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Integrated Conservation Planning for Cetaceans

Planung integrierten Artenschutzes für Cetaceen

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Abstract

The Integrated Conservation Planning for Cetaceans team, a sub-group of the IUCN SSC's Cetacean Specialist Group, was formed in response to the desperate situation of increasing numbers of endangered riverine and coastal dolphin and porpoise species and populations in the world today. The extinction of the baiji and the catastrophic decline to the edge of extinction of the vaquita are both examples of conservation actions being too late and not having all the necessary tools ready for dealing with those emergencies. Integrated conservation action plans actively fill-in knowledge gaps and explicitly consider all tools that may be needed to save a species or population.

Introduction

This paper is intended to familiarize readers with the goals and objectives of the Integrated Conservation Planning for Cetaceans (ICPC) team. Furthermore, it is intended to encourage discussion about how accredited zoos, aquariums, cetacean biologists, and NGO's can foster collaboration and avoid unnecessary duplication or contradictions. ICPC is a sub-group, nested within the International Union for Conservation of Nature Species Survival Commission's Cetacean Specialist Group (CSG). ICPC members are biologists, veterinarians, and individuals with other relevant expertise. Integrated conservation planning involves various stakeholders working across disciplinary groups and is actively promoted by the IUCN. Motion 079 (IUCN, 2020), recently adopted by the IUCN, "1. URGES the Secretariat and professional societies to promote integration of *in situ* and *ex situ* conservation interventions by applying the One Plan Approach, to ensure effective use of all available conservation tools.". This motion "3. ALSO CALLS ON all Members to ensure that 11th hour, last ditch *ex situ* conservation efforts are prevented by proactive and timely application of planning methods, such as the One Plan Approach, and informed by the Guidelines on the Use of *Ex situ* Management for Species Conservation.

The ICPC team was formed in response to the desperate situation of increasing numbers of endangered riverine and coastal dolphin and porpoise species and populations in the world today. The report of the *Ex Situ* Options for Cetacean Conservation (ESOCC) workshop held at Nuremberg in 2018 recommended *inter alia*, that "marine mammal conservationists around the world work together and act with urgency to consider critically needed conservation measures both in wild environments within the species' geographic range (*in situ*) and in protected or modified environments within or outside that range (*ex situ*)" (Taylor et al., 2020). Many of the threatened species and populations most vulnerable to extinction or extirpation have shallow-water distributions that entirely overlap areas used intensively by people. Most are declining due, at least in part, to bycatch mortality in fishing nets (e.g., Brownell et al., 2019) and for some, we already know extinction is imminent without concerted action to save them. Many species experiencing serious conservation issues are in countries with poor governance coupled with corruption and impunity, which makes it difficult to implement timely solutions to reduce or eliminate bycatch. Some of these extreme cases may require *ex situ* interventions to bridge the time-gap between when the species could become extinct in the wild and when meaningful management actions allowing recovery are taken. The extinction of the baiji (Turvey et al., 2007) and the catastrophic decline to the edge of extinction of the vaquita (Jaramillo-Legorreta et al., 2019) are both examples of conservation actions being insufficient, ineffective, coming too late, and of not having all the necessary tools ready for dealing with those emergencies. Integrated conservation action plans explicitly consider from the outset all tools that may be needed to save a species or population and to actively fill-in knowledge gaps.

The need for integrated planning for the most at-risk species and populations is especially urgent as knowledge gaps for many small cetaceans are complex and may take decades to fill. Field biologists are often focused on addressing questions of abundance and decline and therefore gaps relating to basic biology and health may seem less important. The consequences are epitomized by the dilemma of the vaquita,

where a lack of knowledge about the species' response to capture and handling (i.e., stress response) proved detrimental to efforts to save the species with the attempted *ex situ* measures.

Integrated conservation plans and the One Plan Approach

Integrated conservation plans are action plans with specific goals and deadlines, including for monitoring and assessment. Those plans are developed by individuals with a variety of backgrounds and expertise, working together to identify and evaluate needed conservation measures. This may include both *in situ* and *ex situ* measures. If after careful consideration of all risks and available options it is determined that no *ex situ* conservation measures are justified or necessary, the end-product is still considered an integrated conservation plan.

