

CLASS MAMMALIA
ORDER CETACEA
SUBORDER ODONTOCETI
Family PHOCOENIDAE (PORPOISES)



- Small, relatively robust but slender porpoises with short and poorly defined beaks; small spade-shaped teeth.
- 120–240 cm.



- All oceans and some rivers in East and South Asia.
- Shoreward of the continental shelf, mostly shallow waters less than 180 m deep; two species occur in deep, oceanic waters (hundreds to thousands of meters deep), and two in rivers.
- 3 genera, 7 species, 11 taxa.
- 1 species Critically Endangered, 2 Vulnerable; none Extinct since 1600.

Systematics

The family Phocoenidae is a morphologically distinctive and ancient lineage of cetaceans, likely diverging from other odontocetes during the Miocene about 12–16 million years ago. For most of the past five decades, six extant species of phocoenids have been recognized (the Harbor Porpoise, *Phocoena phocoena*; the Vaquita, *P. sinus*; Burmeister's Porpoise, *P. spinipinnis*; the Spectacled Porpoise, *P. dioptrica*; Dall's Porpoise, *Phocoenoides dalli*; and the finless porpoise, *Neophocaena phocaenoides*), but in 2011 the finless porpoise was split into two species (the Indo-Pacific Finless Porpoise, *N. phocaenoides*, and the Narrow-ridged Finless Porpoise, *N. asiaeorientalis*). In the past, many conflicting phylogenies have been constructed, including one in which the Spectacled Porpoise and Dall's Porpoise were considered sister species and were aligned with several fossil forms in a separate subfamily (Phocoenoidinae). Most of these phylogenies (including the one described above) have been rejected with the accumulation of more information from morphometric and molecular data and new evidence from the fossil record. The most plausible phylogeny is currently one based on a recent analysis of multiple lines of anatomical evidence. It firmly places *Neophocaena* as the oldest extant genus, originating early in the evolutionary history of the family. In both morphological and molecular phylogenies, the Harbor Porpoise and Dall's Porpoise are most closely related to each other, suggesting further taxonomic revision may be needed.

There are also several extinct genera and species in the family, known from fossil evidence (*Lomocetus*, *Salumi-phocaena*, *Australithax*, *Piscolithax*, *Habrophocaena*, and *Septemtrioctus*). The extinct genera and species are all considered basal to modern phocoenids. Most fossil phocoenids have been found in deposits of the North Pacific (e.g. Japan, west coast of USA, and Mexico), and it is thought that the family originated in that ocean basin in the middle Miocene. The finless porpoise's precursor apparently moved west into the Indian Ocean early in the family's history. Dispersal into the Southern Hemisphere is thought to have occurred in the middle Pliocene, and dispersal to the North Atlantic occurred via the Arctic some time in the early to late Pliocene; some fossil phocoenids have been discovered around these ocean basins (e.g. Belgium and Peru). The Vaquita is thought to have originated from a common ancestor with Burmeister's Porpoise about 1–2 million years ago. Multiple lines of evidence suggest that this happened when a Pleistocene cooling event allowed their ancestor to cross the Equator from the south and subsequently become entrapped in the Gulf of California. With the exception of the Indo-Pacific Finless Porpoise, which has a tropical and subtropical distribution, the family has an anti-tropical

distribution. In fact, the family is often described as anti-tropical, but this is not strictly true.

Morphological Aspects

All phocoenids are united by several morphological characteristics associated with the skull and skeleton. The most important of these are the relatively small number (usually no more than 28) of spatulate (spade-shaped) teeth, the posterior projection of the right premaxillary, and the bony bosses on the premaxillary bones at the base of rostrum anterior to the bony nares. They also have in common a relatively short and wide-based rostrum and a short mandibular symphysis. The similarities result not only from a common phylogeny but also from convergent evolution, associated partly with pedomorphosis



The **Narrow-ridged Finless Porpoise** is the larger of the two species of finless porpoise (genus *Neophocaena*), with a body length that can reach over 2 m. *Neophocaena* is the oldest of the three extant porpoise genera, originating early in the evolutionary history of the family. Finless porpoises lack the dorsal fin that is found in other porpoise species. The dorsal ridge that replaces the fin can be clearly seen here. Finless porpoises are generally more slender than others in the family.

Neophocaena asiaeorientalis
Shimonoseki Marine Science
Museum, Yamaguchi, Japan.
Photo: Grant Abel

There are four species in the genus *Phocoena*. The **Harbor Porpoise** is found in shallow waters throughout the temperate parts of the Northern Hemisphere, with three subspecies: *phocoena* in the North Atlantic Ocean, *vomerina* in the eastern North Pacific Ocean, and *relicta* in the Black, Azov, and Marmara seas. In common with most other porpoise species, Harbor Porpoises are small (mostly less than 1.8 m), with a dumpy body shape that contrasts with the graceful build of many small cetaceans. Their beaks are short and poorly defined. This retention of juvenile characteristics into adulthood, also evident in some skeletal features, particularly in the skull, is known as *paedomorphosis*.

Phocoena phocoena
Fjord & Bælt Center, Denmark.
Photo: Solvin Zankl/naturepl.com



(retention of juvenile traits into adulthood). In the two oceanic species, the Spectacled Porpoise and Dall's Porpoise, the foramen magnum aligns the skull with the vertebral column, giving the rostrum less of a ventral orientation, and the facial region is larger and more concave than in other species of phocoenids. In this family, three to seven cervical vertebrae are fused, severely limiting movement of the head in most species.

There are also a series of common features in the external morphology among species of phocoenids, although there are exceptions to each. Most porpoises have a small (shorter than 240 cm), relatively robust body, and a head with a short, poorly defined beak, although finless porpoises can be quite slender and generally have no beak. Most species have a short, wide-based, triangular dorsal fin, although finless porpoises have no fin, and the fin may be relatively large in the Vaquita and some Spectacled Porpoises. Finally, many members of the family have a series of tubercles along the leading edges of

the dorsal fin and flippers; the tubercles on the dorsal ridge structure of finless porpoises appear to be analogous to this. Dall's Porpoise generally has tubercles that are absent or poorly developed. Sexual dimorphism is variable among species, with some having strong dimorphism (Dall's Porpoise and the Spectacled Porpoise), others having subtle or no dimorphism (the Vaquita, Burmeister's Porpoise, the Indo-Pacific Finless Porpoise, and the Narrow-ridged Finless Porpoise), and still others having reverse dimorphism (the Harbor Porpoise).

Color patterns of phocoenids are generally not as well developed or complex as they are in most delphinids (ocean dolphins)—by many accounts, the most closely related family. Most species of phocoenids have a relatively drab color pattern of gray and white tones, generally counter-shaded, with only a few subtle stripes. The bright patches, spotting, and stripes that characterize many of the ocean dolphins tend to be absent in phocoenids. Nevertheless, Dall's Porpoises and Spectacled

The ocean-going **Dall's Porpoise** is the only species in the genus *Phocoenoides*. However, recent morphological and molecular analysis indicate that Dall's and the Harbor Porpoise (*Phocoena phocoena*), the two northern porpoises, may be each other's closest relatives; they regularly interbreed. Dall's Porpoises are the largest members of the family and are very stocky, with very small heads. Most porpoises have subtle, even drab coloration, but Dall's Porpoise is one of two species with a striking black-and-white pattern. The other, the Spectacled Porpoise (*Phocoena dioptrica*), may also be largely ocean-going.

Phocoenoides dalli
Pribilof Islands, Alaska, USA.
Photo: Todd Pusser/naturepl.com





Porpoises have been thought of as slow and lumbering, but recent observations show that most are agile and capable of sharp turns. In fact, **Dall's Porpoise** may be the fastest of all cetaceans, at least in short bursts, by one estimate reaching speeds of up to 55 km/h. When swimming fast, these porpoises throw up a large V-shaped "rooster-tail" of spray as they surface to breathe, as shown here. At other times, they swim slowly, surfacing without splashing. This is known as slow rolling. Like other porpoises, they bring very little of their bodies above the surface.

Phocoenoides dalli
Queen Charlotte Strait, SW British Columbia, Canada.
Photo: Jared Towers

Porpoises are exceptions; they are strikingly colored, with highly contrasting black and white patterns (or dark gray and light gray in younger individuals). The prominent facial markings around the eyes and mouth of the Vaquita and the Spectacled Porpoise are also atypical of the family. Anomalously white individuals have been observed in several species of porpoises and appear to be relatively common in Harbor Porpoises.

Habitat

Most species in the family Phocoenidae are inhabitants of coastal, relatively shallow waters over the continental shelf. These waters are typically somewhat murky and high in sediments. This includes all species, except Dall's Porpoise and the Spectacled Porpoise, both of which inhabit deep oceanic wa-

ters that extend far past the edge of the continental shelf. In general, porpoises prefer cold waters, and with the exception of the Indo-Pacific Finless Porpoise, the family has an anti-tropical distribution. The Indo-Pacific Finless Porpoise appears to be unusual because it is found in tropical and subtropical waters throughout the Indian and western Pacific oceans. These waters remain warm throughout the year. Finless porpoises (both species) also occur in some rivers. There is a riverine population of Narrow-Ridged Finless Porpoises in the Yangtze River, the "Yangtze Finless Porpoise" (*Neophocaena asiavorientalis asiavorientalis*), and Indo-Pacific Finless Porpoises move several tens of kilometers up the Indus and Brahmaputra rivers. The Vaquita also inhabits waters that become very warm in summer and autumn, but this may be an artifact of its restricted distribution in the upper Gulf of California. The Vaquita may be effectively trapped in the Gulf of California, and it clearly



The typical surfacing pattern of the **Harbor Porpoise** is slow rolling, with no splash. At times, they move faster, and surface with a sloppy splash, known as pop-splashing, which is very different from the "rooster-tail" of a Dall's Porpoise (*Phocoenoides dalli*) surfacing with speed (previous picture). Harbor Porpoises have been reported swimming at estimated speeds of up to 22 km/h. Groups usually consist of 2-5 individuals. Harbor Porpoises can sometimes be seen lying motionless at the surface for short periods, possibly resting.

