

A pilot whale meets the camera head on. The frontal bulge, or melon, on its head is thought to contribute to this whale's acoustic abilities.
(Susan H. Shane)

Pilot Whale

by Stephen B. Reilly and
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The pilot whale (*Globicephala macrorhynchus*)—with a variety of common names, an unsettled taxonomic status, and many gaps of information in its life history—is a creature of confused identity. (The confusion is ours, of course.) Some of its characteristics, however, are undisputed: it is among the most sociable and intelligent of the cetaceans. In captivity, it has proved itself at least as intelligent as the well-known bottlenose dolphin. In the wild, the gregarious pilot whale is usually found in groups whose social structure seems to be highly organized.

Pilot whales are known by many names, including “potheads,” a term which refers to their bulbous, blunt heads, and “blackfish,” which reflects their dark appearance. In the eastern Atlantic, they associate with schools of herring, and, because fishermen there came to believe that the whales were “calling” them to fish, the whales became known as “caa’ing” whales. The name “pilot whale” is said to have a similar origin—a popular belief that the whales would “pilot” fishermen to their catch. Another theory relates to the presumption that pilot whales often have a leader or “pilot” at the head of their pods.

Pilot whales are, in effect, large dolphins. Most scientists place them in the same family with the dolphins and porpoises (Delphinidae). Taxonomists do not agree about correct classifications of groups or about distinctions among the various pilot whale forms. Nevertheless, wherever they are found, pilot whales are similar. As a result of this basic similarity, some types of information obtained about pilot whales in one area may serve as a good indication for all.

Pilot whales are predominantly black with their most distinguishing features being a blunt, bulbous head and a widely based, squat dorsal fin, which is set far forward on the body. Calves are gray in color. Some forms of this genus (including those off the Pacific coast of North America) have a gray or white saddle-shaped area just behind the dorsal fin. On the chest, potheads have a gray or white anchor-shaped patch, which is sometimes connected by a narrow blaze to a grayish white area around the genitals. Also distinctive of this cetacean are its long, sickle-shaped pectoral fins. It has been suggested that a famous 1934 photograph of Scotland’s Loch Ness monster is remarkably similar to the sight of a pothead lying on its side at the water’s surface and waving a pectoral fin in the air. The very long tail stock is laterally com-

pressed, thus forcing beached animals to lie on their sides rather than on their bellies. When the whale begins a long dive, the tail stock is exposed in an arching roll, which is frequently followed by the appearance of its small dark tail flukes.

Although subadult males and adult females are indistinguishable in the field, the adult male is significantly larger in all proportions than the adult female. The male has a larger melon, which protrudes beyond the upper jaw, a more deeply keeled tail stock, and a thicker leading edge on the dorsal fin. In the North Pacific, males generally reach a length of about twenty feet and females reach only fifteen or sixteen feet.

Pilot whales are sometimes confused with other whales, such as the false killer whale, which reaches comparable lengths, is black, and is sometimes called "blackfish." However, the body of the false killer is considerably less robust. Its head is smaller and gently tapering, and its dorsal fin is taller, more narrowly based, and set farther back on the body. False killer whales also sometimes ride the bow waves of boats—a skill that pilot whales are not known to practice. Off southern California, inexperienced observers often mistake Risso's dolphins (*Grampus griseus*) for pilot whales. These dolphins, however, have tall pointed dorsal fins and distinctly whitish heads.

Generally pilot whales are found in the world's tropical and temperate oceans. They are more abundant where schooling squid—their preferred food—are found. In turn, pilot whales are the prey of sharks, humans, and perhaps killer whales. Along the Pacific coast of North America, pilot whales are most abundant south of Point Conception (just northwest of Santa Barbara, California). From there north to the Gulf of Alaska, they are only rarely sighted; these infrequent movements north of Point Conception may be related to seasonal influxes of warmer temperate waters.

In southern California, there is a traditional aggregation of a few hundred pilot whales each winter at Santa Catalina Island. The whales come to feed on spawning market squid. In the winter of 1983–84, when the warm waters of the most severe El Niño on record affected the marine ecosystem, the squid failed to gather at this island for spawning, and the pilot whales failed to make their annual appearance for the first time on record. Although water temperatures were restored to normal the following winter, the residual effects of El Niño resulted in only a small number of spawning squid at Santa Catalina Island, and only one pod of twenty pilot whales spent the winter there. The location of most of the pilot whales during these two winters remains a mystery, although it is likely that they moved farther offshore.

