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Whalewatcher

Porpoises in Peril
The Vaquita and its Relatives

Vaquita - The little "desert porpoise," sometimes called the "Panda of the Sea"

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Dear ACS Member,

Cheryl McCormick
Executive Director, American Cetacean Society

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A Focus on the Porpoises

They're Elusive and Endangered

by Thomas Jefferson

The six species of porpoises (comprising the cetacean family Phocoenidae) are often overshadowed by their larger relatives, the marine dolphins (family Delphinidae). Dolphins occur everywhere in marine waters of the world, most species ride bow waves, and have showy behavior – often performing spectacular leaps. This group includes such well-known animals as the killer whale, dusky dolphin, spinner dolphin, and the ubiquitous bottlenose dolphin. Dolphin-watching tours in many parts of the world attract numerous tourists, and some people travel the world specifically to see them.

The porpoises, on the other hand, tend to remain in the shadows. They are universally small (less than 2.5 m long), they don't often leap out of the water, most species don't bow ride, and they are generally cryptic and hard to observe. Few, if any, cetacean-watching cruises target them. Phocoenids (as porpoises are known) only occur in specific parts of the world, and are absent throughout most of the tropics.

Dr. Jefferson documents rare sightings of the small porpoise so close to extinction in the northern Gulf of California. Less than 150 vaquitas are thought to be remaining. Taking the editorial helm of this Whalewatcher issue to gather current science, rare photos, and educational illustrations and bring them to you is just one of the many efforts Tom is coordinating to increase awareness and initiate action.
Photo © Thomas Jefferson

Gillnet fisheries threaten many populations of harbor porpoises, and one species – the vaquita – is in serious danger of extinction in the next year or two, due to entanglement in gillnets in the northern Gulf of California.

Until recently, most porpoise species were very poorly-known and there were not even decent photos of most species alive in the wild. This is beginning to change, and we now have good photos of all species in their natural habitat. We are finally learning something of the other species besides just the well-studied harbor porpoise.

Unfortunately, what we are learning is not very positive. It seems that all porpoise species have problems with fishing nets, in particular the passive fishing nets used in almost every corner of the world to catch a variety of fish and shrimp species – gillnets (driftnets and trammel nets are types of gillnets). Gillnet fisheries threaten many populations of harbor porpoises, and one species – the vaquita – is in serious danger of extinction in the next year or two, due to entanglement in gillnets in the northern Gulf of California.

The articles in this special issue cover four of the six species of porpoises in detail. The spectacled and Burmeister's porpoises are not represented by dedicated articles, not because of a bias against Southern Hemisphere species, but because not much is known about them, and there

is not much to say. They are, however, fully represented in the photo montage, illustration 'centerfold', and also in text boxes. I sincerely hope that, as our knowledge improves, we are able to cover them in detail in a future such publication.

You may notice that there is a very strong emphasis on the vaquita in this special issue, with three of six articles devoted to this species, and I offer no apology for this bias. The vaquita is Critically Endangered, with only an estimated 125-150 remaining. It is the smallest of the true porpoises, and is the only one that lives in warm waters of the eastern Pacific Ocean. It is found in a tiny area in the extreme northern Gulf of California, in Baja California, Mexico, just a few short hours drive south of the US/Mexico border.

In the last few decades, the small vaquita population has plummeted as gillnets set for fish and shrimp kill more porpoises than are born annually. These nearly-invisible gillnets trap vaquitas and they drown or suffocate. The very perilous situation of the vaquita has been recognized by the International Union for the Conservation of Nature (IUCN), International Whaling Commission, Mexican Government, and United States Government, among others.

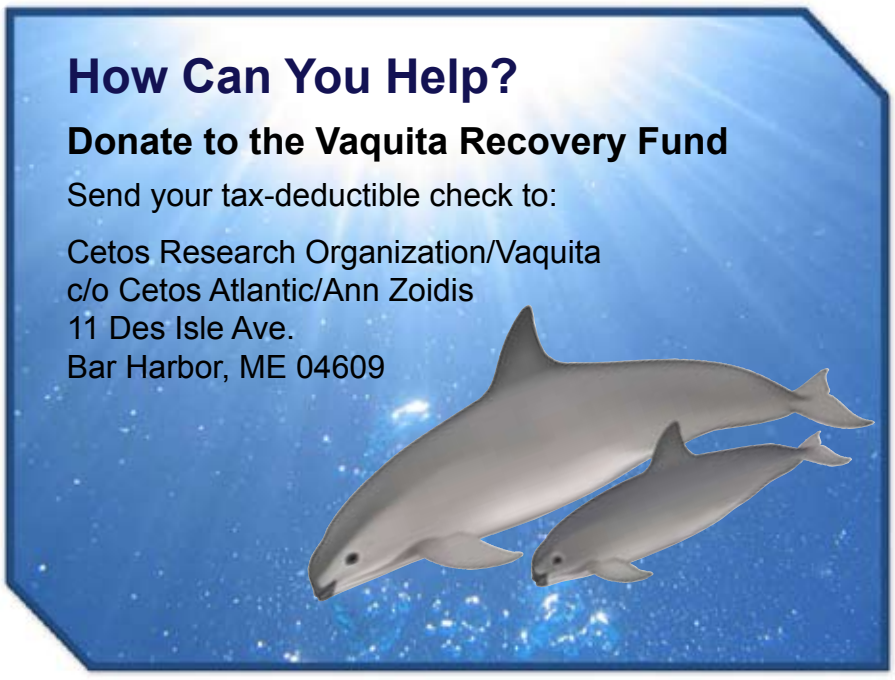
There is now a major effort underway to prevent the vaquita from going the way of the baiji (Yangtze River dolphin), which was declared probably extinct after an extensive 2006 survey of its entire habitat failed to find any survivors. The Mexican and US governments have joined forces to develop a vaquita acoustic monitoring program, and a gillnet buyout and alternative gear development program is underway. New research is revealing previously-unknown secrets about these elusive animals, which will serve to focus conservation and management programs. Two new websites, www.vivavaquita.org and www.vaquita.tv, provide details on these initiatives.

But the vaquita is not alone in facing threats from human activities. All six species of porpoises have problems with gillnets, and there is even a direct hunt for Dall's porpoise in Japan. Several populations of harbor, Dall's, finless, and Burmeister's porpoises are also facing local extinction. This issue contains a full-color photo gallery showing some of the first-ever high-quality photos of these species alive in the wild, and Uko Gorter has prepared a set of illustrations showing the variation and beauty of these amazing creatures that most people never see!

It is my desire that this special issue will raise awareness of porpoises in general, and of the vaquita in particular. I hope that it may help to stimulate some to get involved in porpoise conservation efforts. We are very quickly nearing the point of 'no return' for the vaquita, and a better effort must be made to solve the problems facing it – or it will surely follow the baiji into the annals of extinction.

I would like to take this opportunity to thank the many people and organizations that helped make this issue possible. First and foremost, the American Cetacean Society was enthusiastically receptive to the idea of dedicating an issue of the *Whalewatcher* to the neglected porpoises. I would also like to thank the private foundation (which prefers to remain anonymous) that has funded our education work and which funded the color printing of this issue. ACS Monterey Bay and Save the Whales have been active partners in our efforts to help the vaquita, and Tom Kieckhefer deserves special mention here. Mason Weinrich, Cheryl McCormick, and Kaye Reznick helped pave the way for this issue to move forward. And of course, I also thank all the authors and photographers whose work appears herein, and finally Uko Gorter, whose beautiful illustrations make up the centerspread of the issue.

So, enjoy this first-ever issue of *Whalewatcher* dedicated to the porpoise family. Remember to give our *phocoenid phriends* the respect they deserve, and *¡Viva la Vaquita!*



Why We NEED to Save the Vaquita

by Thomas Jefferson

Lately, you are probably hearing cries of "Save the Vaquita" or "¡*Viva la Vaquita!*"… But some people may ask the question: Why should we bother trying to save this little species of porpoise that most people will never see, especially when it involves disrupting the lives of so many people in Mexico? Let's examine this query and see what answers we can provide.

The baiji was known for decades as the world's most endangered cetacean species. Despite dozens of international meetings and workshops to discuss its conservation, the Chinese government never took the issue seriously. The baiji population continued to dwindle, and a 2006 expedition declared it "functionally extinct." This represents the first human-caused extinction of a cetacean species. Photo © Wang Ding.

We Need To Reverse the Precedent Set by the Baiji

For most of my career as a marine mammal biologist, the baiji (*Lipotes vexillifer*) was considered the most endangered marine mammal species in the world. Living only in the Yangtze River in China, this was one of only four species of river dolphins. Since at least the 1970s, it was recognized by marine mammalogists that the baiji was in trouble. Pollution, entanglement in fishing nets and lines, explosions and electricity used in fishing and river channel construction, and the myriad problems associated with having nearly 10% of the world's human population living in close proximity had taken their toll, and the baiji population was clearly dwindling.

In the 1980s and 1990s, the international community engaged itself in the plight of the baiji, and there were numerous meetings and workshops with experts on cetaceans and conservation biology from around the world. Green groups took up the call and began raising awareness. China even began brewing "Baiji Beer." Recommendations were made and a plan emerged to pluck the species from the brink of extinction. But being a species that occurred wholly in China, little could be done without the support of the Chinese Government. And while the PRC Government paid lip service to the need to save the baiji, ultimately most conservation recommendations were ignored and the baiji continued to decline. I became directly involved in the issue in 1996, as Co-director of the Ocean Park Conservation Foundation. But, by that time it was becoming quite clear to most of us close to the issue that the baiji was probably past the point of no return. The condition of the Yangtze River was so bad that it was hard to see how anything could survive in it. In 2006, a large-scale survey of the entire known range of the species failed to find a single shred of evidence that the species still existed. The researchers were forced to conclude that the baiji was "functionally extinct" (i.e., if any individuals were still alive, they were so rare as to no longer fulfill their role in the ecosystem). We had witnessed the first extinction of a cetacean species caused by human actions! This is a horrible precedent, and if we are not careful the same fate could await any number of cetacean species that currently are endangered.

The Vaquita is The Most Endangered Marine Mammal Species

There are many species of marine mammals that are currently vying for the position of "most endangered." The Japanese sea lion (*Zalophus japonicus* – considered by most to be

already extinct), North Atlantic and North Pacific right whales (*Eubalaena glacialis* and *E. japonica*), and Hector's dolphin (*Cephalorhynchus hectori*) are but a few examples of species facing a very uncertain future. And of course, there are many subspecies and populations of more numerous species that are small and nearing extirpation.

The vaquita (*Phocoena sinus*), however, with a tiny range of only about 4,000 km2, a miniscule population of about 125-150, and an apparently precipitous decline in numbers wins the unenviable "prize" of the world's most endangered marine mammal species (see the articles in this issue by Rojas-Bracho & Fueyo and by Taylor & Jaramillo for more details). But, unlike the baiji, the vaquita's habitat is quite clean and relatively healthy. All indications are that gillnet entanglement is the only threat that is endangering them. Experts agree that if we can just remove gillnets from the species's range, the vaquita population can be expected to recover and increase in numbers.