Phocoena phocoena
Moray Firth, Scotland, UK.
Photo: Kevin Robinson

Next to the flukes of a diving Humpback Whale (*Megaptera novaeangliae*), **Dall's Porpoise**, the largest member of the family, appears tiny. Despite the disparity in size, the two species can be found feeding together on similarly sized fish. Dall's porpoises have a more complicated relationship with Killer Whales (*Orcinus orca*).

Several forms of Killer Whale occur together in coastal waters of British Columbia, Washington, and south-eastern Alaska. The resident population of Killer Whales eats fish almost exclusively, but the transient population has been observed to prey only on seals, cetaceans, and seabirds. The two Killer Whale populations do not mix and differ in other aspects of behavior and social structure. Dall's Porpoises are a significant prey for the meat-eating Killer Whales, although their ability to move at higher speed than other small cetaceans can give them an edge. In 18 observed predation attempts, eleven Dall's Porpoises succeeded in escaping, whereas all 16 attempts on Harbor Porpoises (*Phocoena phocoena*) ended in a kill. Dall's Porpoises appear to be able to distinguish between fish-eating and mammal-eating Killer Whales—in the lower picture, a Dall's Porpoise and a Killer Whale can be seen feeding together on fish.

Phocoenoides dalli

Prince William Sound, Alaska, USA.
Photos: Gerry Sanger/Natural Images





Porpoises feed on whatever suitable fish are abundant, according to region or season. As a result, the main prey can vary considerably between different populations of the same species. In the North Atlantic Ocean, the **Harbor Porpoise** feeds primarily on clupeoid (herring and sardines) and gadoid (cod, hake, and whiting) fish, while in the North Pacific Ocean, they prey largely on engraulids (anchovies) and scorpaenids (scorpion fish). Research by fishery organizations has found that salmon (*Salmonidae*) is not an important food item in any northern porpoise's diet. There can be sharp differences between the primary prey taken by neighboring porpoise populations. Harbor Porpoises from Scotland eat significantly more sand eels than those from Denmark, and fewer cod. The proportion of sand eels in the diet has increased as north-eastern Atlantic stocks of herring and sprat have declined. Sand eels spend most of the autumn and winter buried in the sand, and so they are a much more significant item in the diet during spring and summer. During the winter months, the sand eel is replaced by whiting and other gadoids, which are much more plentiful in inshore waters at this season.

Dall's Porpoise similarly takes a wide range of surface-living and mid-water fish and squid, but its diet in any area may be dominated by a few abundant species. Dall's Porpoises have an unusually thin blubber layer for a cold-water cetacean and, perhaps to compensate, have a high metabolic rate. They require 10–12 kg of prey daily (although some captive individuals are reported to eat 15 kg of mackerel a day), compared to 3–5 kg for the Harbor Porpoise.

Above: *Phocoena phocoena*
Oosterschelde, Netherlands.
Photo: W. J. Strietman/AGAMI

Below: *Phocoenoides dalli*
Prince William Sound, Alaska, USA.
Photo: Gerry Sanger/Natural Images

The penis of the **Harbor Porpoise**, seen here, is very long for a small cetacean, at around 0.5 m. The testes of a reproductively active adult male may comprise up to 6% of total body mass, among the largest relative to size of any mammal. This, among other factors, suggests that the mating system is promiscuous. Females are larger than males. Males approach females from below and behind so rapidly that they often leap clear of the water. Copulation takes just a few seconds.

Phocoena phocoena
San Francisco Bay, California, USA.
Photo: Bill Keener

cannot move farther north to seek cooler water. The waters to the south are very deep and may not provide suitable, shallow-water feeding habitat for the Vaquita.

The two common North Pacific species of phocoenids, Dall's Porpoise and the Harbor Porpoise, favor different microhabitats (Dall's prefer waters deeper than 200 m and Harbor Porpoises are mostly found in waters shallower than 100 m), but they do overlap somewhat in their distributions. This is especially common in the inshore waters of the Pacific Northwest (Washington, USA, and British Columbia, Canada), Alaska, and probably also in Russian waters, where they do interact at times and apparently even hybridize on a regular basis.

General Habits

Phocoenids are generally elusive and shy, and they do not seek out human interaction, as do some species of ocean dolphins. Most species of phocoenids do not ride the bow or stern waves of vessels, and in fact, they are thought to actively avoid motor vessels in most cases. The single exception to this pattern is Dall's Porpoise, which is an avid bow rider. Individual Dall's Porpoises may accompany fast-moving vessels for extensive periods of time, darting back and forth with jerky movements as they get pushed along by the pressure waves produced by the bows of vessels. As a rule, however, porpoises are not very showy. Aerial displays (such as breaching, spy hopping, and flipper and fluke slaps on the surface) are rare, and their social behavior and group organization appear to be much less sophisticated than in their ocean dolphin cousins, which often live in large schools with complex social structure. The phocoenids have been thought of as slow-moving and lumbering in the past, but recent observations show that most species are very agile and capable of very sharp turns.

Very little is known about the social structure of porpoise groups because long-term studies of identified individuals (either from natural marks or tagging studies) have not been done on significant segments of any population. As a result, we do not have the sophisticated data on the social structure and group dynamics of phocoenids, the way we do for most species of dolphins and small whales, which are amenable to photo-identification using natural markings. From what little we do know, porpoise groups are almost always very small (less than 5–10 individuals, except for occasional, short-lived feeding or breeding aggregations), and long-term social bonds beyond the mother-offspring pair are apparently not the norm. This



relatively simple social structure of phocoenids is in contrast to the societies of many of the delphinid species, which often have long-term (even life-long) bonds among individuals.

Communication

Very little is known about the communication among the phocoenids. Most of what is known comes from studies of individuals in captivity, but phocoenids have not been successfully held in captivity in many places (in fact, only the Harbor Porpoise has been held captive with any kind of success). Phocoenids do produce click sounds at high frequencies (greater than 100 kHz), although these are thought to be used primarily for echolocation and not so much for communication. The whistles and burst pulse sounds that appear to be the primary social communication signals of delphinids are either not produced by phocoenids, or are produced in very simple form and infrequently.

The acoustic signals produced by phocoenids tend to be very stereotyped. They are high frequency (generally centered

The mother **Spectacled Porpoise** and her offspring are often accompanied by a single male. This may be evidence of a mate-guarding mating system, as seen in Dall's Porpoise (*Phocoenoides dalli*). Very little is known about any aspect of the Spectacled Porpoise's life cycle, but reproduction appears to be seasonal, with young born primarily in the austral spring and summer. This photograph, courtesy of the International Whaling Commission, was taken on 11 January 2008 during the 2007/2008 IWC Southern Ocean Whale and Ecosystem Research cruise; see www.iwc.int/sower.

Phocoena dioptrica
Southern Ocean,
61° 33' 14" S 117° 30' 14" E.
Photo: Greg Donovan/International
Whaling Commission





Gestation in all porpoise species for which this information is known is around eleven months. A single offspring is the norm. The newborn Dall's Porpoise is about 1 m long. Growth is rapid, and the young Dall's Porpoise is generally weaned before it is a year old. Newborn Dall's Porpoises have a mottled color pattern of various shades of gray, and the white "frosting" on fins and tail flukes is absent. As the young grow, they gradually take on the bold black-and-white coloration of the adult. At one year of age, the juvenile Dall's Porpoise may reach around 1.5 m in length, and white "frosting" begins to develop on the rear edges of the tail flukes and dorsal fins. The weaned youngster grows in length faster than it grows in bulk. In males, but not females, the dorsal fin continues to cant forward as they age. The trailing edge of the flukes may also become more convex in older adult males. By 3–4 years old, females have reached 1.7–1.9 m and may be ready to reproduce. Males become reproductively active at 3.5–8 years and 1.8–2 m. The male Dall's Porpoise has relatively small testes. In contrast to the promiscuous system of the Harbor Porpoise (*Phocoena phocoena*), the mating system of Dall's Porpoise is thought to be polygynous, with the larger male guarding a single female at a time, with which he mates relatively infrequently.

Phocoenoides dalli
near Storey Island, Prince William Sound, Alaska, USA.
Photo: Gerry Sanger/Natural Images

at around 120 kHz), narrow-band clicks (single or double pulses). These signals are produced in trains while individuals forage and travel and are thought to be used for navigation and ranging, but they may also involve some unknown communication function. There are also low-frequency components of these acoustic signals, but many researchers believe these to be artifacts of the sound-production process. There is almost nothing known about how phocoenids actually communicate with each other acoustically. It is assumed that visual displays also play a part in their communication, but this aspect has not been studied in any detail.

