Chapter 22
Endangered Odontocetes and the Social Connection: Selected Examples of Species at Risk

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Abstract Despite centuries of whaling focused mostly on mysticete species, eight of the ten most endangered species of cetaceans in the world today are odontocetes. These species have certain features of their ecology in common, such as coastal habitats and usually ranges in developing countries, but also have some shared behavioral and social traits, such as strong susceptibility to entanglement in fishing nets and acoustic disturbance. I use four species of small cetaceans as case studies to examine the elements that have caused their predicaments. It is likely that the vaquita (*Phocoena sinus*) will soon become the second species of cetacean to go extinct in modern times, and the Atlantic humpback dolphin (*Sousa teuszii*) appears to be the next most endangered species. Several other cetacean species are facing similar levels of risk—despite some having misleading status assessments. There is a need to learn from our past mistakes to provide better protection to those species at risk and thereby avoid future extinctions.

Keywords Cetaceans · Dolphins · Endangered species · Extinction · Management · Porpoises · Small cetaceans

22.1 Introduction[1]

Cetaceans have long been prized by people looking for a readily available source of food, oil, and a whole host of other products. Because they are large, they were particularly attractive subjects for human exploitation, but their relatively inaccessible habitats made them hard to hunt until the past several hundred years (Ellis 2018;

[1]This introduction is mostly paraphrased from Jefferson (2019).

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Reeves 2018a). Although there is evidence that prehistoric humans took advantage of fortuitous strandings of fresh whales or dolphins, most cetaceans were safe from large-scale human exploitation until relatively recently (see Moore et al. 2018).

The first known large-scale hunting of whales was by the Basques (who lived in what is presently part of northern Spain), starting in the first millennium AD. They mainly targeted the North Atlantic right whale (*Eubalaena glacialis*) and were so effective in killing such numbers that the species' recovery is still in doubt (Ellis 2018; Kraus 2018). Norse and Icelandic whalers also hunted in the North Atlantic, and the Japanese began their culture of whale hunting in the 1600s (Kasuya 2018). In the 1700s, the "Yankee whaling" era began, focusing largely on sperm whales (*Physeter macrocephalus*), and this led to the United States becoming a major player in the commercial whaling game (Townsend 1935; Ellis 2018). In the late 1800s, development of steam-powered vessels and the exploding harpoon ushered in the modern era of commercial whaling (Brownell et al. 2018; Clapham and Baker 2018). Fast-swimming species, such as the rorquals (blue, fin, sei, Bryde's, Omura's, and minke whales, *Balaenoptera* species), were now within the realm of commercial whalers. It did not take long for them to decimate multiple species, starting with the largest and working their way down the list. This often extended to the point of "commercial extinction," which is defined as the stage at which it is no longer financially viable to continue the hunt.

However, the public perception that all large whales are endangered is not correct. Most large whales are no longer commercially hunted, and many are recovering from past exploitation—major exceptions being the North Atlantic and North Pacific right whale (*E. japonica)* species (Kraus 2018). Most of the truly serious conservation problems now lie with several of the smaller cetacean species and subspecies (Brownell et al. 1989; Reeves et al. 2003). The vaquita (*Phocoena sinus*), Indus susu (*Platanista minor*)[2], North Island Hector's dolphin (*Cephalorhynchus hectori maui*), Atlantic humpback dolphin (*Sousa teuszii*), and Taiwanese white dolphin (*Sousa chinensis taiwanensis*) are among those in worst shape.

In recent decades, direct killing of whales and dolphins has become less significant, and the indirect deaths of small cetaceans (especially dolphins and porpoises) have increased (Jefferson and Curry 1994; Reeves et al. 2013a, b; Northridge 2018a; Reeves 2018b). More cetaceans now die incidentally in fishing nets each year than from any other threat, including whale and dolphin hunting. Other major threats include habitat degradation, environmental contamination, climate change, noise pollution (including from naval sonar and seismic surveys), and even live captures for oceanaria displays and research (Evans 2018; Northridge 2018b; Reijnders et al. 2018; Southall 2018). Despite a number of populations of cetaceans in specific regions having been wiped out by humans (e.g., the Atlantic gray whale by commercial whaling), it is only recently that an entire cetacean species (see below) has

[2]This geographic form is currently recognized as a subspecies, *Platanista gangetica minor,* but there is strong evidence for its species-level distinctiveness (Braulik et al. 2015), and I expect it to be split out some time soon.

gone extinct at the hands of humans. Unfortunately, several other species are now on the verge of that very fate.

