

NORTHERN PIKE

CARD 20

GROUP 4: FISH

ORDER
Salmoniformes

FAMILY
Esocidae

GENUS & SPECIES
Esox lucius



The pike's drab coloring and good vision are adaptations to life as an underwater predator. It is well camouflaged as it hides in the weeds, and it can spot prey as far as 50 feet away.

KEY FACTS



SIZES

Length: Females, up to 5 ft. Males are smaller.

Weight: Males, rarely more than 11 lb. Females, up to 55 lb.



BREEDING

Spawning season: March and April.

No. of eggs: 40,000-500,000.

Hatching time: 2-3 weeks.



LIFESTYLE

Habit: Predatory; ambushes prey rather than hunting actively.

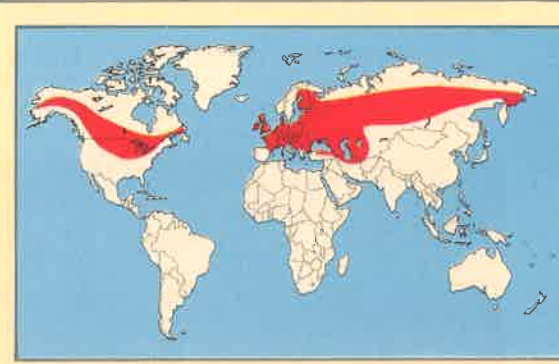
Diet: Mainly other small fish. Will also eat young coots and ducks.

Lifespan: Average 7-10 years.



RELATED SPECIES

Relatives of the pike include the muskellunge, *Esox masquinongy*; grass pickerel, *E. americanus*; and chain pickerel, *E. niger*, from North America, and black-spotted pike, *E. reicherti*, from the Soviet Union.



Range of the northern pike.

DISTRIBUTION

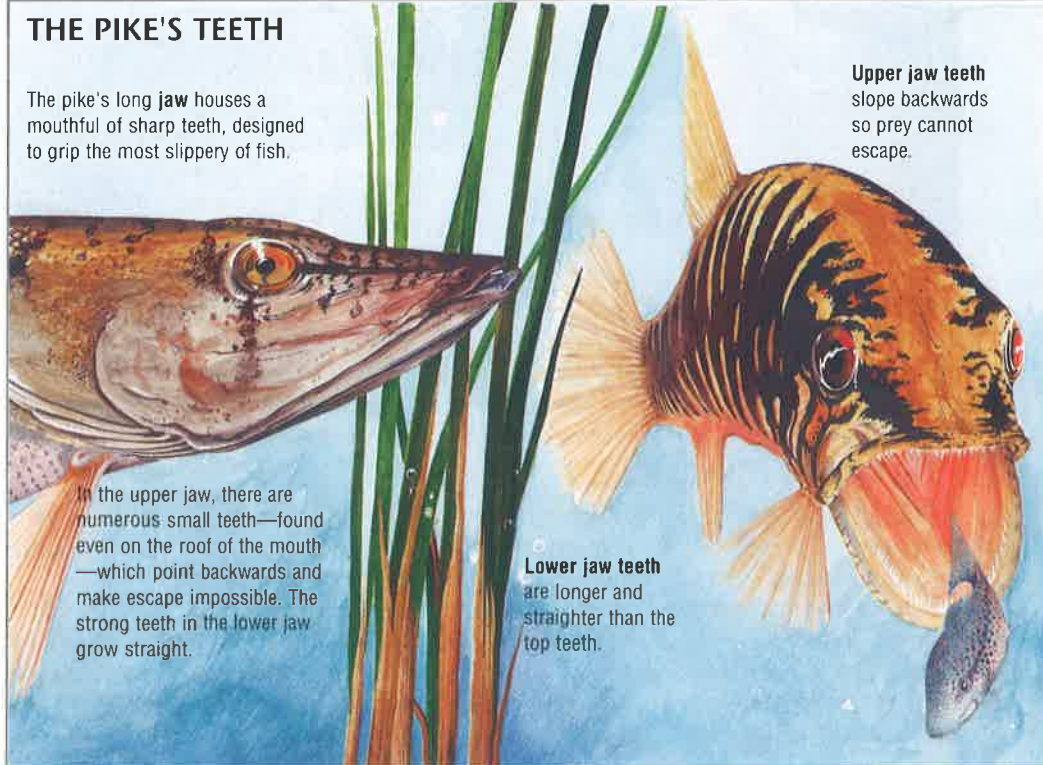
Throughout Great Britain, except for Hebrides, Orkney, and Shetland, and throughout Europe except for Spain and Portugal. Related species are found in the United States and parts of Asia and the Soviet Union.

CONSERVATION

Pike have few natural enemies, but numbers are kept balanced by sport fishing and their own cannibalism.