The Vaquita is Like No Other Species

There are only six species of true porpoises (cetacean family Phocoenidae). Most are inhabitants of cold waters far from the tropics. The vaquita is different. It occurs in waters of the northern Gulf of California, Mexico where summer water temperatures may exceed 34°C. True, the finless porpoise (genus *Neophocaena*) also inhabits very warm waters (e.g., tropical waters of the Indian Ocean and Southeast Asia), but the finless porpoise and vaquita are very different. While the finless porpoise has no dorsal fin (thus the name), the vaquita has the largest dorsal fin of any porpoise species. It is thought that this large dorsal fin (along with large flippers) may help the vaquita to deal with the massive temperature changes that occur in its habitat.

The harbor porpoise (*Phocoena phocoena*) of the Northern Hemisphere is the vaquita's closest geographic relative. Yet it is separated by a minimum swim of at least 2,500 km around the tip of the Baja Peninsula. The harbor porpoise is again very different from the vaquita, and even someone not very familiar with cetaceans can easily see the distinctions between the two.

Taxonomically, the closest living relative of the vaquita is the Burmeister's porpoise (*Phocoena spinipinnis*) of the South American coast. This species is separated from the vaquita by at least 6,000 km. While a common ancestor of these two species is thought to have crossed the equator during a past cooling period, the Burmeister's porpoise and vaquita are now distant cousins. They don't really look much alike – the Burmeister's having a small, banana-shaped dorsal fin (very different from the vaquita's large, dolphin-like appendage). The fact is the vaquita has no close relative, and if the single population dies out, there is nowhere

This photo of a vaquita mother and calf demonstrates two important points. First, vaquitas are still reproducing, and if we can only bring the number of porpoises killed well below that of the number born each year, then the species should recover. Second, a significant portion of the adult vaquita population appears to have distinctive markings on their backs and dorsal fins, which may allow them to be photo-identified in the long-term. Photo-ID can assist us with monitoring the status of the population. Photo © Thomas A. Jefferson

to provide individuals to repopulate its range. It will be gone forever….

Unknown Ecological Benefits?

We don't really know much about the vaquita's ecology and behavior. Exactly what role it plays in its ecosystem is still not understood. We do know that there are not many other cetaceans that occur in the range of the vaquita. The vaquita may very well be the dominant cetacean in the region (especially before its numbers started to be decimated by gillnets).

What effect the removal of this top predator will have on the fragile marine ecosystem of the upper Gulf of California can only be guessed.Will it cause a radical shift in species composition of its prey species, or set off a cascade of impacts on species that are linked to it in the food web? Let's hope we never have to find out.

Time is Running Out

We have maybe a year or two to turn the tide for the vaquita. And while some progress has been made (remember, we felt we had also made progress with the baiji), the vaquita still has a date with extinction. The gillnet buyout plan (see Rojas-Bracho & Fueyo's article) needs to be fully implemented immediately. The double whammy of H1N1 flu and the economic meltdown have each done their part to throw up roadblocks to vaquita conservation efforts in Mexico. All the while, gillnets continue to take their toll on vaquitas.

Not all the news is bad, though. It is commonly believed that the point of no return for the vaquita has not yet been reached. So, let us not waste any more time on considering whether we should try to save the vaquita. Let's all do our part to support the Mexican Government's plan to put the gillnet ban into place. Tell your friends and family members about the vaquita. Check the websites www.vivavaquita.org and www.vaquita.tv regularly to keep up on the latest and see what you can do to help. With the loss of the baiji, we now have one less species of cetacean than we did a decade ago. We failed the baiji. Let's all make a commitment to not let this happen again on our watch.

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Vaquitas face an uncertain future. However, if we can ensure a place for the vaquita in the ecology of the Upper Gulf of California, it will set a positive precedent that may help to reverse the negative one set by the recent extinction of the baiji in China's Yangtze River. Photo © Paula A.Olson

Thomas A. Jefferson is an independent biologist affiliated with several organizations. His main interests are the development of marine mammal identification aids, and investigating the systematics and population ecology of the poorly-known species of dolphins and porpoises. Most of his work has been related to conservation and management of marine mammals threatened by human activities. He has a soft spot in his heart for phocoenids, and has conducted extensive research on Dall's and finless porpoises and has had an interest in the vaquita since the mid-1980s. Tom is a member of the Cetacean Specialist Group of the International Union for the Conservation of Nature (IUCN) and has contributed to the development of the IUCN Red List assessments for marine mammals. He also serves on the Taxonomy Committee of the Society for Marine Mammalogy.

Helping the Vaquita to Recover

Conservation and Management Actions By Mexico

by Lorenzo Rojas-Bracho and Luis Fueyo

Vaquitas (*Phocoena sinus*) have been caught in gillnets for many decades. This mortality has placed this unique species of porpoise at the brink of extinction. From the time it was described in 1958 to the first minimal conservation actions, several decades passed, and the population declined. In 1994, Mexican authorities finally listed the vaquita as an endangered species.

Until the early 1990s there were disagreements as to what were the most significant risk factors for vaquita survival (by-catch, lack of flow of the Colorado River and pollution). This controversy hindered management actions. Some authorities still believe today that by-catch is not the main threat to the vaquita. Also in those years, there were disagreements on the vaquita's population size, distribution, and therefore population status and how other anthropogenic activities have affected them (e.g., reduced flow of the Colorado River, pollution). Let's take a look at how these issues have brought us to where we are today with vaquita conservation.

Conservation and Management: the Early Years

Ironically, one of the key management measures to benefit vaquita was not directed to its protection, but to prevent the overexploitation of totoaba (a large, valuable fish that later became endangered itself). This was the main commercial gillnet-fishery in the Upper Gulf of California that was closed in 1975.

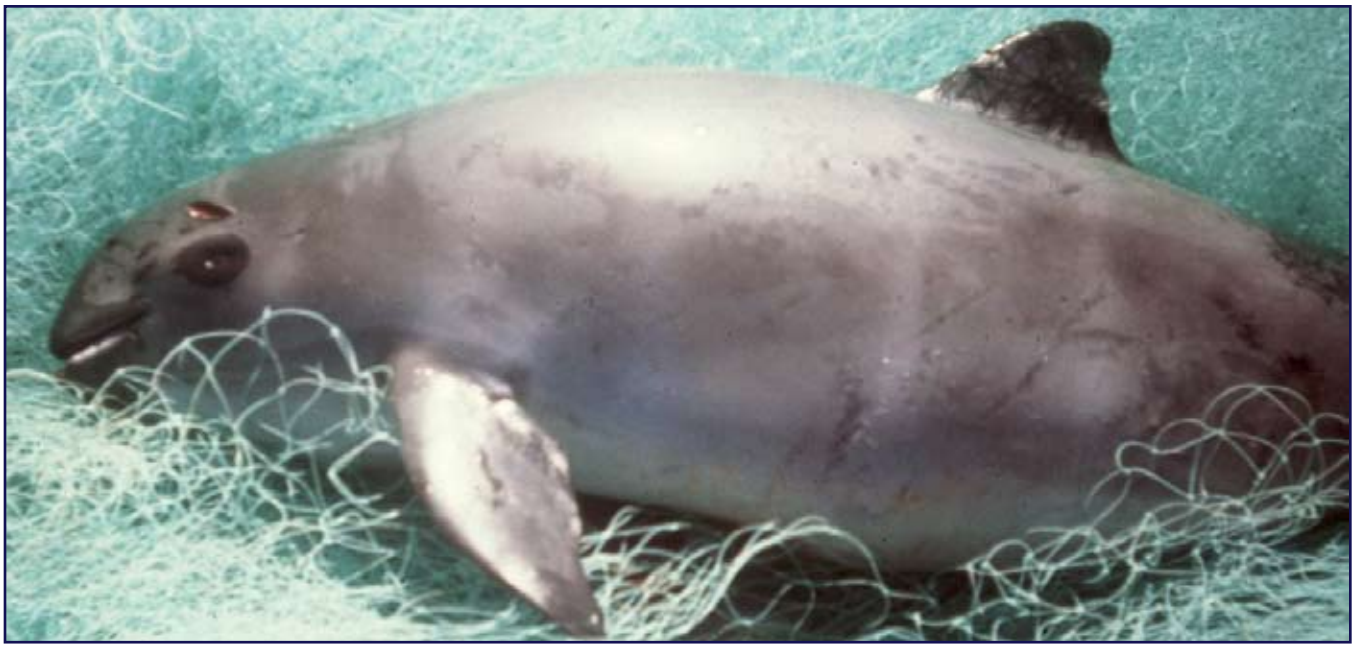
From approximately the mid-1930s to the mid-1970s, this was also the most important fishery in terms of vaquita by-catch. Though there are no by-catch records from those years, the impact of the totoaba fishery can be visualized using data from an experimental fishery, which operated from 1983-93, to estimate by-catch rate. The estimated by-catch rate in this experimental fishery was 58 vaquitas/year – a significantly high number. So the banning of the totoaba fishery turned to be an important step for vaquita survival.

Gillnet panga retrieving a net in the northern Gulf of California. Photo © Thomas Jefferson

In 1993 the decree creating the Biosphere Reserve of the Upper Gulf of California and Colorado River Delta was published. Even though the Reserve has fallen short of its potential as an instrument for vaquita conservation it has given an important legal framework to push other specific actions.

Current Actions: The Recovery Team and the Priority Species Recovery Program

Probably the most influential step for the recovery of the vaquita was the creation of the International Committee for the Recovery of the Vaquita (CIRVA). This gave solid scientific support to the conservation actions. It was established in 1996 to develop a recovery plan based on the best scientific evidence. It was expected from the outset that the plan would be a step-by-step manual for use by current and future agencies responsible for vaquita conservation. Importantly, the committee was expected to consider not only scientific issues, but also socio-economic aspects. CIRVA meets on an *ad hoc* basis. Critical to the future



Vaquita caught in a gillnet fishery in the northern Gulf of California. Photo © O. Vidal and C. Navarro/Projecto Vaquita

recovery was that CIRVA conducted analyses of risk factors affecting the vaquita and concluded in its first meeting that incidental mortality in gillnets represents the greatest immediate threat to the survival of the species, and that vaquita abundance is likely in the hundreds (probably the low hundreds).

At its second meeting, CIRVA reviewed the results of a new vaquita abundance estimate and agreed that 567 was the best available estimate of vaquita population size. After this, CIRVA recommended that by-catch of vaquitas must be reduced to zero as soon as possible, that gillnets and trawlers should be banned from the Biosphere Reserve, that research should start immediately to develop alternative fishing techniques to replace gillnets, and that the international community should be invited to join the Government of Mexico and provide assistance to implement the conservation measures.

At its most recent meeting in 2004, CIRVA concluded that important progress has been made on most of the ten recommendations from the second meeting. However, two of the more critical ones related to the ban on gillnets have lagged behind. Considering this, the Committee recommended that immediate action should be taken to prevent any net fishing within the core area of vaquita distribution. In noting that only a portion of the core area was contained within the Biosphere Reserve, CIRVA recommended extending the net ban to a sizeable area outside the Reserve. In 2005 the Refuge Area for the Protection of Vaquita was declared. However, keeping the refuge as a zone free of fishing-nets took longer.