This holistic framework for species conservation planning, known as the "One Plan Approach", was developed by the IUCN Species Survival Commission's Conservation Planning Specialist Group (CPSG). The approach seeks to engage all relevant stakeholders, consider all available resources from the start, and combine science-based decision making to create the species or population conservation action plan (Byers et al., 2013).

The IUCN *ex situ* guidelines and the full range of *ex situ* approaches

The IUCN Species Survival Commission "Guidelines on the Use of *Ex situ* Management for Species Conservation" (IUCN 2014) provide guidance on how to determine if, when, and how to employ *ex situ* measures in a species conservation plan, the precise role(s) that *ex situ* measures could play, and how to thoroughly integrate those activities into the overall conservation plan for the species.

The term *in situ* is typically used to describe animals living in their natural habitat. The IUCN *Ex situ* Guidelines describe *ex situ* as: "conditions under which individuals are spatially restricted with respect to their natural spatial patterns or those of their progeny, are removed from many of their natural ecological processes, and are managed on some level by humans."

And notes that: *"Ex situ* management may take place either within or outside the species' geographic range but is in a controlled or modified environment."

In practice, the range of *ex situ* measures includes actions such as safeguarding animals in protected environments, for example in semi-natural reserves and netted or fenced enclosures, as well as the recovery, rehabilitation, and release of stranded, bycaught or otherwise incapacitated individuals. The practice of e*x situ* management also applies to other actions, such as capture and removal of animals from imminent threats such as a disease outbreak or a climate catastrophe, drought that dries up river channels leaving animals stranded or in fragmented groups, or a hurricane that causes animals to become beach-cast or stranded in unsuitable habitats.

An integrated conservation action plan explicitly considers all populations of a species, whether inside or outside of the species' natural range, and all management options, including *ex situ* approaches, as potential contributors to the successful conservation of that species or population in the wild. The social conditions and culture of both the stakeholders and the species concerned are critical factors to be considered (e.g., Venter et al., 2008; Whitehead and Rendell, 2015; Brakes et al., 2019). In this way, integrated conservation planning encourages the formation of new partnerships, increases communication, trust and understanding among conservation practitioners and stakeholders across multiple management contexts, and expands and enhances the range and quality of the tools available for science-based conservation action. In general, advantages of an integrated conservation plan include:

Having *in situ* and *ex situ* experts working together to fill critical knowledge gaps.

Having field biologists and veterinarians working together to improve overall understanding of the species and individual animal responses to various situations.

Having social scientists and others engaging stakeholder communities in the development of an integrated conservation action plan, including alternative livelihood options, thereby enhancing support for the plan, and increasing the likelihood of success.

Ex situ measures have already been used for marine mammal populations. Notably, self-sustaining *ex situ* populations of Yangtze finless porpoises (*Neophocaena asiaeorientalis* ssp. *asiaeorientalis*) have been established in oxbow lakes contiguous with the current natural habitat of the species, as insurance populations (Wang, 2009). They also provide research and training opportunities for local and regional scientists and are used to benefit conservation directly as well as contribute to public awareness and education. The rescue, rehabilitation, and translocation of young Hawaiian monk seals (*Neomonachus schauinslandi*) that otherwise would have died is another example of successful *ex situ* conservation action (Baker et al. 2011). In total, 32% of the Hawaiian monk seals alive in 2012 were either directly involved in survival-enhancing interventions or are descendants of seals that had benefited from dehooking, disentanglement, removal from high predation zones, vaccination and other medical interventions (Harting et al. 2014).

Another outcome of the ESOCC workshop was the recognition that many knowledge gaps remain for most of the 'at risk' species reviewed during the workshop. For example, almost every year some Indus dolphins are trapped in irrigation canals and need to be translocated to the mainstem of the river. Providing experienced veterinary expertise to improve local skills to care for those animals while at the same time learning about the species' stress response has multiple benefits: directly to the *in situ* population in the short term, and improved prospects for success should longer translocations to safe habitats become necessary in the long term.

