SC/68C/SM/03

Sub-committees/working group name: SM

An introduction to Integrated Conservation Planning for Cetaceans, including areas of potential collaboration with IWC to advance small cetacean conservation

Barbara L. Taylor 1, Grant Abel 2, David Bader 3, Jay Barlow 1, Gill Braulik 4, Frank Cipriano 5, Tim Collins 6, Douglas DeMaster 7, Lorenzo von Fersen 8, Forrest Gomez 9, Yujiang Hao 10, Philip S. Miller 11, Gianna Minton12, Randall R. Reeves 13, Lo

An introduction to Integrated Conservation Planning for Cetaceans, including areas of potential collaboration with IWC to advance small cetacean conservation

Barbara L. Taylor [1], Grant Abel [2], David Bader [3], Jay Barlow [1], Gill Braulik [4], Frank Cipriano [5], Tim Collins [6], Douglas DeMaster [7], Lorenzo von Fersen [8], Forrest Gomez [9], Yujiang Hao [10], Philip S. Miller [11], Gianna Minton[12], Randall R. Reeves [13], Lorenzo Rojas-Bracho [14], Eduardo Secchi [15], Cynthia R. Smith [9], Robert Suydam [16], Ding Wang [10], Randall S. Wells [17], Alexandre Zerbini [18]

[1] Southwest Fisheries Science Center, NMFS, NOAA, 8901 La Jolla Shores Drive, La Jolla, CA 92037 USA
[2] Seattle Aquarium, 1483 Alaskan Way, Pier 59, Seattle, WA 98101-2051 USA
[3] 1324 W 26th Place, San Pedro, CA 90732 USA
[4] Sea Mammal Research Unit, University of St. Andrews, UK
[5] California Academy of Sciences, 55 Music Concourse Drive, San Francisco CA 94118 USA
[6] Wildlife Conservation Society, Bronx, New York, USA
[7] National Marine Fisheries Service, NOAA, USA (retired)
[8] Tiergarten Nürnberg and YAQU PACHA e.V., Am Tiergarten 30, 90480 Nürnberg, Germany
[9] National Marine Mammal Foundation, 2240 Shelter Island Drive Suite 200, San Diego, CA 92106, USA.
[10] Institute of Hydrobiology, Chinese Academy of Sciences, No. 7, South Rd. of East Lake, Wuhan 430072 China
[11] IUCN-SSC Conservation Planning Specialist Group, 12101 Johnny Cake Ridge Road Apple Valley. Minneapolis, MN, 55124-8151 USA
[12] Megaptera Marine Conservation, Wassenaar, South Holland, Netherlands
[13] Okapi Wildlife Associates, 27 Chandler, Hudson, Quebec J0P 1H0, Canada
[14] Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO), Ensenada BC 22860 Mexico
[15] Instituto de Oceanografia, Universidade Federal do Rio Grande/FURG, Rio Grande, Rio Grande do Sul, Brazil
[16] Department of Wildlife Management, North Slope Borough, Box 69, Utqiaġvik, AK 99723 USA
[17] Chicago Zoological Society's Sarasota Dolphin Research Program, c/o Mote Marine Laboratory, 1600 Ken Thompson Pkwy, Sarasota, FL 34236 USA
[18] Marine Mammal Laboratory, Alaska Fisheries Science Center, NOAA Fisheries, 7600 Sand Point Way NE, Seattle, WA, 98115-6349, USA

ABSTRACT

Integrated Conservation Planning for Cetaceans, 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 (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 too little and coming too late, and of not having all the necessary tools ready for dealing with those emergencies. Integrated conservation action plans explicitly consider all tools that may be needed to save a species or population and to actively fill-in knowledge gaps.

INTRODUCTION

This paper is provided to the Scientific Committee of the International Whaling Commission to familiarize the Committee with the goals and objectives of the Integrated Conservation Planning for Cetaceans (ICPC) team. Furthermore, this paper is intended to encourage discussion about how the Committee and ICPC can foster collaboration and synergism 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 taxonomic groups and is now actively promoted by IUCN, which recently adopted Motion 079 which "1. URGES the Secretariat and professional societies to promote integration of *in situ* and *ex situ* conservation interventions by applying the One Plan approach[1], to ensure effective use of all available conservation tools." and "3. ALSO CALLS ON all

[1] Description of the One Plan approach to conservation can be found **here**

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"[2].