The central goal is to eliminate vaquita by-catch. Given that fishing is one of the most important economic activities in the Upper Gulf of California, PACE-Vaquita has designed mechanisms to remove the fishing gear that has threatened the vaquita....

PACE and the Gillnet Buyout Plan

Decisive steps by the Government to invest resources to protect the vaquita finally came in 2007. That year, Mexico's President announced the Conservation Program for Endangered Species (PROCER), which required specific Species Conservation Action Programs (PACE) for selected species. The vaquita topped the list of only five species. PACE-Vaquita, the first of its kind to be presented, is Mexico's conservation policy strategy to put into practice CIRVA's recommendations. An intense effort by the Mexican Government is taking place and this includes a coordinated program by the Ministry of Environment and that responsible for fisheries (SAGARPA) and all stakeholders, including fishermen (artisanal and industrial), NGOs, and NAFTA's Commission for Environmental Cooperation (CEC).

The fundamental objective of PACE-Vaquita is to conserve and recover the vaquita population. The central goal is to eliminate vaquita by-catch. Given that fishing is one of the

most-important economic activities in the Upper Gulf of California, PACE-Vaquita has designed mechanisms to remove the fishing gear that has threatened the vaquita by:

(1) Enforcing the existing bans on gillnet fishing in the Biosphere Reserve and Refuge Area, and possibly expanding the ban to a larger protected area;

(2) Encouraging alternative methods of fishing that do not catch vaquitas; and

(3) Providing economic compensation to fishermen, including a buyout plan and assistance with starting alternative businesses.

The buyout program is voluntary and invites the artisanal fishing community to engage in activities other than fishing (with government support). Those wishing to continue fishing have to be involved in an alternative fishing gear program. Through this program, the Government provides financial and technical resources to the fishing community to find new fishing methods that do not harm the vaquita. It regulates the granting of fishing permits and monitors license holders, their boats, fishing gear and authorized landing sites.

Thus, the program seeks the reduction of fishing effort in two ways: the removal of fishing boats for those who have opted to receive government support for other ventures, and the removal of illegal boats that have operated for decades due to an ineffective fisheries management process. In addition to the retirement programs for fisheries and technological reconversion, the Vaquita Refuge that covers 80% of vaquita sightings has been designated a net-free zone. Though the Refuge dimensions and form did not follow CIRVA's recommendations, it has given protection to an important part of the population through the Government's designated mechanism to compensate fishermen to stop fishing in this important core area of vaquita distribution, as well with an efficient enforcement and surveillance program.

So what are the results so far with regard to the implementation of PACE-Vaquita? With the investments made in 2008 the following results have been achieved:

(1) The Vaquita Refuge is essentially free of entangling and gillnets and shrimp trawlers;

(2) 230 artisanal fishing boats have withdrawn from fishing activities; and

(3) 105 artisanal fishing boats are participating in the fishing gear replacement program.

For 2009, SEMARNAT spent 65 million pesos (US$5 million) to expand and reinforce the actions taken previously. There is support for those fishermen who wish to participate in the testing of the prototype fishing gear that will be substituted for gill and entangling nets. With this support, 602 fewer artisanal boats will be using nets that kill vaquitas. Enforcement is an important component of the recovery program. PROFEPA, the environmental watchdog of SEMARNAT, with the support of the Navy, mounted a huge operation that involves 48 people, eight boats, one interceptor craft, two motherships and one helicopter. During this fishing season, aircraft overflights have been conducted to determine the actual fishing effort applied in the biosphere reserve.

Conclusions

The Mexican Government's current effort to save the vaquita is the largest conservation program ever in Mexico. The policy of the government's Ministry of the Environment, as expressed in PACE-Vaquita, is the development of an appropriate policy to avoid further decline and eventual extinction of the vaquita. However, to achieve full success this will require eliminating vaquita by-catch completely. This is now clear to the Government. However, it has not yet been achieved, and the vaquita is still in danger. But SEMARNAT, even in this time of economic hardship, is keeping its promise to work to eliminate gillnets from all of the vaquita's range.

PROFEPA vessel patrolling to enforce fishing restrictions needed to save the vaquita. Photo © Thomas R. Kieckhefer.

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Lorenzo Rojas-Bracho is widely-recognized as the world's foremost authority on the vaquita. He is currently Coordinator of the National Marine Mammal Program, at the National Institute of Ecology, in Mexico. In the last several years, he has concentrated his attention on research and conservation actions to prevent the extinction of the vaquita. Among the conservation actions to recover the vaquita, he established and chairs the vaquita recovery team (International Committee for the Recovery of Vaquita/ Comité Internacional para la Recuperación de la Vaquita; CIRVA).

Luís Fueyo has a long, outstanding career in public service working for the management and conservation of marine natural resources. He was responsible for the assessment of pelagic fishery resources from 1983-1986 and Director of the Fisheries Research Center at Mazatlan, Sinaloa, from 1986-1989. In 1997 he transferred to PROFEPA as Director General of Inspection and Supervision of Fisheries and Marine Resources. In 2001 he was appointed PROFEPA's Director General of Inspection and Monitoring of Marine and Coastal Ecosystems. In 2007 the Secretary of Environment and Natural Resources appointed him National Coordinator of the Vaquita Program for the federal government.

All In The Family - Editor's Note on Burmeister's Porpoise (*Phocoena spinipinnis*)

The closest living relative of the vaquita is the Burmeister's porpoise of South America. This small porpoise reaches a maximum size of about 2.0 m and 85 kg, although most adults are much smaller. It is characterized by an all-dark color pattern (except for some light patches on the belly) and a small, "banana-shaped" dorsal fin with a concave leading edge. It is found in a narrow coastal ribbon from Peru, south to the tip of Tierra del Fuego, and thence north to southern Brazil. Recent genetic evidence suggests that there is a major population division separating Peruvian porpoises from those in Chile and Argentina. Almost nothing is known of the behavior and ecology of Burmeister's porpoise, although major conservation problems are known to result from direct hunting and gillnet by-catch in Peruvian and Chilean waters. There are no estimates of abundance.

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Vaquitas on the Brink

Can We Save Mexico's Imperiled Porpoise?

by Armando Jaramillo-Legoretta and Barbara L. Taylor

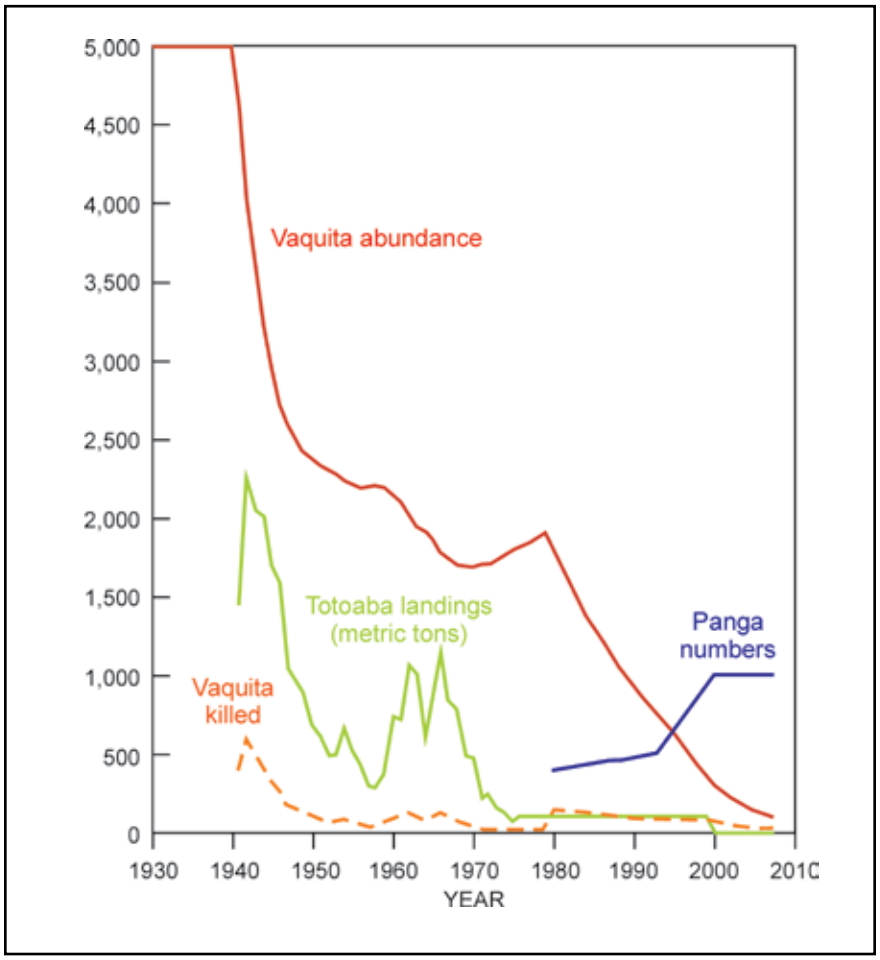
To answer the question posed in the title: Yes, we can. We know the main threat, so we just need to take action. Steps necessary to save the vaquita (*Phocoena sinus*) are being taken and could provide a critically important example that could apply to saving other coastal and riverine cetaceans from extinction.

The Vaquita's Status

The vaquita has a short history from the human perspective. The first specimens were carcasses collected in 1950 on a beach near San Felipe, the small fishing village closest to the vaquita habitat. Comparisons of their skulls indicated that the vaquita's closest living relative is the Burmeister's porpoise (*Phocoena spinipinnis*), found in South America (which was later corroborated with genetic analyses). Vaquitas are isolated from other porpoises in a very special habitat that supports many other species found only there (that are endemic).

Vaquitas live in the Upper Gulf of California, in an area roughly one-quarter the size of the city of Los Angeles. This small range makes them naturally vulnerable. Fishermen settled the region (San Felipe, Golfo de Santa Clara and Puerto Peñasco) in the early 1920s and concentrated on fishing for totoaba (*Totoaba macdonaldi)*, a very large, tasty and profitable fish that eventually became endangered itself. By 1940, vaquitas were already being accidentally killed in gillnets set for totoaba. This "by-catch" is considered by most scientists and conservationists to be the greatest threat to the survival of small cetaceans worldwide. Dr. Bernardo Villa, a pioneer of marine mammal research in Mexico, concluded that the vaquita was already endangered in the 1970s. By 1975 the fishery for totoaba was banned due to a drastic reduction in catches, but other gillnet fisheries emerged that continued catching vaquitas. Unfortunately, vaquitas die in nets of every mesh size, including the smallest nets used to catch shrimp, which brings in the majority of income today for most fishermen.

Based on a year of interviewing fishermen, Caterina D´Agrosa estimated that 78 vaquitas were killed in 1993. To know whether that was



The estimated history of vaquita abundance, together with the number of vaquitas killed and the fishing activities through time.

sustainable, we first needed to know how many vaquitas there were. A survey done in 1997 estimated that only 600 vaquitas remained. Killing 78 out of 600 vaquitas was a decline of 13% each year, and since porpoises can only increase by about 4% per year the number being killed was not sustainable. To make matters worse, the number of fishing boats using gillnets increased from about 500 in 1993 to around 1,000 in 2007. We used this information to estimate that only about 150 vaquitas remained in 2007, representing a 75% decline in only 10 years! Another model used fishery data to infer that vaquitas once numbered around 5,000, which means only 5-10% of the original vaquita population remains.