Food and Feeding

Phocoenids are generally considered to be opportunistic feeders, taking whatever suitable prey is most abundant and available in the area. Individual prey items are swallowed whole (not bitten into pieces). The most common prey types are small, epipelagic schooling fish such as clupeoids like herring (*Clupea*), sardines (*Sardinops*, *Sciaena*), sprats (*Sprattus*), and anchovies (*Engraulis*, *Anchoa*), or capelin (*Mallotus*, *Osmeridae*); small mid-water fish such as hake (*Merluccius*, *Merlucciidae*); small benthic and demersal fish such as rockfish (*Scorpaeniformes*), grunts, and croakers (*Sciaenidae*); and oceanic squid (such as *Loligo* and *Lolliguncula*) and cuttlefish (*Sepiida*). Porpoises occasionally eat shrimps and other invertebrates, although these

food items generally are not considered to be their primary prey. Dall's Porpoise is unusual in the family because it lives in oceanic waters and dives deeply to feed, allowing it to prey on lanternfish (*Myctophidae*) and deep-water squid (*Goniatidae*). Only a few stomachs of the Spectacled Porpoise have been examined, so virtually nothing is known about its feeding habits.

Not much is known about phocoenid feeding behavior and prey-capture strategies, which take place mainly underwater and thus, have not been well studied. Porpoises are thought to locate, chase down, and hone in on prey mostly using echolocation. Vision probably does not play a major role. Some species, such as Dall's Porpoises, appear to feed preferentially at night on vertically migrating fish and squid. There is little evidence of cooperative feeding, and most prey items appear to be taken individually. Harbor Porpoises require about 3–5 kg of prey daily, and Dall's Porpoises, which are much larger and have higher metabolic rates, may require 10–12 kg each day.

Breeding

The reproductive biology of phocoenids is generally not well known for most members of the family. The exception is the Harbor Porpoise, for which there have been numerous studies of life history using large samples from various populations in North American and European waters. The same is true to a lesser extent for the Indo-Pacific Finless Porpoise and

To meet the cost of feeding her rapidly growing young, the lactating female Harbor Porpoise increases her food intake by as much as 80%. Up to 37% of the young's body mass is blubber. The female may simultaneously be pregnant. In one large sample of Harbor Porpoises killed as fishery bycatch in Icelandic waters between September and June, all but one of the adult females were carrying fetuses. Young are weaned before they are one year old. Studies from the Bay of Fundy suggest that growth rates and age at sexual maturity vary with prey availability, or with the density of the porpoise population.

Phocoena phocoena
Oosterschelde, Netherlands.
Photo: W. J. Strietman/AGAMI



the Narrow-ridged Finless Porpoise, which have been studied mostly in Japanese and Chinese waters. Dall's Porpoise and Burmeister's Porpoise have been studied in just a few locations (Dall's Porpoise in Japanese and western North Pacific pelagic regions and Burmeister's Porpoise mostly in Peru). Reproduction in the remaining species (the Vaquita and the Spectacled Porpoise) is virtually unknown, because studies from large samples of specimens have not been conducted.

What little is known suggests that most species of phocoenids have much in common relative to their reproductive biology and life history. Most species of phocoenids appear to be short-lived, rarely living beyond 20 years of age, in contrast to some other species of cetaceans that can live to be nearly 100 years of age, and possibly up to 200 years. However, Indo-Pacific Finless Porpoises and Narrow-ridged Finless Porpoises appear to regularly live past 20 years. Phocoenids appear to be relatively r-selected (able to reproduce quickly), at least compared with the closely related delphinids (ocean dolphins). Porpoises reach sexual maturity at an early age (typically 3–7 years), and there is no evidence for a period of reproductive senescence as occurs in most long-lived ocean dolphins. Reproduction of porpoises is usually annual or biennial, after a gestation of 10–11 months. A single offspring is the norm, as is true in all cetaceans, and twinning is rare. Offspring are nursed for short periods, generally much less than one year and often no more than six months. Many populations of porpoises have been heavily exploited, and it is clear that some estimates of life history characteristics are influenced by density-dependent factors and thus might be different in undisturbed populations.

Seasonality in breeding appears to be the norm for porpoises. This is not surprising for species that live in high latitudes such as Dall's and Harbor Porpoises, but it also appears to be the case for porpoise species that occur at lower latitudes such as the Vaquita and the Indo-Pacific Finless Porpoise. In species with wide geographic distributions such as finless porpoises and the Harbor Porpoise, there is often geographic variation in the peak of the birthing season.

Movements, Home range and Social organization

Not much is known of the movements of most species of porpoises. The only species for which extensive tagging efforts

have been conducted is the Harbor Porpoise, and these show that individuals are capable of long-range movements, on the order of more than 1000 km. In fact, seasonal movements of Harbor Porpoises from eastern Canadian waters to the south-eastern USA have been documented in recent years. Seasonal migrations of many hundreds of kilometers also are known for Dall's Porpoises in both eastern and western parts of their distribution, although tagging studies are almost non-existent. The individual movements of other species in the family are virtually unknown because tagging studies or studies using photo-identification of individuals have not been conducted. For the Vaquita, long-range movements do not appear to be likely because its entire population occurs in a small area of just a few thousand square kilometers throughout the year. No studies have examined, in detail, the home range patterns of any porpoise species.

Virtually nothing is known about the social organization or association patterns of phocoenids. Because of the lack of studies in which large numbers of individuals have been tagged or recognized from natural markings, little information has come to light on this issue for members of the family. However, it is known that all species of phocoenids occur in small groups (less than half a dozen individuals is the norm), and when larger groups develop, there appears to be no stable group structure. Groupings of phocoenids appear to be opportunistic aggregations to take advantage of good feeding or breeding opportunities, and they seem to have no long-term persistence. Mother-offspring pairs appear to be the only groups with any long-term persistence. Nevertheless, it is important to recognize that this assessment is based on very little actual data, and future, detailed studies in which individuals can be identified and tracked over long periods may indeed show more group structure and stability than we currently have evidence for.

Relationship with Humans

Populations of phocoenids generally have not supported large commercial hunting operations, but there are exceptions. Harbor Porpoises have been hunted in large numbers in such places as the Black Sea, Baltic Sea, Greenland, and Bay of Fundy (Canada). Currently, Harbor Porpoises are only hunted commercially near Greenland. The harvests have occurred to supply meat for human consumption and pet food. Dall's Porpoises also have been heavily hunted. In the waters off northern



Japan, Dall's Porpoises still support a large-scale harpoon fishery, which although regulated by the Japanese government is infamous for allowing unsustainable harvest to occur, despite objections by the International Whaling Commission and various conservation groups. What started out as incidental harvest of Burmeister's Porpoises and several species of ocean dolphins using harpoons and nets in Peru has grown into a commercial harvest in recent years. It has now extended into Chilean waters. Hunting of other species of porpoises has occurred at various times but generally not on a large or commercial scale.

Without a doubt, the greatest threat to populations of porpoises as a whole is accidental entanglement in fishing nets, including set gillnets, trammel nets, and driftnets. These passive fishing nets are left in the water to entangle and ensnare fish and invertebrates, and they are apparently difficult for porpoises to detect or avoid, at least when they are focused on feeding. Many tens of thousands of porpoises die every year as a result of gillnet fisheries, and every species is affected by this threat. Acoustic warning devices ("pingers") have been used to reduce the level of mortality in many cases, but they generally do not eliminate the threat completely. Although the level of mortality is not always high, in some cases, the numbers of porpoises killed are high enough to cause depletion of populations. In the worst case, the Vaquita of the Gulf of California, Mexico, is threatened with imminent extinction because of bycatch in gillnet-type fisheries. Although gillnets are the major culprit, other types of fisheries also cause porpoise mortality. Trawl nets, traps, weirs, set nets, and even purse seines are known to capture and kill porpoises on occasion.

Habitat destruction and degradation are also threats that affect porpoise conservation. As coastal species, most porpoises can be impacted by the modification of coastal and inshore waters that are inevitably associated with human activities near shore. Contamination by environmental pollutants may be affecting some populations of porpoises. Finally, the most recently recognized threat might be the effects of ocean noise. Porpoises seem especially susceptible to noise disturbance and, in some cases, may even be driven out of areas by high levels of anthropogenic noise, such as from acoustic harassment devices or pile driving.

Although there have been a handful of individuals of each species of Phocoenidae held in captivity for short periods of time, often after accidental live capture or live stranding, only the Harbor Porpoise has been held in captivity with any success. The Harderwijk Dolfinarium in the Netherlands has held a large number of Harbor Porpoises captive over many decades, and scientists there have done extensive research on communication, behavior, and ecophysiology of these captive individuals. For the most part, however, porpoises do not seem to do well in captivity, and as such, they are generally not sought after for captive display.

Because of their cryptic nature and lack of showy behavior at the surface (e.g. they very rarely leap out of the water), porpoises have not become the targets of tourism operations. While ocean dolphins and whales support extensive and profitable

With a global population estimated at 675,000, the **Harbor Porpoise** is not considered threatened. However, of more than 14 subpopulations in the North Atlantic, some are in serious trouble, mostly due to fisheries bycatch. In the early 1990s, annual mortality of Harbor Porpoises in gillnets in the Bay of Fundy, Canada, and the Gulf of Maine, USA, was estimated to be 3–4% of the population, comparable with the theoretical annual growth of this population. The Baltic Sea population of Harbor Porpoises is under 250 mature individuals and is listed as *Critically Endangered* on The IUCN Red List. The current bycatch of at least seven porpoises per year is thought to be unsustainable, and Baltic porpoises may become extinct in the near future.

Phocoena phocoena
Bay of Fundy, Canada.
Photo: John Y. Wang



Porpoises trapped in nets are unable to surface to breathe and die by suffocation. In the Bay of Fundy, Canada, and the Gulf of Maine, USA, fishermen can call on teams to rescue porpoises from their herring nets. Research in the 1990s found that acoustic alarms known as "pingers" reduced accidental mortality of the **Harbor Porpoise** in gillnets by 70–80%. Pingers are now being used around North America, in European waters, and off the Turkish Coast of the Black Sea. However, the only way to reduce bycatch completely will be to ban gillnets, which have a devastating effect on many kinds of marine wildlife. Possession of gillnets is illegal in some US states and their use is declining in the North Atlantic Ocean.