In the Atlantic, there are two well-defined species of pilot whales, distinguished by differences in distribution, skeletal and external morphology, and coloration. *Globicephala melana* is called the long-finned pilot whale because its pectoral flippers reach at least one fifth of the length of its adult body. The other Atlantic species, *G. macrorhynchus*, is called the short-finned pilot whale because the pectoral fins of adult animals are up to one sixth of the total body length. Some overlap does occur in these characteristics. The distributional boundaries between the two Atlantic species are relatively well defined. The long-finned pilot whale's distribution is "antitropical"—located in temperate waters to the north and south of the generally tropical short-finned pilot whale.

Unfortunately, our knowledge of pilot whales in the Pacific is less complete. There are at least two, possibly three, distinct forms present. The long-finned variety, *G. melana*, ranges north from the Antarctic convergence along the west coast of South America to Peru, in the cold Humboldt Current. Subfossil material discovered in Japan indicates



*A breaching pilot whale shows
its sickle-shaped flippers.*
(Susan H. Shane)

that *G. malaena* was present in the North Pacific as recently as the tenth century.

Some controversy currently surrounds the eastern North Pacific form. The short-finned pilot whale, *G. macrorhynchus*, is variously described as being tropical (as this species is also in the Atlantic and Indian oceans) and as occurring from about Guatemala north to the Gulf of Alaska. Most investigators consider the eastern North Pacific form to be the same as the pilot whale of the tropical Pacific, *G. macrorhynchus*, while a few have labeled it a separate species entirely, most often *G. scammonii*. The basis of this problem is as old as the study of biology: Just exactly what defines a species? Unfortunately, not all biologists accept the same set of criteria. The identity of the North Pacific pilot whales is a case in point.

In 1971 Dutch cetologist P. J. H. van Bree compared skull measurements of a number of proposed species of pilot whales and, finding no significant differences, concluded that all tropical and temperate North Pacific pilot whales are of the same species: *G. macrorhynchus*. In 1981 a statistical analysis of all available Pacific pilot whale skulls by James Polisini of the University of Southern California, essentially confirmed Van Bree's finding. While acknowledging the similarity of skull characteristics, other scientists point out the larger overall size of the North Pacific form, its temperate distribution, larger melon, and flipper length intermediate between that defined for the short-finned and long-finned species. Because of these apparent differences, a few biologists continue to recognize *G. scammonii*. The problem is compounded by

the fact that both of these types—*G. macrorhynchus* and *G. scammonii*—seem to occur together along Baja California and off southern California, and near Japan, as well.

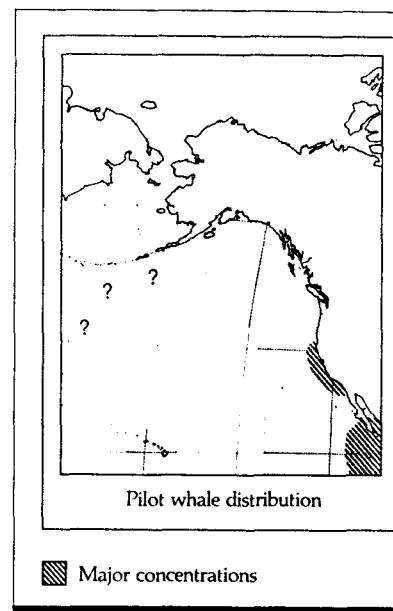
Squid is the pilot whale's major food, although when squid are not available, some fish are consumed. A current theory holds that, in the toothed whales that consume primarily squid, there is an evolutionary trend toward reduction in the number of teeth. While the predominantly fish-eating spotted dolphin has a total of 150 to 160 teeth, and the white-sided dolphin has 100 to 110, the squid-eating pilot whale has 28 to 48. Other squid eaters, such as the Risso's dolphin and the beaked whales, have 4 to 12 and 0 to 4 respectively. This theory argues further that teeth are not necessary to capture densely schooling squid; teeth may even interfere with the process of engulfing large numbers of the prey.

Like other cetaceans, pilot whales generally swallow their food whole, without chewing it, and probably ingest using strong suction. A typical eighteen-hundred-pound adult female pilot whale fills her three-chambered stomach with twenty-five to thirty pounds of squid. If, as has been estimated, she requires eight hours for complete digestion, she may fill her stomach two to three times each day. Thus, an average mature female pothead may consume fifty to ninety pounds of food daily.