With such a small population, tiny distribution range, low rates of natural population growth and continuing kills in gillnets, the vaquita could become extinct in the very near future. Can the vaquita recover from such low numbers? We think so. There are examples of recovery from low numbers: the Guadalupe fur seal, the northern elephant seal, and the California population of sea otters. All these species or subspecies recovered from very small populations once humans stopped killing them. Removing gillnets from vaquita habitat will provide such protection, as there are currently no other significant threats to their survival. Although the lack of flow, and nutrients, from the Colorado River has been cited as a threat to the vaquita, none of the over 60 vaquitas examined after dying in gillnets appeared emaciated, something that would be expected if lack of food due to habitat alteration were a problem. Also, animals recently observed in the wild appear fat, and calves are regularly seen. High levels of primary productivity in the Upper Gulf, as shown by the amount of fishery catches, also indicate that this ecosystem can sustain a recovered vaquita population. A lack of prey is not responsible for the decline in vaquita population - gillnets are the problem.

A Plan to Monitor the Vaquita Population

Recognizing the urgency of the vaquita's plight, the Mexican Government has implemented a recovery plan by creating a Vaquita Refuge where no fishing is allowed, enforcing this protected area and reducing the number of boats permitted to use gillnets there (see article by Rojas-Bracho & Fueyo).

Saving the vaquita will be costly, so the government wants ongoing evidence of positive results to generate public support and maintain the vigilance needed to keep vaquita waters safe. Monitoring the vaquita is difficult because the area is remote, the animal is shy and its numbers are low. Vaquitas typically avoid motorized boats so that most fishermen claim to have never seen a live vaquita. We asked whether we could effectively monitor vaquita using traditional visual methods. The answer is no. Vaquitas are so hard to see and so rare that our estimates of numbers are not precise enough to determine, in a few years, whether they are recovering or continuing to decline. A 4% per year increase means that if we had 100 vaquitas this year we could expect on average only 104 next year. Estimates made from ship surveys cannot give the level of precision necessary to distinguish between 100 and 104. But, vaquitas locate their food and each other in the muddy productive waters of the Gulf by making high-frequency sonar clicks. Over the past 10 years vaquitas have been monitored from an anchored boat by detecting their clicks. Although these data were pivotal in demonstrating to the government that the vaquita was indeed declining at a high rate, this method is also not able to detect the small annual increases hoped for in a recovery.

To obtain the precision needed to detect recovery, we need much more and better data. Fortunately, researchers have developed autonomous acoustic detectors, which are sound recorders that are suspended in the water and anchored to the bottom. These instruments store sounds like those vaquitas produce for up to 5 months, which can be later analyzed to estimate abundance and movements of vaquitas.

In 2008, researchers from Mexico, the USA, United Kingdom, Japan, Canada, Germany, Switzerland and Australia collaborated to find the best method to monitor the vaquita. The trials tested two types of autonomous recorders and an acoustic array towed behind a sailboat that could "stealthily" survey for vaquitas. Although the sailboat survey worked well and located vaquitas outside the reserve, the researchers estimated it would take over 3,000 survey days each year to detect recovery in a five-year window. Clearly the sailboat could not be used as a primary monitoring tool. The science team also estimated that a network of 62 autonomous detectors called C-PODs could detect changes in vaquita numbers.

Inventor Nick Tregenza is holding the very first C-POD which was used in Vaquita Expedition 2008. Photo © G. Saad/WWF-Mexico.

This vaquita mother and calf, observed in October 2008, appear healthy and fat. There is no evidence from porpoises observed in the wild, nor from by-catches and strandings, that vaquitas are emaciated or having trouble finding nourishment. All indications are that gillnets are their only significant threat. Photo © Paula A. Olson.

Why devote so much effort and resources on monitoring when it is getting the gillnets out of the water that is needed to save the vaquita? We should remember the last baiji died alone while the world's eyes were focused on other matters (see article by Jefferson). Saving endangered species is a full-time job and will be for the foreseeable future. It is hard to maintain focus for long periods, but that is what is required to prevent the extinction of vaquita. Monitoring will not only accomplish the government's goal to reinforce tough management decisions with feedback on vaquita status but will also help maintain focus on this critically endangered porpoise.

The Mexican government has demonstrated the will and desire to save the vaquita, including spending significant resources during a severe world economic crisis. Recovery actions will promote new sustainable economic activities while developing sustainable fishing methods that will not kill vaquitas. The time to recover the vaquita to healthy population numbers will take many years and its future depends on finding permanent ways for local people to make a decent living without using gillnets. Death of coastal porpoise and dolphin species in gillnets is a global problem destined to rob future generations of many species and populations of cetaceans unless an economic replacement for gillnets is found. If Mexico succeeds, not only will future generations enjoy this unique animal living in a healthy sustainably-fished environment, but Mexico and the international community will be able to hold up the first example of saving a species from local small-type fisheries. Marine mammal biologists, conservation groups, economists and governmental agencies (including enforcement) must work together to solve this problem, not only for the vaquita but for all coastal species.

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Dr. Armando Jaramillo is a marine biologist for the University of Baja California Sur and he has a Doctorate in coastal oceanography from the University of Baja California. He has 22 years experience studying marine mammals, mainly on aspects of population ecology and dynamics. He has been researching the vaquita population for the last 13 years and is in charge of the project to monitor the species with acoustic methods.

Dr. Barbara L.Taylor leads the marine mammal genetics group at the Southwest Fisheries Science Center, NOAA Fisheries. She has 30 years of marine mammal experience and specializes in assessing risk for endangered species. She has worked on the vaquita for 13 years, including co-leading Expedición Vaquita 2008.

Surviving The Nets

Current Status of Harbor Porpoise Populations

A harbor porpoise surfaces in the Bay of Fundy, Canada. Photo © Ari Friedlaender.

by Andrew J. Read

The harbor porpoise (*Phocoena phocoena*) is abundant throughout most of its range in coastal waters of the temperate Northern Hemisphere. The International Union for Conservation of Nature and Natural Resources (IUCN; http://www.iucnredlist.org/) considers the harbor porpoise to be of least conservation concern due to its abundance and extensive range at the species level. Nevertheless, some populations of harbor porpoises are at significant risk due to human activities, primarily by-catch in gillnet fisheries, the same risk factor threatening the vaquita.

Marine mammal scientists currently recognize four geographically-isolated sub-species of harbor porpoises (http://www.marinemammalscience.org/) in the North Atlantic, Black Sea, Eastern Pacific and Western Pacific. Multiple populations exist within each of these sub-species except, perhaps, for the Black Sea. Most scientists now agree that conservation and management activities should be focused at the level of the population, so definition of population units is a critical step to assessing conservation status. Populations can be defined using genetic markers, morphology, studies of individual movements or by identifying geographical features that could limit the movement of porpoises. This is an extremely active area of research and scientists are currently working to define population units and refine our understanding of this structure.

North Atlantic

Harbor porpoises range across coastal waters of the Atlantic from Senegal to North Carolina. At least fourteen populations of harbor porpoises have been described in the North Atlantic. In some areas, particularly in the North Sea, the population structure is complex and poorly understood. Populations may mix seasonally, further complicating assessment of their status. By-catches occur frequently throughout much of the North Atlantic; conservation measures, including the use of acoustic alarms, or pingers, have been implemented in some U.S. and European fisheries to reduce these by-catches to sustainable levels. Porpoises were hunted intensively in several areas during the last century, particularly in Danish waters. The only current hunt occurs in western Greenland, where hundreds of animals are killed each year by aboriginal peoples. There has been no

scientific assessment of the effects of this hunt.

The population in the Baltic Seas is at particular risk and is considered Critically Endangered by the IUCN – the highest level of conservation risk. This population likely numbers only 500-600 individuals and is subject to by-catches in the gillnet fisheries of several countries. The European Union and member countries of the Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS; http://www.ascobans.org/) are implementing conservation measures to reduce the risk of by-catch in this small population. These measures include restrictions on some gillnet fisheries and the use of pingers in some other fisheries. It is not yet clear whether these measures will be sufficient to ensure the conservation of this population. In many ways, the Baltic Sea population of harbor porpoises is similar to the vaquita; a very small population threatened by small but persistent by-catches in a variety of gillnet fisheries.

Black Sea

The population of harbor porpoises in the Black Sea is effectively isolated from their counterparts in the Atlantic by the Mediterranean Sea, in which the species is absent. A few individuals have been observed in the Aegean Sea, but these are likely stragglers from the Black Sea that made their way through the Turkish Straits. This population is considered Endangered by the IUCN; there are no estimates of abundance, although it is believed that several thousand porpoises exist in this enclosed sea. The population was hunted intensively in Turkey until recently and is subjected to large by-catches in the gillnet fisheries of Turkey and the Ukraine. In addition, the ecology of the Black Sea has been altered extensively due to over-fishing, the introduction of exotic species and pollution; the effects of these alterations on the porpoise population are unknown. There have been several recent mass die-offs of harbor porpoises in the Black Sea and Sea of Azov, but the cause of these mortalities is not fully understood.

Eastern Pacific

In the eastern North Pacific, harbor porpoises range from central California north to Alaska and into the southern Beaufort and Chukchi Seas. The structure of populations along the western coast of North America appears to be complex and is poorly understood. In some areas, such as the waters of Puget Sound, small, resident and geographically-discrete populations of porpoises exist. In other areas, particularly in Alaskan waters, there is insufficient information to assess population structure. Harbor porpoises are taken as by-catch in fisheries throughout this range; in some areas, fisheries restrictions (including closures) have been implemented to conserve

