

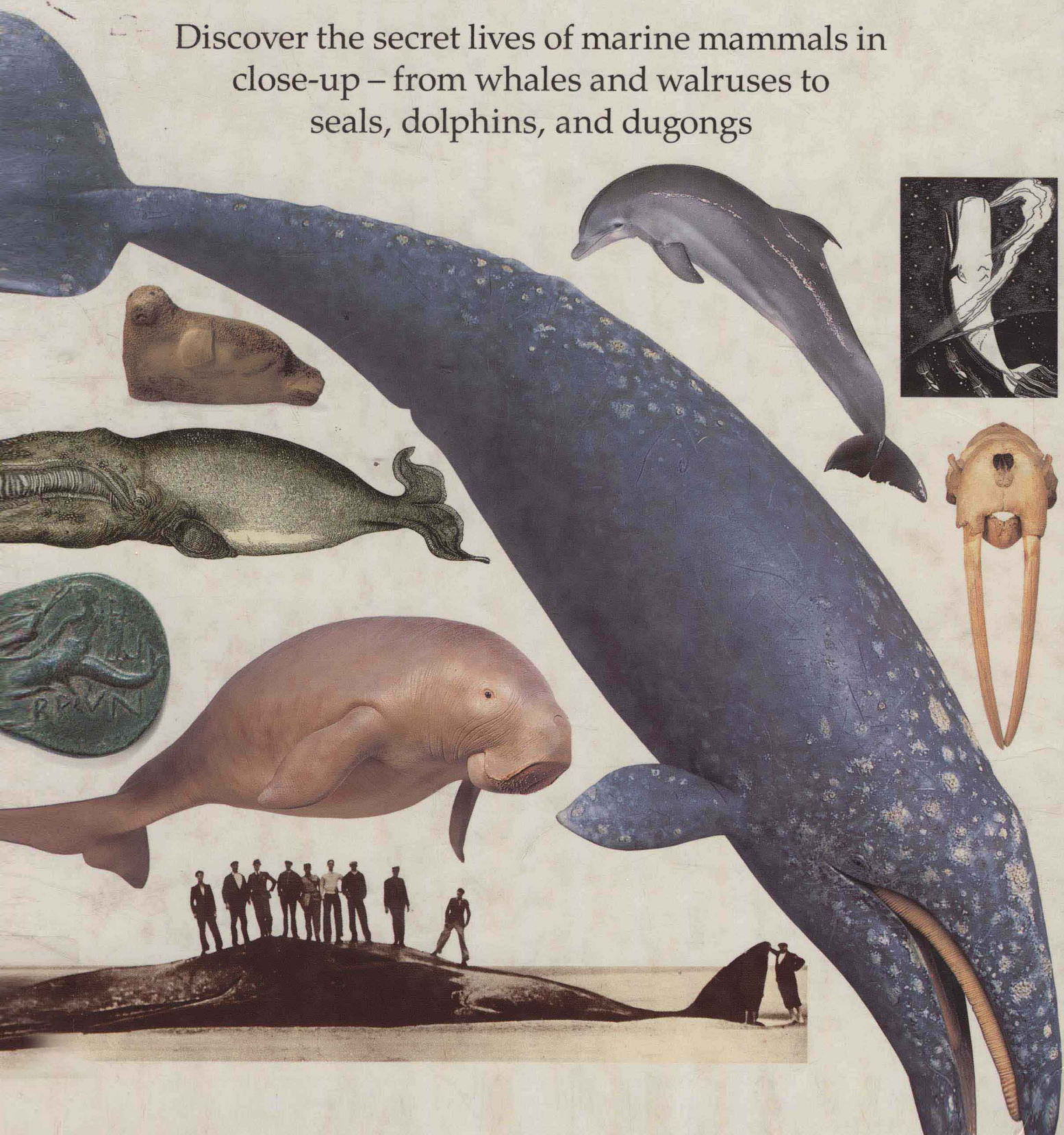
JONAH & WHALE

EYEWITNESS BOOKS



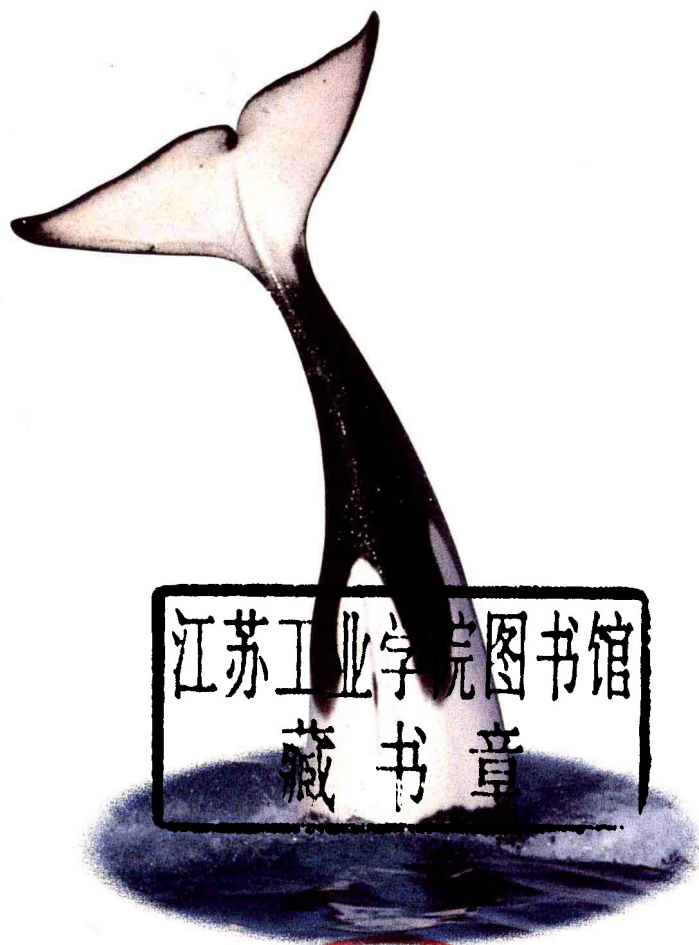
WHALE

Discover the secret lives of marine mammals in close-up – from whales and walruses to seals, dolphins, and dugongs



EYEWITNESS BOOKS

WHALE





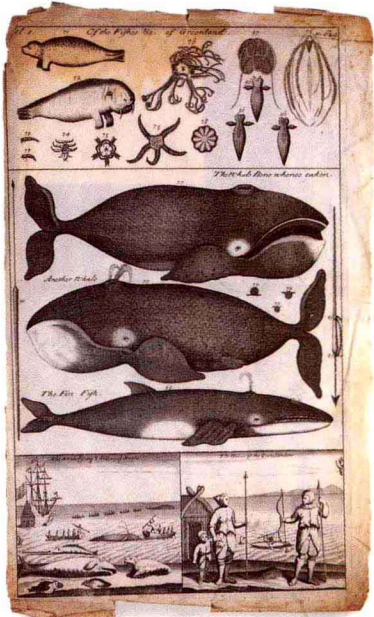
The Dionysus Cup, ancient Greek, c. 540 B.C.



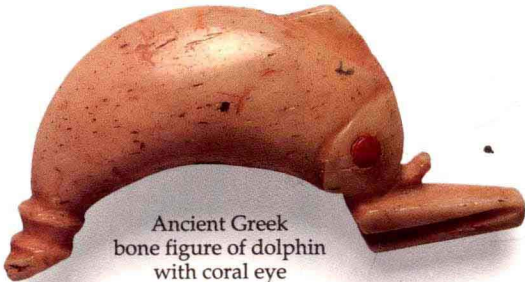
Krill



Roman coin with boy riding dolphin, 2nd century B.C.

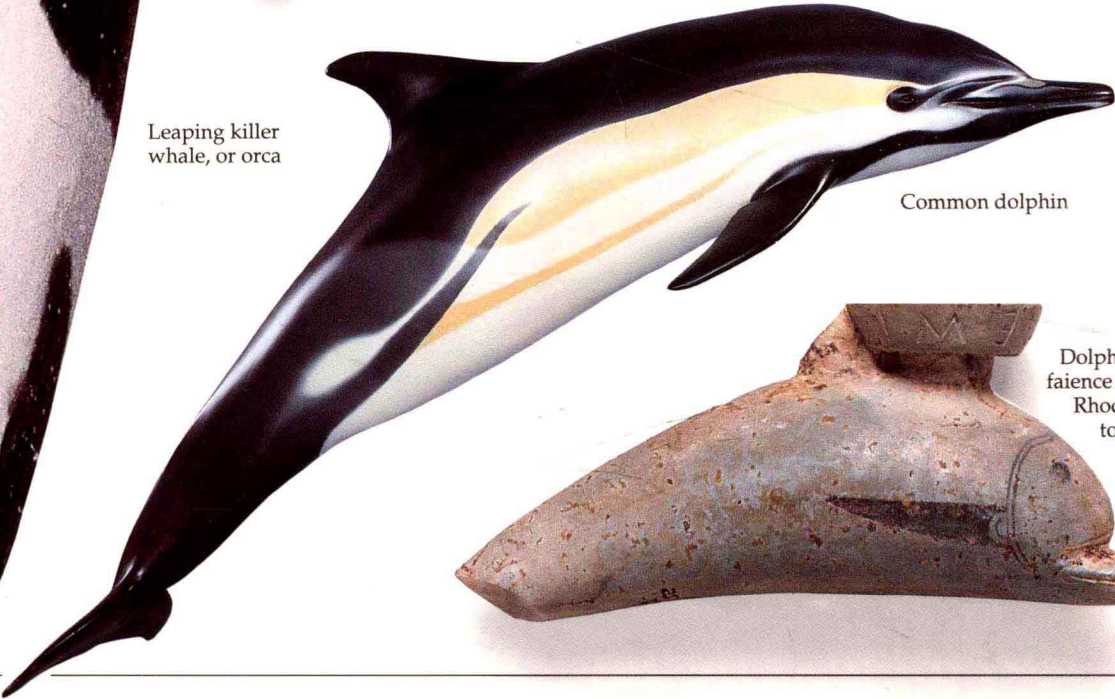


17th-century engraving of whales and whaling



Ancient Greek bone figure of dolphin with coral eye

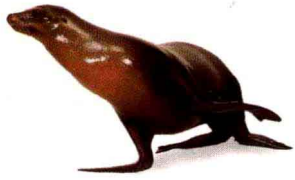
Leaping killer whale, or orca



Common dolphin



Dolphin-shaped faience vase from Rhodes, 550 to 500 B.C.