While we currently know almost nothing of the life history of eastern North Pacific pilot whales, those of the western North Pacific (off Japan) have been studied in detail by Toshio Kasuya of the Far Seas Fisheries Research Laboratory in Shimizu and Helene Marsh of James Cook University in Australia. These researchers have found that breeding is diffusely seasonal, with a single peak of conceptions in April and May, and a single peak of births in July and August. Gestation lasts about fifteen months. Breeding seasonality is probably related to the females' reproductive cycle, since they showed a peak in ovulations coincident with the spring peak in conceptions, while there was no clear evidence of seasonality in the sexual condition of males.

As with other marine mammals, one calf is born at a time. Most young pilot whales studied in the western North Pacific are suckled for at least two years, while calves of older cows may be nursed for considerably longer. Females mature at nine years on average and usually have four or five calves, the last prior to their fortieth year, even though they may live sixty years. Male potheads become sexually mature at about fourteen years, but are not socially mature until about seventeen years of age. Males are shorter-lived than females: out of 170 males examined by Kasuya and Marsh, the oldest was forty-six. The natural mortality of males is apparently higher than that of females at all ages.

Pilot whales are considered to be among the most social of the cetaceans, but little is known about the structure of their sociality. In the Pacific, these animals typically travel in groups or pods of between twenty and twenty-five, whereas in Newfoundland groups of a few hundred are quite common. Presumably the pod constitutes the basic social unit, and the larger groups are actually aggregations of several pods. The ratio of mature females to males in stranded, hunted, and free-ranging pods is always biased in favor of females, indicating polygyny. Researchers in Japan and Canada believe that the sex ratio is skewed because males suffer from a higher mortality rate than do females. Based upon the life history data collected on pilot whales killed in Japanese fisheries, researchers hypothesize that pilot whale pods are stable matrilineal kinship groups, in which females remain for life while males move to pods other than the one into which they are born. It remains unclear whether the pods actually have a single leader. Preliminary observations by one of us (Shane) suggest that pod composition



may be stable over time.

Bonds between pilot whales, both in captivity and in the wild, appear to be very strong. An example of this attachment was demonstrated when a young adult female was caught by Marineland of the Pacific in Palos Verdes, California, and held on a line for five and one-half hours before being transported by boat. During her struggle, the whale was accompanied by five or six other pilot whales from her pod, as well as by several Pacific white-sided dolphins. The pilot whales swam just ahead of the captive and dove synchronously with her. The mother-calf bond is also very strong. Female pilot whales, like many other toothed cetaceans, will frequently carry their dead young for hours or days, both in captivity and in the wild. One of us (Shane) has discovered a unique variation on this behavior at Santa Catalina Island. There, pilot whales carry the bodies of dead California sea lions for hours or perhaps even days.

In contrast to the exuberant playfulness of most dolphins, pilot whale behavior is relatively sedate and single-minded. Aerial behaviors, such as leaping, are infrequent and probably have social connotations when they do occur. When feeding, these whales are found in dispersed herds usually composed of more than one pod. Because squid spawn on the bottom at depths of 50 to 120 feet in southern California, pilot whales are usually found within one-quarter to one mile of shore during the winter season. After feeding, the whales coalesce into distinct, well-organized pods, which travel parallel to the coast, possibly hunting for more food. The pods sometimes stop to rest, with each whale lying motionless at the surface and exposing only its melon and the leading edge of its dorsal fin. Resting pods frequently settle in a line-abreast formation. Sightings of small calves and the behavior of pilot whales in captivity suggest that mating may occur in the winter off southern California. In captivity, one element of courtship behavior involves violent head-butting in which the male and female slam their rounded melons into one another at high speed. Scarring is seen frequently on subadult males, indicating possible competition for status in a dominance hierarchy.

Pilot whales are often accompanied by other cetaceans and even by pinnipeds. Presumably pilot whale pods are exceptionally efficient at detecting food and so other marine mammals take advantage of this skill. The most common associate of pilot whales near the California Channel Islands is the bottlenose dolphin, but Pacific white-sided dolphins, common dolphins, and California sea lions are also seen with potheads.