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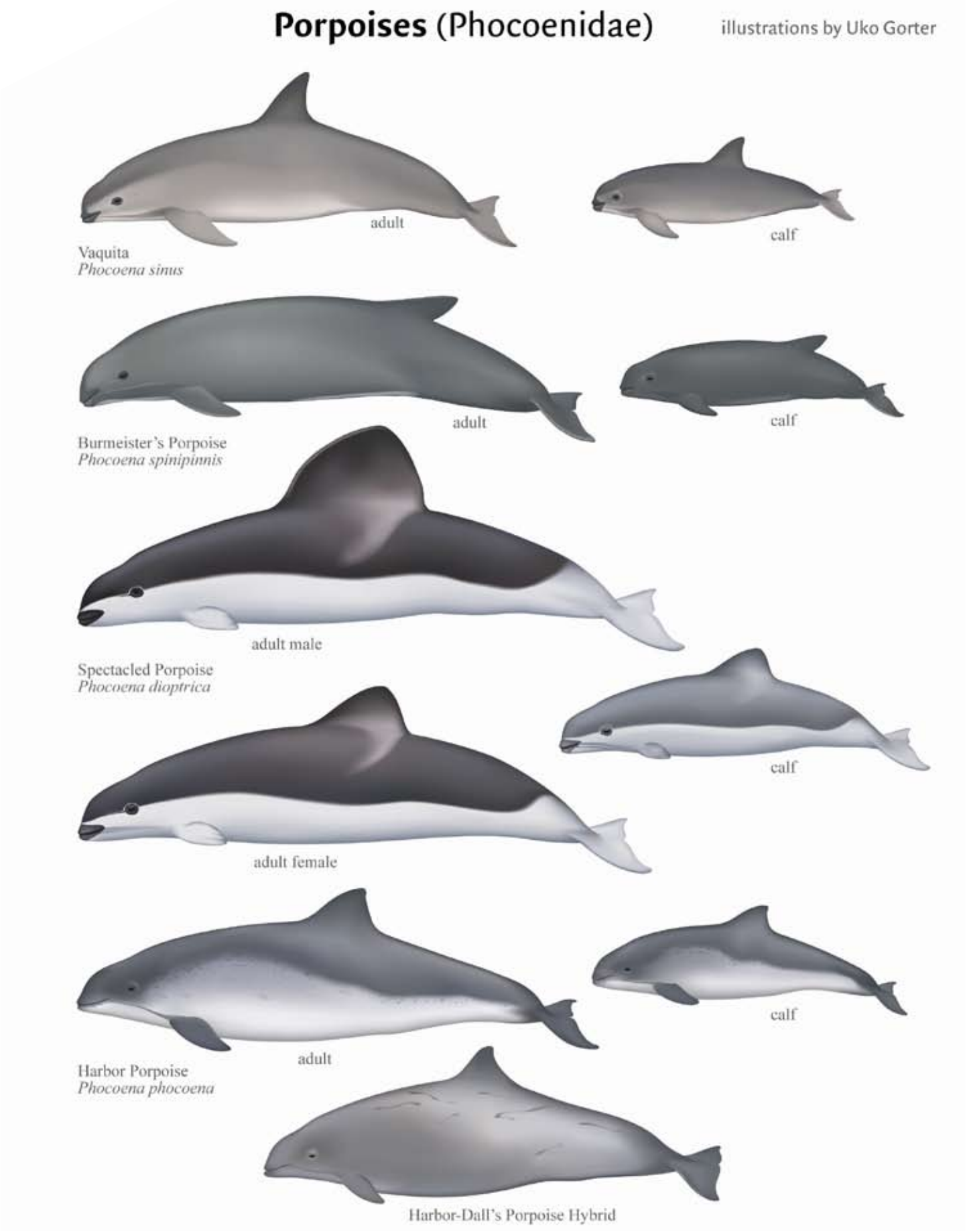
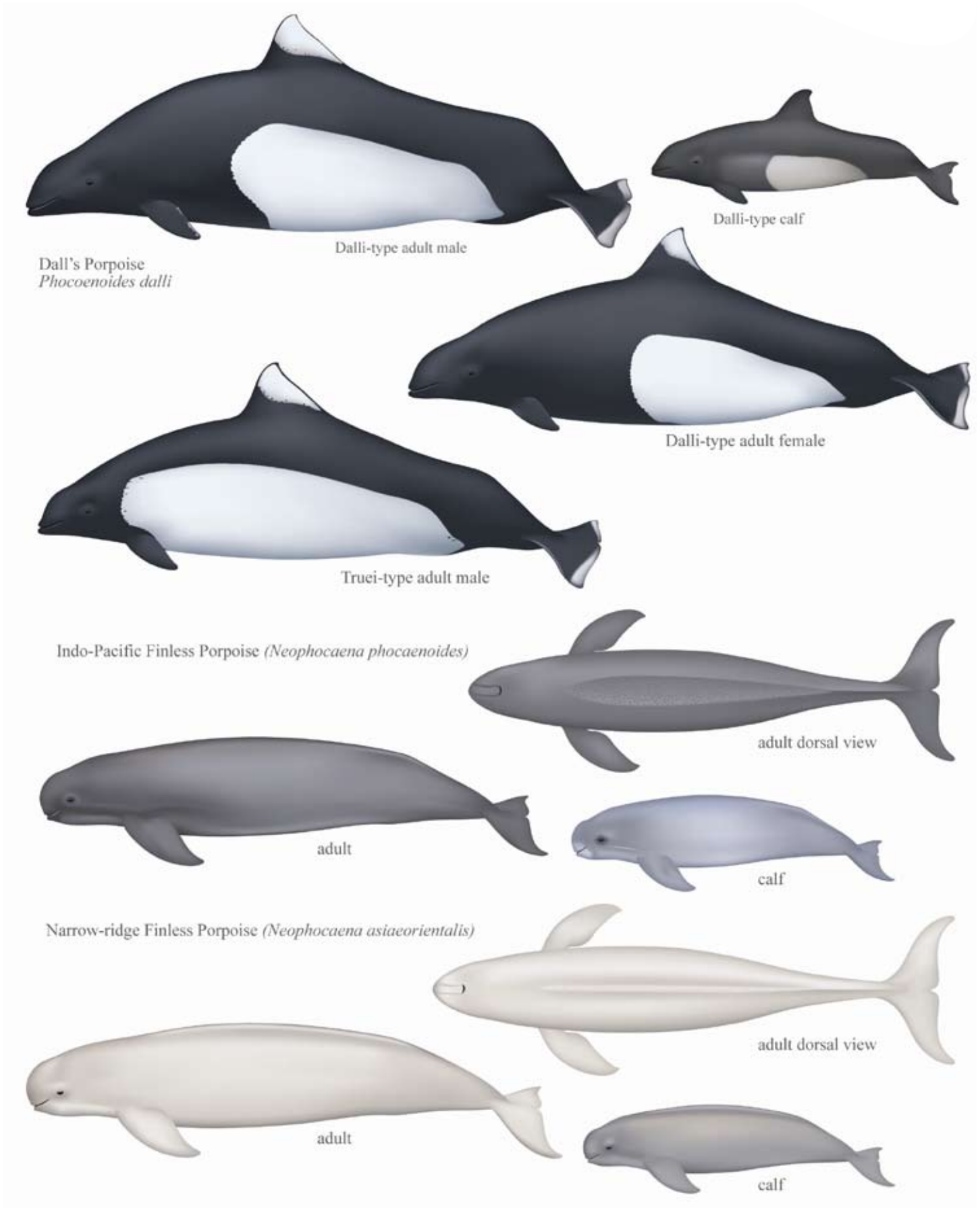
A harbor porpoise being released from herring weir iin the Bay of Fundy, Canada. Photo © John Wang, Grand Manan Whale and Seabird Research Station.


Porpoises (Phocoenidae)
illustrations by Uko Gorter
adult
calf
Vaquita
Phocoena sinus
adult
calf
Burmeister's Porpoise
Phocoena spinipinnis
adult male
Spectacled Porpoise
Phocoena dioptrica
calf
adult female
calf
adult
Harbor Porpoise
Phocoena phocoena
Harbor-Dall's Porpoise Hybrid


Dalli-type adult male
Dalli-type calf
Dall's Porpoise
Phocoenoides dalli
Dalli-type adult female
Truei-type adult male
Indo-Pacific Finless Porpoise (Neophocaena phocaenoides)
adult dorsal view
adult
calf
Narrow-ridge Finless Porpoise (Neophocaena asiaeorientalis)
adult dorsal view
adult
calf

harbor porpoises and other marine mammals. There is particular concern over the by-catch of porpoises in the gillnet fisheries of southeastern Alaska – by-catch in these fisheries has not yet been assessed through the use of independent observer programs.

Western Pacific

On the western side of the North Pacific, the species ranges from northern Honshu, Japan, to the Bering Strait and into the Chukchi Sea. It is unclear whether or not the species occurs in Korean waters. Relatively little is known about population structure, abundance, or the status of harbor porpoises in this region. By-catch occurs in Japanese gillnet fisheries and likely also in Russian waters, but there have been no scientific assessments of these porpoises.

Conclusions

Throughout the range of this species, the major cause for conservation concern is by-catch in gillnet fisheries. In North America and Europe a considerable amount of research has been conducted into measures that will reduce the number of animals killed in this fashion. The results of this research hold many lessons for the vaquita. For example, we know that the use of acoustic alarms can be effective at reducing, but not eliminating, by-catches of harbor porpoises. In addition, pingers are unpopular with many fishermen due to their cost, so their use must be enforced at sea. Several scientific reviews have concluded that the use of pingers is not an appropriate conservation strategy for highly endangered species, such as the vaquita, in which mortality must be eliminated completely. In addition, it is unrealistic to expect pingers to be used appropriately in small-scale artisanal fisheries, such as those that take vaquitas in the Gulf of California. In such cases, the only effective conservation measures are to remove gillnets from the range of the species of concern.

Other risk factors for the harbor porpoise include: anthropogenic noise and other forms of disturbance; habitat modification and loss; reduction in prey populations due to overfishing; and the accumulation of toxic chemicals. In general, we do not have a full understanding of the impact of these factors on populations of harbor porpoises, although it is clear that this species is particularly sensitive to disturbance and noise. There is also cause for concern over the unregulated hunt of porpoises in Greenland. We are

A gillnet fisherman in North Carolina using acoustic alarms, or pingers, to reduce the chance of marine mammal by-catch. Photo © Danielle Waples.

fortunate, however, that harbor porpoises are still abundant in many parts of their range and that the species as a whole is not endangered or threatened by human activities.

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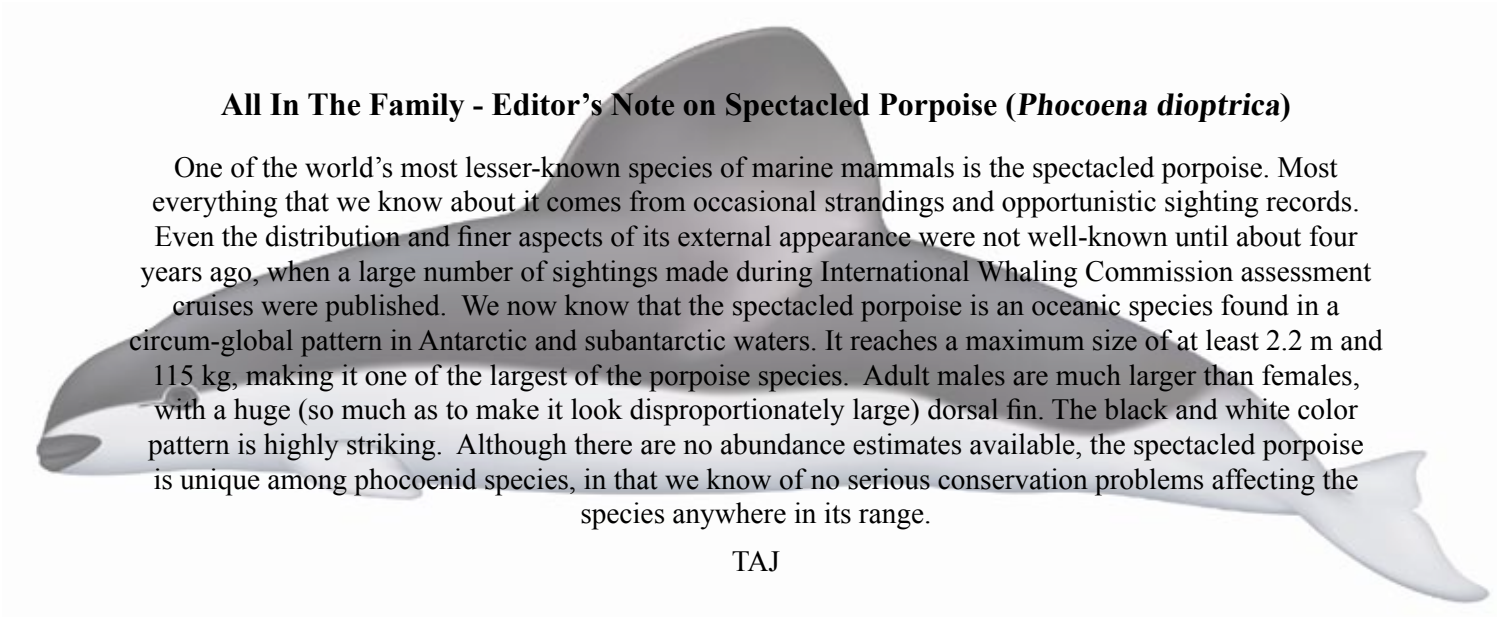