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[3] 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 that make it difficult to implement timely solutions to reduce or eliminate bycatch. Such 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 would be 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 too little and coming too late, and of not having all the necessary tools ready for dealing with those emergencies. Integrated conservation action plans explicitly consider all tools that may be needed to save a species or population and to actively fill-in knowledge gaps.

Knowledge gaps for many small cetaceans are especially complex and may also take decades to fill for some species/populations, so the need for integrated planning for the most at-risk species and populations is especially urgent. 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' extreme negative response to chasing and handling (i.e.., stress response) proved detrimental to efforts to save the species with the *ex situ* measures used.

Integrated conservation plans and the One Plan approach

Integrated conservation plans are fully operationalized action plans with specific goals and deadlines, including monitoring and assessment. Those plans are developed by individuals with a wide variety of backgrounds and expertise, working together with other stakeholders to consider critically needed conservation measures. The range of potential conservation measures considered can include both *in situ* and *ex situ* measures. The resulting action plan is considered an integrated conservation plan, even if after careful consideration has been given to risks and all available options, no *ex situ* conservation measures are determined to be justified or necessary.

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

[2] The Guidelines document can be found here

[3] The full report of the ESOCC workshop can be found **here**

features direct involvement of multiple stakeholders, whenever possible – fishers, farmers, local community leaders, conservation scientists, relevant NGO representatives, government wildlife managers, and other individuals with relevant expertise, such as veterinarians – combined with science-based decision making to create a 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 published the "Guidelines on the Use of *Ex situ* Management for Species Conservation" (IUCN 2014), which provides guidance on whether and when to employ *ex situ* measures in a species conservation plan, the precise role(s) that the *ex situ* measures could play, and how to thoroughly integrate those activities into the overall conservation plan for the species. This integration can optimize the effectiveness of environmental stewardship to decrease the risk of extinction.

The term *in situ* is typically used to describe animals living in their natural habitat, under natural conditions. The IUCN *Ex situ* Guidelines (IUCN 2014) 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 note 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* approaches 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 stranded animals or fragmented groups, or a hurricane that causes animals to be 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 in the wild. In addition, the IUCN Guidelines promote the active engagement of all relevant parties and the consideration of all available resources from the very start of the conservation planning process. 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 initiatives encourage the formation of new partnerships, increase levels of communication, trust and understanding among conservation practitioners and stakeholders across multiple management contexts, expanding and enhancing 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 allows for more effective planning to fill critical knowledge gaps
- Having field biologists and veterinarians working together can improve overall understanding of the species and individual animal responses to various situations
- Having social scientists and others engage stakeholder communities in the development of an integrated conservation action plan, including alternative livelihood options, will enhance support for the plan and can improve the likelihood of success

Some *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 current habitat of the species, as insurance populations (Wang.

2009). They also provide research and training opportunities for local and regional scientists that are used to benefit conservation directly as well as contribute to regional education and awareness. 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 translocation to a safe habitat become necessary in the long-term.

Integrated conservation planning and the ICPC priority projects

ICPC and associated collaborators are directly involved in six priority projects that were identified during the 2018 ESOCC workshop. The projects have been advanced by ICPC members working with individual project leads and are listed below (see Appendix 1 for points of contact and Appendix 2 for further descriptions of each project):

- Yangtze finless porpoises (*Neophocaena asiaeorientalis asiaeorientalis*)- Initial workshop (November 2019) and continued planning for a population viability analysis
- Atlantic humpback dolphins (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 dolphins (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 tag study
  2. Enhancement of stranding response and neonate rehabilitation protocols
- Lahille's dolphin (Tursiops truncatus gephyreus) - Initial planning occurred at the Franciscana workshop (2019)
  1. Development of health assessment methods for stranded and incidentally captured dolphins
  2. Enhanced methods of aging individual animals for population assessment
- 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. ICPC is still developing the approach for prioritizing projects/species/populations for future planning. Candidate species for these future projects will be small cetaceans at high and continuing risk, with concern about the timeline for success of current *in situ* conservation measures or loss of populations significant to the species' survival.

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.

The Yangtze finless porpoise example

During the 1990s, biologists and 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). Another range-wide survey will be conducted within the next 12 - 24 months to 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 update of the YFP Action Plan, with explicit incorporation of the IUCN integrated conservation planning principles, could help to maximize chances for recovery of the wild porpoise population.