Possibly the most perplexing behavior pattern of pilot whales and several other species is their tendency toward mass strandings, in which most whales usually die. In recent years, mass pilot whale strandings along the Pacific coast have occurred at Mazatlan and La Paz, Mexico, and on San Clemente Island off the coast of southern California, where twenty-eight animals swam ashore. So far, none of the many theories proposed to explain mass strandings has gained general acceptance. The popular concept of suicide seems unlikely, given our present knowledge about these and other cetaceans. The most prevalent theories among cetologists include the following. First, a combination of bottom or environmental conditions might render the animals' sonar ineffective. (This may be at least part of the explanation, as mass strandings occur in similar habitats, such as gently sloping beaches with sandy or muddy bottoms.) Second, heavy parasite infestations in the heads of the whales might render their sonar ineffective. Third, the pod leader for some reason might lose its sonar (from

parasites?), or for some other reason swims onto a beach, and the pilot whales' strong social bond disposes the rest of the pod to follow. Fourth, the whales may be fleeing from killer whales or other danger, although this theory is less frequently considered.

Two more recent theories regarding strandings are of interest. Preliminary results of a comparison of live stranding localities and the contours of the earth's geomagnetic field suggest that these events often occur in areas where magnetic "valleys" intersect the coast. It has been suggested that the animals navigate in part by means of cues from the geomagnetic field and for some reason follow the "valleys" up to and onto the beach. Another theory suggests that strandings are a form of population regulation, occurring primarily in populations near their environmental carrying capacity, and most often in the core rather than at the peripheries of their ranges.

Like all cetaceans, pilot whales have efficient sonar on which they rely heavily for both navigation and prey location. Captive pilot whales have demonstrated that they can retrieve objects and swim efficiently in a tank with their eyes covered. Vision in these animals appears to be very good, although no experimental evidence is available on this point.

Pilot whales are highly auditory animals. They communicate primarily by vocalizations that include whistles and frequency modulated calls. Unlike dolphins, which vocalize at very high frequencies, most pilot whale sounds are below 15 kilohertz. Individual pods probably have signature whistles, and vocalizations are more complex when these animals are highly aroused and interacting socially than when they are resting or traveling.

Pilot whale skin is sensitive and easily abraded. Physical contact may play an important role in communication. In captivity, pilot whales often respond favorably to touch and enjoy a brisk rubbing with a scrub brush. They are also easily trained in captivity and survive well. Often they form strong attachments to tank mates of different species.

Aside from the antics required for oceanarium performances, pilot whales have been trained for relatively complex maneuvers for a few research projects. In the United States Navy's "Project Deep Ops," a pilot whale was trained to work untethered in the open sea. There it learned to locate objects at depths of up to 1,650 feet by means of beepers. The animal carried a recovery device in his mouth and attached it to the located object, which was then raised by means of a gas generator and a lifting bag. Pilot whales trained in this manner could be used to help recover expensive oceanographic instruments or to carry out similar tasks.

The earliest record of a pilot whale fishery dates from the sixteenth century at the Faroe Islands, where a small, fairly stable yearly catch of around fifteen hundred whales continues to this day. The whales are captured by a "drive fishery" method whereby entire herds are driven ashore by villagers in rowboats and skiffs. Probably the largest drive fishery for these whales took place in Newfoundland between the mid-1940s and the mid-1960s, with catches approaching ten thousand whales during peak years. There is also a small fishery for the short-finned pilot whales at St. Vincent Island in the Caribbean, where two hundred or more whales were taken yearly by harpoon during the 1960s and 1970s. Recent catches, however, have decreased to fewer than twenty whales per year.

Aside from an undetermined number of harpoon catches by sperm whalers in the nineteenth and early twentieth centuries, there is no history of direct exploitation in the eastern Pacific. Some live captures have been made in this area for oceanariums and research facilities. In

recent years, the pilot whales' pursuit of squid in the southern California Bight has resulted in direct competition with squid fishermen for the seasonally abundant cephalopods. Up to a dozen or more pilot whales have been killed there during winters when the squid fishery is in operation, most near Santa Catalina Island. The size of the whale population in this area is unknown, but from estimates of minimum numbers seen around Santa Catalina Island, the annual mortality may approach ten percent, constituting a potentially serious impact.

Although pilot whales lack the charisma and ebullience of most dolphin species, they are intriguing because of their tightly knit social groups and their persistent tendency toward mass stranding. The strong association between pilot whales and squid distribution, the disruption of these whales' normal patterns by El Niño, and their frequent association with other marine mammals indicate the important role these enigmatic cetaceans play in the marine ecosystem. Further long-term research holds the promise of unlocking some of the secrets surrounding the pilot whale.