The baiji (*Lipotes vexillifer*) was assessed to be probably extinct after an extensive survey of their entire known range in 2006 resulted in no sightings or acoustic detections (Turvey et al. 2007). The baiji was found only in the Yangtze River (and some connected lakes) in China. Besides incidental deaths in fishing gear and problems of severe pollution, baiji suffered from overall habitat loss and degradation, due to rapid modification of the river for human use, this done with little or no concern for impacts on its original inhabitants (Turvey 2008, 2010). The Chinese government largely ignored calls of scientists and conservationists and thus allowed their only endemic cetacean species to go extinct. They must bear the primary responsibility for this environmental catastrophe.

Twenty years ago, Perrin (1999) provided an insightful summary of small cetaceans at risk of extinction. He pointed out the special problems that make many small cetaceans highly susceptible to extinction risk: (1) ease of capture, (2) vulnerable habitats, (3) development of new markets, (4) difficulties of monitoring and regulation, and (5) lack of international means of management. Since that time, one species that he reviewed has become extinct (the baiji), and a second one (the vaquita) is very close. It is hoped that the current review, which in many ways is an extension of Perrin (1999), will further help to clarify views and promote effective plans for preventing future extinctions among odontocetes.

22.2 The Most Endangered: What Puts Them at Risk?

The five factors that Perrin (1999) highlighted are important issues in what makes a species prone to extinction. Internationally, the IUCN Red List (http://www.iucnredlist.org/) reviews information related to species status and provides an empirical assessment of extinction risk, based on a set of predetermined criteria, many of which are quantitative. The Red List categories are (from least at risk to most):

Least Concern (LC)
Near Threatened (NT)
Vulnerable (VU)
Endangered (EN)
Critically Endangered (CR)
Extinct in the Wild (EW)
Extinct (EX)

Species in the categories of VU, EN, and CR are considered to be threatened. Species for which there is not enough information to place them into one of the above categories are listed as Data Deficient (DD).

Although the IUCN Red List designations—as well as national endangered species listings that are produced by many countries—are helpful in determining which species are most at risk of extinction, listings can be misleading (see Merrick

et al. 2018). There are political and technical considerations that can mask a species' true potential for extinction. Examples of this are the sperm whale (*Physeter macrocephalus*), which is globally distributed, with a population of at least hundreds of thousands, and for which the main threat (commercial whaling) has largely been removed. Yet this species is listed on the Red List as Vulnerable and on the US Endangered Species List as Endangered. But most biologists agree that sperm whales are in no immediate danger of extinction. At the opposite end of the spectrum are species such as the Chilean dolphin (*Cephalorhynchus eutropia*), which is found in a small range in South America, numbers at most in the low thousands, and is facing continuing (and very possibly escalating) threats to its survival. However, the species is listed on the Red List at Near Threatened, and is not even listed on the US Endangered Species List.

Although there are bound to be disagreements, I generated a list of what I consider the ten most endangered cetacean species on Earth (Table 22.1). For this review, I attempted to consider factors such as how much is known about the species, whether there is at least one area of the range where the species is quite "safe," how much potential there is for ex situ conservation methods, the attention paid to the species by NGOs, and what the political and management-related situations are within their range countries. Eight of the ten species are odontocetes (Table 22.1).

To my thinking the Atlantic humpback dolphin is at higher risk of extinction than the North Atlantic right whale, despite the former species having a population that may be almost one order of magnitude higher. But, there are almost no effective management or conservation measures in place in any of the range countries for the Atlantic humpback dolphin, and no major NGOs are focusing effort on this species at present. Some will disagree with my decision to put *S. teuszii* above the right whales (a few perhaps quite strongly), but I attempted to minimize political and personal biases.