Integrated conservation planning workshops and the ICPC priority projects

ICPC and associated collaborators are directly involved in seven priority projects that were identified during the 2018 ESOCC workshop and focused workshops on the franciscana (Argentina, 2019), Yangtze finless porpoise (China, 2019), tucuxi (Florida, 2022), and on applying tools, methods, and approaches from social science disciplines to the development of integrated conservation plans (Nuremberg WS, 2022). The projects have been advanced by ICPC members working with individual project leads and are listed below (see Appendix 1 for points of contact, Appendix 2, and the ICPC projects webpage for further descriptions of each project):

Yangtze finless porpoise (*Neophocaena asiaeorientalis asiaeorientalis*) – Initial workshop (November 2019) and continued planning for a population viability analysis

Atlantic humpback dolphin (*Sousa teuszii*) – Short- and medium-term priority actions to conserve the Atlantic humpback dolphin were drafted in 2020 (Weir et al 2020), and these led to the formation of an international consortium

Ganges & Indus river dolphin (*Platanista* spp.) – rescue/translocation assistance and local capacity building

Franciscana (*Pontoporia blainvillei*) – Initial workshop (October 2019) and continued planning for franciscana

1. Health assessment added to catch/release/satellite-linked tagging study
2. Enhancement of stranding response and neonate, juvenile and adult rehabilitation protocols

Lahille's bottlenose dolphin (*Tursiops truncatus gephyreus*) – Initial planning occurred at the franciscana workshop in 2019

Development of health assessment methods for stranded and incidentally captured dolphins

Enhanced methods of aging individual animals for population assessment

Tucuxi (*Sotalia fluviatilis*) – Initial workshop (July 2020) included a review of the distribution, movements, and genetic distinctiveness of tucuxi, analysis of critical data gaps for enhancing tucuxi conservation, and planning to develop a better understanding of genetically distinct populations in relation to localized threats.

Analysis of capture myopathy in small cetaceans - to develop a better understanding of capture myopathy, which is an essential veterinary consideration for hands-on conservation work with small cetaceans.

ICPC's goal is the eventual development of integrated conservation plans for some of the most endangered small cetacean species, i.e., those with freshwater or very coastal distributions and other challenges, prioritized by their conservation status, the imminence of catastrophic decline or extinction, and the potential for effective mitigation. As a group within the Cetacean Specialist Group, ICPC will build upon efforts to assess the threat levels of subspecies and subpopulations and prioritize which groups are likely to benefit most from the One Plan Approach.

Examples of integrated conservation plans

There are numerous examples of successful integrated conservation plans based on the One Plan Approach (e.g., Pramuk et al., 2013; Delphey et al., 2016; Miller, 2017; Traylor-Holzer et al., 2018) showing how those action plans helped to prevent species extinction. Many of those plans led to the re-establishment of wild, viable, self-sustaining populations of threatened species of mammals, birds, reptiles, amphibians, and various flora (IUCN, 2013). It must be stressed, however, that effective use of *ex situ* conservation measures requires extensive information, intensive preparation, adequate long-term funding and – crucially – it becomes less and less likely to succeed once the wild populations have been reduced to near extinction (Rojas-Bracho et al., 2019). As such, thorough preparatory research, outreach, and planning are required before any decisions can be made (McGowen et al., 2016). It is for this reason that the time-consuming process of addressing key knowledge gaps concerning a species' biology and developing an understanding of the risks and benefits of potential *ex situ* actions for an integrated conservation action plan should begin well before the species or population in question is nearing extinction. Understanding of the risks and potential benefits of appropriate *ex situ* measures takes time and is best done when a small cetacean species numbers in the thousands, or more.

Yangtze finless porpoise

During the 1990s, researchers began bringing wild Yangtze finless porpoises from the main river and lakes into smaller oxbow lakes, which are now referred to in China as *natural ex situ reserves*. As the wild population continued to decline, this subspecies was listed as Critically Endangered in the IUCN Red List of Threatened Species™ (Red List), and the program to establish insurance populations in these reserves became a major component of the government's conservation action plan (Mei et al., 2021; Wang, 2009; Wang et al., 2015). Although not formally developed as an integrated conservation plan following IUCN guidelines, the Chinese Government's Action Plan for Saving the Yangtze Finless Porpoise 2016-2025 (referred to below as the YFP Action Plan) stands as a unique example of applying a conservation management strategy for small cetaceans that integrates both *in situ* and *ex situ* conservation measures. The current *ex situ* population in the Tian-e Zhou *ex situ* reserve is now considered to be reaching the capacity of that reserve, and six porpoises have recently been translocated to other *ex situ* reserves. The potential to return some individuals from the reserves back to the Yangtze River and adjoining lakes is also being considered. Based on the results of a 2017 survey, the decline of the wild population in the mainstem of the river and adjoining lakes appears to have slowed (Huang et al., 2020). Future range-wide surveys will confirm this trend. In addition, the government banned all commercial fishing for ten-years from 2021 and is actively working to restore the health of the Yangtze River.