THE PIKE'S TEETH

The pike's long jaw houses a mouthful of sharp teeth, designed to grip the most slippery of fish.



Upper jaw teeth slope backwards so prey cannot escape.

In the upper jaw, there are numerous small teeth—found even on the roof of the mouth—which point backwards and make escape impossible. The strong teeth in the lower jaw grow straight.

Lower jaw teeth are longer and straighter than the top teeth.

Although it is one of Europe's most predatory fish, the pike is not an active hunter. Instead it prefers to hide in the weeds at the bottom of a lake or stream, waiting for prey to swim by.

HABITAT

Pike are found primarily in lakes, rivers, and reservoirs. They prefer deep, calm, or slow-moving water where the weeds are fairly dense. They

usually hide in these weeds, away from the main current.

The fish's coloration varies according to the waters it inhabits. The most vividly

colored specimens are found in clear water. Their mottled green scales allow them to blend in with weeds and reed stems.

BREEDING

Pike generally spawn in late March or early April in reed beds or in shallow streams. The number of eggs produced depends on the size of the fish. The larger the fish, the more eggs it produces.

The eggs remain on or just above the bottom of the lake or stream until they hatch two to three weeks later. Larvae feed off the yolk sac for 10 days, until it is completely absorbed. The young pike are then ready to hunt for prey.



H. Chaumeton/Nature



H. Reinhard/Bruce Coleman Ltd

Left: Pike wait on the river bottom to ambush prey.

Below: The pike's eyes are well placed for hunting.

Far right: Fins placed far back on the body help the pike to move quickly.

Below: Shoals of smaller fish are common victims of the pike.



David Hosking



R. & V. Taylor/Ardea London

PIKE & MAN

The pike's voracious appetite has long put it at odds with man. Fish farmers net it because it eats trout and salmon; gamekeepers kill it because it eats ducklings. Anglers regard it as a prize, however, and pike fishing is now a major sport.

FOOD & HUNTING

The pike preys mainly on different types of carp, although it will eat most other fish as well, including roach, rudd, and bream. It also eats frogs, swimming voles, rats, and small water birds such as mallard ducklings, moorhens, and coots.

A young pike differs from a mature pike in that it actively pursues its prey. It feeds on water fleas, worms, and young fish. As it gets older, it catches prey by remaining motionless, waiting for an unsuspecting victim to swim within range. Its dorsal and anal fins are

positioned far back on its body, which makes it capable of rapid acceleration.

Prey is detected by sight and a northern pike can spot a potential meal 50 feet away. It is thought that vibrations in the water may also help lead the pike to its prey.

DID YOU KNOW?

- A pike can swallow large fish because its mouth is wide and because the prey passes directly into its long, straight intestine: Still, it takes three to five days for its digestion to be completed.
- A pike's brain accounts for less than one thousandth of its total body weight.
- Although the pike is a fairly indiscriminate feeder, it does not prey on sticklebacks because of their sharp spines.
- The pike has highly acidic digestive juices which can even corrode metal.
- A pike said to have been caught in 1497 was alleged to have been 270 years old. This was proven false when it was discovered that the skeleton was assembled from the vertebrae of other fish.

CARP

CARD 18

GROUP 4: FISH

ORDER
Cypriniformes

FAMILY
Cyprinidae

GENUS & SPECIES
Cyprinus carpio



Hans Reinhard/Bruce Coleman Ltd

The carp is a highly adaptable freshwater fish. It was once found only in Asia, but it is now common throughout much of the world.

KEY FACTS



SIZES

Length: Average 30 in.
Weight: Average 20 lb., but in rare instances females can reach 90 lb.



BREEDING

Sexual maturity: 2-3 years.
Spawning: April to July.
No. of eggs: Up to 2,000,000 from a 20-lb. fish.
Hatching period: 6-10 days.



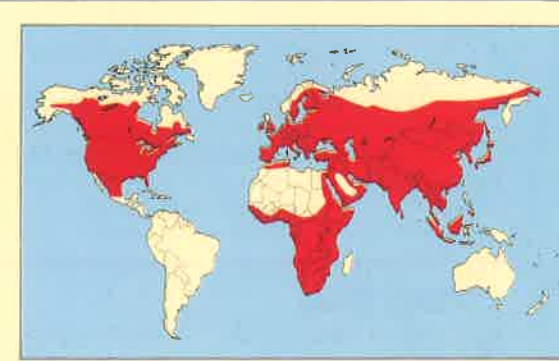
LIFESTYLE

Habit: Extremely cautious; lives in small schools.
Diet: Worms, shrimps, water snails, freshwater mussels, aquatic insects, nymphs, some vegetable matter.
Lifespan: 20-25 years in the wild.



RELATED SPECIES

There are about 2,500 species of *Cypriniformes*. Goldfish and roach are in the same order.