22.3 Selected Species at Risk

Among the eight species of odontocetes that have the dubious distinction of having made my top ten most endangered list (Table 22.1), I discuss four of them in detail here; I hope these examples demonstrate the varied influences of the wide range of factors that make all of them particularly vulnerable to extinction.

*22.3.1 Vaquita (*Phocoena sinus*): Critically Endangered*

The vaquita (Fig. 22.1) is number one on the most endangered cetacean species list. It has long been listed as Critically Endangered on the IUCN Red List (Rojas-Bracho and Taylor 2017), one of only two cetacean species in this most threatened category. This porpoise has probably been declining in numbers since before it was

Table 22.1 The ten most endangered cetacean species

Rank	Common name	Scientific name	IUCN status	Population size	Trend	Population fragmented	Management/ Conservation	Threats	References
1	Vaquita	*Phocoena sinus*	CR	<20	↓	No	Yes	Continuing	Rojas-Bracho and Taylor (2017)
2	Atlantic humpback dolphin	*Sousa teuszii*	CR	<3000?	↓	Yes	No	Continuing	Collins et al. (2017)
3	North Atlantic right whale	*Eubalaena glacialis*	EN	300–400	↓?	No	Yes	New	Reilly et al. (2012)
4	North Pacific right whale	*Eubalaena japonica*	EN	ca. 500	?	No	Yes	New?	Reilly et al. (2008)
5	Indus river dolphin	*Platanista minor*[a]	EN	1200–1800	?	Yes	Yes	Continuing	Braulik and Smith (2017)
6	Ganges river dolphin	*Platanista gangetica*[a]	EN	<4000	↓?	Yes	Yes	Continuing	Braulik and Smith (2017)
7	Chilean dolphin	*Cephalorhynchus eutropia*	NT	Low 1000s	↓	Yes?	Some	Continuing	Heinrich and Reeves (2017)
8	Irrawaddy dolphin	*Orcaella brevirostris*	EN	<10,000?	↓	Yes	Some	Continuing	Minton et al. (2017)
9	Indian Ocean humpback dolphin	*Sousa plumbea*	EN	Low 10,000s	↓	Yes	Some	Continuing	Braulik et al. (2017)
10	Hector's dolphin	*Cephalorhynchus hectori*	EN	<7400	↓	Yes	Yes	Continuing	Reeves et al. (2013a, b)

[a]Indus and Ganges river dolphins are currently classified by IUCN as a single species, but will likely be split soon

Fig. 22.1 A vaquita, *Phocoena sinus*, mother and calf surfacing in the northern Gulf of California, Mexico. The vaquita is the most endangered marine mammal species in the world, with <30 individuals left on the planet. Photo by the author

"discovered" by science in 1958 (Norris and McFarland 1958), and it is now decreasing at a rate of at least 50%/year (CIRVA 2018). The entire population was estimated to be approximately 30 individuals in November 2016 (Thomas et al. 2017), and the current number may be in the single digits by the time this paper is published in 2019. It has at most a year or two left, unless the threat of illegal gillnet fishing is removed or dramatically reduced.

The early history of vaquita conservation actions was reviewed by Perrin (1999). Vaquitas have been threatened by a series of gillnet fisheries within their small range in the northern Gulf of California, Mexico (Rojas-Bracho and Reeves 2013). Conservation efforts are largely through a series of recommendations made by CIRVA (known in English as the International Committee for the Recovery of the Vaquita), a recovery team composed of government, academic, and NGO scientists. At first, the relevant fisheries were legal, though poorly monitored and managed, and they caused the vaquita's initial decline to about 100 individuals by 2014 (CIRVA 2014). Since 2015, a gillnet ban has been in place within the vaquita's range, and now most gillnet fishing in the vaquita's range is illegal, but it has continued, and probably even increased, due to the Chinese demand for swim bladders from a large fish (the

totoaba, *Totoaba macdonaldi*), which shares much of its range with the vaquita and becomes entangled along with vaquitas (Robles et al. 1987).