An international symposium on Yangtze finless porpoise conservation and an associated workshop were held in November 2019 at the Institute of Hydrobiology of the Chinese Academy of Sciences (IHB) in Wuhan, China. The aims of the symposium and workshop were to (a) review the status of the Yangtze finless porpoise, (b) provide participants with an overview of the efforts to maintain the population of wild

porpoises living in the Yangtze River and the series of natural *ex situ* reserves, and (c) initiate a review of the YFP Action Plan.

Overall, the *ex situ* program is impressive, with more than 130 porpoises living nearly natural lives within four protected reserves (Mei et al., 2021). Every five years these porpoises are herded into shallow-water areas and caught, where they can be identified from pit-tags, or if born since the last health examination, have a pit-tag inserted and a genetic sample taken to determine parentage. The first 5 animals were introduced into the Tian-e Zhou oxbow in 1990 before the reserve was formally established in 1992. The capture and physical examination of the porpoises in the Tian-e Zhou reserve was first conducted in 2002. There were a few porpoise deaths during the early years of the capture program, but the methods have been improved over the years and the risk of injury or death has been largely reduced. Further understanding of the porpoises' physiological response to capture and the procedures developed to mitigate fatalities from capture myopathy and other causes, could be advantageous for advancing capture methods for other porpoises.

Although not yet finalized, the general conclusion of the ongoing review is that the laudable goals and strategies described in the YFP Action Plan should be augmented with additional explicit information to support all its stated objectives. The review has already resulted in a series of recommendations for advancing the goals of the YFP Action Plan including short-, medium-, and long-term goals for operationalizing the objectives of the Plan and provides quantitative targets for needed actions (Appendix 3). Some of the recommendations are already being implemented in collaboration with ICPC members, including development of a strategy to both maintain genetic diversity within the *ex situ* population and begin the learning process for reintroduction into the wild population when that is deemed safe.

Concluding thoughts

With this article, we intend to provide context for the formation and objectives of the ICPC team, and as a further step towards the development of improved coordination and collaboration between various stakeholders with the aim of protecting small cetaceans. The adoption of Motion 079 at the last IUCN Congress represents an important milestone by highlighting the potential role of zoos and aquariums in the ICPC framework. Combined with a declaration of commitment by zoos and aquariums to both *in situ* and *ex situ* conservation, this motion provides the basis for their work in species conservation. It is therefore important that the technical groups of the IUCN Species Survival Commission and the zoo and aquarium associations (WAZA, EAZA, AZA to name just a few) strive to establish or strengthen relationships. This is exemplified by IUCN's "Reverse the Red" campaign, in which zoos play an important role by supporting efforts to protect endangered species and their habitats. Zoos and aquariums can host and support both *ex-situ* and *in-situ* research and provide technical expertise to better understand the biology and threats to dolphin and porpoises. In addition, zoos and aquariums have the potential to increase public engagement, stewardship, and importantly, raise funds for the conservation of species and populations in the wild. Co-operation and collaboration between industry peers and non-governmental organizations will harmonize efforts, improve the chances of success and avoid unnecessary duplication. The coming decades will be crucial for many small cetaceans, and it will take the efforts of many dedicated people from a wide range of sectors to prevent further extinctions.

Zusammenfassung

Die Arbeitsgruppe Integrierte Erhaltungsplanung für Wale und Delfine (ICPC), eine Untergruppe der Wal- und Delfin-Spezialistengruppe der IUCN SSC, wurde als Reaktion auf die dramatische Situation ei-

ner wachsenden Zahl gefährdeter Fluss- und Küstendelfinarten und -populationen gegründet. Das Aussterben des Baiji und der katastrophale Rückgang der Vaquita-Populationen bis an den Rand des Aussterbens sind beides Beispiele dafür, dass Schutzmaßnahmen zu spät ergriffen wurden und nicht alle notwendigen Instrumente zur Verfügung standen, um diese Notfälle zu bewältigen. Integrierte Erhaltungsaktionspläne schließen aktiv Wissenslücken und berücksichtigen ausdrücklich alle Instrumente, die zur Rettung einer Art oder Population erforderlich sein könnten.