Range of the carp.

DISTRIBUTION

Originally native to Japan, China, and Central Asia, the carp has been introduced into most of Europe and North America, as well as in parts of Africa, Australia, and New Zealand.

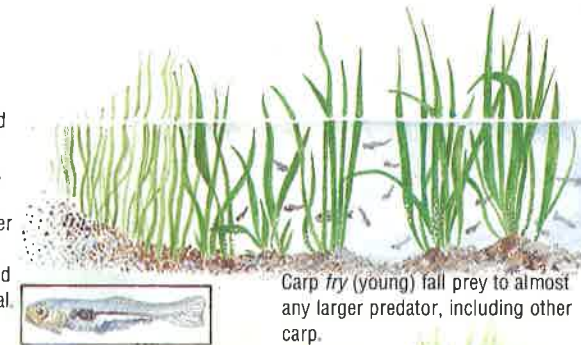
CONSERVATION

Carp breed so successfully wherever they have been introduced that they have reached plaguelike proportions in some countries, destroying stocks of pike and trout.

FEATURES OF THE CARP

Carp avoid clear, fast-flowing waters and shady or cold areas. Instead, they prefer shallow, sunlit waters with plentiful mud and plant growth on the bottom.

The carp's *barbels* (touch organs) are used for feeling for food in the mud. Mud that is swallowed is later ejected after the carp has digested all edible material.



Carp fry (young) fall prey to almost any larger predator, including other carp.



Most carp are plain colored and have greenish brown sides and blue backs. But the valued and exotic koi carp that are bred in Japan are brilliantly colored in contrast to their common carp relatives.

BREEDING

Carp mate in shallow water from April to June. A single 20-pound female can lay up to 2,000,000 eggs. She usually places them on the leaves of aquatic plants.

The *fry* (young fish) hatch

within 6 to 10 days, and they tend to remain in shallow water near the riverbank. At this stage the young are extremely vulnerable to attack from most other fish, including their parents.

FOOD & FEEDING

Carp use the four *barbels* (threadlike growths that function as organs of touch) located around their mouths to find food in the soft mud of the riverbed. They eat worms, shrimp, water snails, freshwater mussels, aquatic insects, nymphs, and water lilies and other plant matter.

Occasionally carp rise to the water's surface to feed on aquatic insects. Carp make a characteristic slurping noise

as they ingest air and water along with their prey.

Carp do not have true teeth. Instead, they use their throats like grinders to crush the shells of water snails and mussels. The carp then eject the shell fragments and swallow the flesh.

Right: *Carp prefer the food-rich, muddy shallows of slow-moving waters and lay their eggs there in early summer after mating near the surface.*

Challinor/Nature



HABITAT

Carp live mainly in large rivers, although they can also be found in most fresh waterways. They prefer shallow, slow-moving water in areas that have an abundance of aquatic plant life.

Carp live in small groups

rather than in schools. They spend much of the time lurking in the weeds at the bottom of riverbeds. On hot afternoons they rise to the surface to bask in the sun. At night they emerge from the weeds to search for food.

P. Morris/Ardea London



Left: *On a hot day, carp may be seen at the surface of the water, basking in the sunlight.*

Right: *A bottom-feeding fish, the carp uses the four barbels, or touch organs, around its mouth to feel in the mud for worms and other prey.*



DID YOU KNOW?

- The age of a carp can be determined by counting the rings on its scales; each ring indicates a spawning year.
- In the Soviet Union, carp have been selectively cross-bred to grow at a faster rate; they gain 9 pounds a year.
- Japanese carp breeders claim that some koi, a type of carp, are 200 years old.
- Carp were introduced into central Africa to provide food for European expatriates.
- In Eastern Europe, carp are often served as the traditional main course at Christmas dinner.
- At the palace of Versailles in France, carp have been taught to pull bell ropes to indicate that they are hungry.

CARP & MAN

Of all fish, the carp has had the longest association with man. It has long been used for food, as an ornament, and as sport for fishermen. Aristotle made the earliest known reference to them in 550 B.C. Since that time carp have been introduced to countries throughout the world.

Carp have been selectively bred as ornamental fish for

thousands of years. The Japanese have bred the carp most successfully. They produce a variety known as the koi carp. The koi are brilliantly colored fish and may be black and red, pure white, white with a red mark on the head, black and white, black and orange, or blue. They are considered to be extremely valuable.

COMMON STURGEON

CARD 17

GROUP 4: FISH

ORDER
Acipenseriformes

FAMILY
Acipenseridae

GENUS & SPECIES
Acipenser sturio



The common sturgeon has changed very little since the age of the dinosaurs. At that time its ancestors were among the most abundant fish in the seas.