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 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 ameliorated. 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

We offer this paper to provide context for the creation and goals of the ICPC team, and as an early step toward developing higher-level communication, coordination and enhancement of collaborations for the future conservation of small cetaceans. Both the IUCN and the IWC are working towards an improved understanding of the biology, and reducing extinction risks, of multiple dolphin and porpoise populations. Working in concert will surely help to harmonize outreach efforts, improve the chances of success, and reduce unnecessary duplication. The coming decades will be critical for many small cetaceans and it will take the efforts of many dedicated people to prevent more extinctions. With limited conservation resources and time, effective actions will be promoted by efficient communications, not only between ICPC and the IWC, but also with NGOs and a wider range of stakeholders. We also note that several ICPC projects overlap with various IWC initiatives, including Conservation and Management Plans, Small Cetacean subcommittee Task Teams, and shared communication and community engagement goals, as exemplified by the new IWC 'Extinction Initiative'. We welcome continuing dialog and communication with the working groups involved in those initiatives.

References Cited

Baker, J.D., Becker, B.L., Wurth, T.A., Johanos, T.C., Littnan, C.L. and 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. and 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., and 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., Collin,s T., et al. 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. and 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., and 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., and C.L. Littnan. 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., et al. 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. ISBN: 978-2-8317-1609-1

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).

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., and 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. and Snyder, J.A. An index of optimal sustainable population for the Pacific Walrus. – Ecological Indicators 43: 36 - 43. https://doi.org/10.1016/j.ecolind.2014.02.013

McGowan, P.J.K., Traylor-Holzer, K. and 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. and 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. , and 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., and 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., and 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. http://www.cbsg.org/sites/cbsg.org/files/documents/Global ICAP Workshop for Canids and Hyaenids_final report.pdf

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., et al. 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. *et al.* 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., and 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.

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

Appendix 1. Contact details for ICPC and related projects

ICPC CO-CHAIRS

Barbara L. Taylor
Southwest Fisheries Science Center, NMFS, NOAA
8901 La Jolla Shores Drive
La Jolla, CA 92037 USA
barbara.taylor@noaa.gov

Grant Abel
Seattle Aquarium
1483 Alaskan Way, Pier 59
Seattle, WA 98101-2051 USA
g.abel@seattleaquarium.org

IUCN SSC CETACEAN SPECIALIST GROUP CHAIR

Randall R. Reeves
Okapi Wildlife Associates
27 Chandler, Hudson, Quebec J0P 1H0, Canada
rrreeves@okapis.ca

IUCN SSC CPSG REPRESENTATIVE

Philip S. Miller
IUCN SSC Conservation Planning Specialist Group
12101 Johnny Cake Ridge Road Apple Valley
Minneapolis, MN, USA 55124-8151
pmiller@cpsg.org

MEDIA CONTACT

David Bader
Marine Mammal Care Center
3601 S Gaffey St. #8
San Pedro, CA 90731 USA
dbader@marinemammalcare.org

CONSERVATION MEDICINE SPECIALISTS

Cynthia Smith DVM
Forrest Gomez DVM
National Marine Mammal Foundation
2240 Shelter Island Drive Suite 200
San Diego, California 92106 USA
forrest.gomez@nmmpfoundation.org

RAPPORTEUR

Frank Cipriano
California Academy of Sciences
55 Music Concourse Drive
San Francisco CA 94118 USA
frankwcipriano@gmail.com

PRIORITY PROJECTS POINT-OF-CONTACT

Atlantic humpback dolphin

Tim Collins
Wildlife Conservation Society
tcollins@wcs.org

Gianna Minton
Megaptera Marine Conservation
gianna.minton@gmail.com

Yangtze finless porpoise

Ding Wang,
Institute of Hydrobiology
Chinese Academy of Sciences. China
wangd@ihb.ac.cn

Yujiang Hao,
Institute of Hydrobiology
Chinese Academy of Sciences. China
hao.yj@ihb.ac.cn

Indus and Ganges river dolphins

Gill Braulik
University of St Andrews, Scotland
gillbraulik@gmail.com

Capture myopathy

Cynthia Smith DVM
National Marine Mammal Foundation
2240 Shelter Island Drive Suite 200
San Diego, California 92106 USA
cynthia.smith@nmmpfoundation.org