References

Baker, J.D., Becker, B.L., Wurth, T.A., Johanos, T.C., Littnan, C.L., & Henderson, J.R. (2011). Translocation as a tool for conservation of the Hawaiian monk seal. Biological Conservation 144, 2692-2701. https://doi.org/10.1016/j.biocon.2011.07.030

Barham, P. J., Underhill, L. G., Crawford, R. J. M., Altwegg, R., Leshoro, T. M., Bolton, D. A, Dyer, B. M., & Upfold, L. (2008). The efficacy of hand rearing penguin chicks: evidence from African penguins (*Spheniscus demersus*) orphaned in the Treasure oil spill in 2000. Bird Conservation International 18, 144-152. DOI: 10.1017/S0959270908000142

Brakes, P., Dall, S.R.X., Aplin, L.M., Bearhop, S., Carroll, E.L., Ciucci, P., Fishlock, V., Ford, J.K.B., Garland, E.C., Keith, S.A., McGregor, P.K., Mesnick, S.L., Noad, M.J., di Sciara, G.N., Robbins, M.M., Simmonds, M.P., Spina, F., Thornton, A., Wade, P.R., Whiting, M.J., Williams, J., Rendell, L., Whitehead, H., Whiten, A., & Rutz, C. (2019). Animal cultures matter for conservation: understanding the rich social lives of animals benefits international conservation efforts. Science 363:1032-1034. http://science. sciencemag.org/content/363/6431/1032

Brownell Jr., R.L., Reeves, R.R., Read, A.J., Smith, B.D., Thomas, P.O., Ralls, K., Amano, M., Berggren, P., Chit, A.M., Collins, T., Currey, R., Dolar, M.L.L., Genov, T., Hobbs, R.C., Kreb, D., Marsh, H., Zhigang, M., Perrin, W.F., Phay, S., Rojas-Bracho, L., Ryan, G.E., Shelden, K.E.W., Slooten, E., Taylor, B.L., Vidal, O., Ding, W., Whitty, T.S., & Wang, J.Y. (2019). Bycatch in gillnet fisheries threatens Critically endangered small cetaceans and other aquatic megafauna. Endangered Species Research 40, 285-296. DOI: 10.3354/esr00994

Byers, O., Lees, C., Wilcken, J., & Schwitzer, C. (2013). The One Plan approach: the philosophy and implementation of CBSG's approach to integrated species conservation planning. WAZA Magazine 14, 2-5.

Delphey, P., Runquist, E., Harris, T., Nordmeyer, C., Smith, T., Traylor-Holzer, K., & Miller, P.S. (eds). (2016). Poweshiek Skipperling and Dakota Skipper: Ex Situ Feasibility Assessment and Planning Workshop. Apple Valley, MN: IUCN/SSC Conservation Breeding Specialist Group. Rep. 2016-004.pdf

Harting, A.L., Johanos, T.C., & Littnan, C.L. (2014). Benefits derived from opportunistic survival-enhancing interventions for the Hawaiian monk seal: the silver BB paradigm. Endangered Species Research 25, 89-96. DOI: https://doi.org/10.3354/esr00612

Huang, J., Mei, Z., Chen, M., Han, Y., Zhang, X., Moore, J.E., Zhao, X., Hao, Y., Wang, K., & Wang, D. (2020). Population survey showing hope for population recovery of the critically endangered Yangtze finless porpoise. Biological Conservation, 241, 108315. https://doi.org/10.1016/j.biocon.2019.108315

International Union for Conservation of Nature Species Survival Commission (2013). Guidelines for Reintroductions and Other Conservation Translocations. Version 1.0. Gland, Switzerland: IUCN Species Survival Commission, viiii + 57 pp.

International Union for Conservation of Nature Species Survival Commission. (2014). Guidelines on the Use of *Ex Situ* Management for Species Conservation. Version 2.0. Gland, Switzerland: IUCN SSC. IUCN-2014-064 (Accessed Feb. 23, 2020).