KEY FACTS



SIZES

Length: Male, 3-5 ft. Female, 4-7 ft.
Can reach over 11 ft.
Weight: Up to 600 lb.



BREEDING

Sexual maturity: Male, 7-9 years.
Female, 8-14 years.
Spawning season: May to June.
Eggs: Up to 2.5 million.
Hatching time: 3-7 days.



LIFESTYLE

Habit: Migratory. Bottom living.
Diet: Crustaceans, polychaete worms, mollusks, and small fish.
Lifespan: 100 years or more.



RELATED SPECIES

Closest relative: *Acipenser oxyrinchus*, in the northwest Atlantic. Other relatives: *A. fulvescens*, lake sturgeon; *Huso huso*, beluga; and *H. dauricus*, kaluga.



Range of the common sturgeon.

DISTRIBUTION

The adult common sturgeon is found in the Black Sea and its associated rivers, the northern Mediterranean, and the northeast Atlantic coast from Morocco to Norway.

CONSERVATION

Fishing, pollution, and obstructions across spawning rivers have greatly reduced the sturgeon's population. It has become rare within all but the eastern portion of its range.

LIFECYCLE AND FEATURES OF THE COMMON STURGEON

1 Roe (eggs): In early summer a female spawns more than two million roe, each less than a tenth of an inch long. They stick to the river bed and hatch in three to seven days.



Barbels: Sensitive feelers below the snout detect prey on the river or sea bed. The **mouth** then extends like a tube to scoop up prey.

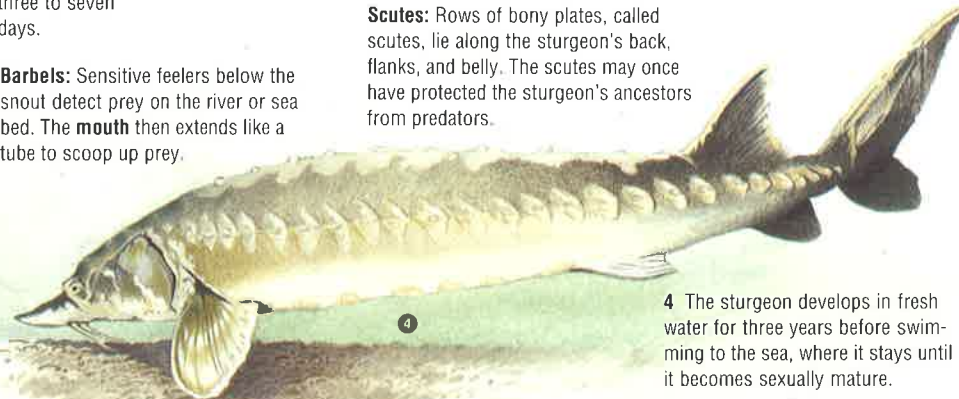
2 The newly hatched **larva** is about a third of an inch long. It feeds from an attached yolk sac.



3 Within six months to a year the **fry** (young fish) develops a primitive mouth and barbels (see below).



Scutes: Rows of bony plates, called scutes, lie along the sturgeon's back, flanks, and belly. The scutes may once have protected the sturgeon's ancestors from predators.



4 The sturgeon develops in fresh water for three years before swimming to the sea, where it stays until it becomes sexually mature.



Left: The mouth of the common sturgeon can project outward to form a sucking tube that scoops up prey from the sea- or riverbed. The touch-sensitive barbels under its snout help it to detect the prey.

The common sturgeon is one of the largest fish to use rivers and lakes for breeding grounds. Some sturgeons grow to several yards in length and may outlive humans. Widespread commercial fishing has left few of these older and larger specimens.

HABITS

The common sturgeon is a bottom-dwelling fish, spending much of its time inshore, where the seabed is 50 to 150 feet deep. It is the only European sturgeon that can live in full salt water as well as in the brackish (mixed salt and fresh) water of estuaries. After spawning in fresh water, some adult sturgeons remain near the mouths of their breeding rivers, while others travel more than 600 miles throughout the seas of their range.

Pollution and the dams and weirs that obstruct spawning rivers have taken their toll on

the sturgeon population. While the common sturgeon remains fairly numerous in the Black Sea between Turkey and the Soviet Union, it is now a rare visitor to the northern European coast. Only a few are caught in British waters, for example. In southwestern Europe the sturgeon is concentrated in just a few places, such as around the French Gironde estuary and the mouth of the Guadalquivir River in Spain.

Right: Sturgeons now rarely reach the size of specimens found in the days before overfishing.

DID YOU KNOW?

- In some areas, such as the Gironde estuary in France, young sturgeons grow faster than average. There, the young fish reach about 15 inches in their first year.
- Sturgeons were once so plentiful in North America that dishes of caviar were provided free in bars.
- In the Black and Caspian seas the beluga have been known to reach 16 feet in length.
- More than 12,000 tons of sturgeon are caught every year in the Black and Caspian seas.