Female California
sea lion

EYEWITNESS BOOKS

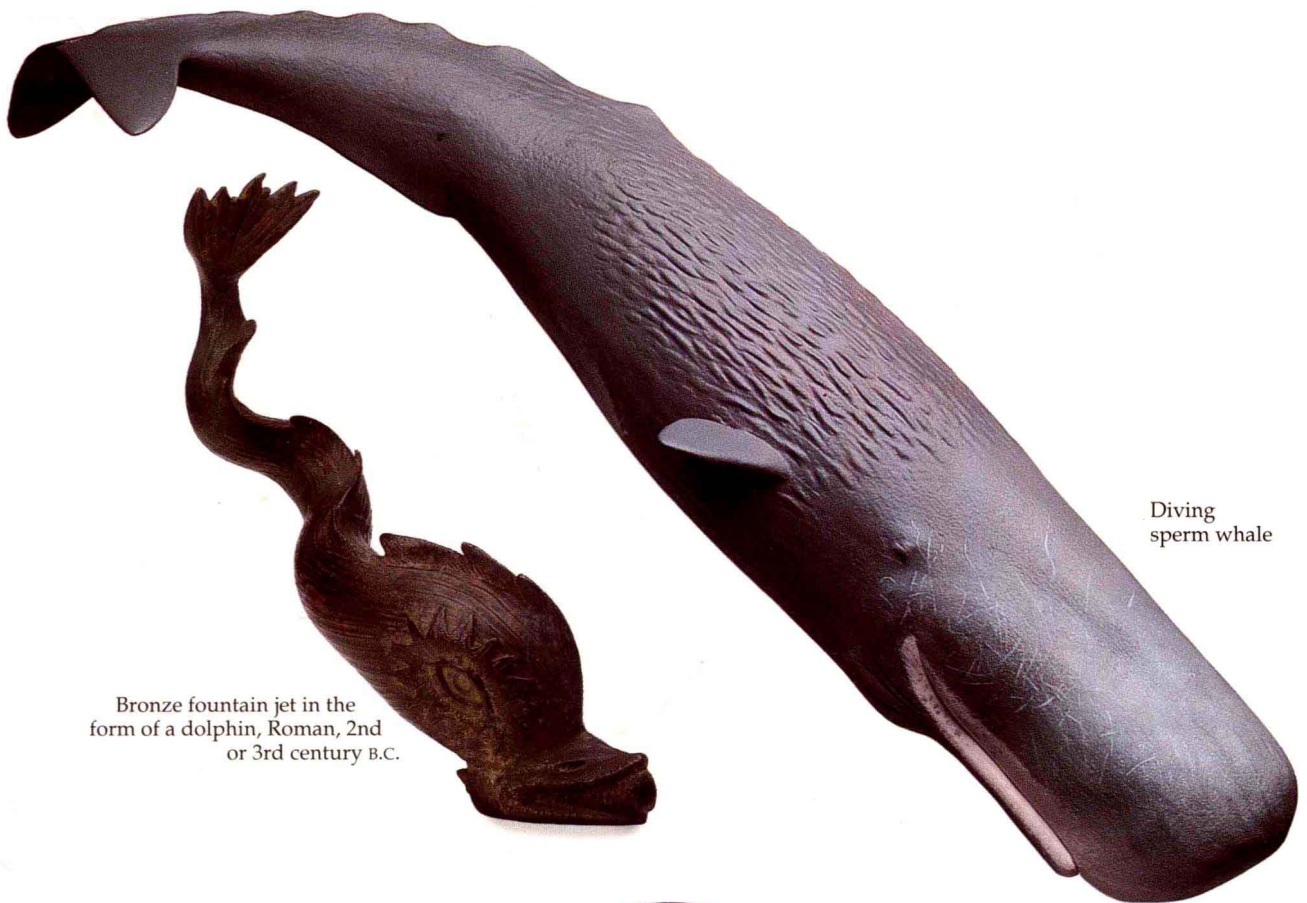


Male walrus

WHALE

Written by
VASSILI PAPASTAVROU

Photographed by
FRANK GREENAWAY



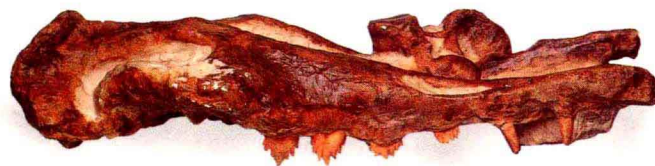
Bronze fountain jet in the
form of a dolphin, Roman, 2nd
or 3rd century B.C.

Diving
sperm whale

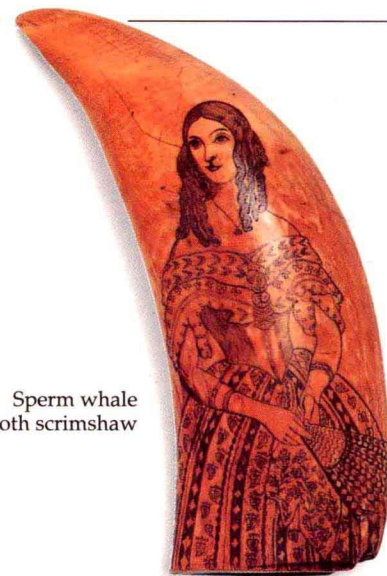
Stoddart



Baleen plate decorated by 19th-century whaler



Upper jaw of extinct whale *Basilosaurus*



Sperm whale tooth scrimshaw



A DORLING KINDERSLEY BOOK

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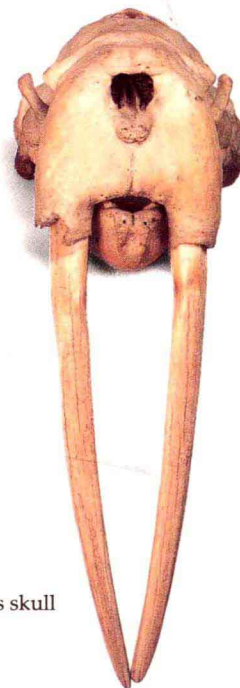
Whale meal



Spermaceti oil



Dyed baleen bristles



Walrus skull



Narwhal skull with long tusk

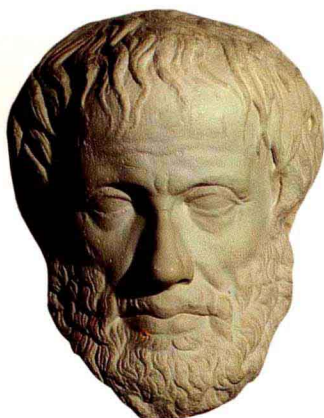


Gray whale

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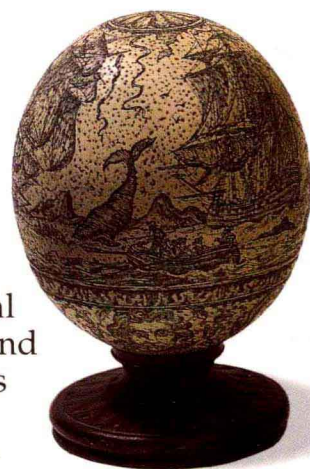
Marine mammals



ARISTOTLE

Whales are mammals, not fish. The Greek scientist and philosopher Aristotle recognized this 2,400 years ago. He also noticed that they suckle their young and breathe air, like other mammals.

AT FIRST SIGHT A DOLPHIN looks more like a fish than a person. But like you, the dolphin is a mammal, a warm-blooded animal that feeds its young on mother's milk. It is one of the many kinds of whale, the most successful group of marine mammals. Several other unrelated groups of mammals, including seals and dugongs, also make their homes in salt water. Millions of years ago their ancestors left the land to live in the sea. Over time they evolved to suit their new environment, becoming sleek and streamlined. Unlike fish, which take oxygen from the water, marine mammals must come to the surface regularly to breathe. But taking oxygen from the air is efficient, and most marine mammals are fast swimmers and powerful hunters.



GLOBE SWIMMERS

This globe made from an ostrich egg shows whales swimming all over the world. Marine mammals live in every ocean, from the balmy tropics to the icy polar seas, and in several great rivers. Some migrate vast distances to feed and give birth.



WHALE-SIZED

In every language, the word for 'whale' connotes something large. Even the smallest whales are the size of a person. This pilot whale weighs 2,850 lb (1,300 kg), about 18 times the size of an adult man. The largest whales are bigger than any dinosaur, and the blue whale, the largest of all, weighs 220 tons (200 tonnes) and is as long as a Boeing 737 jet!



SEA MONSTER

Whales are mysterious creatures. The biggest species live far out at sea and spend most of their lives under water. Early drawings were based on sailors' stories of sea monsters with huge mouths that huffed and puffed like dragons.

Layer of fur protects and keeps animal warm

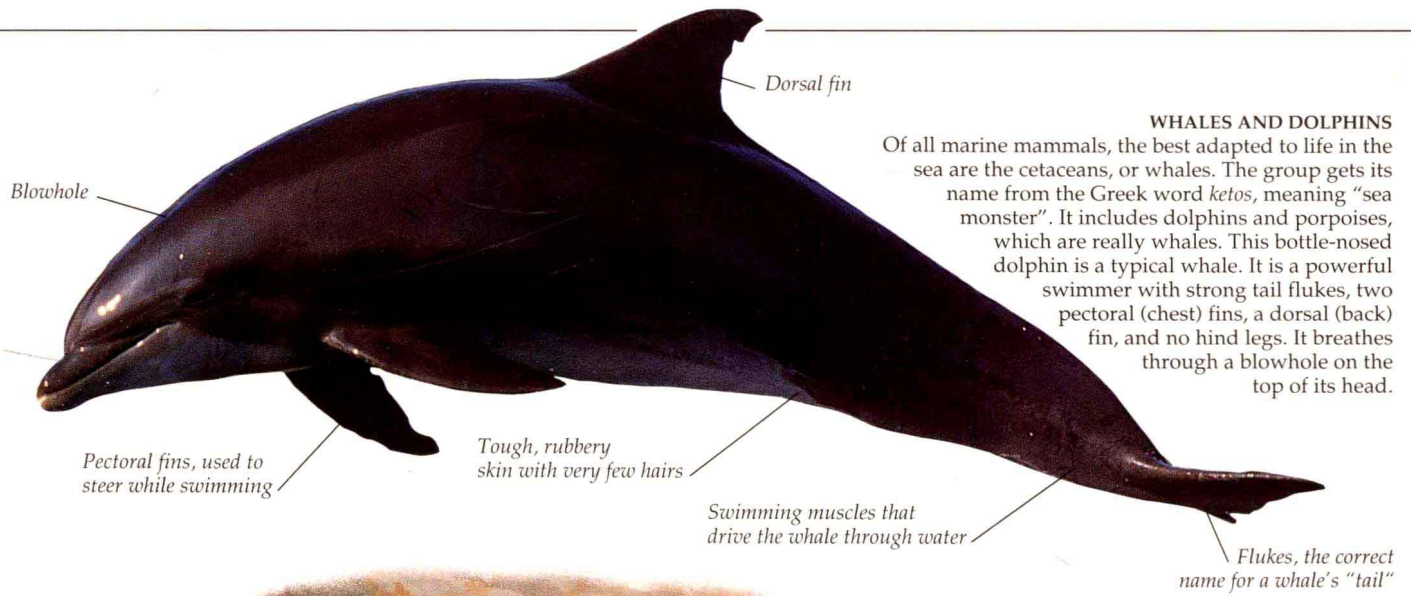


FIN FOOT

Seals, sea lions, and walruses are pinnipeds, which means "fin-footed." They are powerful swimmers superbly adapted to life in the sea. As their name suggests, they have webbed feet. But unlike whales, they have not lost their back legs and have to come ashore to give birth.