International Union for Conservation of Nature (2020). Linking in situ and ex situ efforts to save threatened species (WCC-2020-Res-079-EN). https://portals.iucn.org/library/sites/library/files/resrecfiles/WCC_2020_RES_079_EN.pdf

Jaramillo-Legorreta, A.M., Cardenas-Hinojosa, G., Nieto-Garcia, E., Rojas-Bracho, L., Thomas, L., Ver Hoef, J.M., Moore, J., Taylor, B., Barlow, J., & Tregenza, N. 2019. Decline towards extinction of Mexico's vaquita porpoise (*Phocoena sinus*). Royal Society Open Science 6, 190598. DOI: 10.1098/rsos.190598

MacCracken, J.G., Lemons, P.R., Garlich-Miller, J.L., & Snyder, J.A. An index of optimal sustainable population for the Pacific Walrus. Ecological Indicators 43, 36-43.

McGowan, P.J.K., Traylor-Holzer, K., & Leus, K. (2016). IUCN guidelines for determining when and how *ex situ* management should be used in species conservation. Conservation Letters 10, 361-366. DOI:/10.1111/conl.12285

Mei, Z., Chen, M., Han, Y., Hao, Y., Zheng, J., Wang, K., & Wang, D. 2021. Thresholds of population persistence for the Yangtze finless porpoise: implications for conservation managements. Integrative Zoology DOI: 10.1111/1749-4877.12523. Online ahead of print.

Miller, P.S. (2017). Population viability analysis for the Mexican wolf (*Canis lupus baileyi*): Integrating wild and captive populations in a metapopulation risk assessment model for recovery planning. Report prepared for U.S. Fish and Wildlife Service, Albuquerque NM. https://mexicanwolves.org/uploads/RP02-03-2017_FWS-PopulationViabilityAnalysis.pdf

Pramuk, J., Koontz, F., Tirhi,M., Zeigler, S., Schwartz, K., & Miller, P. (eds). (2013). The Western Pond Turtle in Washington: A Population and Habitat Viability Assessment. IUCN/SSC Conservation Breeding Specialist Group, Apple Valley, MN. http://www.cbsg.org/sites/cbsg.org/files/documents/WPT_PHVA_FINAL_26Sept2013_0.pdf

Rojas-Bracho, L., Gulland, F.M.D., Smith, C.R., Taylor, B., Wells, R.S., Thomas, P.O., Bauer, B., Heide-Jørgensen, M.P., Teilmann, J., Dietz, R., Balle, J.D., Jensen, M.V., Sinding, M.H.S., Jaramillo-Legorreta, A., Abel, G., Read, A.J., Westgate, A.J., Colegrove, K., Gomez, F., Martz, K., Rebolledo, R., Ridgway, S., Rowles, T., van Elk, C.E., Boehm, J., Cardenas-Hinojosa, G., Constandse, R., Nieto-Garcia, E., Phillips, W., Sabio, D, Sanchez, R., Sweeney, J., Townsend, F., Vivanco, J., Vivanco, J.C., & Walker, S. 2019. A field effort to capture critically endangered vaquitas *Phocoena sinus* for protection from entanglement in illegal gillnets. Endangered Species Research 38, 11-27. https://doi.org/10.3354/esr00931

Taylor, B.L., Abel, G., Miller, P., Gomez, F., von Fersen, L., DeMaster, D.P., Reeves, R.R., Rojas-Bracho, L., Wang, D., & Cipriano, F. (eds). (2020). *Ex situ* options for cetacean conservation: December 2018 workshop, Nuremberg, Germany. IUCN. Gland, Switzerland. https://doi.org/10.2305/IUCN.CH.2020.SSC-OP.66.en

Traylor-Holzer, K., Leus, K., & Bauman, K. (eds). (2018). Global Integrated Collection Assessment and Planning Workshop for Canids and Hyaenids: Final Report. IUCN SSC Conservation Planning Specialist Group, Apple Valley, MN. https://doi.org/10.2305/IUCN.CH.2020.SSC-OP.66.en

Turvey, S.T., Pitman, R.L., Taylor, B.L., Barlow, J., Akamatsu, T., Barrett, L.A., Zhao, X., Reeves, R.R., Stewart, B.S., Wang, K., Wei, Z., Zhang, X., Pusser, L.T, Richlen, M., Brandon, J.R., & Wang, D. (2007). First human-caused extinction of a cetacean species? Biology Letters 3: 537-540. https://doi.org/10.1098/rsbl.2007.0292

Venter, F.J., Naiman, R.J., Biggs, H.C., & Pienaar, D.J. (2008). The evolution of conservation management philosophy: Science, environmental change and social adjustments in Kruger National Park. Ecosystems 11:173-192. https://doi.org/10.1007/s10021-007-9116-x

Wang, D. (2009). Population status, threats and conservation of the Yangtze finless porpoise. Chinese Science Bulletin 54, 3473-3484. https://doi.org/10.1007/s11434-009-0522-7

Wang, D., Wang, K., Hao, Y., & Zheng, J. (2015). Review of population status and conservation measures for Baiji and Yangtze finless porpoise. American Fisheries Society Symposium. https://doi.org/10.47886/9781934874448.ch7.