BREEDING

In March or April, adult common sturgeons enter river mouths and begin swimming upstream. Some fish remain in the lower sections of the rivers, but others make their way 300 or more miles inland. In the past, when the rivers were more habitable, the common sturgeon spawned as far as 600 miles from the sea.

Spawning occurs in May and June. Each female produces a vast number of eggs—up to 2.5 million. The sticky roe

(eggs) adhere to stones or plants on the river bed, and the adult returns to the sea.

The eggs hatch in three to seven days, depending on water temperature. The larvae, about a third of an inch long at first, grow steadily—to about four inches in the first year. They continue to develop in fresh water for up to three years before leaving for the sea, where they remain until mature enough to spawn.

STURGEON & MAN

Commercial fishing increasingly threatens the common sturgeon. Fishermen hunt the sturgeon for both its flesh and its roe, which is processed to become caviar.

After the roe is taken from the body of a mature female, it is soaked in brine, then pressed, packed in containers, and exported as a luxury food. Commercial fishing is still a major industry in the Soviet Union and around the Black and Caspian seas.

FOOD & FEEDING

The sturgeon forages for food on the seabed, using its long, shovel-shaped snout to root around in the mud and sand. Four sensitive barbels (feelers) under its snout feel for edible morsels.

For its size, the common sturgeon feeds on fairly small prey: mainly invertebrates

such as mollusks, worms, and shrimp. A larger adult will also eat small fish such as gobies and sand eels. During its spawning trips up rivers, the sturgeon does not eat at all.

The fry (young fish) developing in the rivers feed on freshwater prey, such as insect larvae and aquatic worms.



WELS CATFISH

CARD 16

GROUP 4: FISH

ORDER
Siluriformes

FAMILY
Siluridae

GENUS & SPECIES
Silurus glanis



D. Avon/Ardea London

The freshwater Wels catfish nightly patrols the weed beds and the rim of its murky lake or river home. It is a danger to all unsuspecting smaller fish.

KEY FACTS



SIZES
Length: Averages 5 ft., but can grow to 16 ft.
Weight: About 200 lb.; largest over 700 lb.



BREEDING
Sexual maturity: 4-5 years.
Spawning season: May to July.
No. of eggs laid: 100,000-370,000.



LIFESTYLE
Habit: Solitary; nocturnal.
Diet: Fish, small mammals, reptiles, and birds.
Lifespan: Up to 15 years.



RELATED SPECIES
The only other species found in Europe, *Silurus aristotelis*, is found in southern Greece. It can reach a length of 6 ft. and weigh as much as 350 lb.



Range of the Wels catfish.

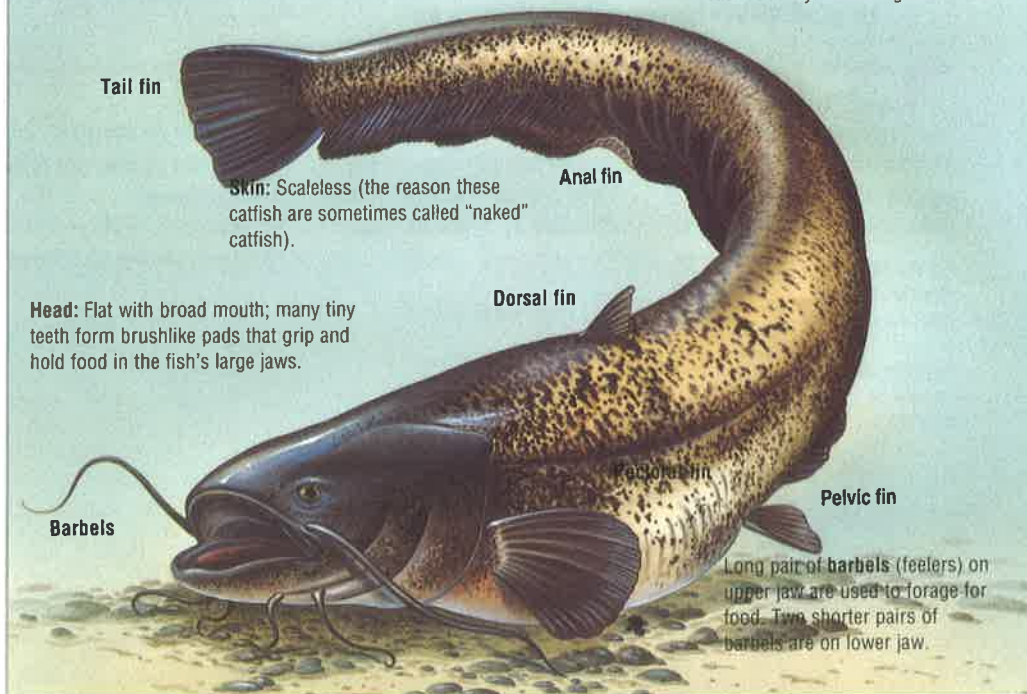
DISTRIBUTION

Once confined mainly to eastern Europe, the Wels catfish's range now extends into western Europe and England. It is also found in brackish waters of the Baltic and Caspian seas.