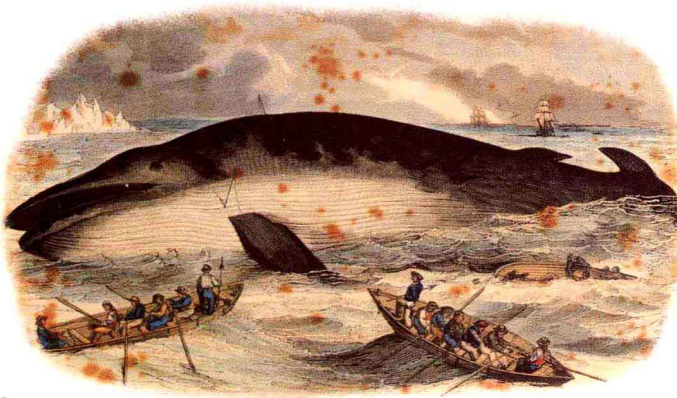
Powerful front flippers used to propel sea lion through water

Webbed back flippers



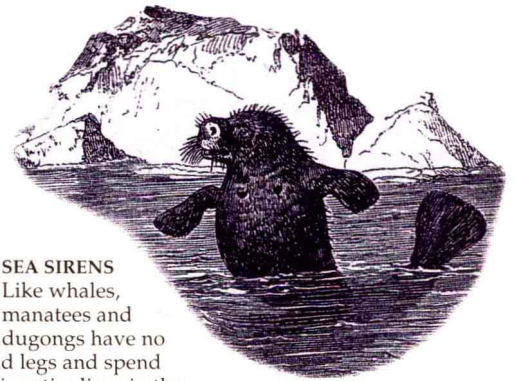
WHALES AND DOLPHINS

Of all marine mammals, the best adapted to life in the sea are the cetaceans, or whales. The group gets its name from the Greek word *ketos*, meaning "sea monster". It includes dolphins and porpoises, which are really whales. This bottle-nosed dolphin is a typical whale. It is a powerful swimmer with strong tail flukes, two pectoral (chest) fins, a dorsal (back) fin, and no hind legs. It breathes through a blowhole on the top of its head.



THAT SHE BLOWS!

No group of animals has been hunted as ruthlessly as whales (pp. 46–51). They were once common in all the world's oceans, but by the middle of this century many populations had been virtually wiped out. The industry declined, and a public outcry helped to control the killing. But many whale populations may never recover (p. 63).



SEA SIRENS

Like whales, manatees and dugongs have no hind legs and spend their entire lives in the water (pp. 44–45). They are gentle vegetarians, and sailors used to mistake them for mermaids. They are known as sirenians, from the Greek word for mermaid, *seiren*.

Light color blends in with snow and ice of Arctic

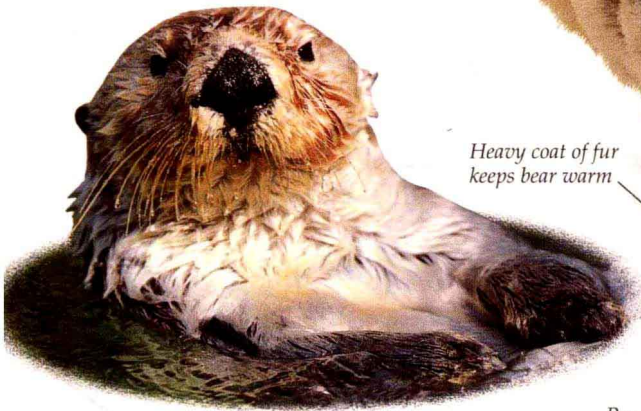
SEA BEAR

Are polar bears marine mammals? Probably, because they depend on the sea. For much of the year, polar bears live on the floating ice pack, spending hours in the water hunting seals. They are superb swimmers but cannot stay under water very long.



Heavy coat of fur keeps bear warm

Powerful paws used to kill prey such as seals



SEA OTTER

Most otters are found in rivers, but there are two species that live all the time in salt water. Sea otters entered the oceans relatively recently and are not as well adapted as other marine mammals. They are sleek and streamlined, with dense fur and webbed feet.

Whale evolution



AN EARLY WHALE?

Most scientists agree that whales have the same ancestors as even-toed ungulates (hoofed animals), which include modern cows and deer. These ancestors lived on land and hunted other animals. This is a model of *Mesonyx*, an odd carnivore that looked like a wolf but had hooves like a cow. Just like today's carnivores, *Mesonyx* had several different kinds of teeth (pp. 22–23).

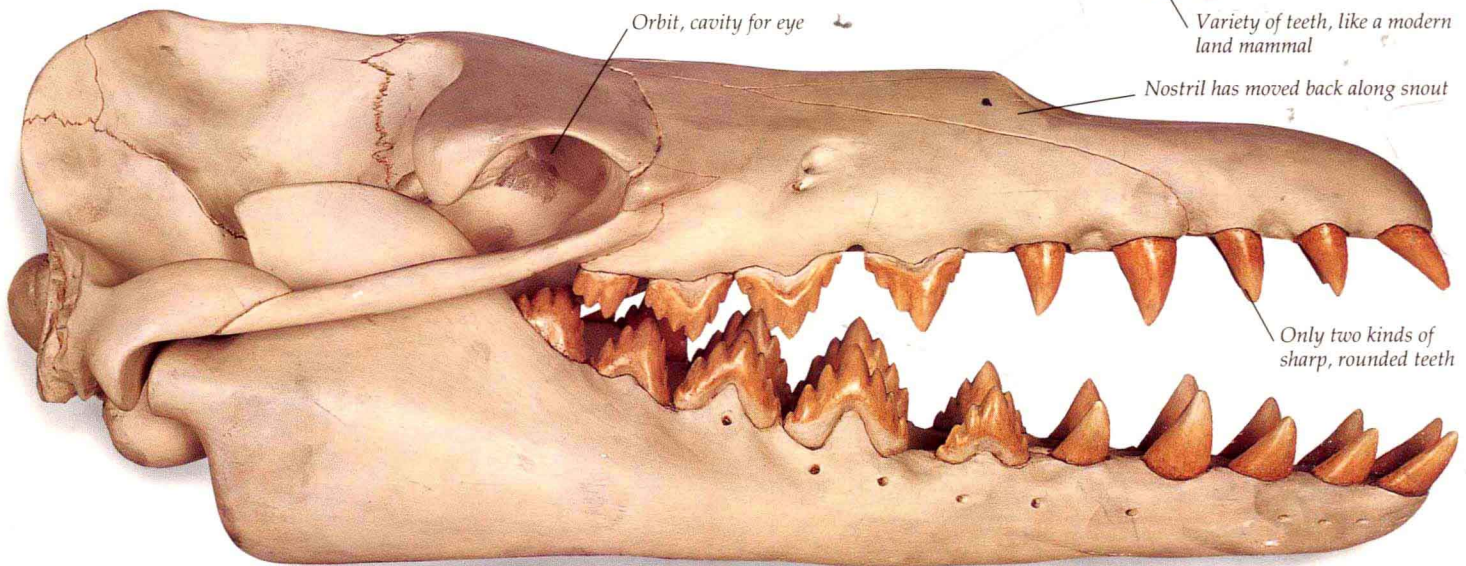
OLD WHALE

The *archæocetes* (from the Latin for “old whales”) lived in shallow seas and salty estuaries 55 million years ago. Their nostrils were still at the front of their heads.



Nostrils near front of snout

Variety of teeth, like a modern land mammal



Orbit, cavity for eye

Nostril has moved back along snout

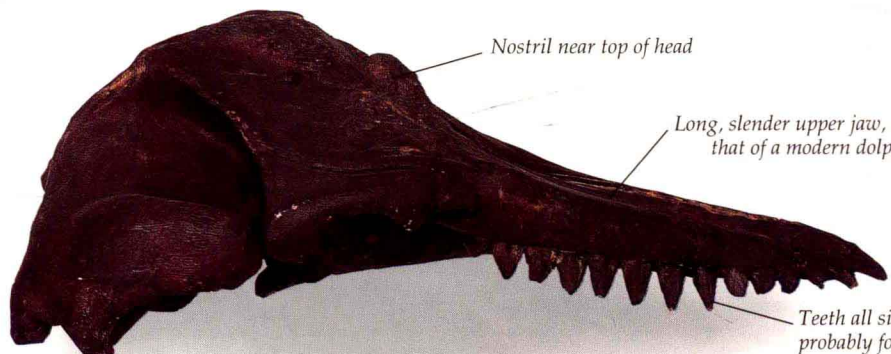
Only two kinds of sharp, rounded teeth

SEAFOOD PLATTER

We know almost nothing about how early whales lived. But the teeth give some clues. *Prozeuglodon isis* probably lived in shallow water, where it caught fish and ground up shells to eat the soft-bodied animals within.

MORE LIKE A DOLPHIN

In some ways the skull of *Prosqualodon davidi*, which lived 25 million years ago, looks like a modern dolphin's skull (p. 23). Its blowhole must have been near the top of its head, and its teeth are all a similar size and shape.