All In The Family - Editor's Note on Spectacled Porpoise (*Phocoena dioptrica*)

One of the world's most lesser-known species of marine mammals is the spectacled porpoise. Most everything that we know about it comes from occasional strandings and opportunistic sighting records. Even the distribution and finer aspects of its external appearance were not well-known until about four years ago, when a large number of sightings made during International Whaling Commission assessment cruises were published. We now know that the spectacled porpoise is an oceanic species found in a circum-global pattern in Antarctic and subantarctic waters. It reaches a maximum size of at least 2.2 m and 115 kg, making it one of the largest of the porpoise species. Adult males are much larger than females, with a huge (so much as to make it look disproportionately large) dorsal fin. The black and white color pattern is highly striking. Although there are no abundance estimates available, the spectacled porpoise is unique among phocoenid species, in that we know of no serious conservation problems affecting the species anywhere in its range.

TAJ

Dall's Porpoise

Accidental and Intentional Victims

by Masao Amano

Basic Biology of Dall's Porpoise

The most remarkable feature of Dall's porpoise (*Phocoenoides dalli*) is the large white flank patch in the middle of the black body. This is the feature which has long caused controversy among many scientists. There are two distinct "forms" recognized; *dalli*-type porpoises found throughout most of the range, have relatively small white flank patches, extending forward to around the level of dorsal fin, while *truei*-type porpoises inhabit the Pacific coast of Japan through the central Okhotsk Sea, and have much larger white patches that reach the level of the flipper.

The latter form was first described by Roy Chapman Andrews when he examined a porpoise taken by a whaler in Ayukawa, Japan in 1910. He described this form as a new species, *Phocoenoides truei*. He correctly recognized that the differences between the two forms were mostly in the pigmentation and not much in other traits. Actually, soon after his description, most of the diagnostic characteristics he identified were recognized as sexually dimorphic characteristics. Because of minor color variation in the two morphs, occasional mingling of them in the same group, and rather small genetic differences between the two forms, most scientists have come to consider that they represent polymorphism in a single species. However, it is still a mystery why such a striking difference in coloration is maintained.

Besides these two populations having different color patterns, there are suggested to be nine other populations or stocks in the North Pacific, Bering Sea and Okhotsk Sea and porpoises of all these populations apparently have the "usual" *dalli*-type coloration.

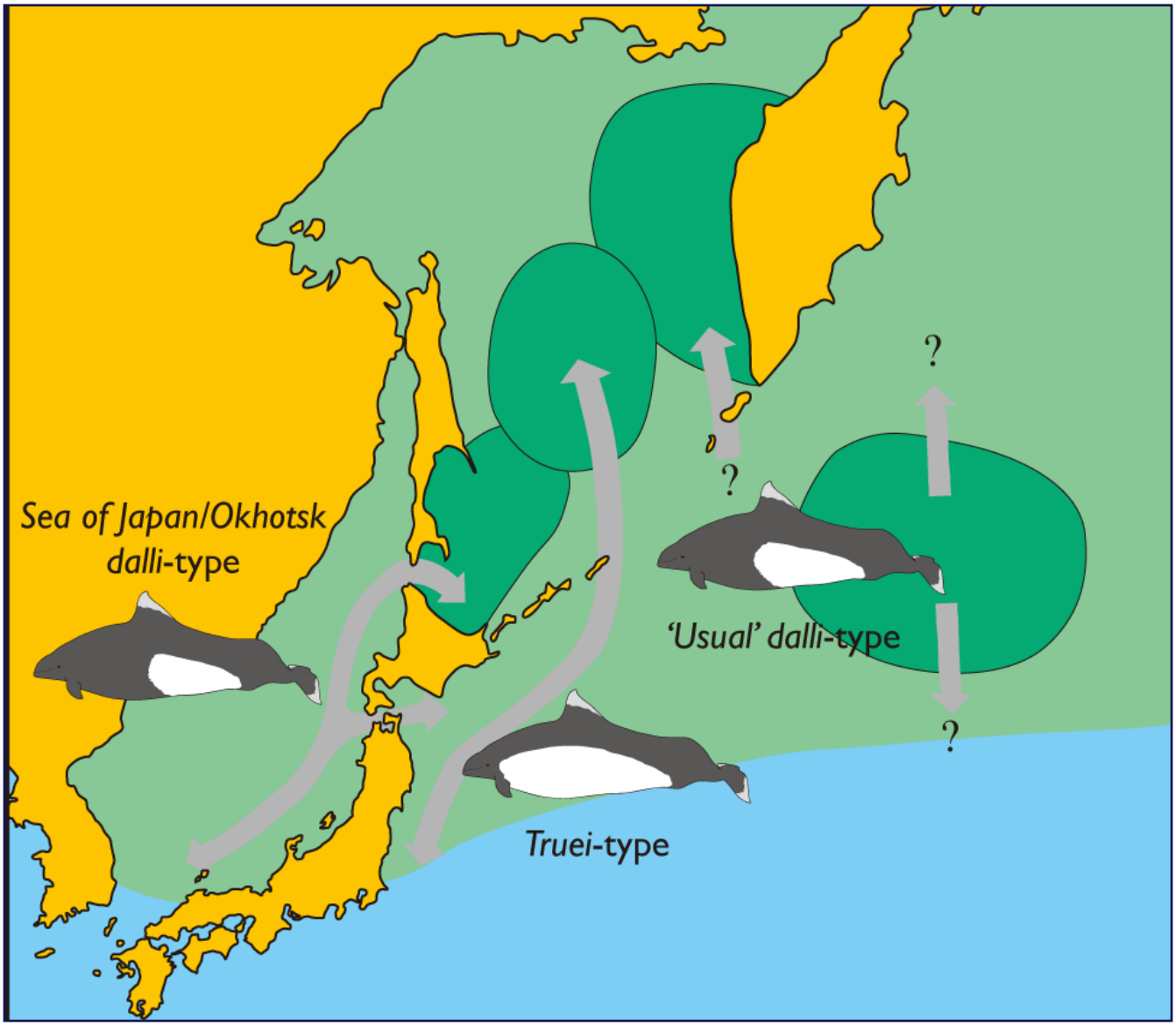
Driftnet Entanglements

Dall's porpoises are considered to be one of the most numerous (over two million) small cetaceans, though there are no reliable recent global abundance estimates. However, they have been under serious threat by human activities. Entanglements by the Japanese salmon driftnet fishery that operated in the northern North Pacific and Bering Sea were once a considerable threat to this species. It was estimated that about 7,000-10,000 porpoises were incidentally taken annually from the early 1950s until 1993, when the fishery closed under the United Nations ban on high-seas driftnet fisheries. A squid driftnet fishery started in 1978 by Japanese, Korean and Taiwanese fleets was another threat, and about 3,000 porpoises were taken annually until 1993. After the moratorium on the high-seas driftnet fisheries, the salmon driftnet fishery has still been conducted in the Japanese EEZ, but there is no available information on the entanglement of non-target animals. There are some Japanese salmon driftnetters operating in the Russian EEZ along the coasts of the Kuril Islands and Kamchatka Peninsula, under the agreement between Japan and Russia. About 600-3,000 Dall's porpoises have been reported to be taken incidentally in this fishery during 1993-1999, but recent estimates are not available.

Harpoon Hunting in Japan

Dall's porpoises have long been hunted in northern Japan in a hand harpoon fishery in which fishermen harpoon bow-riding porpoises from a platform

A dead Dall's porpoise being disentangled from a Japanese salmon driftnet in the northern North Pacific Ocean, 1986. Photo © T.A. Jefferson



Distribution of breeding grounds (dark green) and possible migration route for Dall's porpoise populations in the western North Pacific.

that extends forward from the bow. Fishermen in the Sanriku area on the Pacific coast of Honshu (main) Island of Japan used to take mainly swordfish in summer and hunt *truei*-type Dall's porpoises in winter. Porpoise meat was transported to the inland area and was said to be an important source of protein to get though severe winters. The porpoise hunt and consumption was seemingly local and not large until the 1970s. After the collapse of the striped dolphin population and fishery in the late 1970s to 1980s in the Izu Peninsula area (where people have hunted and consumed dolphins since the middle of the 19th century), Dall's porpoises began to be transported from the Sanriku to Izu area and this might have resulted in an expansion of the porpoise fishery. After that, the moratorium on commercial whaling in 1986 resulted in an expansion of the demand for porpoise meat as a substitute for whale meat, and the price rose steeply. The fishermen explored new fishing grounds and found another population migrating around Hokkaido Island in summer, the Sea of Japan/Okhotsk population, and started to operate throughout the year. The number of porpoises caught increased from 1986 and it exceeded 40,000 in 1988, which is about 10% of the estimated abundance for the two populations off Japan. This encouraged the Japanese government to instigate management procedures and set catch quotas for each population. The initial quota did not change for 14 years (*dalli*-type, 9,000; *truei*-type, 8,700), but was reduced a little in 2007 (*dalli*-type, 8,708; *truei*-type, 8,168). The number of captures fluctuated greatly, but gradually increased overall until around 2000. Recently,

however, it seems to be decreasing. This is attributed to the decrease in the catch of Sea of Japan/Okhotsk *dalli*-types, which have not fulfilled the quota in recent years (a probable sign of depletion).

The other indirect evidence for a decrease in the Sea of Japan/Okhotsk *dalli*-type population is the ratio of Dall's porpoises in the odontocete strandings along the Japanese coast. The coverage of stranding reports has improved in the last 10 years. While it is not possible to make a precise conclusion, but the proportion of Dall's porpoise dropped sharply from 1985 to 1993, which coincides with the period when Dall's porpoises were under the most severe hunting pressure. Although there seems to be some recovery after 2003, the apparent peaks in 1997, 2003, 2004, and 2008 included very unusual serial or mass strandings in similar locations on the Hokkaido coast where Dall's porpoise fishing occurs, which makes one suspect some connection with hunting operations, possibly from struck-and-lost porpoises or discards of spoiled carcasses.