CONSERVATION

The Wels catfish is not an endangered species.

FEATURES OF THE WELS CATFISH



Body: Broad at head; flattens toward back. Usually a brown-green color.

Tail fin

Anal fin

Skin: Scaleless (the reason these catfish are sometimes called "naked" catfish).

Dorsal fin

Head: Flat with broad mouth; many tiny teeth form brushlike pads that grip and hold food in the fish's large jaws.

Pelvic fin

Barbels

Pelvic fin

Long pair of barbels (feelers) on upper jaw are used to forage for food. Two shorter pairs of barbels are on lower jaw.



Left: *The Wels catfish, sometimes called the European catfish, is popular with fishermen.*

Silvestris

HABITS

The Wels catfish feeds mainly at night. It rests during the day in the shelter of overhanging or weedy banks, or on the muddy bottom of deeper water in slow rivers and muddy lakes.

It prefers to spend its time in an almost static position. It never jumps, although it sometimes rolls just under the surface.

A loner, the catfish establishes and defends its territory. However, food-rich waters can support several catfish in the same area.

The huge Wels catfish feeds

mainly on live fish. It also eats

small mammals, amphibians, and birds

that might be in the water. But catfish

sometimes scavenge for carrion,

so sport fishermen use animal meat as bait.

FOOD & HUNTING

On its nightly hunting trips the adult catfish stalks and catches live fish, including the young of other catfish. It uses its longest pair of whiskerlike *barbels* (feelers) to forage along the muddy bottom for small invertebrates.

Fish is the Wels catfish's basic diet, though it also eats water voles, ducklings, frogs, and crayfish. Sometimes it will surface to gulp down swimming amphibians, birds, and even small mammals in the water.

Right: *Close-up of catfish head showing the barbels, or feelers, on its top and bottom jaws.*



P. Morris

BREEDING

The Wels catfish spawns from May to July, depositing its eggs under weed beds. First, the male digs a shallow hole

with his nose, then the female lays her eggs in the hole. She can produce from 100,000 to 370,000 eggs,

depending on her size.

The male guards the eggs for two to four days, until the young hatch. Then the black

tadpole-shaped *fry* (young fish) fend for themselves. They feed mainly on tiny invertebrates.

Right: *Of the thousands of eggs laid, only a small number will survive to maturity.*



Silvestris

CATFISH & MAN

In Eastern Europe catfish are an important commercial fish. They are caught in nets, in large traps, or even on baited lines.

In some areas the fish are successfully farmed because they are content to live in an artificial environment where food is readily available. Under these favorable conditions they grow rapidly and reach a marketable size quickly. Their meat is eaten fresh, salted, or smoked.

Catfish are also a popular sport fish in several European countries.

DID YOU KNOW?

- In Asia "walking" catfish have lunglike organs that let them breathe on land. They can pull themselves along on land with their fins.
- There are more than 2,000 species of catfish, from 30 families. They vary in size from smaller than a half inch to 16 feet.
- Only two families of marine catfish exist: *Plotosidae* and *Aridae*. The *Aridae* male carries the fertilized eggs in his mouth for as long as two months and does not eat during this time.

ANGELFISH

CARD 14

GROUP 4: FISH



ORDER
Perciformes

FAMILY
Pomacanthidae

GENUS & SPECIES
Pomacanthus



Angelfish are among the most colorful of marine animals. Coral reefs, found in tropical seas around the world, are their natural habitat.

KEY FACTS



SIZES
Length: Up to 2 ft., but usually much smaller.



BREEDING
Little is known about the breeding habits of the angelfish in the wild, and they do not breed well in captivity. Probably spawn as pairs, producing hundreds of eggs.



LIFESTYLE
Habit: Active by day, either solitary, in pairs, or in small groups.
Diet: Algae, worms, shellfish, and sponges.
Lifespan: Unknown in the wild.



RELATED SPECIES
There are 74 angelfish species. Their closest relatives are the similar butterfly fish (family *Chaetodontidae*), including the foreceps fish, *Forcipiger longirostris*.



Range of the angelfish.

DISTRIBUTION

Found throughout the world in tropical and subtropical, shallow seas, usually on coral reefs.

CONSERVATION

Angelfish are in no danger from man, including collectors. However, in areas such as the Caribbean, pollution and coastal development pose a threat to their coral reef habitats.