Nostril near top of head

Long, slender upper jaw, like that of a modern dolphin

Teeth all similar shape, probably for catching fish



Small hind limbs

Slender, snakelike shape, which suggests that Basilosaurus swam by wriggling like an eel

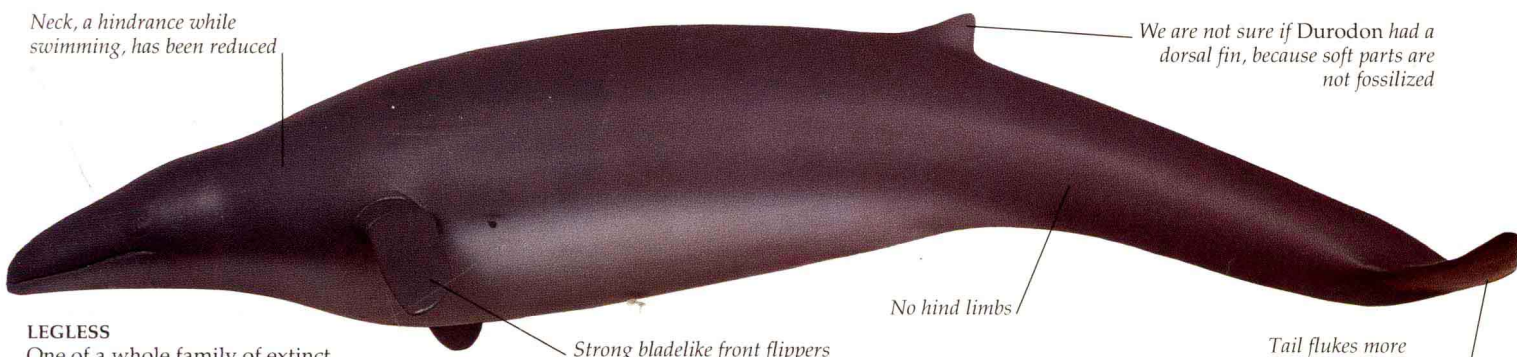
KING LIZARD

In 1832, the fossilized bones of a huge animal were discovered in Alabama and Louisiana. The

scientists who examined them thought they came from a huge reptile, which they named *Basilosaurus* – “king lizard.” We now know *Basilosaurus* was an early whale that was common in most ancient seas. The largest fossil found so far is 75 ft (23 m) long. *Basilosaurus* had small limbs which must have been useless for swimming. They may have been used to hold on to each other while mating.

Neck, a hindrance while swimming, has been reduced

We are not sure if *Durodon* had a dorsal fin, because soft parts are not fossilized



No hind limbs

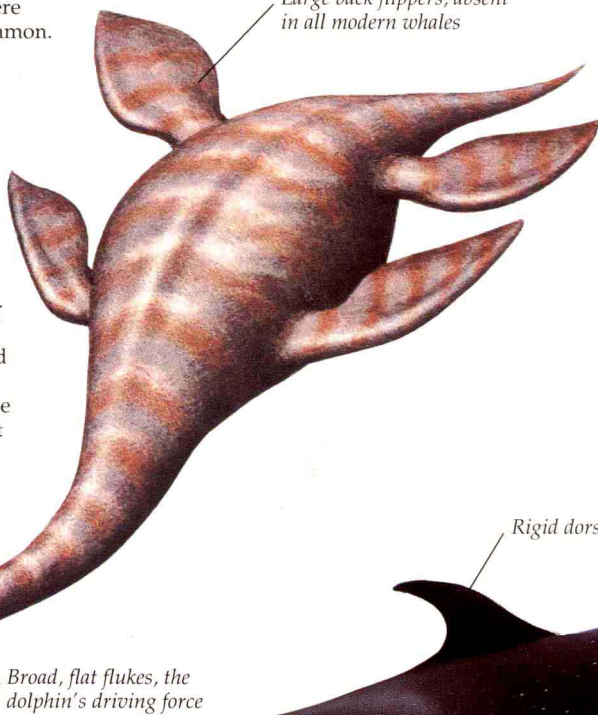
Strong blade-like front flippers

Tail flukes more developed than those of *Basilosaurus*

LEGLESS

One of a whole family of extinct whales, *Durodon* probably survived into the Miocene period, 25 million years ago. By this time primitive toothed and baleen whales were becoming more and more common.

Large back flippers, absent in all modern whales



BEFORE THE WHALE

Long before whales existed, giant reptiles like this plesiosaur were swimming the world's oceans. Most were streamlined like whales, but they were completely unrelated. All these marine reptiles became extinct 65 million years ago, at the same time as the dinosaurs.



STILL OUT THERE?

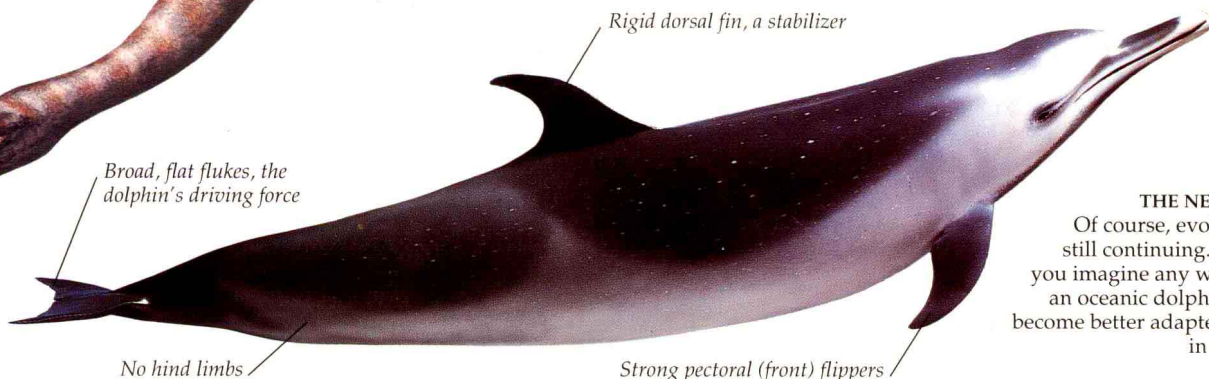
Discovering a new species of mammal can be exciting. Some people believe that the yeti, or abominable snowman, is an unknown species of primate. A new kind of whale was found in Peru in 1989, and there may be more species still out there waiting to be discovered.

Rigid dorsal fin, a stabilizer

Broad, flat flukes, the dolphin's driving force

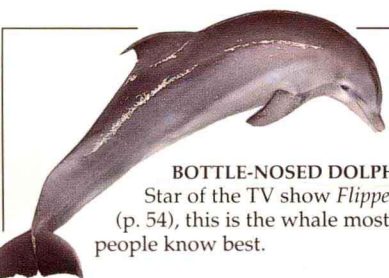
No hind limbs

Strong pectoral (front) flippers



THE NEXT STEP

Of course, evolution is still continuing. But can you imagine any ways that an oceanic dolphin could become better adapted to life in the sea?

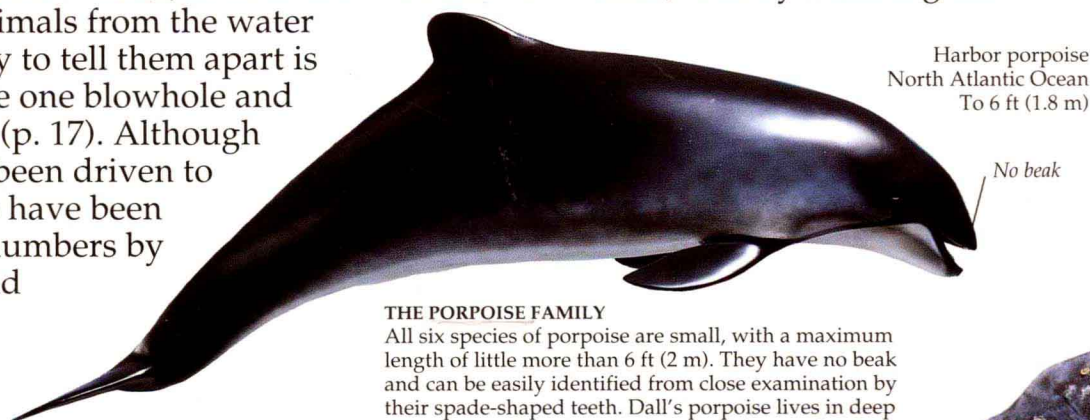


BOTTLE-NOSED DOLPHIN

Star of the TV show *Flipper* (p. 54), this is the whale most people know best.

Whales big and small

WHALES ARE FOUND IN EVERY OCEAN, from the tropics to the icy waters of the Poles, and in five of the world's largest rivers. At a maximum length of 100 ft (30 m) and weight of 220 tons (200 tonnes), the blue whale is the largest animal that has ever lived. At the other end of the scale, the smallest dolphins and porpoises are less than 6 ft (2 m) long. There are about 78 species of whale, in two main groups. The toothed whales, such as the dolphins and the sperm whale, hunt fish and squid (pp. 22–23); the huge baleen whales, such as the blue and fin whales, feed by straining fish and small shrimplike animals from the water (pp. 24–25). Another way to tell them apart is that toothed whales have one blowhole and baleen whales have two (p. 17). Although no species of whale has been driven to extinction, many species have been reduced several to low numbers by whaling, fishing nets, and pollution (pp. 58–59).



Harbor porpoise
North Atlantic Ocean
To 6 ft (1.8 m)

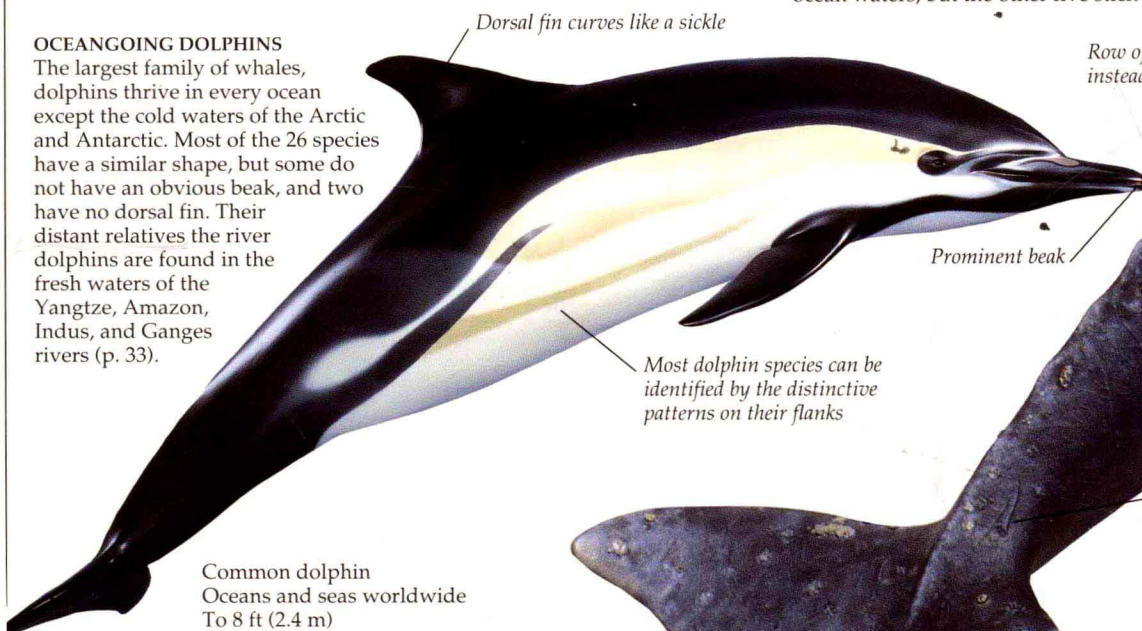
No beak

THE PORPOISE FAMILY

All six species of porpoise are small, with a maximum length of little more than 6 ft (2 m). They have no beak and can be easily identified from close examination by their spade-shaped teeth. Dall's porpoise lives in deep ocean waters, but the other five stick close to the coast.