The gillnet ban followed a plan by the Mexican government to eliminate the gillnet threat through voluntary means (buyouts and "rent-outs") to reduce fishing gear causing vaquita mortality (Rojas-Bracho and Reeves 2013). This did not work, and a more stringent gillnet ban was then seen to provide renewed hope, but also was ineffective. A desperate program to capture several of the remaining vaquitas and remove them from the dangers of life at sea (called VaquitaCPR) was attempted in late 2017 (CIRVA 2017a, b). After two individuals were captured, both showing signs of major stress, and the second animal died in human care, this effort was canceled (CIRVA 2018). There is now little chance that the vaquita can be saved. It will take an unlikely radical change that results in quick elimination of the demand for totoaba bladders or a massive increase in the efficiency of fishery enforcement efforts through the donation of tens/hundreds of millions of dollars from a rich donor. Most people involved are not giving up hope, but there is also the realization that the clock has nearly run out (Thomas et al. 2017).

The vaquita situation demonstrates the tragic case of a species that occurs only within an area where conservation efforts (necessarily expensive and disruptive to some human activities) are viewed by much of the local population as in conflict with the welfare of people (see Cantu-Guzman et al. (2015) for a review of Mexico's history of vaquita 'mismanagement' efforts). The "its us or them" argument, when made in a situation like this, although not necessarily valid, is often effective in hampering or slowing conservation efforts by those who oppose them.

22.3.2 *Atlantic Humpback Dolphin (***Sousa teuszii***): Critically Endangered*

The Atlantic humpback dolphin (Fig. 22.2), an obligate shallow-water species of West Africa, is listed as Critically Endangered on the IUCN Red List, largely based on inferred evidence of a decline in population size over the past three generations (about 75 years, Collins et al. 2017). Only the vaquita, with less than 30 individuals remaining, shares that dire listing among cetaceans. Yet, the Atlantic humpback dolphin was not even viewed as in great danger of extinction until recently. It had traditionally been in one of the "data-poor" categories (data deficient or insufficiently known). It was listed as Vulnerable (the least severe of the threatened categories) when previously assessed in 2012, and it was not until its reassessment in 2015 that it was recommended for a higher level of extinction risk (Critically Endangered, Collins 2015). There have been some recent calls for attention to the plight of this species (Van Waerebeek and Jefferson 2004; Weir et al. 2011), but there has been no new concerted action, with no recovery team or recovery plan in place.

Part of the reason for little or no action on Atlantic humpback dolphins is that the species ranks among the least known of all small cetaceans, and even its taxonomic

Fig. 22.2 An Atlantic humpback dolphin, *Sousa teuszii*, breaks the surface near shore off Angola, West Africa. Although the population biology of this species is very poorly known, there is little doubt that it is seriously threatened by human activities and is in danger of extinction in the next decade or two. Photo by C. Weir/Ketos Ecology

status as a distinct species has been uncertain until recently (see Jefferson and Van Waerebeek 2004; Jefferson and Rosenbaum 2014). There are likely fewer than 3000 of these animals remaining, and the separate populations appear to be small and declining (Collins et al. 2017). There is apparent isolation of many populations, and much of this may have been caused by human impacts resulting in severe fragmentation (e.g., Van Waerebeek et al. 2004). However, it should be noted that this species has been virtually unstudied in most of its range, many of the conclusions about its status are based on old or incomplete data, and its current IUCN status makes liberal use of inference and assumption.