Phocoena phocoena
Bay of Fundy, Canada.
Photo: John Y. Wang

With the exception of the Harbor Porpoise (*Phocoena phocoena*), porpoises do not tend to do well in captivity. Their secretive and discreet behavior and low "surfacing profile" also mean that they are rarely targeted by dolphin and whale-watching tourist enterprises. Finless porpoises are particularly cryptic, but although they do not appear to leap from the water very frequently, individuals have been observed performing "tail stands" in the Yangtze River. Like most other porpoise species, they do not ride the bow-waves of boats, and they move away when they are startled by engines. However, individual **Narrow-ridged Finless Porpoises** have been kept for study purposes in Japan and China. In 2004, it was estimated that the species was held by ten different aquaria in Japan, where this photograph was taken. In China, efforts to conserve the "Yangtze Finless Porpoise" in recent years have focused on setting up natural and semi-natural reserves, and initiating captive-breeding attempts. The first finless porpoise to be bred in captivity, a 69-cm male, was born in 2005 at the Baiji Dolphinarium at the Institute of Hydrobiology of the Chinese Academy of Science in Wuhan. By 2009, at least six young Yangtze Finless Porpoises had been born in two captive breeding colonies, one at the Wuhan Baiji Dolphinarium and the other at Tongling Freshwater Cetacean National Natural Reserve.

Neophocaena asiaeorientalis
Japan.
Photo: Hiroya Minakuchi/GETTY





Like all members of the family, **Burmeister's Porpoise** is vulnerable to gillnet entanglement, but it is also hunted for its meat, and for fish and crab bait. It is found in near-shore waters around the coast of South America from northern Peru to southern Brazil. There may be one continuous population, or several. This species has been little studied, and essentially nothing is known about its abundance or population trends, but the kill rates in Peruvian waters are thought to be above sustainable levels. *Burmeister's Porpoise* is classified as Data Deficient on The IUCN Red List.

Phocoena spinipinnis
Chiloé Island, Chile.
Photo: Sonja Heinrich

ecotourism operations, porpoise sightings, when they occur, are generally considered just a brief diversion for most cetacean-watching vessels.

Status and Conservation

Populations of porpoises often have clumped distributions, and there may be areas of very high density for most species. These areas are generally associated with good feeding habitats. Although porpoises are considered to be among the most vulnerable of the cetacean species to human impacts, they are relatively widespread and appear to be doing well in some parts of their distributions. The Vaquita is the clear exception and is in very real danger of extinction.

The Harbor Porpoise has an extensive distribution in shallow, cool-temperate to subpolar waters of the Northern Hemisphere. Due to its close proximity to shore (and thus to human activities) in most parts of its distribution, many populations of Harbor Porpoises have suffered from human activities. More than 14 populations have been described from the North Atlantic, and some of these are in serious trouble, mostly due to bycatch, but in some cases also exacerbated by habitat alteration or contamination issues. The Baltic Sea population of Harbor Porpoises is under 250 mature individuals and is listed as Critically Endangered on *The IUCN Red List*. Other populations that have been depleted, for example in the North Sea and along the USA–Canadian eastern seaboard, have shown some recent evidence of recovery. The isolated population of Harbor Porpoises in the Black Sea is considered Endangered on *The IUCN*



Confined to the northern end of the Gulf of California in Mexico, the **Vaquita** has the smallest distribution of any marine cetacean. It is also thought to be the world's most threatened marine mammal and is listed as Critically Endangered on The IUCN Red List. If 1997–2008 trends have continued, there may be fewer than 200 surviving individuals in 2013. Gillnet fishing is believed to be the primary cause of mortality. In 2005, the Mexican government declared a Vaquita Refuge that covers the locations of approximately 80% of all verified Vaquita sightings. More recently, the government has embarked on a campaign to replace gillnet fishing with less harmful techniques. But progress is slow and may not come in time to save the Vaquita.

Phocoena sinus
Gulf of California, Mexico.
Photo: Thomas A. Jefferson

There is clear evidence of a declining trend in two major parts of the range of the **Narrow-ridged Finless Porpoise**, and it is classified as **Vulnerable** on The IUCN Red List. In the Inland Sea of Japan, a decline of nearly 70% was estimated between 1976 and 2000. There is also evidence of a rapid decline in the Yangtze River and adjoining lake systems of China. Porpoise habitat in the Yangtze River has been degraded by pollution, growth in river traffic, and fragmented by dams, including the Three Gorges Dam and hundreds of smaller dams on tributaries. The "Yangtze Finless Porpoise" (*N. a. asiaorientalis*) has recently been uplisted to **Critically Endangered** on The IUCN Red List.

Neophocaena asiaorientalis
Shimonoseki Marine Science
Museum, Yamaguchi, Japan.
Photo: Grant Abel



Red List, and direct hunting has played a role there. In the North Pacific, there is great concern about populations of Harbor Porpoises in south-eastern Alaskan waters, where bycatch and other factors may be causing problems. In some other areas, such as central California, populations of Harbor Porpoise appear to be recovering. They have even recently returned to San Francisco Bay (California, USA) after an absence of many decades.

Dall's Porpoise, the Indo-Pacific Finless Porpoise, the Narrow-ridged Finless Porpoise, and Burmeister's Porpoise remain relatively common and abundant, but for each species, one or more populations is facing serious threats, mostly from entanglement in fishing nets, with gillnets almost always the most serious threat. There is little danger of global extinction in the near future for these species, but the loss of specific populations is a very real possibility. For Dall's Porpoise, the risk comes almost exclusively from hunting and bycatch in Japanese and other Asian driftnet fisheries, and their conservation may be simply a matter of the Japanese Government enforcing reasonable quotas, which has not happened so far. For the Indo-Pacific Finless Porpoise, the Narrow-ridged Finless Porpoise, and Burmeister's Porpoise, the threats are more varied and often involve artisanal fisheries in the very protein-poor parts of the world where they occur. Conservation will be more difficult for these species because in many cases little is known about the

specific population status of the stocks involved. The Indo-Pacific Finless Porpoise and the Narrow-ridged Finless Porpoise are both classified as **Vulnerable** on *The IUCN Red List*, and the Yangtze Finless Porpoise, a subspecies of the Narrow-ridged Finless Porpoise, is listed as **Critically Endangered**.

The conservation status of the Vaquita is undoubtedly the most dire of all porpoises, and in fact, it is considered by many to be the most endangered marine mammal in the world. It is listed as **Critically Endangered** on *The IUCN Red List*. There is only a single population, and the total numbers were estimated at about 245 individuals in 2008, representing about an 8% annual decline from numbers in the late 1990s. If this decline has continued (as it appears to have done), there would be considerably fewer than 200 individuals left in early 2013. The only known threat to the Vaquita of any severity is incidental catch in gillnets. There is an active program in Mexico, with extensive US support, to eliminate gillnet fishing in the Vaquita's remaining distribution and thereby save it from certain extinction. Nevertheless, the plan has been difficult to implement fully, and the Vaquita remains in very serious danger of extinction in just a few short years. Mexico's new president has pledged support for conservation of the Vaquita, so there is some reason for optimism as of 2013.

The **Indo-Pacific Finless Porpoise** lives in shallow tropical waters from the Persian Gulf east to China, and south to the Sunda Islands, Indonesia. Some of the largest and fastest-growing human populations live along the coasts where this species is found, and pressure from fishing and rapid economic development is thought to be considerable. As a coastal species, the Indo-Pacific Finless Porpoise is also affected by habitat loss and degradation, boat traffic, and pollution. It is classified as **Vulnerable** on The IUCN Red List.

Neophocaena phocaenoides
Hong Kong, China.
Photo: Samuel Hung



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1

PLATE 28

inches 28
cm 70



2

ssp asiaorientalis



ssp sunameri



3

♂



♀



5



4



6

ssp vomerina



ssp phocaena



ssp relicta



♂

ssp dalli

7



♀



ssp trui ♂

Genus *NEOPHOCAENA*

(Hillme, 1822)

1. Indo-Pacific Finless Porpoise *Neophocaena phocaenoides*

French: Marsouin aptère / German: Wattschweinswal / Spanish: Marsopa sin aleta indopacífica

Other common names: Black Finless Porpoise, Finless Black Porpoise, Finless-backed Black Porpoise, Indian Dolphin, Indian Finless Porpoise, Little Indian Porpoise, Wideridged Finless Porpoise.



Taxonomy. *Delphinus phocaenoides* G. Cuvier, 1829, "au Cap" (= South Africa, Western Cape Prov., Cape of Good Hope). Almost certainly erroneous; unknown today from the coast of Africa.

This species is monotypic.

Distribution. Shallow, coastal waters of tropical and subtropical S & E Asia, from the Persian Gulf E to the S East China Sea and S to the Sunda Is. There are no records from Oman and the Philippines,

although the species is expected eventually to be found in both locations.

Descriptive notes. Total length 135–171 cm; weight 30–55 kg. Of the two species of finless porpoise, the Indo-Pacific Finless Porpoise is the smaller, reaching a known maximum total body length of only 171 cm. There is no dorsal fin, but there is a dorsal structure (often called a "ridge" or "groove" in the literature) that is lower and wider than in the Narrow-ridged Finless Porpoise (*N. asiaorientalis*); it is 4–8–12 cm wide, with 10–17 (occasionally as few as nine or up to 25) roughly longitudinal rows of tubercles. Even in young Indo-Pacific Finless Porpoises, the dorsal structure is wider than in adults of the other species of porpoises. The ridge begins posterior to the mid-length of the body. Head of the Indo-Pacific Finless Porpoise is blunt with no beak, and its body is relatively slender. Adult coloration is dark gray to nearly black, although newborns are much paler than adults, often a creamy gray. Adult condylobasal skull length is 181–245 mm. The rostrum is relatively wide and short; its length is 62–92 mm, with a mean of 74.6 mm. Tooth counts in each half of each jaw are 15–22 in the upper row and 16–22 in the lower row.