OCEANGOING DOLPHINS

The largest family of whales, dolphins thrive in every ocean except the cold waters of the Arctic and Antarctic. Most of the 26 species have a similar shape, but some do not have an obvious beak, and two have no dorsal fin. Their distant relatives the river dolphins are found in the fresh waters of the Yangtze, Amazon, Indus, and Ganges rivers (p. 33).



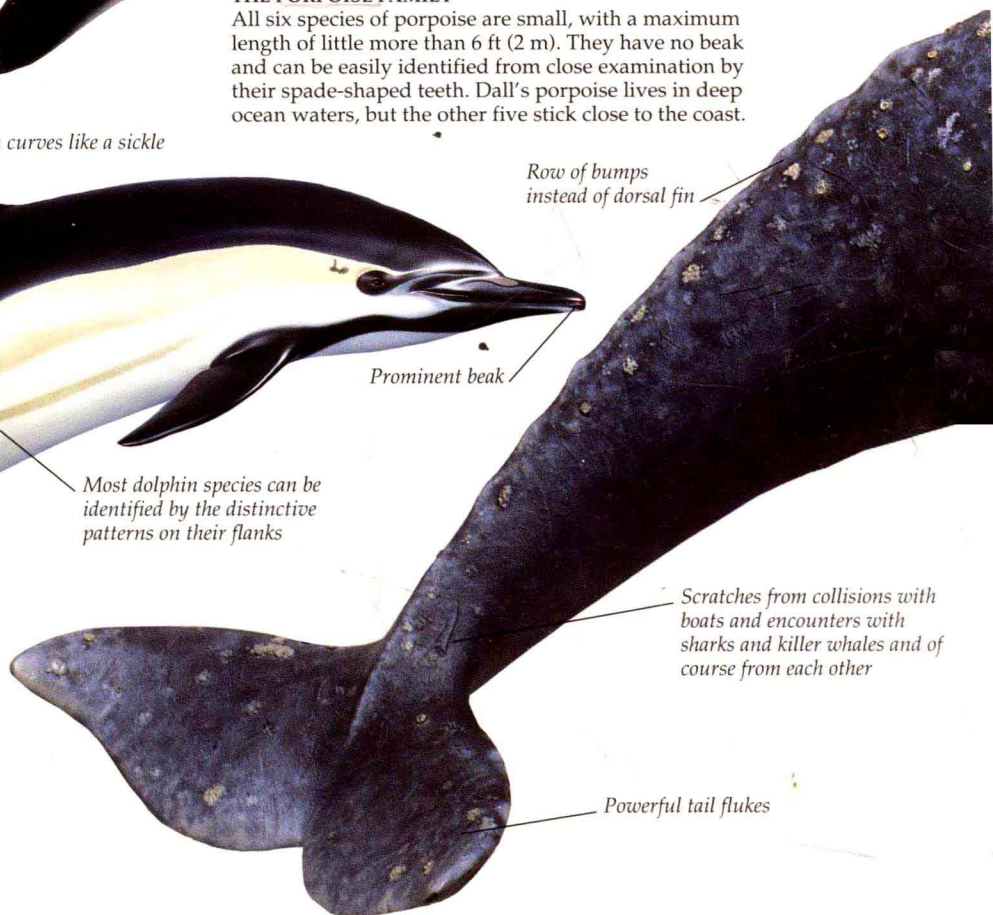
Common dolphin
Oceans and seas worldwide
To 8 ft (2.4 m)

Dorsal fin curves like a sickle

Row of bumps
instead of dorsal fin

Prominent beak

Most dolphin species can be
identified by the distinctive
patterns on their flanks

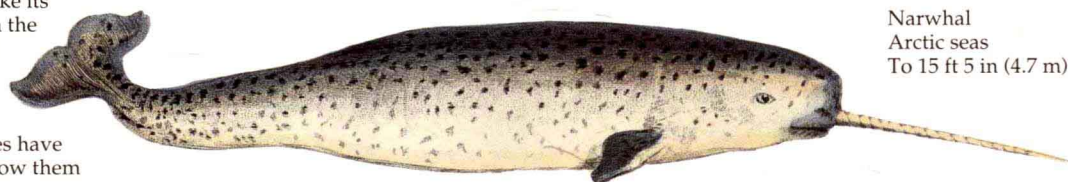


Scratches from collisions with
boats and encounters with
sharks and killer whales and of
course from each other

Powerful tail flukes

THE NARWHAL FAMILY

Sometimes called "the unicorn of the seas", the male narwhal has one of the most remarkable teeth of any animal (pp. 36–37). Like its close relative the beluga, it lives in the icy waters of the Arctic. The third member of this family, the Irrawaddy dolphin, is found far away in tropical Asia. Unlike most other whales, all three species have unfused neck vertebrae, which allow them to turn their heads.



Narwhal
Arctic seas
To 15 ft 5 in (4.7 m)

BEAKED WHALES

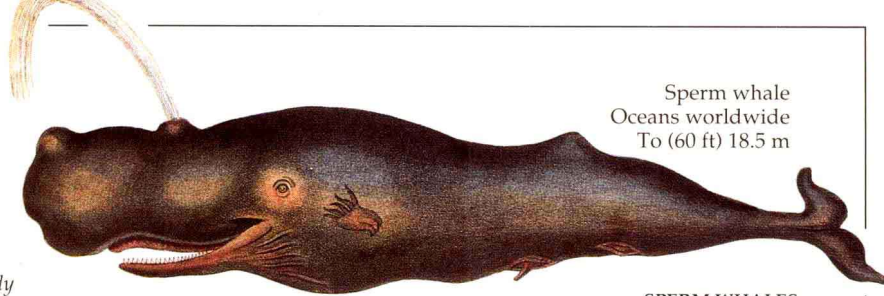
These are the most mysterious whales. Of the 18 species, one has never been seen alive and is known only from two skulls washed up on the beach. Another species was first reported in 1989. The beaked whales are creatures of the open ocean, where they are thought to feed on squid far below the surface. Females have no visible teeth, while males usually have one pair on their protruding lower jaws.

Dorsal fin far back on body



Cuvier's beaked whale
Oceans worldwide
To 23 ft (7 m)

Sperm whale
Oceans worldwide
To (60 ft) 18.5 m



SPERM WHALES

The great sperm whale is the largest toothed whale. With its huge, square head and massive teeth, it is hard to confuse with any other animal. It was immortalized by Herman Melville in his novel *Moby Dick* (p. 38). Like the killer whale, the sperm whale is found all over the world. Its two cousins, the pygmy and dwarf sperm whales, are much smaller and are restricted to tropical and temperate waters.

Colonies of barnacles and lice live on skin and may cause scars

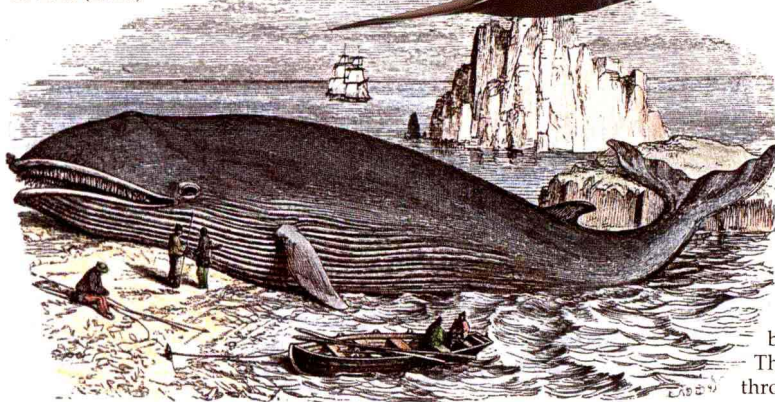


Gray whale
North Pacific Ocean
To 50 ft (15 m)

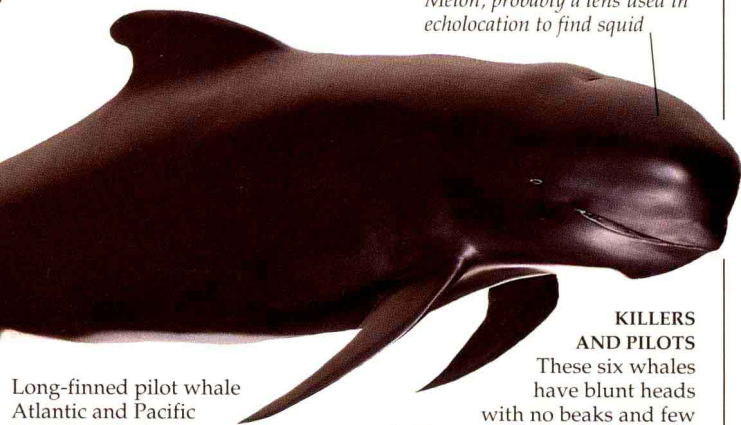
BALEEN WHALES

Gentle filter feeders, the baleen whales include the biggest animals on Earth. There are three families: the right whales, the gray whale, and the rorquals. The four species of right whales have smooth bellies with no throat grooves; their large mouths hold long, narrow plates of baleen. The gray whale is unusual enough to be placed in a family of its own. It was once found in the Atlantic Ocean, but whalers exterminated this population by the 18th century.

Fin whale
Oceans worldwide
To 78 ft (24 m)



Melon, probably a lens used in echolocation to find squid



Long-finned pilot whale
Atlantic and Pacific
To 28 ft (8.5 m)

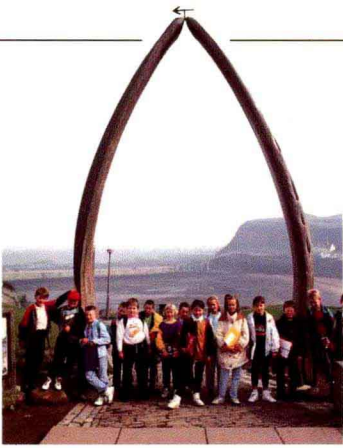
KILLERS AND PILOTS

These six whales have blunt heads with no beaks and few teeth. The best-known species is the killer whale, or orca, which grows to 30 ft (9 m) long and is found all over the globe (pp. 34–35). Little is known about the smaller species, including the pygmy killer, which is little bigger than a porpoise.