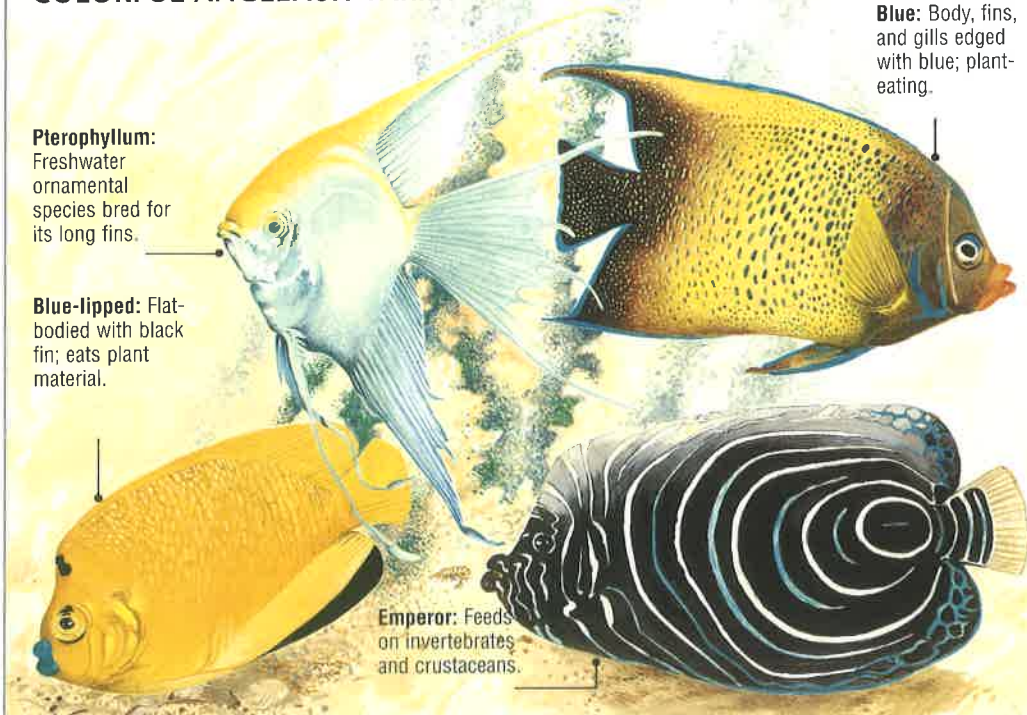
COLORFUL ANGELFISH VARIETIES

Pterophyllum:
Freshwater ornamental species bred for its long fins.

Blue-lipped: Flat-bodied with black fin; eats plant material.

Emperor: Feeds on invertebrates and crustaceans.

Blue: Body, fins, and gills edged with blue; plant-eating.



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Angelfish are a favorite subject of underwater photographers, but little is actually known about their behavior. In many ways they are unique, changing their color, pattern—and even their sex—as they mature.



HABITAT

The angelfish is so brilliantly colored it seems unlikely that it could escape the attention of predators.

Some people have assumed that the colorful angelfish in home aquariums are a special breed—that angelfish in the wild are drab and dull-colored. But, in fact, all angelfish have bright colors and distinct markings.

Angelfish are found on coral reefs in tropical and subtropical seas throughout the world. Of the 74 different species of angelfish, the blue-lipped, emperor, and blue angelfish are among the most colorful (see back cover).

Above: Angelfish *Holacanthus bermudensis* on a Florida reef.

DID YOU KNOW?

- The markings on some young angelfish look like Arabic script. In Zanzibar, an angelfish was spotted that supposedly had “There is no God but Allah” written on one side, and “A warning sent from Allah” on the other.
- Some angelfish have markings near their fins that resemble eyes, called eyespots, that confuse predators and keep them away from the fish’s head.
- In some species of angelfish, such as the emperor angelfish, the young fish have different markings than the adults.

Right: A blue-girdled angelfish, *Euxiphops navarchus*.

BREEDING

One of the most unusual things about reef-dwelling fish is the way many species, including certain angelfish, change sex as they mature. Most often, it is the mature females who change into fully functioning males. In some species, the change in sex is automatic; in others, the change is circumstantial.

BEHAVIOR

On the rich feeding grounds of the reef, most angelfish can find enough food within a relatively small area. Singly or in groups, fish will often jealously defend their feeding grounds against others of the same species. They flaunt themselves so that the intruders recognize their distinctive markings and retreat without a confrontation.

Some angelfish, such as the blue-and-gold dwarf angelfish, *Centropyge bicolor*, claim territory within a small, algae-rich area of the reef. They live in family groups that are dominated by a single male. Other families are kept out of the territory—partly by the aggressive

A static group consists of a single male and his harem of females. The largest and oldest female, however, changes sex and takes over his position when he dies, defending the group and fertilizing the eggs.