Habitat. Shallow, warm waters near the coast. The Indo-Pacific Finless Porpoise is often found in high densities in and near estuaries of large rivers. Although it is tropical, there is a record of its occurrence from the Yellow/Bohai Sea area, although this is considered extralimital. It penetrates into the Indus River for c.60 km and into the Brahmaputra River for c.40 km from their mouths.

Food and Feeding. Indo-Pacific Finless Porpoises feed on a wide variety of small marine organisms, some of which are pelagic and others benthic or demersal. Its prey includes fish in the families Apogonidae, Carangiade, Clupeidae, Sparidae, and Engraulidae, plus cephalopods (squid and cuttlefish) and crustaceans.

Breeding. Reproduction of the Indo-Pacific Finless Porpoises has been studied more extensively than in most other species of porpoises. The population that has been best studied is from the area around Hong Kong, where reproduction is strongly seasonal, with most births taking place from October (autumn) to January (winter). Sexual maturity of males occurs at 4–5 years of age and lengths of 138–154 cm, and at 5–6 years and 137–150 cm for females. Gestation appears to last c.11 months, and newborns are c.70–80 cm in length. Both species of finless porpoises appear to live up to 20 years, but some individuals in waters near Hong Kong have apparently lived to over 30 years of age.

Activity patterns. Indo-Pacific Finless Porpoises are cryptic, and they generally have a low surfacing profile. Although they do not often appear to leap from the water, they can be very active at times and will often chase fish at high speeds, making sharp turns and fast accelerations. They have more mobility of the neck than do other porpoise species. They do not ride bow waves of vessels.

Movements, Home range and Social organization. There is virtually nothing known about individual movements and home ranges of Indo-Pacific Finless Porpoises because no studies have successfully identified or tagged individuals. In some areas, such as around Hong Kong, there are seasonal shifts in abundance, with higher densities near shore in winter and spring, and lower densities in summer and autumn (when individuals are presumed to spend more time farther offshore). As in other porpoise species, Indo-Pacific Finless Porpoises generally occur as singles or in small groups of up to c.6 individuals. Larger aggregations of up to several dozen sometimes form in areas of good feeding opportunities.

Status and Conservation. CITES Appendix I (under *N. phocaenoides*). Classified as Vulnerable on *The IUCN Red List*. The Indo-Pacific Finless Porpoise was recently evaluated separately on *The IUCN Red List* (previous assessments listed all finless porpoises as a single species). Its classification as Vulnerable was due to observed population declines and inferred reductions of at least 30% in the past three generations. Although it has an extensive distribution throughout south-eastern Asia, and there are clearly many thousands of Indo-Pacific Finless Porpoises, no global population assessment has been attempted. A number of threats face the Indo-Pacific Finless Porpoise, including destruction of habitat from coastal development, disturbance from vessel traffic and other coastal activities, vessel strikes, and various forms of pollution. The major threat, however, comes from entanglement in equipment of

various fisheries, especially gillnets, and this may be threatening the viability of some populations. The population that occurs in waters near Hong Kong is one of the only ones for which robust estimates of abundance have been made, and it appears to number at least 220 individuals. About 1400 Indo-Pacific Finless Porpoises occur in waters off Bangladesh.

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2. Narrow-ridged Finless Porpoise

Neophocaena asiaorientalis

French: Marsouin du Yangzi / German: Östlicher Gattschweinswal / Spanish: Marsopa sin aleta asiacooriental

Other common names: Finless Porpoise, Yangtze Finless Porpoise (asiacooriental), East Asian Finless Porpoise, (sunameri)



Taxonomy. *Neomeris asiaorientalis* Pilleri & Gühr, 1972, "Yangtze, Prov. Kiangsu, Shanghai, China."

Two subspecies are recognized.

Subspecies and Distribution.

N. a. asiaorientalis Pilleri & Gühr, 1972 – middle and lower reaches of the Yangtze River, C China.

N. a. sunameri Pilleri & Gühr, 1975 – shallow marine waters of E Asia; records are known from Japan, South Korea, China,

and Taiwan. Occurrence in North Korea is not documented but is strongly suspected, and a stranding record from the island of Okinawa, S Japan, is considered to be extralimital.

Descriptive notes. Total length 130–227 cm; weight 40–72 kg. Of the two species of finless porpoise, the Narrow-ridged Finless Porpoise is the larger species, with a total body length up to 227 cm, although this may be an outlier because most specimens are much smaller. There is no dorsal fin, but the tubercled patch is narrow, 0.2–1.2 cm, occasionally up to 2.4 cm, in width at its widest point. Dorsal ridge is high (up to 5.5 cm), is covered with 1–10 rows of tubercles, and originates at or anterior to the mid-length of the back. There is no beak, and head is blunt, with a steep forehead. Especially in the Yangtze River, body of the Narrow-ridged Finless Porpoise has a very soft and "mushy" texture, different from most cetaceans. Coloration tends to be much paler than in the Indo-Pacific Finless Porpoise (*N. phocaenoides*). Adults range from pale cream to dark gray, but they are a moderate shade of gray in most populations. Newborns are dark gray and get paler as they age. Compared with their congeners, skull of the Narrow-ridged Finless Porpoise has a relatively long and narrow rostrum (length 77–97 mm, with a mean of 86.8 mm). Adult condylobasal skull lengths are 210–295 mm. Teeth are small, and tooth counts in each half of each jaw are 16–21 in the upper row and 15–20 in the lower row.

Habitat. Shallow, temperate waters of eastern Asia. Both marine and fresh waters are inhabited, and there is a population of Narrow-ridged Finless Porpoises found exclusively in the freshwaters of China's largest river, the Yangtze. Although it tends to occur mostly very near shore, it has a greater tendency than the Indo-Pacific Finless Porpoise to be found in offshore waters. Shallow, offshore (more than 240 km from shore, but less than 200 m deep) regions of the Yellow and Bohai seas are inhabited by the Narrow-ridged Finless Porpoise.

Food and Feeding. Narrow-ridged Finless Porpoises feed on a wide variety of small marine organisms, some of which are pelagic; others are benthic or demersal. Its prey includes fish (families such as Apogonidae, Carangiade, Clupeidae, Sparidae, Engraulidae, Sciaenidae, Gobiidae, and Atherinidae), cephalopods (Octopodidae, Sepiidae, Sepiolidae, and Loliginidae), and crustaceans (mostly shrimps). Available data also indicate that Narrow-ridged Finless Porpoises in the Yangtze River feed on fish and shrimps.

Breeding. Life history of the Narrow-ridged Finless Porpoise has been relatively well studied, largely due to the abundance of specimens available from large bycatches in various fisheries. Newborns are c.73–79 cm long and are born mostly in spring and summer, although births in some populations can occur in autumn and winter. Sexual maturity of males occurs at 3–6 years of age and lengths of 132–145 cm, and at c.4–6 years and 132–140 cm for females, with some variation among populations. Gestation lasts c.10–11 months. Most individuals appear to reach a maximum age of c.20–25 years, but they can live as long as 33 years.

Activity patterns. Both species of finless porpoises are very cryptic, and they generally have a low surfacing profile. Although they do not appear to leap from the water very frequently, individuals have been observed performing "tail stands" in the Yangtze River. They can be very active at times and will often chase fish at very high speeds, making sharp turns and fast accelerations. There are reports of mother porpoises carrying young on their backs (supposedly with the offspring lying on the roughened dorsal ridge), but these reports are somewhat questionable. They do not ride bow

waves of vessels, and they may move away with rooster-tail-type splashes when they are startled by a motor boat.

Movements, Home range and Social organization. Not much is known about individual movements or home range patterns of the Narrow-ridged Finless Porpoise because few studies have been able to track individual movements through tagging or individual identification work. Nonetheless, moderately extensive movements in the Yangtze River are known or suspected. Seasonal shifts in abundance are known from some waters of China and Japan, although these do not appear to qualify as well-defined migrations. Group sizes tend to be small. Narrow-ridged Finless Porpoises generally occur as singles or in small groups of up to ten individuals or so. Larger aggregations of up to several dozen sometimes form in areas of good feeding opportunities, but these groups do not have a cohesive structure.

Status and Conservation. CITES Appendix I (under *N. phocoenoides*). Classified as Vulnerable on *The IUCN Red List*. The nominate subspecies *asiacorientalis* is classified as Critically Endangered, and the subspecies *sunameri* has not been evaluated separately on *The IUCN Red List*. Vulnerable status is due to observed population declines and inferred reductions of at least 30% in the past three generations. In particular, populations in the Yangtze River and the Inland Sea of Japan have suffered dramatic declines in recent decades, and the future of both populations is in serious doubt. Although the Narrow-ridged Finless Porpoise has an extensive distribution, no global assessment of abundance has been attempted. There are, however, thought to be somewhat more than 1800 individuals in the Yangtze River and 5000–10,000 individuals in 5–6 different populations in Japanese waters. In the Yellow Sea of Korea, c.21,500 individuals were estimated to occur in offshore waters and c.5500 in coastal waters, but these estimates are thought to be low. They are faced with a number of threats, including destruction of habitat from coastal development, disturbance from vessel traffic and other coastal activities, vessel strikes, and various forms of pollution and noise disturbance. As for the Indo-Pacific Finless Porpoise, the major threat to the Narrow-ridged Finless Porpoise may come from entanglement in equipment of various fisheries, especially those using gillnets and related trammel nets.