The species faces multiple threats, including fishery bycatch; directed killing (and use in the "marine bush meat" trade); prey reduction from overfishing; coastal development and associated habitat loss, degradation, and disturbance; and environmental contamination (Collins et al. 2017). Fishery impacts (both direct and indirect) are especially concerning and probably are the major factors causing the species to decline. With the exception of the creation of some marine protected areas (most of which are ecosystem-oriented, without much specific focus on dolphins), conservation measures designed to help the species are nearly nonexistent. Most or all of the countries in the species' range are poor, with a shortage of available sources of protein for humans, and the political situations in many of them are unstable. Even basic assessment needs are unmet, such as population structure and monitoring, and specifics on exact range. Where there has been work, it is quite recent and not well

funded (see Collins 2015; Collins et al. 2017). Because of fragmentation and population declines, it is almost certain that genetic diversity of the species has declined, although empirical data are lacking.

Conservation measures that are effective in stopping and reversing population declines will have to be bold and will need to bridge international borders (e.g., there are 19 countries within the species' moderate ribbon-like range of <10,000 linear km, although only 11–12 of these currently have known records—see Collins 2015; Weir and Collins 2015). Extinction risk is considered to be very real for this species in the next decade or two (Collins et al. 2017). There is a very real need for robust, quantitative population assessments in major portions of its range (such as that recently undertaken in Guinea by Weir 2015), and presently conservation action to benefit the species is virtually nonexistent. For these reasons, I consider the Atlantic humpback dolphin to be the second-most endangered cetacean species on the planet, after the vaquita.

22.3.3 *Indus River Dolphin (*Platanista minor*): Endangered (Under* P. gangetica*)*

The Indus River dolphin (Fig. 22.3) is currently recognized as a subspecies of the South Asian river dolphin (*Platanista gangetica*—classified by IUCN as Endangered—Braulik and Smith 2017), though it has vacillated several times in the past few hundred years between being viewed as a distinct species and a rank somewhere below the species level (Braulik et al. 2015). Recent molecular and morphometric work (primarily by G. Braulik and her colleagues) has shown strong evidence from multiple markers of species-level distinctness from the form in the Ganges/Brahmaputra/Meghna and Karnaphuli/Sangu river systems, and I here tentatively recognize the Indus form as a full species (*Platanista minor*), in anticipation of an impending split by the Society for Marine Mammalogy's Taxonomy Committee.

The Indus "species" occurs only in the lower portions of the Indus River system of Pakistan and India (Reeves and Brownell 1989). This group has been fragmented by a series of barrages, built primarily to divert water for agricultural irrigation, into 17 relatively distinct segments, essentially making it a meta-population. Of these, at least ten groupings have already been extirpated, and only six to seven still contain dolphins, though most individuals are found in just three of these (Braulik and Smith 2017). Overall, there has been a nearly 80% reduction in the size of the range of this species since the 1870s (Anderson 1879; Reeves et al. 1991). Abundance and density decrease as one moves upstream, away from the mouth of the river.

The major threat to the Indus River dolphin is severe fragmentation caused by the creation of barrages (Reeves and Brownell 1989; Braulik 2012), as dolphin movement through the barrage gates is almost impossible. Another serious threat is water pollution, from industrial wastes, agricultural (including DDT and other pesticides) effluent, and poorly treated human sewage. Though largely unstudied, impacts of

Fig. 22.3 An Indus River dolphin (bhulan), *Platanista* sp.; mother and calf swim next to a ferry boat in the Beas River of India. It is likely that the Indus form is distinct from the Ganges form at the species level, and therefore the bhulan moves up the list of most endangered cetacean species. Photo by H. Aisha, courtesy of G. Braulik

massive pollution on these animals must be significant. Bycatch in fishing gear is another significant problem (Braulik and Smith 2017). Despite the fact that much fishing occurs in side channels of the river (where dolphins are less frequently found), incidental kills are still likely unsustainable. Between 1993 and 2012, at least 95 dolphins were killed in fishing gear in the main sections of the river (Waqas et al. 2012). Finally, hunting was a significant threat in the past, but since the early 1970s, it has been largely curbed (Pilleri and Zbinden 1973/74).