I have become concerned about the status of this population because the fishery operates in the middle of its breeding area. Formerly, it was said that pregnant females or females with calves were difficult to catch because they tended to avoid boats and did not bow ride. Recently, however, some boats came to be equipped with fast engines and started to chase porpoises until they were exhausted. In the late 1990s, this change brought an increase in the number of lactating females in the catches from the Sea of Japan/Okhotsk population, and I suspect that these mothers were easier to take because their calves exhaust faster. The government banned the taking of females with calves, but I do not know the efficiency of this act because few landed animals have been examined recently. These changes in the fishing method make estimating fishing effort and management more difficult.

Clearly, we have to keep an eye on Dall's porpoise populations off Japan and the effects of these fisheries on them. A recent sophisticated simulation study suggested that the potential biological removal, or artificial mortality limit, that can sustain the population at a sound level under possible uncertainties is about 3,500 individuals for each population, which is smaller than half of the current quota. Without sound management and good science, it is possible that one or more of these populations could be exploited to the point of local extinction.

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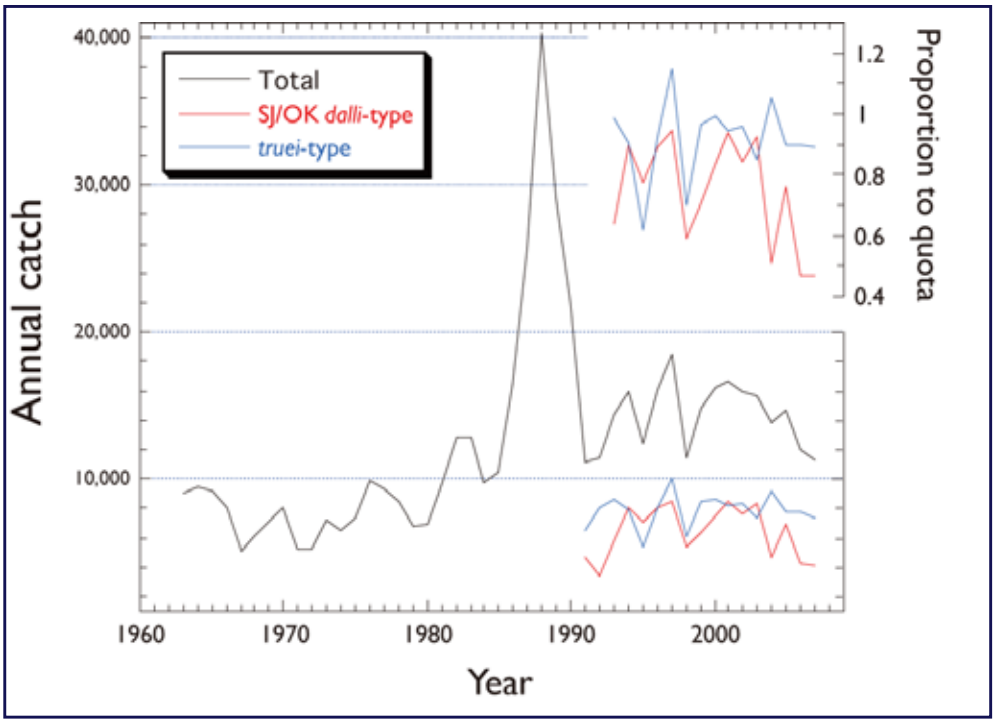
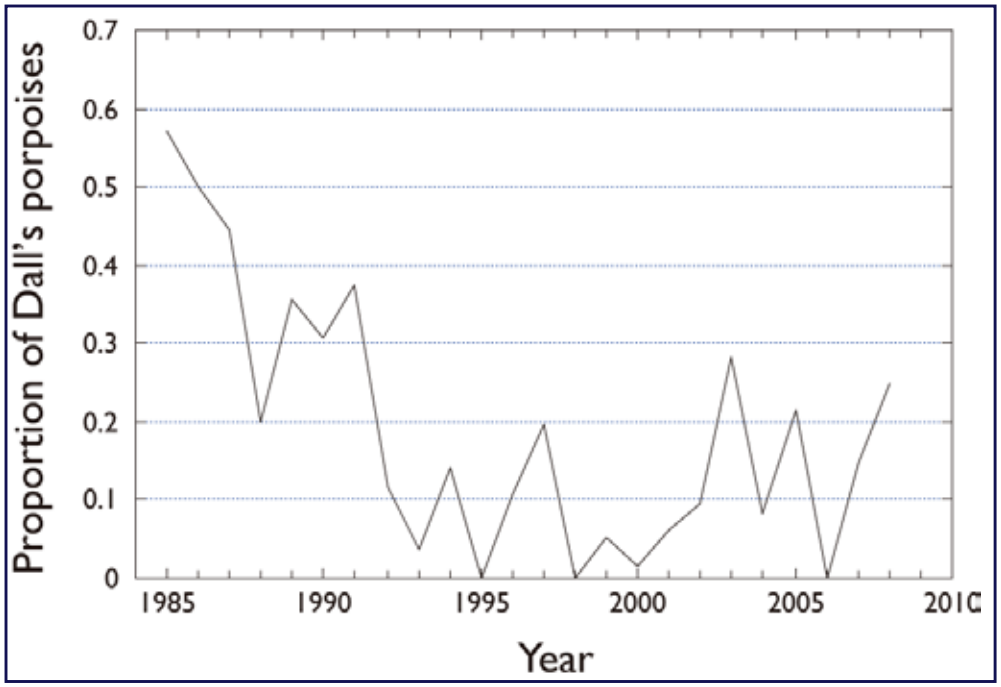
Masao Amano is a professor of marine mammalogy at the Faculty of Fisheries, Nagasaki University, Nagasaki, Japan. He has long studied Dall's porpoise and elucidated migration patterns and population structure of Dall's porpoises around Japan, having lived in Otsuchi, a capital of the Dall's porpoise harpoon fishery. He received his Ph.D. from Kyoto University in 1993. He is currently interested in the behavior and social structure of sperm whales and Indo-Pacific bottlenose dolphins, and on the biology of finless porpoises around the Nagasaki area.



The number of Dall's porpoises taken by the hand harpoon fishery in Japan.



The proportion of Dall's porpoises in the small odontocete strandings reported on the coast of Japan, along the distributional range of Sea of Japan/Okhotsk Dall's porpoise population.