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Genus PHOCOENA

G. Cuvier, 1816

3. Spectacled Porpoise *Phocoena dioptrica*

French: Marsouin à lunettes / German: Brillen-Dwergwal / Spanish: Marsopa de anteojos

Other common names: Spectacled Dolphin



Taxonomy. *Phocoena dioptrica* Labille, 1912, Argentina, Buenos Aires, "capturado en Punta Colares, cerca de Quilmes." This species is monotypic.

Distribution. Southern Hemisphere (E South America from S Brazil to Tierra del Fuego, Falkland Is (= Malvinas), South Georgia Is, Kerguelen Is, Heard I, Macquarie I, Auckland Is, and Tasmania). Although previously thought to be exclusively coastal, like other members of the

genus, recent sightings in oceanic waters of the Antarctic and subantarctic zones suggest that the species actually has a circumpolar distribution and may be largely oceanic.

Descriptive notes. Total length 150–224 cm; weight 50–115 kg. Spectacled Porpoises are relatively large members of the genus, reaching total body lengths of 224 cm for males and 204 cm for females. Males are larger than females and also have much larger dorsal fins, which become oval-shaped and proportionately very large. Leading and trailing edges of dorsal fins are both convex. Females and young have dorsal fins more typical in size and shape for the genus. There is only a slight or no beak, and flippers are small, with rounded tips. Color pattern is striking, two-tone black and white. Dorsal surface and upper sides are black, and belly and lower sides are white. Boundary between the two is very distinct and runs along flanks. A white "spectacle" surrounds each eye. There are black lip and eye patches, and several dark stripes from the gape that run toward the flipper. A faint gray post-dorsal fin saddle may be visible in good lighting. Newborns have a much paler dorsal surface than adults. Tooth counts generally are 17–23 in each half of each jaw.

Habitat. Variable habitats, including very deep, oceanic waters, but also in some rivers and turbid channels near shore. Spectacled Porpoises appear to prefer cold waters, with temperatures of 1–10°C, but in fact, little is known of the ecology of this elusive species. The southernmost sighting of Spectacled Porpoises is currently 64° 34' S.

Food and Feeding. Only a very small handful of stomachs from Spectacled Porpoises have been examined, so very little is understood about their feeding habits or prefer-

ences. From what is known, they appear to be opportunistic, feeding on prey items ranging from anchovies (*Engraulis*) and other small schooling fish to stomatopods and even algae (although the latter items may have been ingested incidentally just before stranding).

Breeding. There is no specific information available for this species, but births appear to occur primarily in spring and summer.

Activity patterns. Numbers of live sightings of Spectacled Porpoises at sea are very limited, and all of these have been opportunistic, so not much is known about their activity patterns. They have inconspicuous surfacing patterns and generally do not ride bow waves or leap clear of the water, although they have been enticed to occasionally surface quickly alongside the bow of research vessels.

Movements, Home range and Social organization. Group sizes of Spectacled Porpoises are generally small, usually singletons, pairs, and trios. Occasionally groups of up to five individuals have been observed. Mother-offspring pairs are usually seen in the company of at least one attending adult male, and this may be suggestive of a mate-guarding mating system, as is observed in Dall's Porpoise (*Phocoenoides dalli*).

Status and Conservation. CITES Appendix II. Classified as Data Deficient on *The IUCN Red List*. Just like virtually everything else about the Spectacled Porpoise, little is known of its conservation status. There are no estimates of abundance, and virtually nothing is known about its population structure. The first-ever molecular work on the Spectacled Porpoise indicated a large population off Tierra del Fuego. Some individuals are caught in gillnets when in coastal waters, and there is a record of an individual caught in a mid-water trawl net. They were sometimes harpooned, at least in the past, by Native Fuegians and whalers. The Spectacled Porpoise is not considered endangered or threatened at this point.

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4. Burmeister's Porpoise *Phocoena spinipinnis*

French: Marsouin de Burmeister / German: Burmeister-Schwalbentwale / Spanish: Marsopa estuaria

Other common names: Black Porpoise



Taxonomy. *Phocoena spinipinnis* Burmeister, 1865, Argentina, Buenos Aires, "captured in the mouth of the River Plata."

This species is monotypic.

Distribution. Near-shore waters of South America, from N Peru (5° S) S to Cape Horn and up the Atlantic coast to S Brazil (28° 50' S). Records from Uruguay and Brazil may be associated with N extrusions of cold water.

Descriptive notes. Total length 150–200 cm; weight 50–105 kg. Burmeister's Porpoises regularly reach lengths of up to 185 cm (although individuals up to 200 cm long have been reported from Uruguay), and males are slightly larger than females. Body shape is generally typical of that of phocoenids, with a moderately robust form. Head has a very short, poorly defined beak. Flippers are broad-based with rounded tips, and flukes are typical of other small cetaceans. Dorsal fin is unique; it rises at a very shallow angle from the posterior portion of the back and is narrow, with a convex trailing edge and a slightly concave or straight leading edge. There are several small tubercles along leading edge of dorsal fin, and sometimes on flippers, which give Burmeister's Porpoise its scientific name. Coloration is generally uniform dark gray, with a slightly paler belly. There are subtle stripes, streaks, and patches on the head, including dark eye and lip patches, a dark chin-to-flipper stripe, and pale streaks on chin and undersides. Flipper stripes are asymmetrical, being narrower and extending farther forward on the right side. Tooth counts generally are 10–23 in each half of each jaw.

Habitat. Shallow coastal waters from very near the shoreline up to 50 km offshore. Burmeister's Porpoises occur in some open-ocean waters but also in enclosed bays, channels, and fjords, and they have even been seen upstream in some rivers. They inhabit cooler waters, and water temperature may limit their northern distribution.

Food and Feeding. Burmeister's Porpoises feed on a variety of pelagic and demersal fish and invertebrate species, including anchovies (*Engraulis* and *Anchoa*), hake (*Merluccius*), sardines (*Sardinops* or *Sciaenidae*), silversides (*Odontesthes*), sculpin (*Normanichthys*), squid (such as *Loligo*), and shrimps. In the central coast of Peru, fish generally make up the majority of the prey items (98%).

Breeding. Life history of Burmeister's Porpoise has not been well studied, but sexual maturity appears to occur at lengths of c.160 cm in males and c.155 cm in females. Gestation lasts c.11–12 months. There are apparently protracted summer birthing peaks in most populations, and in Peru (where they have been best studied), most births occur in late summer to early autumn.

Activity patterns. Very little is known about behavior and activities of Burmeister's Porpoises, which have not been the subject of many ecological studies. Like other porpoises, they appear to be shy and inconspicuous, often avoiding vessels. They do not bow ride, and aerial behavior appears to be rather rare.

Movements, Home range and Social organization. They live in small groups that generally number up to six individuals. On occasion, aggregations of up to 70 individuals have been reported, but these are presumably opportunistic. Although little

is known for certain, it is expected that social bonds are largely short term and transitory. Essentially nothing is known about individual movements or ranging patterns of Burmeister's Porpoises because no tagging or photo-identification studies have been conducted.

Status and Conservation. CITES Appendix II. Classified as Data Deficient on *The IUCN Red List*. Although very little is known about stock structure in Burmeister's Porpoises, there appear to be separate populations in Peruvian and Chilean-Argentine waters. Nevertheless, it is not clear if there is a distributional gap separating them. Burmeister's Porpoises have been hunted with harpoons and nets in Peru and Chile, and the meat is mostly used for human consumption (at least in Peru) and shark and crab bait. These direct kills have been supplemented with incidental kills in gillnets. In Peru, up to 2000 porpoises/year may be killed. Like all members of the family, Burmeister's Porpoises are vulnerable to gillnet entanglement, and these kills are thought to threaten some populations. Other potential threats include mortality in other fisheries, environmental contamination, and habitat alteration. Essentially nothing is known about abundance or population trends of Burmeister's Porpoises, but the Peruvian population appears threatened by the high kill rates.

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5. Vaquita *Phocoena sinus*

French: Marsouin de Californie / **German:** Kalifornien-Schwanzwale / **Spanish:** Vaquitarina

Other common names: Cuchito, Bull of California Porpoise, Gulf Porpoise



Taxonomy. *Phocoena sinus* Norris & McFarland, 1958, "from the northeast shore of Punta San Felipe, Baja California Norte, Gulf of California, Mexico."

This species is monotypic.

Distribution. N Gulf of California (also called the Sea of Cortez) in N Mexico, the smallest known distribution of any marine cetacean.

Descriptive notes. Total length 120–150 cm; weight 30–48 kg. Few fresh specimens of the Vaquita have been measured fully and weighed. Dorsal fin is relatively tall for a porpoise of this genus (up to 15 cm, or c.10% of the total body length). Head is blunt, with little or no beak, as in other species of the genus. General body color is dark brownish-gray on back, fading to pale gray or white on belly. There are black patches around eyes and around lips. There is also a darker chin-to-flipper stripe. Neonates are born darker than adults and gradually get paler in color as they age. Tooth counts generally are 16–22 in each half of each jaw.

Habitat. Very specific habitat in the northern Gulf of California, although there are some suggestions the distribution of the Vaquita may have extended somewhat farther south in the past, before it was badly depleted by gillnet fishing. The current range of the Vaquita is characterized by moderately shallow waters (mostly less than 40 m deep) just south of the mouth of the Colorado River. These waters are murky and sediment-laden. They are biologically very productive, with high chlorophyll levels, and can reach very high temperatures in summer and autumn.