THE MIGHTY RORQUALS

The rorquals are the real giants of the animal kingdom. The largest of the six species, the blue whale, is the size of a jet airliner. The smallest, the minke, reaches a mere 33 ft (10 m). With the exception of the humpback, rorquals are thin, sleek beasts that move surprisingly fast – up to 30 mph (50 km/h). They can be identified by their throat grooves, which allow their throats to expand and gulp large quantities of water.

Inside the whale

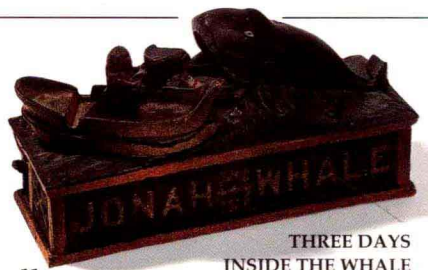


BIG MOUTH

The biggest mouth in the animal kingdom belongs to the blue whale. The huge jaw bones are sometimes erected as arches. This one in the old whaling port of Whitby, England, comes from one of the last blue whales ever caught (pp. 20–21).

land (pp. 8–9). Baleen whale skeletons are easily identified by their vast mouths, which allow the whales to gulp enormous quantities of seawater (pp. 24–25).

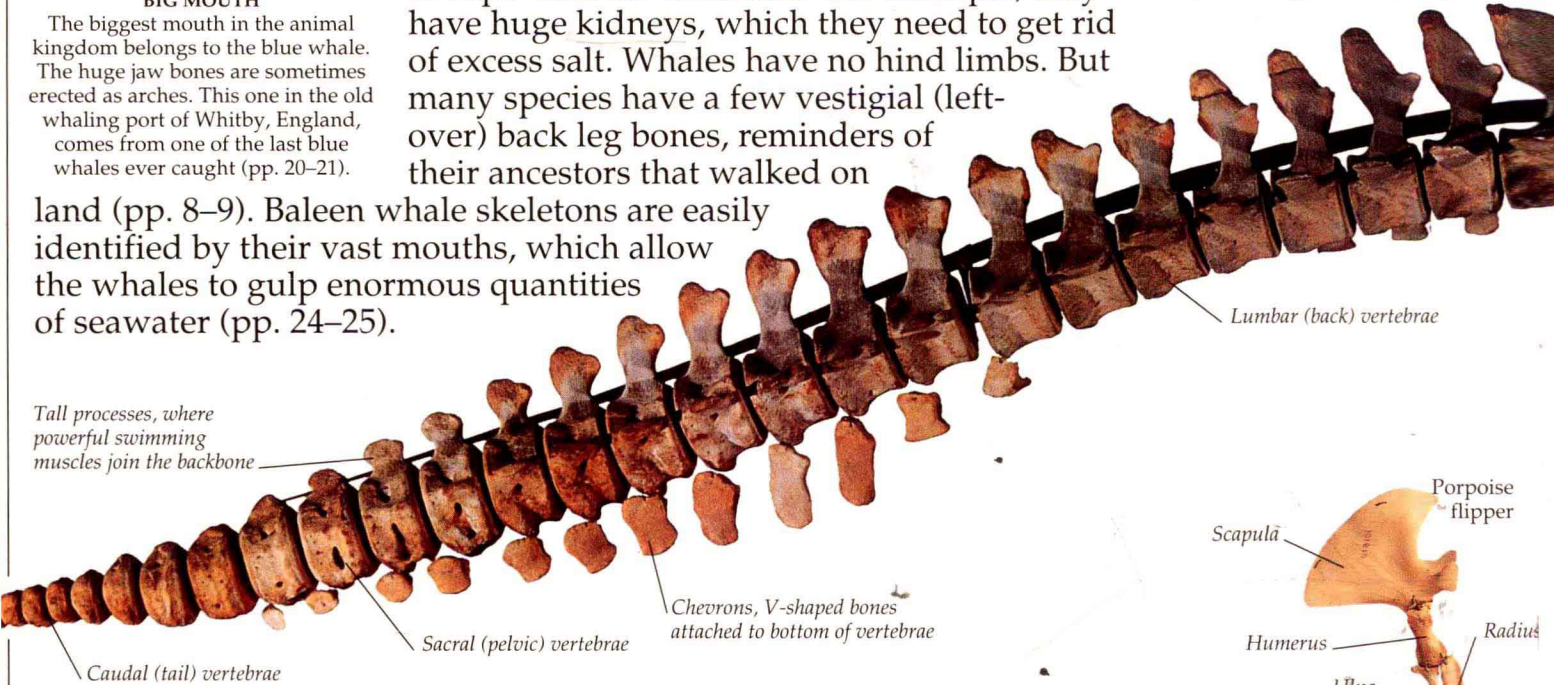
LIKE A WHALE'S OUTSIDES, its insides are enormous. A blue whale's arteries are as big as drainpipes, and its heart is the size of a small car. Its huge tongue weighs 4.4 tons (4 tonnes). Whales have all the same internal organs as other mammals, but many have been modified to cope with life in the sea. For example, they have huge kidneys, which they need to get rid of excess salt. Whales have no hind limbs. But many species have a few vestigial (left-over) back leg bones, reminders of their ancestors that walked on



THREE DAYS INSIDE THE WHALE

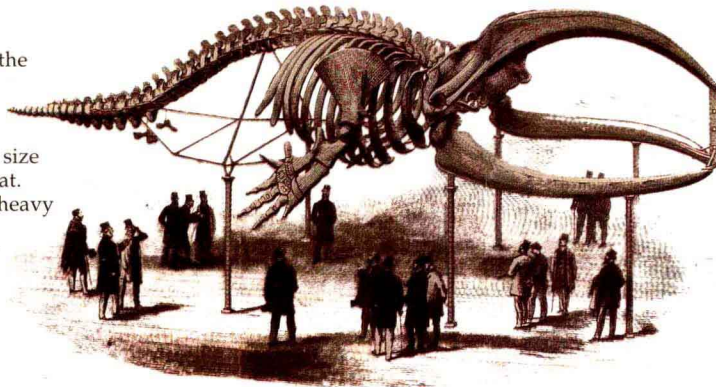
The Bible tells the story of Jonah, who found himself on a boat caught in a storm. The frightened crew threw Jonah overboard, and he was swallowed by a whale. After three days, the whale spat him out, still living, onto a beach (p. 55).

Tall processes, where powerful swimming muscles join the backbone



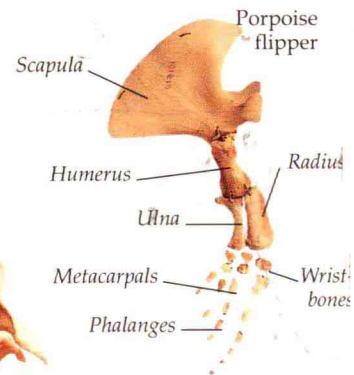
SMELLY BONES

In 1830, visitors flocked to the Royal College of London to admire the bones of a huge right whale. Mounting skeletons of this size is a difficult engineering feat. Many of the bones are too heavy for one man to carry, and have to be held in place by strong steel girders. Whale bones contain a lot of oil and are very smelly before they are cleaned.



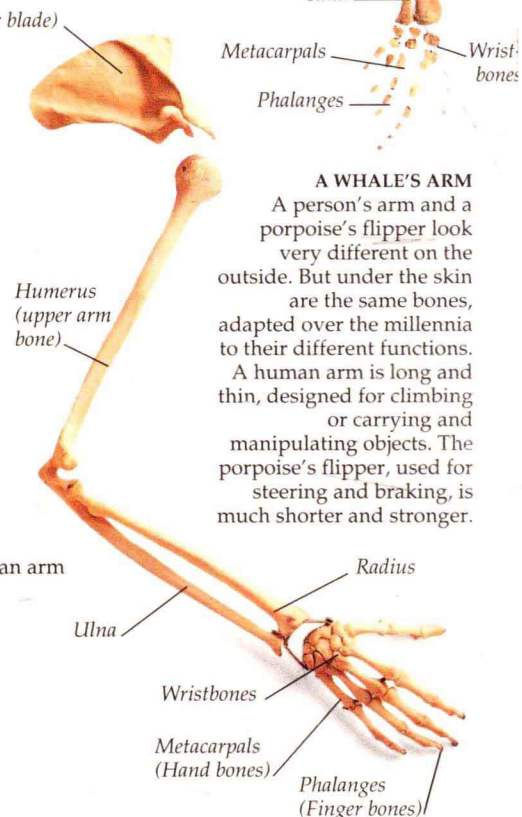
SPONGY BONE

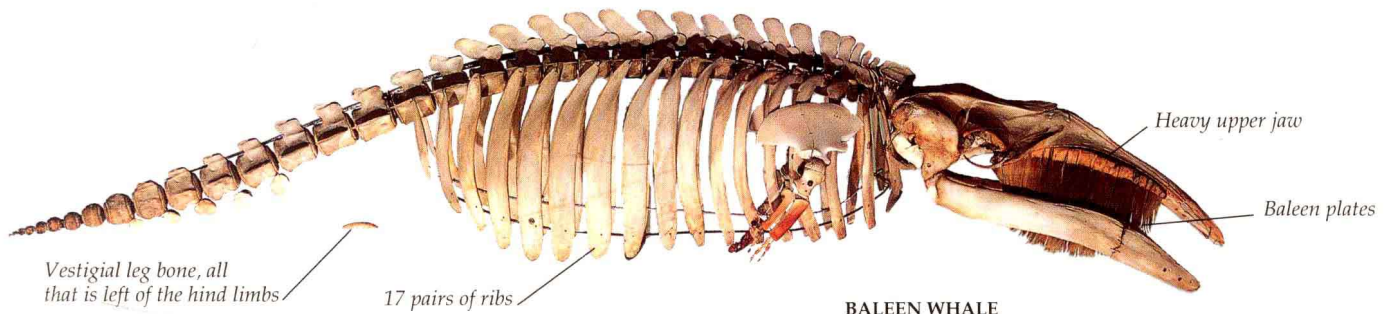
A land mammal's entire weight is held up by its bones, which are hard and strong. But the great weight of a whale is supported by the sea, and its bones have become soft and spongy. This can be seen clearly in Inuit carvings of whale bones, like this sculpture of a seal.