Weir, C., Leeney, R.H., & Collins, T. 2020. Reinvigorating conservation efforts for the Atlantic humpback dolphin (*Sousa teuszii*): A brief progress report. Document presented to the Scientific Committee of the International Whaling Commission SC/68B/SM/07: 1-20.

Wells, R.S., Cremer, M.J., Berninsone, L.G., Albareda, D., Wilkinson, K.A., Stamper, M.A., Paitach, R.L., & Bordino. P. (2022). Tagging, ranging patterns and behavior of franciscana dolphins (*Pontoporia blainvillei*) off Argentina and Brazil: Considerations for conservation. Marine Mammal Science, 38(2): 571-605. https://doi.org/10.1111/mms.12879

Whitehead, H., & Rendell, L. 2015. The cultural lives of whales and dolphins. University of Chicago Press, Chicago, IL. USA. ISBN: 9780226325927

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Appendix 2. Short descriptions of current ICPC-related initiatives

Atlantic humpback dolphins (*Sousa teuszii*) – Conservation Action Plan Project

With fewer than 3000 individuals estimated to remain throughout the species' entire range along the Atlantic coast of Africa, international conservation organizations, including the International Union for the Conservation of Nature (IUCN), the Convention on Migratory Species (CMS) and the International Whaling Commission (IWC) have expressed grave concerns about the species' future. Restricted to shallow-water habitats that overlap with human activities, including fishing and coastal development, Atlantic humpback dolphins are thought to be in decline throughout their range. In 2020 scientists involved with the ICPC, as well as the IWC and CMS collaborated to form the Consortium for the Conservation of the Atlantic Humpback Dolphin (CCAHD). This consortium now involves over 90 partners, including an increasing number of scientists and conservation organizations from 15 of the 19 AHD range states, who collaborate to undertake fund-raising and implementation of research and conservation projects. For more information see https://www.sousateuszii.org/, and the CCAHD's recent report on conservation priorities for the species.

Indus (*Platanista minor*) and Ganges River dolphins (*Platanista gangetica*) – Capacity Building Project

The entrapment of Indus and Ganges dolphins in irrigation canals is a regular conservation challenge in Pakistan and India, requiring annual translocation of dolphins from the canals back to the mainstream river. While rescue operations for canal-entrapped dolphins occur, they lack scientific data collection, formal veterinary assessments, and trained personnel, resulting in individual animal loss and lack of data acquisition. Current resource gaps limit the scope of the ongoing rescue efforts, as well as the ability to fill critical species-specific data gaps needed to help conserve these poorly known species. The National Marine Mammal Foundation and St. Andrews University have formed collaborations with the organizations currently overseeing local rescue operations, WWF Pakistan and Turtle Survival Alliance India. The aim of these new alliances is to build urgently needed infrastructure through the training of local first responders and the organization of data collection in order to improve long-term conservation efforts. Funding is currently being sought in support of these developing projects.

Franciscana dolphins (*Pontoporia blainvillei*) – Tagging and Health Assessment Project

Plans are in place for a project off the coast of Argentina in October 2023, to catch, tag, and release up to four franciscanas to learn about movement patterns relative to coastal fisheries, extending research conducted since 2005 in Argentina and Brazil (Wells et al. 2022). The project, sponsored by Disney Conservation Funds and conducted by the Chicago Zoological Society's Sarasota Dolphin Research Program and AquaMarina, will attempt to deploy satellite-linked tags in a region of coastal artisanal fishery activity. During the process of handling for tagging, efforts will be made to carefully incorporate health assessment protocols by experienced veterinarians from AquaMarina, the National Marine Mammal Foundation, and Disney, and document responses.