Food and Feeding. The Vaquita appears to be an opportunistic feeder, eating a variety of small benthic and demersal fish species. Some cephalopods and crustaceans are also eaten. Although only a handful of stomachs have been examined to determine feeding habits, the Vaquita appears to feed mostly on several species of grunts and croakers (Sciaenidae). They also occasionally feed on squid (e.g. *Lolliguncula*).

Breeding. Very little is known about reproduction of the Vaquita because there has only been a single study (using small samples) of its life history. Porpoises, in general, reach sexual maturity at 3–6 years of age, and females appear to give birth every other year (unusual for porpoises that usually have annual reproduction). Gestation is c.10–11 months. Breeding of the Vaquita appears to be strongly seasonal, with most births occurring in March–April. The oldest known Vaquita was 21 years old, but they may sometimes live a bit beyond this age.

Activity patterns. There have been no detailed studies of the behavior of the Vaquita, and all that has been learned comes from opportunistic sightings or those that occurred during other types of studies. Vaquitas are generally considered to be elusive and difficult to approach. They have a low, cryptic surfacing pattern that generally does not produce any splash or visible blow. They tend to stay many hundreds of meters away from large, motorized vessels, but they may occasionally approach smaller, idling vessels. When foraging, they generally surface 3–5 times and then perform a longer dive that may last several minutes. Their surfacing behavior is very unpredictable. They do not ride bow waves of boats and have never been observed breaching or performing other aerial displays.

Movements, Home range and Social organization. Essentially nothing is known of individual movements or home range patterns of Vaquitas because specimens have never been tagged. Photo-identification of individuals is possible, and although it has not been used much to date, such studies in the future may shed some light on this issue. Porpoises are generally observed alone or in small groups of 2–4 individuals (often consisting of several mother-offspring pairs). Vaquitas occasionally gather into large foraging aggregations that may consist of up to ten or more individuals, but these

groups have little or no cohesion. These aggregations are presumably related to good feeding opportunities.

Status and Conservation. CITES Appendix I. Classified as Critically Endangered on *The IUCN Red List*. The Vaquita is also listed as endangered on national legislation in Mexico and the USA. It is currently considered by many to be the most endangered marine mammal species in the world. The entire population of the Vaquita was estimated at 245 individuals in 2008, and this represents a nearly 8% annual decline in numbers estimated by the same methods in 1997. If this decline has continued, then the Vaquita would number less than 200 individuals in 2013. There are a number of potential threats, but only entanglement in gillnets has been documented as the definite cause of death for most specimens examined. Until recently, the major culprit was the fishery for totoaba (*Totoaba macdonaldi*, a sea bass found in the northern Gulf of California), but in the last couple of decades, other gillnet fisheries have become more prominent within the distribution of the Vaquita. Targets of these fisheries include several species of finfish, sharks, rays, and in particular shrimps. The Mexican government has embarked on an ambitious program to save the Vaquita, involving elimination of gillnet fishing within its distribution. New fishing gear (mini trawl nets) has been developed to replace gillnets that cause most mortality, but implementation has been slow. Mortality in gillnets continues, and it is uncertain whether it can be reduced to insignificant levels in time to save the Vaquita—the next 5–10 years will be critical. The new presidential administration in Mexico appears to be genuinely supportive of conservation of the Vaquita.

Bibliography. Barlow *et al.* (2010), D'Agrosa *et al.* (2000), Gerrodette & Rojas-Bracho (2011), Gerrodette *et al.* (2011), Jaramillo-Legorreta (2008), Jaramillo-Legorreta, Rojas-Bracho, Brownell *et al.* (2007), Jaramillo-Legorreta, Rojas-Bracho & Gerrodette (1999), Jefferson & Curry (1994), Jefferson, Olson *et al.* (2009), Ortega-Ortiz *et al.* (2000), Rojas-Bracho & Fuyao (2010), Rojas-Bracho & Jaramillo-Legorreta (2009), Rojas-Bracho & Reeves (2013), Rojas-Bracho & Taylor (1999), Rojas-Bracho *et al.* (2006), Silber (1990, 1991), Silber & Norris (1991), Silber *et al.* (1994), Taylor & Rojas-Bracho (1999), Vidal (1990), Villal-Ramirez *et al.* (1993).

6. Harbor Porpoise *Phocoena phocoena*

French: Marsouin commun / **German:** Schwanzwale / **Spanish:** Marsopa común

Other common names: Common Porpoise, Sea-hog, Sea pig; Atlantic Harbor Porpoise, North Atlantic Harbor Porpoise (*phocoena*); Black Sea Harbor Porpoise (*inflecta*); Eastern North Pacific Harbor Porpoise, Eastern Pacific Harbor Porpoise (*hyomelas*)



Taxonomy. *Delphinus phocoena* Linnaeus, 1758, "Habitat in Oceano Europaeo & Baltico" (= Baltic Sea, "Swedish Seas").

In addition to the subspecies listed below, there is also an unnamed subspecies recognized from the western North Pacific Ocean. Three subspecies recognized.

Subspecies and Distribution.

P. p. phocoena Linnaeus, 1758 – coastal waters of the N Atlantic Ocean.

P. p. natica Abel, 1905 – coastal waters of

the Black Sea, the Azov and Marmara seas (isolated population). A few stragglers from this population show up periodically in the Aegean Sea, but they do not occur throughout most of the Mediterranean Sea.

P. p. vomerina Gill, 1865 – coastal waters of the NE Pacific Ocean.

A still unnamed form is present in the coastal waters of the NW Pacific Ocean.

Descriptive notes. Total length 130–200 cm; weight 45–75 kg. Harbor Porpoises are small cetaceans, growing to a maximum length of only c.200 cm. Most adults are less than 180 cm long. Body is robust, with small appendages. There are small tubercles (or denticles) on the leading edge of the dorsal fin and sometimes also on flippers. Beak is very short and poorly defined, and dorsal fin is low, triangular, and wide-based. Color pattern is somewhat bland at first appearance, but it is actually more complex when analyzed in detail. Body is generally counter-shaded, with a dark gray back and white belly. Generally, dark and pale regions blend into each other, but margins between the two are often splotchy and streaked. Appendages are all dark, and there is a dark stripe running from gape to flipper, and there are also dark streaks on the lower jaw. There is a great deal of individual variation in color pattern, but no obvious differences among different populations have been identified. Thirty-four records of anomalously white individuals (three patterns have been observed, some perhaps albinos) have been recorded in the Atlantic and Pacific oceans. Newborns have a muted color pattern, generally of subdued tones of dark and pale gray. Tooth counts generally are 19–28 in each half of each jaw.

Habitat. Shallow waters throughout the temperate parts of the Northern Hemisphere, over the continental shelf, and usually near shore, although Harbor Porpoises may travel quite far from shore in some places and have been recorded in deep waters between land masses. They may also occur in deep waters in some inshore regions, such as in south-eastern Alaska, but only where there are shallow waters nearby. Habitat of the Harbor Porpoise is cool temperate to subpolar waters, generally with low water temperatures.

Food and Feeding. Harbor Porpoises are opportunistic feeders, although their main prey appears to vary on regional and seasonal scales. In the North Atlantic, they feed primarily on clupeoids and gadoids, while in the North Pacific, they prey largely on engraulids and scorpaenids. They eat a wide variety of fish and cephalopods, although the diet in any specific area may be dominated by just a few species. Harbor Porpoises feed heavily on small schooling fish that occur in the water column, such as herring and sprat (Clupeidae), capelin (*Mallotus*), hake (*Merluccius*), and mackerel (*Scomber*,

Scombridae); they also consume market squid (*Loligo*) in some areas. Although many of these prey species occur in the water column, many of the other prey species are benthic or demersal. Benthic invertebrates are sometimes also consumed, but these are generally considered to be secondarily ingested. In the north-eastern Atlantic, there has apparently been a long-term shift from predation on declining stocks of clupeid fish (mainly herring, *Clupea harengus*) to sand lance (Ammodytidae) and gadoid fish.

Breeding. Reproductive biology of the Harbor Porpoise has been studied more extensively than for any other member of the family, due to the large number of specimens that have been available from strandings and incidental catches in fisheries. Mating system of the Harbor Porpoise is thought to be promiscuous. Anatomical evidence (Harbor Porpoises have some of the largest testes relative to body mass of any mammal species) has for some time suggested that sperm competition may be the primary way that males compete to inseminate females. Recent behavioral observations of Harbor Porpoises in the San Francisco Bay area (USA) appear to support this idea. Young are typically born in April–August (late spring through mid-summer), after gestation of c.10–11 months. Offspring are weaned before they reach one year of age. Sexual maturity occurs at 3–4 years of age and lengths of 120–150 cm. There is geographic variation in these parameters among different populations, and density-dependent variation has also been documented. Harbor Porpoises regularly interbreed and produce hybrids with Dall's Porpoises (*Phocoenoides dalli*) in the inshore waters of the Pacific Northwest (Washington State, USA and southern British Columbia, Canada) and occasionally elsewhere where the two species are sympatric. It is virtually always the case that the mother is a Dall's Porpoise and the father is a Harbor Porpoise, and this is what would be predicted, based on their respective mating systems (Dall's are considered polygynous, with males apparently not using sperm competition, but guarding females to prevent insemination by other males). Harbor Porpoises live into their 20s, although in some areas most individuals may die before they reach twelve years of age.

