina.

CRAM= Centro de Reabilitação de Animais Marinhos/Universidade Federal do Rio Grande, Brasil.

CURE-UDELAR = Centro Universitario Regional del Este, Universidad de la República, Uruguay.

ECOMEGA= Laboratório de Ecologia e Conservação da Megafauna Marinha/ Universidade Federal do Rio Grande, Brasil

Fundación Cethus = Fundación Cethus, Argentina.

FURG= Universidade Federal do Rio Grande, Brasil.

GEMARS = Grupo de Estudos de Mamíferos Aquáticos do Rio Grande do Sul, Brasil.

IBAMA = Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis/Ministério do Meio Ambiente, Brasil.

ICMBio = Instituto Chico Mendes de Conservação da Biodiversidade/Ministério do Meio Ambiente, Brasil.

Instituto Caipora = Instituto Caipora, Brasil.

Kaosa = Organização Não Governamental Kaosa, Brasil.

MMA = Ministério do Meio Ambiente, Brasil.

Ministry of Environment of Uruguay

Mundo Marino = Mundo Marino, Argentina.

NEMA = Núcleo de Educação e Monitoramento Ambiental, Brasil.

NMMF= National Marine Mammal Foundation, United States

UDESC = Universidade do Estado de Santa Catarina, Brasil.

UERGS = Universidade Estadual do Rio Grande do Sul, Brasil.

UERJ = Universidade do Estado do Rio de Janeiro, Brasil.

UFPR = Universidade Federal do Paraná, Brasil.

UFRGS = Universidade Federal do Rio Grande do Sul, Brasil.

UFSC = Universidade Federal de Santa Catarina, Brasil.

UNESC = Universidade do Extremo Sul Catarinense, Brasil.

UNIVALI = Universidade do Vale do Itajaí, Brasil.

Yaqu Pacha UY = Yaqu Pacha, Uruguay.