Franciscana dolphins (*Pontoporia blainvillei*) – Neonate Rehabilitation Project

The franciscana dolphin is distributed along shallow coastal waters and estuaries in Brazil, Uruguay, and Argentina, increasing their vulnerability to anthropogenic activities, mainly gillnet entanglement. Due

to high bycatch rates, the species is considered the most endangered dolphin in the South Atlantic Ocean. Live stranded franciscana dolphins require rapid response, especially neonates that typically die within hours of stranding. To date, rehabilitation success of orphaned neonates is minimal and there is a critical need for enhancement of current conventions. To answer this urgent call, Yaqu Pacha (YP), the National Marine Mammal Foundation (NMMF), and Zoo Nuremberg (ZN) formed a consortium with local and international experts to improve existing rehabilitation protocols for franciscana dolphins. A neonate protocol has been completed and is being translated into multiple languages. Improvement of adult franciscana procedures and the development of mobile animal care units are also underway. This collaborative project aims to: (1) increase individual animal survival and subsequent release, (2) aid in the acquisition of critical species-specific data, (3) expand the body of knowledge on species biology and medicine, and (4) inform future conservation actions. The project is currently supported with funds from YP, the NMMF Board of Directors Grants Program, and ZN. Additional funding is being sought for international training and capacity building.

Lahille's bottlenose dolphins (*Tursiops truncatus gephyreus*) – Understanding Knowledge Gaps Project

The Lahille's bottlenose dolphin (*Tg*) occurs only in southern Brazil, Uruguay, and Argentina. Abundance estimates suggest a maximum total population size of 600 dolphins, with an estimated 360 mature individuals. *Tg* are listed as vulnerable on the IUCN Red List and endangered on the respective National Red Lists of Brazil and Argentina. Improved knowledge of age structure, population demographics, and health status could provide further basis for classification and protections. The National Marine Mammal Foundation (NMMF) and Universidade Federal do Rio Grande (FURG) are developing a skin-based, epigenetic aging technique to estimate the age of *Tg*. Establishing an epigenetic aging technique will directly address IWC health assessment priorities by creating a foundation to establish population demographics and age-related context for individual health status of *Tg*. The project builds on the emerging epigenetic aging techniques developed for common bottlenose dolphins. The research team aims to apply this technique to *Tg* and establish the ages of previously sampled animals through population surveys conducted by FURG. If successful, this project will help fill critical data gaps regarding population demographics. Additionally, the resulting technique and data will provide a foundation on which to study biological aging of *Tg*. Research is underway with funds from the NMMF Board of Directors Grants Program. Additional funds are being sought for data analysis, interpretation, and international capacity building.

Capture myopathy analysis – Understanding Knowledge Gaps Project

NOAA's Marine Mammal Health & Stranding Response Program held a virtual capture myopathy workshop in February 2021, co-chaired by the University of California at Davis, in collaboration with the Smithsonian Institute, University of Illinois, and National Marine Mammal Foundation. The primary goal was to develop a better understanding of capture myopathy, which is an essential veterinary consideration for hands-on conservation work with small cetaceans. The workshop brought together marine mammal and terrestrial wildlife veterinarians and biologists to discuss risk factors, diagnostic techniques, treatment options, and prevention strategies for capture myopathy. Spin-off projects currently being discussed include the development of field-ready diagnostics and prognostic indicators for small cetaceans, as well as the continued collaboration needed to advance these tools and techniques.

Tucuxi – Elucidating Population Structure from Environmental DNA (eDNA) Analysis

Tucuxi (*Sotalia fluviatilis*) is an endemic freshwater dolphin species inhabiting the Amazon basin. Tucuxi are found throughout the Amazon, occurring in all types of water, but there are no estimates of popula-

tion size for most parts of the tucuxi's range. In some areas observed rates of declines are consistent with a 'critically endangered' status. Threats include accidental entanglement in fishing nets, habitat fragmentation due to dam building and associated decreases in food supply, and the effects of pollutants and continued habitat destruction. Genetic evidence suggests two distinct subpopulations of *Sotalia fluviatilis*: one in the upper Amazon of Colombia and Peru and the other in the middle and lower Amazon in Brazil, while the genetic distinctiveness of the isolated Ecuador subpopulation still needs to be evaluated. Researchers studying the distribution, movements, and genetic distinctiveness of tucuxi in Colombia and Ecuador are now using eDNA analysis to develop a better understanding of population differences in relation to localized threats across their range.