Activity patterns. Harbor Porpoises are shy and unobtrusive animals, with a low surfacing profile and not a great deal of aerial behavior. They do not ride bow waves of vessels, and in many cases, they appear to actively avoid motorized vessels. There are exceptions to this, and at least in the San Francisco Bay area, they may be more approachable. These individuals sometimes lie nearly motionless at the surface for several seconds, and it is not clear why they do this. The typical surfacing pattern is a slow roll, in which the individual does not create any splash. At times, they do move faster and surface with a sloppy splash (this is called "pop-splashing," and the splash looks very different from the more V-shaped splash of a rooster-tailing Dall's Porpoise). Diving behavior of Harbor Porpoises has been studied with time-depth recording tags. Although most dives last less than one minute, Harbor Porpoises have been found to be capable of diving to depths of at least 220 m and for periods of more than five minutes.

Movements, Home range and Social organization. Singles or small groups of less than a half-dozen Harbor Porpoises are most commonly seen, although they do aggregate, at times, into loose groupings of 50 to several hundred individuals. This occurs mostly when feeding on an aggregated food source or during migration, and these large groups generally have little structure. Movement patterns of individual Harbor Porpoises are not very well known, but it is known that they are capable of large-scale movements of many hundreds to thousands of kilometers. On the other hand, repeated sightings of identifiable individuals in San Francisco Bay show that some populations may have more limited movements. Not much is known about social organization of Harbor Porpoises, but most bonds outside the mother–offspring pair appear to be weak, and there do not seem to be any other long-term associations.

Status and Conservation. IUCN Appendix II. Classified as Least Concern on *The IUCN Red List*. The subspecies *velista* is classified as Endangered, and the Baltic Sea population, which only numbers c.500–600 individuals, is classified as Critically Endangered. Other subspecies have not been evaluated separately on *The IUCN Red List*. There has been a long and somewhat tragic history of human interactions with Harbor Porpoises. Hunting has occurred in many different parts of its distribution, especially in northern European waters. Major hunts have occurred in the Black Sea, Baltic Sea, and the Bay of Fundy, and in the waters off western Greenland (the latter is still active). Many of these caused depletion of local populations. More recently, bycatch from fisheries, especially in various forms of gillnets or trammel nets, has been responsible for threatening existence of populations throughout the distribution of the Harbor Porpoise. The largest mortality has occurred in fisheries in the Gulf of Maine, western Greenland, North Sea, and Celtic Shelf, but smaller kills have occurred almost everywhere the Harbor Porpoise occurs. It is believed that Harbor Porpoises can normally detect gillnets at distances necessary to avoid entanglement, but accidents may happen due to attention shifts or auditory masking. Use of acoustic alarms ("pingers") and other mitigation measures have managed to reduce mortality in many areas, but the only way to eliminate bycatch completely is to eliminate gillnets. Catches of Harbor Porpoises in trawls, set nets, herring weirs, pound nets, cod traps, and even anti-submarine nets have also been documented and have taken their toll. Other threats include detrimental effects of environmental contaminants, vessel traffic, anthropogenic noise impacts, prey depletion, and habitat deterioration or destruction. The Harbor Porpoise is not rare and not endangered. Globally, there may be more than 675,000 Harbor Porpoises. Nevertheless, particular populations in many areas have been impacted by human activities and quite a few of these are indeed threatened and in need of protection.

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Lockyer & Andreassen (2004), Lockyer & Kinze (2003), McLellan *et al.* (2002), Nielsen *et al.* (2012), Northridge (1990), Falke (2008), Plead (1999b), Plead & Hohn (1995), Plead & Westgate (1997), Rosel (1997), Rosel *et al.* (2003), Scholfield *et al.* (2006), Siebert *et al.* (2006), Sonntag *et al.* (1999), Stenson (2003), Teilmann (2003), Thomsen *et al.* (2007), Tolley & Rosel (2006), Tonay *et al.* (2012), Virfuß *et al.* (2007), Vaud-Martin *et al.* (2007), Westgate & Reed (1998), Westgate & Tolley (1999), Westgate, Reed, Berggrén *et al.* (1995), Westgate, Reed, Cox *et al.* (1998), Willis *et al.* (2004), Woodley (1995).

Genus PHOCOENOIDES

Andrews, 1911

7. Dall's Porpoise *Phocoenoides dalli*

French: Marsouin de Dall / German: Weißflanken-Schwenkwal / Spanish: Marsopa de Dall

Other common names: Dall Porpoise, True Porpoise, Dall-type Dall's Porpoise (*dalli*), True-type Dall's Porpoise, True Porpoise (*truei*)



Taxonomy. *Phocaena dalli* True, 1885, USA, Alaska, "in the strait west of Adak [sic] Island, one of the Aleutian group."

Two subspecies are recognized.

Subspecies and Distribution.

P. d. dalli True, 1885 – cool temperate regions of the N Pacific Ocean from Japan to Alaska and S to N Baja California, Mexico.

P. d. truei Andrews, 1911 – NW Pacific Ocean waters c.35–54° N, including the Okhotsk Sea.

Descriptive notes. Total length 165–240 cm; weight 60–200 kg. Dall's Porpoise is the largest member of the family, reaching lengths of up to 240 cm for males and 220 cm for females. It is very stocky, with a very small head and small appendages. There is a very slight, poorly defined beak. Dorsal fin is wide-based and triangular, and in males, it is extremely canted forward. Tailstock is deepened, exceedingly in adult males. Flukes may have a convex trailing edge, especially in adult males. Color pattern is contrasting black and white, with a large, ventrally continuous, white flank patch (extending farther forward in the subspecies *truei*) and white frosting on upper margins of dorsal fin and trailing edge of flukes. In newborns, color pattern is muted, consisting of various shades of gray, and frosting on fin and flukes is absent. Color pattern becomes bolder as individuals age, and frosting (or trim) begins to appear in the first year of age. Tooth counts generally are 23–28 in each half of each jaw.

Habitat. Deep, cold waters. Dall's Porpoises are generally found far offshore, but they do occur in near-shore waters where there is water deeper than 100–200 m nearby. They are commonly seen in the inshore waters of north-western USA (Washington, Alaska) and west Canada (British Columbia), where they inhabit deep channels and passes.

Food and Feeding. Dall's Porpoises are opportunistic feeders, taking a wide variety of prey items. These include mostly mid-water and surface-living fish and cephalopods, such as herring (*Clupea*), anchovies (*Engraulis*), sardines (*Sardinops*, Clupeidae), hake (*Merluccius*), sauries (*Cololabis*, Scomberesocidae), lanternfish (Myctophidae), and gonaid squid (Gonatidae). They occasionally consume invertebrates such as krill, decapods, and various species of shrimps, but these latter items are not considered to be their primary prey.

Breeding. Dall's Porpoise is a seasonal breeder, with all populations known to have a very strong birthing peak in summer. Age and length at sexual maturity appear to vary among different populations, but they generally occur at 4–7 years of age and lengths of 170–190 cm for females and 3–5–8 years and 180–200 cm for males. Gestation lasts c.11 months, and offspring are generally nursed for less than one year. Mating system of Dall's Porpoise is strongly polygynous, with males apparently using their sexually dimorphic morphologic characters to compete directly for females, and then guarding the female from other potential suitors. In inshore waters of Washington, where they overlap in distribution with Harbor Porpoises (*Phocaena phocaena*), the two species regularly appear to interbreed and produce hybrids, and this also is known to occur elsewhere in their distributions. In these cases, a Dall's Porpoise is generally the maternal parent. Longevity is rarely much greater than 20 years.

Activity patterns. Dall's Porpoise is an active, energetic species. It may be the fastest swimmer of the cetaceans, at least for short bursts. They are most frequently seen swimming very quickly and throwing up a large V-shaped rooster-tail of spray as they surface to breathe at high speed, bringing only very little of their body above the surface. When riding bow waves of vessels, which they do frequently, they rooster-tail on virtually every surfacing, but at other times, they slow down and surface in a slow roll, with no splash. Breaching, spy hopping, and other types of aerial displays are not common, and they very rarely porpoise completely clear of the water.

Movements, Home range and Social organization. Dall's Porpoises are most commonly found as singletons and pairs, or in small groups of up to a dozen. They occasionally gather in large groups of several dozens or even hundreds (although these opportunistic aggregations do not have any particular structure). Groups of up to several thousand have been reported, but there is some doubt as to correct species identification in these cases. Seasonal movements of population segments of Dall's Porpoises are known, with increased densities near shore and in more southern areas in winter, and corresponding northern and offshore shifts in summer. Little is known about home ranges or movements of individual Dall's Porpoises because specimens have rarely been identi-

fied, either through photo-identification studies or tagging work. Based on what little is known, however, it would appear that they can undergo rather extensive movements of at least several hundred kilometers in pelagic portions of their distribution.

Status and Conservation. CITES Appendix II. Classified as Least Concern on *The IUCN Red List*, reflecting the large numbers that occur throughout the North Pacific Ocean. The subspecies *dalli* and *trui* have not been evaluated separately on *The IUCN Red List*. Dall's Porpoise has been hunted heavily in Japanese waters, where they are the main target species of a harpoon fishery based in Hokkaido. Meat is used for human consumption and pet food. It has also been incidentally killed in very large numbers in several pelagic driftnet fisheries that have operated in waters of Japan, Russia, and the USA (Alaska). Other potential threats include occasional kills in trawl nets, environmental contamination, anthropogenic noise disturbance, and habitat deterioration,

but fishery kills are major factors affecting populations. Several populations in the western Pacific have been depleted by these kills, and their future is uncertain because Japan has often set kill quotas that are unsustainable, ignoring advice from their own nationals and the international community. The total number of Dall's Porpoises in the North Pacific may be over 1-2 million individuals. Specific populations are estimated at 104,000 in waters off Japan, 554,000 in the Okhotsk Sea, 83,000 off Alaska, and 100,000 off the US West Coast.

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