The Indus River dolphin numbers fewer than 2000 individuals. Four surveys of their range between 2001 and 2017 resulted in counts of 1200–1800 individuals (Braulik 2006; Braulik et al. 2012a, b; Noureen 2013). However, there is some good news. Although overall trends in the entire population are not known, there is good evidence of an increase in the size of the subpopulation between Guddu and Sukkur barrages. The best evidence suggests a 5.65% annual increase in size of this subpopulation since the 1970s, though methodological differences may explain some portion of this (Braulik et al. 2012a, b). Although its future is by no means assured, the ability of this subpopulation to increase in numbers in the face of multiple anthropogenic problems is somewhat encouraging.

Fig. 22.4 Two Chilean dolphins, *Cephalorhynchus eutropia*, cavort in the fjords of Chile. Much uncertainty surrounds the Chilean dolphin, as it has only recently been studied in a few locations. But there are concerns about heavy mortality and habitat issues, and the species is likely declining. Photo by S. Heinrich

*22.3.4 Chilean Dolphin (*Cephalorhynchus eutropia*): Near Threatened*

The Chilean dolphin (Fig. 22.4) is listed on the Red List as Near Threatened (since 2008—Heinrich and Reeves 2017), and before that was in one of the "data-poor" categories. It remains a poorly known species, with detailed studies only conducted in a handful of small areas within the species' range in Chile and Argentina (Goodall 1994; Heinrich 2006). The species is thought to number in the "low thousands," and there are currently no quantitative data on the decline rate (though it is assumed to be declining), resulting in the IUCN assessment not leading to one of the threatened categories (Heinrich and Reeves 2017). Although it may not be as rare as once thought, due to it shyness and evasive behavior, there is little doubt that the species is at risk. Dawson (2018) cautioned that the species numbers may only be in the hundreds and suggested "urgent consideration."

There are a number of threats to Chilean dolphins. These include hunting for food and crab bait, which was much more serious in the past (late 1900s) than it is thought to be at present (Lescrauwaet and Gibbons 1994). Fishery bycatch is a serious threat and probably affects the species throughout its range, with gillnets a particularly serious problem. The magnitude of the take is largely unknown. Negative effects of aquaculture farming (mostly for salmon and various invertebrates) have also been implicated, though impact levels are undetermined (Heinrich and Reeves 2017).

There has been little directed conservation or management work on Chilean dolphins (Viddi et al. 2016), and it seems likely to me that the species should qualify for one of the threatened categories (perhaps Endangered), but lack of quantitative data on population levels and decline rates has prevented it from being placed into the appropriate category. However, the situation here is not much different than for the Atlantic humpback dolphin (which similarly has virtually no data on population or trends, but for which inference has been used to move it into the Critically Endangered category), so it seems that a more precautionary approach using more liberal use of informed assumption and inference would place the Chilean dolphin into a category that more accurately reflects its extinction risk. I hope that will be done soon.

22.4 The Behavioral and Social Connections

There are several factors related to behavioral ecology of these threatened species, which make them especially vulnerable to human impacts. These are divided into two categories below: behavioral and social.

Behavioral Factors With the possible exception of the North Pacific right whale (for which the range/habitat is still poorly known), the most endangered species are characterized by coastal or inshore/riverine habitats, and those that are endemic to particularly small areas, such as the vaquita and Chilean dolphin, are obviously at even greater risk. Nearshore areas have dramatically increased levels of human activities and thus expose coastal and riverine species to elevated levels of anthropogenic threats. There is even a tendency for some species to be attracted to dangerous or noxious human activities. Examples are the dolphins that ride bow waves of ships and thus become exposed to capture by harpooning (though none of these are on my list) and Indo-Pacific humpback dolphins (*Sousa chinensis*) in Hong Kong, which at times are attracted to dredging activities, putting them at greater risk of being struck by equipment and of acoustic trauma (see Jefferson 2000). In fact, vulnerability to acoustic disturbance and injuries is an issue of particular concern for all odontocete cetaceans, which are sensitive to a wide range of acoustic frequencies and are dependent on their echolocation abilities to navigate, find food and mates, and avoid predators and other threats (Southall 2018).