Phocoenid Gallery

Celebrating the Diversity of Porpoises

Spectacled porpoise mother and calf. Photo © P.A. Olson

Japanese finless porpoise in an aquarium. Photo © G. Abel

Spectacled porpoise "bowriding." Photo © P.A. Olson

Vaquita in the calm. Photo © T.A. Jefferson

Yangtze finless porpoise mother and calf. Photo © Wang Ding

Harbor porpoise in escape mode. Photo © T.A. Jefferson

Dall's porpoise slicing the surface. Photo © J. Durban

Burmeister's porpoise rolling. Photo © S. Heinrich

Bowriding Dall's porpoise. Photo © R.L. Pitman

Finless Porpoises

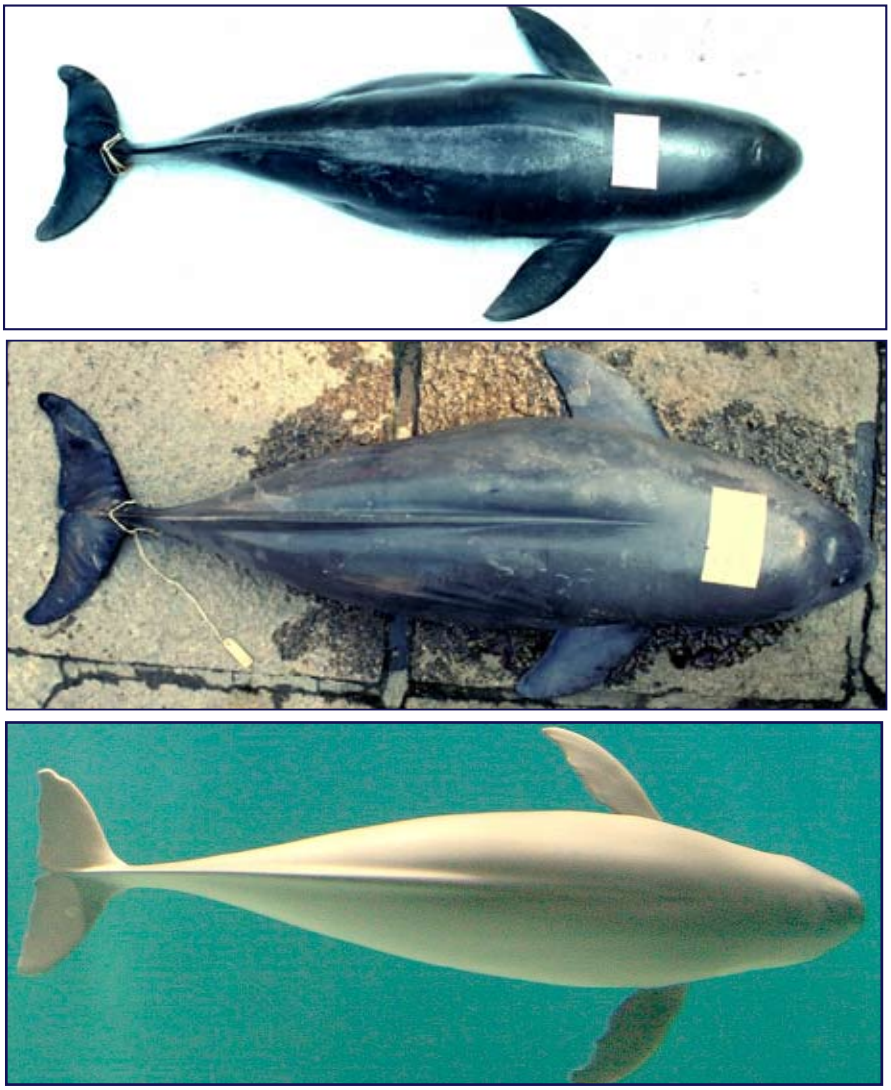
The Forgotten Ones

by John Y. Wang

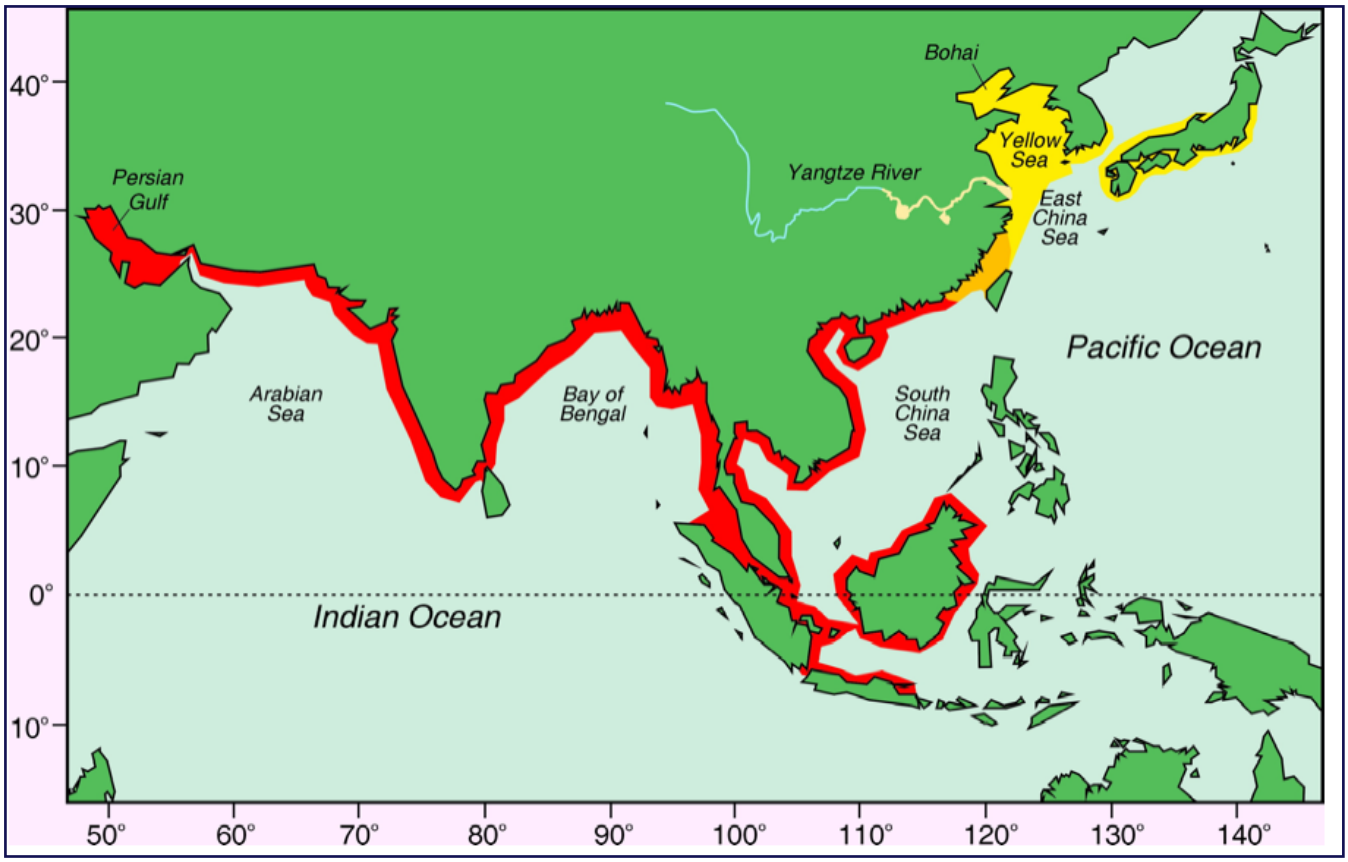
To most people (including marine mammal researchers), finless porpoises are exotic creatures that are rarely seen, dead or alive, and usually only known from images in books. Although for the most part, this is true (partly because most marine mammal researchers reside in western countries), catching a brief glimpse of a finless porpoise is not as difficult as one may think, at least in certain areas (e.g., the waters of Hong Kong, Inland Sea of Japan). However, being intrinsically cryptic in nature (brief surface period, lacking a dorsal fin and usually exposing only a tiny part of their small bodies at the surface, and avoiding boats), finless porpoises are arguably the most challenging cetacean species to observe clearly, photograph well and thus research in the field. This may be part of the reason for the neglect of finless porpoises by marine mammal researchers, which is unfortunate, because the few populations that have been studied fairly well indicate their numbers are declining rapidly. With a few exceptions, almost nothing is known of finless porpoises (except that they exist) throughout most of their range. Even the most fundamental piece of information, "how many species are there?" is still unclear.

General Description

Superficially, finless porpoises resemble miniature beluga whales. Adult coloration can vary greatly from almost white (Japanese porpoises) to nearly black (the Indo-Pacific species). In contrast, newborn calves are dark in Japanese waters whereas calves of the Indo-Pacific species are lighter than adults. They can be long and thin or short and chunky but all have relatively large flukes and flippers (usually ending in a bluntly-rounded tip) and a bulbous forehead that can overhang the snout above a small mouth. The most striking character (and unique among true porpoises) is the lack of a dorsal fin, which is instead replaced by a long, low ridge that can begin anywhere from above the flippers to about the



Dorsal views of Neophocaena phocaenoides *(top);* N. asiaeorientalis asiaeorientalis *(middle) and* N. asiaeorientalis sunameri *(bottom). Photos © J.Y. Wang (top, middle) and S.C. Yang (bottom)/Formosa Cetus research and Conservation Group.*



The presumed global distribution of finless porpoises: Indo-Pacific finless porpoise, Neophocaena phocaenoides *(red); Yangtze finless porpoise,* N. asiaeorientalis asiaeorientalis *(light yellow) and East Asian finless porpoise, (deep yellow). An area where Indo-Pacific and narrow-ridged finless porpoises are known to coexist is shown in orange. Note: boundaries of the distribution of all forms of finless porpoises are uncertain and may not be reflected accurately in this map.*

center of the back and runs onto the tailstock. There is a patch of numerous minute, prickly bumps (or tubercles) that run down the length of the middle of the back. The widest point of the patch can span from 0.2 to 14 cm and have anywhere from 1 to 25 tubercles across. Based on unique combinations of the features of the ridge and tubercle patch, three forms of finless porpoises have been identified. Maximum adult size also varies tremendously by region from about 150 cm to almost 230 cm in length and weights of between about 60 and at least 110 kg (the smallest and largest animals are found in the Indian Ocean and northern China, respectively).

Taxonomy

After much scientific debate about finless porpoise taxonomy in the 1970s, an uneasy agreement was reached amongst marine mammal researchers: one species with three subspecies. However, this widely-accepted consensus appears to have been wrong. A new approach to analyzing and interpreting DNA and morphology patterns provided strong evidence that at least two biological species exist and they have not interbred with each other since the last major glaciation period roughly 18,000 years ago. Although clear differences amongst finless porpoises have been known for decades and DNA analyses have also been conducted, poor research design with inadequate sampling and analyses led to conclusions that were conceptually flawed.

The two species that are presently recognized are: the Indo-Pacific finless porpoise (*Neophocaena phocaenoides*) and the narrow-ridged finless porpoise (*N. asiaeorientalis*) with the latter being comprised of two subspecies, the Yangtze finless porpoise (*N. a. asiaeorientalis*) and the East Asian finless porpoise (*N. a. sunameri*); the latter subspecies is also known as sunameri (a Japanese name). The taxonomy of finless porpoises continues to be far from understood and much more research is needed.

Other Interesting Facts

Not only is the taxonomy of finless porpoises an interesting mystery but also these animals have some unusual characteristics. For example, the blubber of one of the two species of finless porpoises, when eaten by humans, appears to cause the same (infamous) purgative effect that results from dining on the blubber of beaked whales. Also, on most, if not all, male finless porpoises, there is a small blind 'pocket' (the preanal pore - located just anterior to, and superficially resembling, the anus), which houses what appear to be tiny, vestigial teats/nipples. The purpose, if any, of these structures is unknown. Another morphological mystery is the function of the well-innervated tubercles and the reason(s) for the various configurations exhibited by different kinds of finless porpoises.

Distribution

Finless porpoises occur in the Indo-Pacific along a narrow strip of coastal shallow waters (usually <50m deep) from the Persian Gulf in the west to as far as Japanese waters in the northeast, while their southern range extends to the waters off northern Java (Indonesia). A distinct population also exists in the Yangtze River (where the now-extinct baiji once lived) and can be found more than 1,600 km upstream from the sea. Finless porpoises are most often found in shallow bays and waters influenced by rivers (sometimes extending tens of kilometers into some major river systems) with an apparent preference for a soft seafloor. Although most porpoises are found within a few kilometers from shore, they can be found further offshore (e.g., in the Yellow and East China seas) if their preferred habitat is available. Seasonal movements have been recorded for some regions (e.g., in most Chinese waters) but some populations appear to be more-or-less resident.

Conservation Status and Threats

Because finless porpoises inhabit the waters of nations and regions with the largest and densest human populations (i.e., China, India, Bangledesh, Hong Kong SAR, Taiwan), their continued survival is a colossal challenge. Paradoxically, the great concentrations of humans near finless porpoise habitat have not resulted in a good understanding of these animals. Important basic biological information for determining conservation status (e.g., population structure, abundance, etc.) is still lacking throughout most of the range of finless porpoises. Where information exists, mortality caused by fisheries (especially with gillnets but also including trawls, stow nets, fyke nets, set traps, seines and longlines) appears to be too high for local populations to sustain. There are even concerns that some populations may have already been extirpated, or nearly so, by human activities.

The finless porpoise, as a global species, is considered "Vulnerable" by the IUCN Red List of Threatened Species. The Yangtze River population, believed to be isolated to this

By-catches in fishing gear is the greatest immediate threat to the survival of finless porpoise populations throughout their range. Large catches of porpoises over a few days are not uncommon. These porpoises were entangled in trammel and stow nets used in western Taiwan Strait. Photo © J.Y. Wang/Formosa Cetus Research and Conservation Group.

river system (including the connected lakes, tributaries, and the estuary and possibly adjacent coastal marine waters), has been in rapid decline and is classified as "Endangered' under the IUCN Red List. There are great concerns that these porpoises will follow the baiji to extinction because the ever-present threats to cetaceans in the river (i.e., harmful fishing gear, habitat degradation, pollution, noise, vessel traffic, etc.) continue to worsen.

In Japanese waters, there are five distinct populations of finless porpoises (i.e., Omura Bay, Sendai Bay-Tokyo Bay, Inland Sea-Hibiki Nada, Ise Bay-Mikawa Bay and Ariake Sound-Tachibana Bay) that vary in abundance from fewer than 200 to a few thousand. The Inland Sea of Japan population is in sharp decline due mainly to capture in fishing gear and habitat degradation, but there are other contributing threats such as pollution, noise, vessel traffic and live captures. No formal assessments have been undertaken for any Japanese populations but some would certainly qualify for one of the IUCN Red List threat categories (i.e., "Vulnerable", "Endangered" or "Critically Endangered").

Mortality due to fisheries is clearly the greatest immediate threat to finless porpoises and must be addressed effectively. Habitat degradation, pollution, noise, and reduction of freshwater input into estuaries are also contributors, but losses due to these threats are difficult to quantify and require much more research effort and attention. Continued declines in the abundance of Yangtze and Japanese finless porpoises are clear warnings that current conservation actions and legal protection afforded to these populations are insufficient. Continuing to neglect these forgotten porpoises will guarantee that some populations will disappear before most of the world even knows about the existence of these remarkable and fascinating creatures.

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Recent Literature on Porpoises

Adult male spectacled porpoises have dorsal fins that look disproportionally large. Photo © P. Olson

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Vaquitas surfacing in the northern Gulf of California
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Whalewatcher

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