A WHALE'S ARM

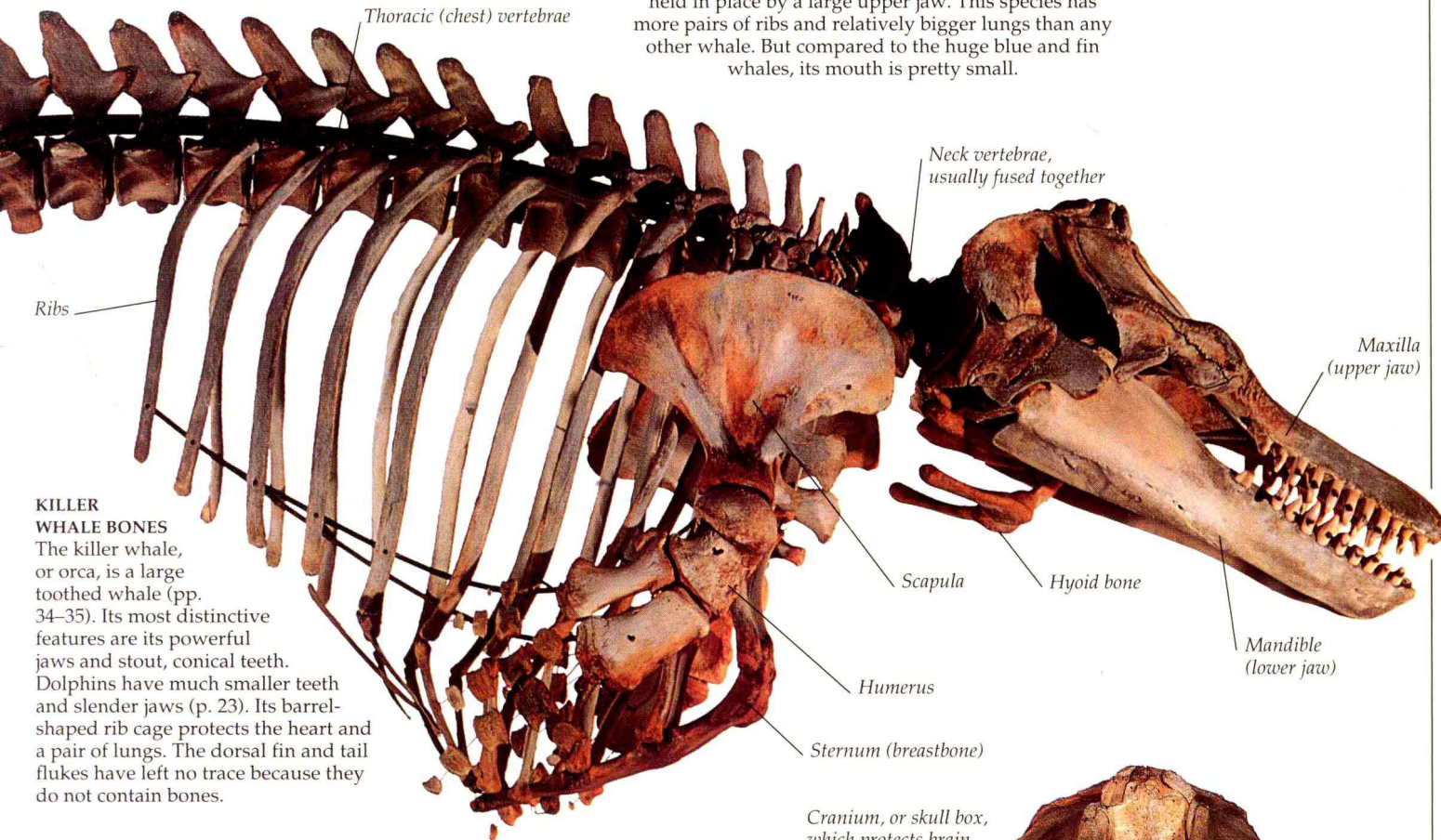
A person's arm and a porpoise's flipper look very different on the outside. But under the skin are the same bones, adapted over the millennia to their different functions. A human arm is long and thin, designed for climbing or carrying and manipulating objects. The porpoise's flipper, used for steering and braking, is much shorter and stronger.





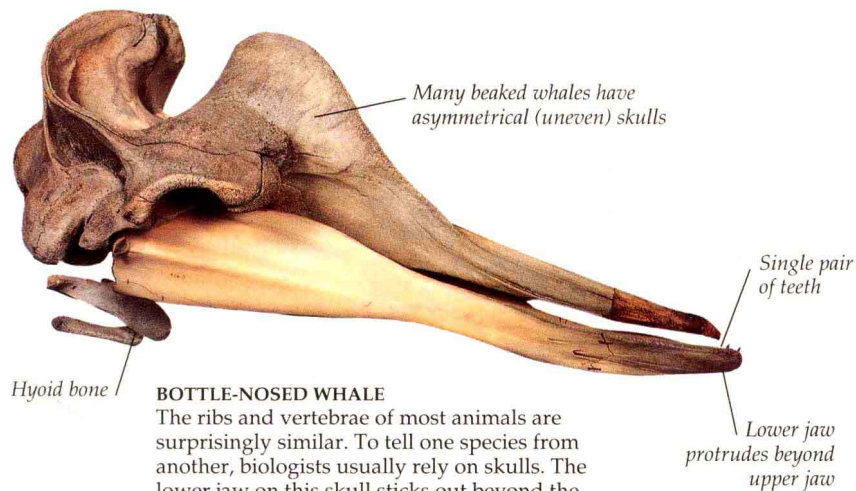
BALEEN WHALE

At a length of 20 ft (6 m), the pygmy right whale is the smallest baleen whale. Its rows of baleen plates are held in place by a large upper jaw. This species has more pairs of ribs and relatively bigger lungs than any other whale. But compared to the huge blue and fin whales, its mouth is pretty small.



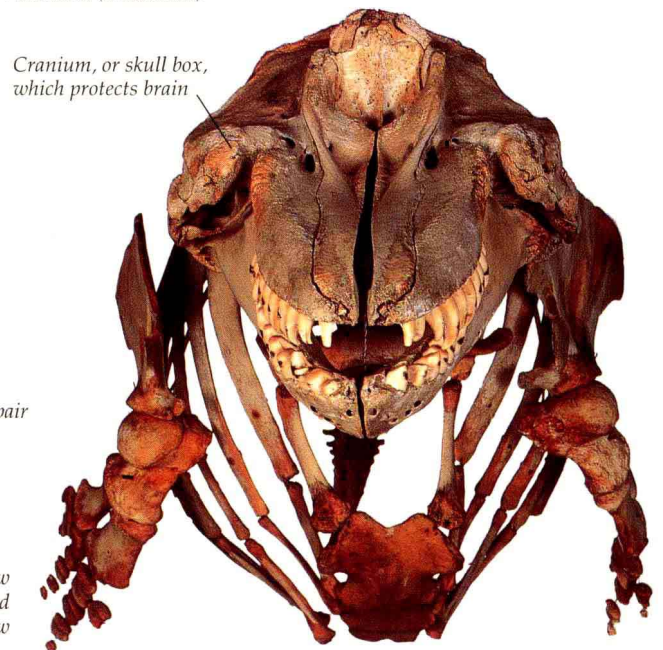
KILLER WHALE BONES

The killer whale, or orca, is a large toothed whale (pp. 34–35). Its most distinctive features are its powerful jaws and stout, conical teeth. Dolphins have much smaller teeth and slender jaws (p. 23). Its barrel-shaped rib cage protects the heart and a pair of lungs. The dorsal fin and tail flukes have left no trace because they do not contain bones.



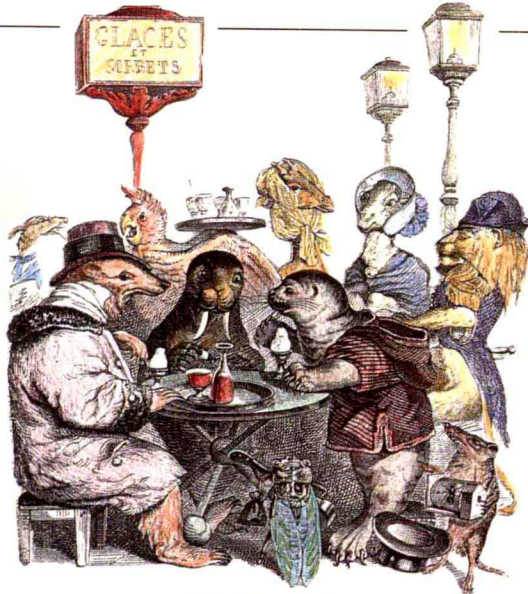
BOTTLE-NOSED WHALE

The ribs and vertebrae of most animals are surprisingly similar. To tell one species from another, biologists usually rely on skulls. The lower jaw on this skull sticks out beyond the upper jaw, a clue that it belonged to a beaked whale (p. 11). The teeth on the lower jaw indicate that the whale was a male.



TEETH FIRST

From the viewpoint of a sea lion, the orca is a terrifying predator (pp. 34–35).



ALL IN THE FAMILY

The largest seal, the male elephant seal, grows to 21 ft (6.5 m) and weighs up to 4.5 tons (4 tonnes). The smallest species, the ringed and Baikal seals, reach 4 ft 6 in (1.37 m) and weigh 140 lb (64 kg).

HAULED OUT

Seals come onto land or ice to give birth. This is called hauling out. Land-breeding seals like the elephant seal gather at a few popular beaches, where competition between bulls (males) can be intense. Bigger, stronger bulls usually triumph, so bulls are usually much larger than cows (females). Ice-breeding seals like this ringed seal are spread out over a larger area, and bulls and cows are closer to the same size.