Last but not least, susceptibility to fishing net entanglement is a major issue for these cetaceans (Northridge 2018a). All eight of the most endangered odontocetes, plus the North Atlantic right whale, have fishing gear entanglement as a major (if not, *the* major) threatening factor. In fact, for the North Atlantic right whale, this issue has now replaced whaling as the main cause of the species' decline.

Social Factors Odontocetes live in groups, and many species have strong and pervasive social bonds. The increased levels of social cohesion of many toothed whale species may help them deal with many external threats in their environment, but they can also be detrimental. This happens when entire cetacean schools perish if

intact herds can be driven ashore in drive fisheries (such as those that occur in Japan and the Faroe Islands—Kasuya 2018; Reeves 2018b) or when a single sick or injured individual leads the entire group into a mass stranding event (Odell et al. 1989). The very large school sizes of some species of dolphins and pilot whales (which can be in the hundreds or even thousands of individuals) only exacerbate the problem.

Finally, for odontocetes there is recent recognition that even survival and reproductive success may be influenced by social factors. This particular issue has been discussed by Wade et al. (2012), who argued that odontocetes are more vulnerable to exploitation than mysticetes, due to unique issues related to their social systems. Examples are the importance of ecological or cultural knowledge and the leadership or other specialized roles of certain individuals in social groups (see also Whitehead and Rendell 2015). This is an issue that requires greater consideration in dolphin, porpoise, and toothed whale management.

22.5 Conclusions and Some Lessons Learned

Some "endangered species lists" include species mainly for political or historical reasons, and their legal status listing may not be accurate. Thus, there is a difference between Endangered (the official status listing, with a capital E) and endangered (the true status of a species, with a lowercase e). For example, the sperm whale is listed as Vulnerable by the International Union for the Conservation of Nature (IUCN) and Endangered by the US Government, yet it is globally distributed, numbers at least hundreds of thousands, and many populations are quite healthy (Whitehead 2003). Thus, the sperm whale, while technically and legally an Endangered species, is not really endangered.

All species of small cetaceans that are in serious danger of extinction are coastal or inshore/riverine species. Despite the incidental kills of millions of pelagic dolphins of several species in offshore drift net and purse seine fisheries (Reeves et al. 2013a, b), none of the truly oceanic species are endangered. This should not surprise us, as the negative effects of human activities on seas and freshwater bodies of the world are much more intense close to land, where most of our activities occur and where the vast majority of people live. One overriding exception may be large-scale climate change, which could affect even deep ocean basins and the cetaceans living in them (Moore 2005).

The social and behavioral issues that have been identified as potential factors in how resilient or vulnerable odontocete species are to exploitation (and, by analogy, any kind of "removals" from populations) should be more fully considered in future assessments. In the past, most management of these species has focused on numbers of individuals removed by outright mortality (see Barlow 2018) and has not considered ages, sexes, or social roles that those individuals play in a cohesive functioning society. In light of evidence that cetacean culture relies on specialized roles of herd defense, alloparenting, assisted reproduction, and other aspects of tight-knit societies, this issue needs to be taken into consideration in future comprehensive management schemes.

There is no doubt that several cetacean species (and many other populations) are in danger of extinction in the next decade or two. That this is the case in a world of great human wealth and enormous technical achievement is a sad statement on our lack of concern for the natural environment. I hope this paper will help especially our new generations of scientists and environmental biologists to better appreciate the diversity and fragility of the world's odontocetes, to better understand which species are truly most at risk from our actions, and to inspire them to change their behavior and that of others and work toward the long-term preservation of these fascinating large-brained social mammals. The chair of the IUCN Cetacean Specialist Group, Randall R. Reeves, recently gave a sobering prediction: "Only with broad-scale, deeply felt changes in how we value and care for what remains of the world's natural variety and abundance can we hope to head off, or even just slow down, a cascade of marine mammal extinctions in the coming decades" (Reeves 2018a, p. 229). The baiji and the vaquita, as well as the rest of these endangered species, remind us that we need to listen and heed his warning and soon.

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