Franciscana dolphin

Lorenzo von Fersen,
Nuremberg zoo, YAQU PACHA e.V. Germany
Lorenzo@vonfersen.org

Lahille's dolphin

Eduardo Secchi
Instituto de Oceanografia, Universidade Federal do Rio Grande/FURG,
Rio Grande, RS, Brazil, 96203-900
edu.secchi@furg.br

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 nearly 70 members, including an increasing number of scientists and conservation organisations from 13 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*) – Health Assessment Project
Plans are in place for a project off the coast of Argentina in March 2022, to catch, tag, and release up to six franciscanas to learn about movement patterns relative to coastal fisheries. The project, sponsored by Disney Conservation Funds and conducted by the Chicago Zoological Society's Sarasota Dolphin Research Program and AquaMarina, will attempt to attach satellite-linked tags. 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.

Appendix 3. R**ecommendations from 2019 Yangtze Finless Porpoise symposium and workshop**

The Chinese government's **Action Plan for Saving the Yangtze Finless Porpoise (2016 – 2025)** (the Action Plan) states a series of goals to support increasing the size of the *ex situ* metapopulation and increasing the number of *ex situ* reserves. The *ex situ* metapopulation was established as an insurance population in the event of continuing decline of the wild population and as a potential action to prevent extinction. The current size of the *ex situ* metapopulation is estimated to be over 130 individuals collectively in all reserves. One of these, the Tian-e Zhou reserve, is believed to be approaching its carrying capacity. Another large reserve, the Hewang Miao oxbow, currently contains only ~20 individuals which is believed to be well below its carrying capacity. The symposium and workshop participants prepared a series of recommendations to support the goals of the Action Plan.

Recommendations for managing the *ex situ* metapopulation

Recommendation: Continue to establish additional reserves until the aggregate carrying capacity is sufficient to maintain an *ex situ* metapopulation that meets the goals of the Action Plan in number, demography, and genetic diversity.

Recommendation: Establish a panel of experts to determine the number, demography, and genetic diversity of the *ex situ* metapopulation needed to meet the goals of the Action Plan. Population viability analysis (PVA) and genetic modeling could be used to estimate the population size needed to maintain the specified genetic diversity of 90% over 100 years. While PVAs have been used for wild and *ex situ* populations of other animals separately, it may be possible to conduct a PVA that synthesizes the risks of extinction and loss of genetic diversity by including both the *in situ* and *ex situ* populations as components of a range-wide metapopulation.

Recommendation: Determine the carrying capacity of all existing reserves and calculate the ability of the metapopulation within the reserves to maintain a specified level of genetic diversity. Various unpublished methods have been used to estimate the carrying capacity of the Tian-e Zhou oxbow, which is approximately 89 individuals. These methods should be peer-reviewed and evaluated. Demographic parameters (recruitment and survival rates) should be calculated to provide additional insight into whether each reserve population is approaching carrying capacity.

Recommendation: Estimate the intrinsic rate of *ex situ* metapopulation growth for the reserves. The actual per-capita growth rate of porpoises within each reserve is currently difficult to estimate. The intrinsic rate of population growth could be calculated from estimates of age-specific birth and survival rates and may provide a better measure of how fast the *ex situ* metapopulation is growing as each reserve approaches its carrying capacity. If all individuals in all reserves were captured once every 5 years, and because the parentage of new individuals is determined with genetics, the data should be available to estimate birth and survival rates relatively precisely.

Recommendation: Develop a detailed plan to grow the *ex situ* metapopulation as rapidly as possible. This outcome may be best achieved by translocating individuals from one reserve that is approaching its carrying capacity to another 'under-populated 'reserve. Because population growth stops when a population reaches carrying capacity, the most rapid population growth may be achieved by moving animals out of a reserve before

its carrying capacity has been reached. An optimal level for the reserves is likely around 70-80% of carrying capacity, until the specified *ex situ* metapopulation size is reached (MacCracken et al. 2014).

Recommendation: Evaluate retrospective health data on wild porpoises and those in the reserves, together with fish in those areas, to assess disease prevalence in reserves and the river/lake system. Incorporate health assessments during capture events to characterize individual animal health and to understand the physiologic response to capture when porpoises are being moved between semi-natural reserves or are being moved from the river system into a reserve.