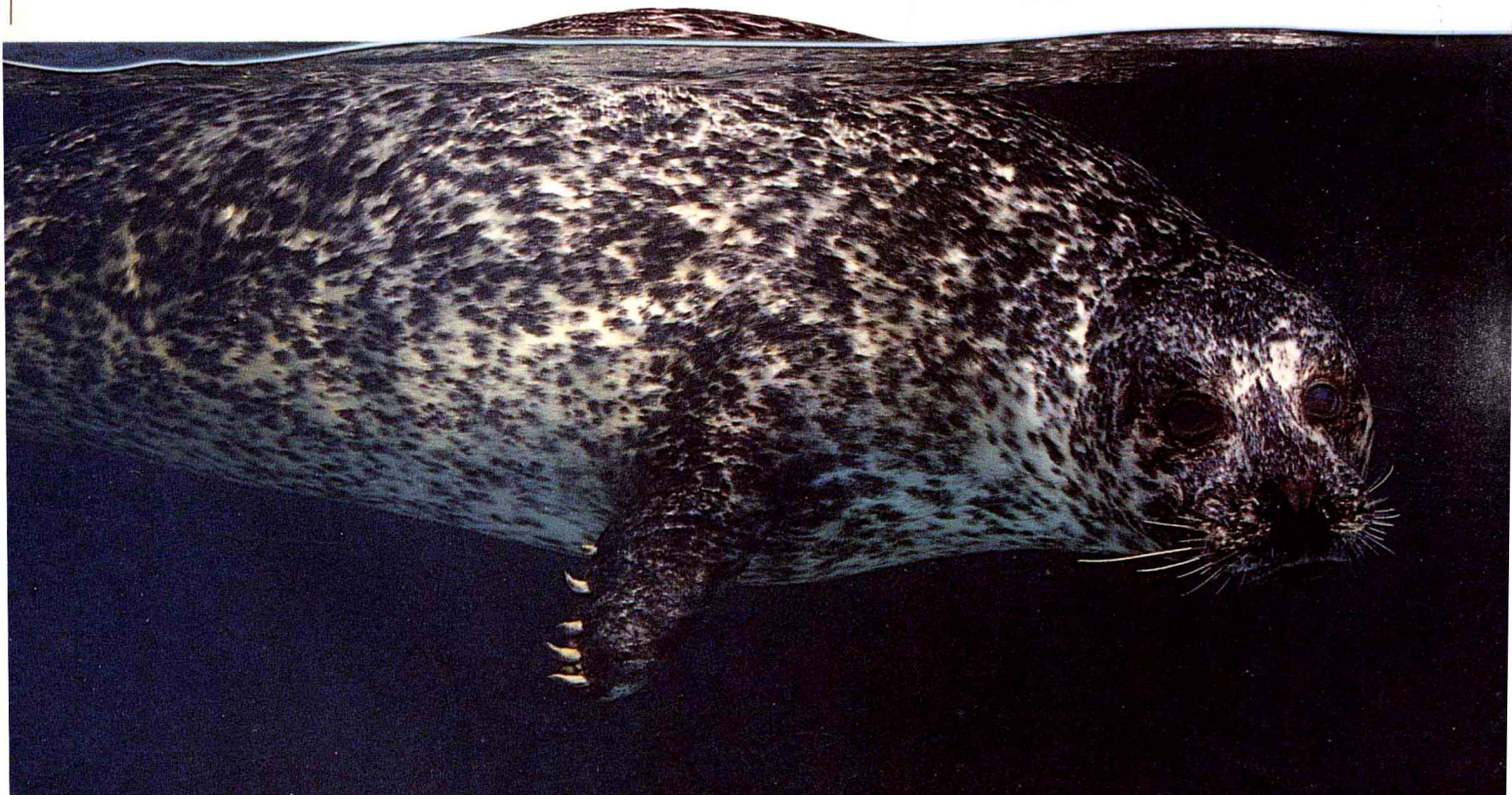


Seals and sea lions

ALL 34 SPECIES OF SEAL are hunters. Most feed on fish, but some, such as the ferocious leopard seal, eat other seals. There are three families: the true, or earless, seals (18 species), the eared seals (15 species), and the walrus, which is unusual enough to go in a family of its own. Seals are found all over the world, but they are most common in the icy waters of the Arctic and Antarctic. This is probably because food supplies are more reliable in the polar regions than in warmer waters. Many species have been reduced to low numbers by human activities. Sealing was just as ruthless as whaling (pp. 52–53), and millions of animals were killed in the last two centuries. Now other seal populations are seriously threatened by pollution (pp. 58–59). Seals spend much of their lives at sea and so are hard to study. Yet new techniques such as satellite tracking (p. 61) are revealing surprising new information about this remarkable and mysterious group of mammals.

TRUE SEALS

This common, or harbor, seal is a true seal. It has a round, chubby shape and no obvious earflaps. Like all true seals, it cannot turn its hind flippers under its body, so it cannot climb very well on land. But it moves surprisingly fast on rocky shores. This family includes the world's most common marine mammal, the crabeater seal, and the monk seals, which are among the rarest.





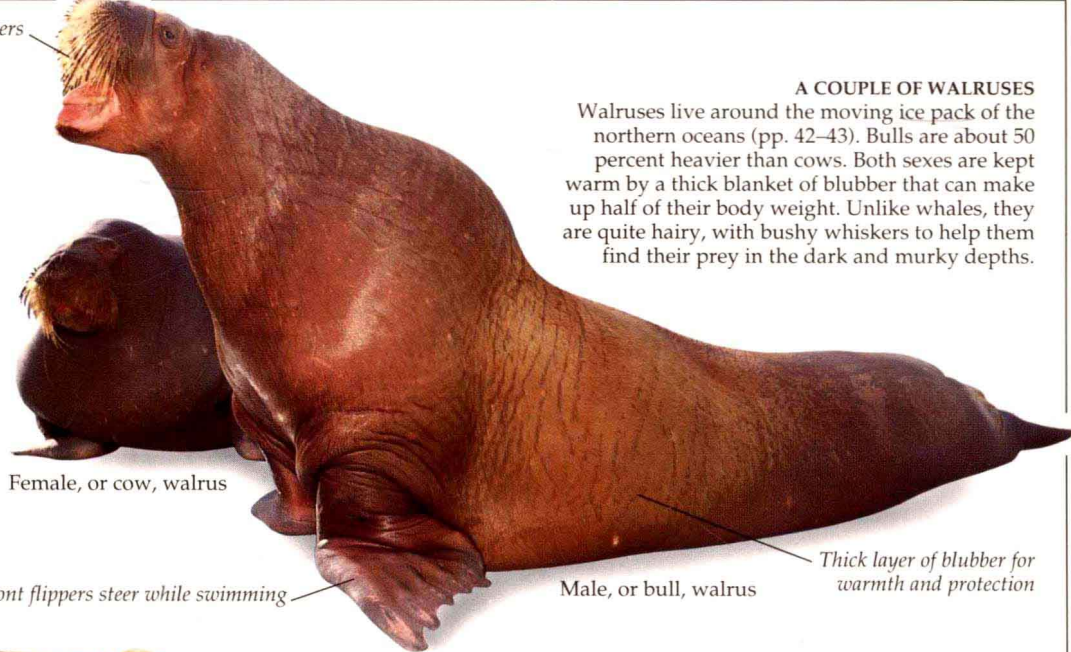
COLD COMFORT

In the Arctic, the native Inuit (Eskimo) people have always hunted the seal for its meat, fur, and hide (p. 52). They even use the seal's tendons and bones to make tools or rope. This Inuit stone carving of a seal comes from Frobisher Bay in the Canadian Arctic.



Cribbage board carved from a walrus tusk and decorated with seals

Sensitive whiskers



Female, or cow, walrus

Male, or bull, walrus

Thick layer of blubber for warmth and protection

Front flippers steer while swimming

WATER HOUNDS

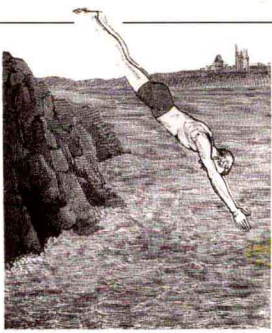
Biologists think seals evolved from doglike carnivores and share the same ancestors as this jackal. But why did they take to the sea 30 million years ago? Probably because changes in ocean currents created rich new food supplies in the oceans.



EARED SEALS

Like all eared seals, this California sea lion is using its long front flippers to swim through the water; true seals and walruses push with their hind flippers instead (p. 19). There are two main groups of eared seals, the sea lions and the fur seals. They have longer limbs than true seals, and are more agile on land. Like most seals, they have large eyes to help them navigate and find underwater prey.





DIVING IN

In most of the world, the ocean is cold enough to take your breath away. In polar seas, a human would barely survive a minute. Water is a very good conductor of heat, so an animal loses heat 25 times faster in water than in the air.

Suited to life in the sea

WHALES AND SEALS ARE SUPERBLY SUITED to life in the sea. Because they are supported by the water, they do not need strong legs, and they have evolved a sleek shape that slides easily through the water. Many species can swim as fast as a small boat. Powerful muscles in the tail and flanks drive them forward. Their fins are also streamlined, like a plane's wings. Water is a cold home, and almost all whales and seals have thick layers of blubber which keep them very warm. Many seals also have heavy, oily fur which traps bubbles of air and keeps the animals warm and dry.

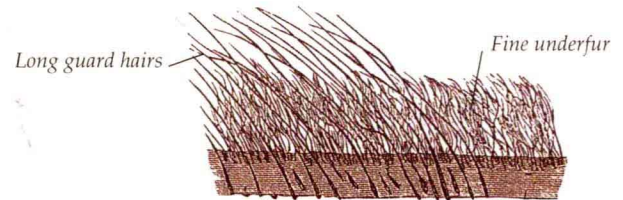


Female California sea lion

Male California sea lion

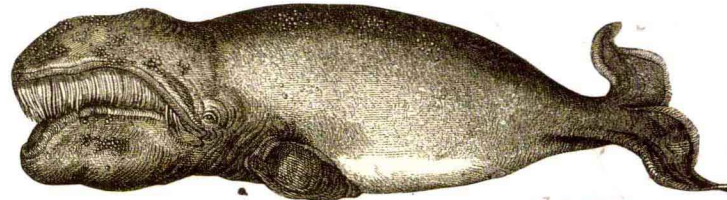
SUNBATHING

Seals and sea lions often bask in the sun to warm up. But they are so well insulated that they can easily get too hot. When this happens, they cool off by waving their front flippers in the air or burying them in the sand. When northern elephant seals overheat, they flip cool sand over their backs (pp. 40–41).



A LINED COAT

A close look at a fur seal's coat reveals two kinds of hair. The longer, thicker hairs protect the seal as it scrapes against the rocks. But it is air bubbles caught in the fine, dense underfur that keep the seal warm.



FAT FOOD

A whale's fat or blubber does not just warm and protect it. It is also a food store. When a right whale is feeding, its blubber may grow to 2 ft (60 cm) thick. The whale can then live off its blubber during the long periods when it does not eat at all.

NOT HALF FAT

Walrus have a lot of fat! As much as half of their body weight is blubber. The rolls of fat keep them warm in the freezing seas and ice floes of the Arctic. Thousands of walrus were once killed for their blubber, which was boiled and turned into oil (p. 53).

When a walrus is too hot, tiny blood vessels in the skin fill with blood and the animal seems to blush