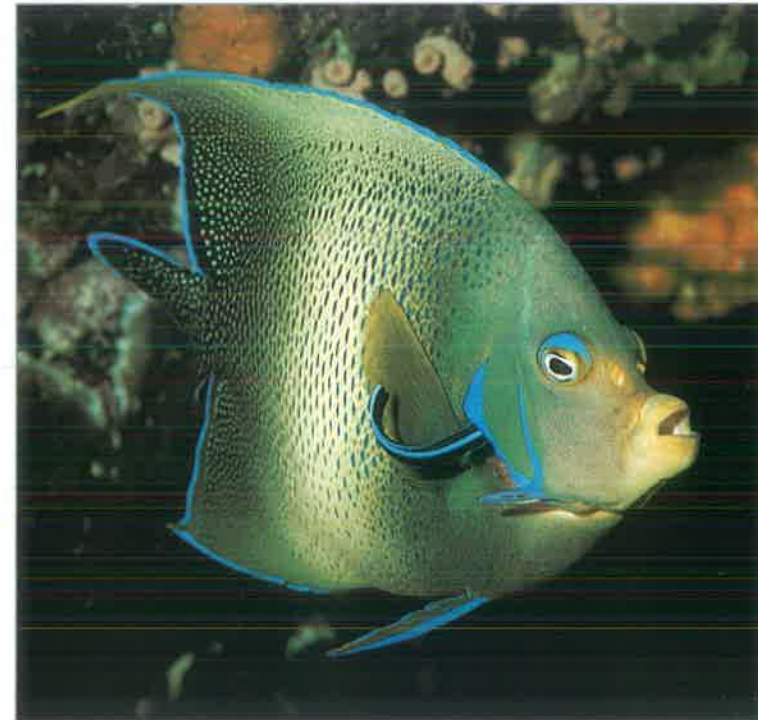
Little is known about the spawning behavior of angelfish. The spawning (producing

or depositing of eggs) of most reef fishes takes place above the reef. The male and female dash toward the ocean surface, shed the eggs and sperm, and dive back to the shelter of the coral. The fertilized eggs float off in the currents, away from reef predators.

The larvae that hatch from

the eggs may drift off into the open sea, either to die or to settle on another reef. Only a small proportion survive to reach maturity.

Below: The blue angelfish *Pomacanthus semicirculatus*.



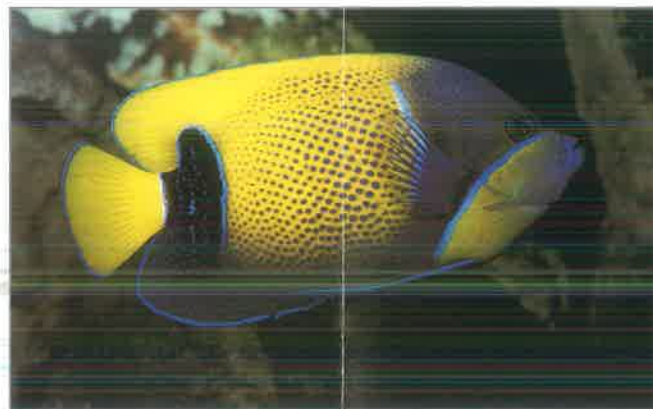
FOOD & FEEDING

Many species, such as the dwarf angelfish, are primarily plant eaters. They scrape algae off rocks with fine, brushlike teeth. This activity also helps keep the algae in check.

Larger species, such as the emperor angelfish *Pomacanthus imperator*, eat shrimp, worms, and shellfish. They have strong, beaklike jaws with which they crush prey.

Some angelfish species have protruding mouths that allow them to probe for food in crevices between the corals.

Occasionally, an angelfish will eat parts of a coral polyp—one of the tiny, anemone-like, colonial animals that are part of the reef—and seems to be unaffected by the stinging cells in the polyp’s tentacles.



CLOWNFISH

CARD 13

GROUP 4: FISH

ORDER
Perciformes

FAMILY
Pomacentridae

GENUS & SPECIES
Amphiprion



The brilliantly colored clownfish gets its name from its distinctive, black-and-white markings.

KEY FACTS



SIZES
Length: 2-5 in., depending on species.



BREEDING
Spawning season: Year-round in tropical waters.
Eggs: Laid in large batches.
Hatching time: 4-5 days.



LIFESTYLE
Habit: Usually live in pairs within an anemone.
Diet: Leftovers from fish consumed by anemone; algae.
Lifespan: 3-5 years in captivity.



RELATED SPECIES
Clownfish belong to the group of fish known as damselfish. They include the common *A. percula*, the two-banded *A. kindynos*, the black *A. melanopus*, the black-banded *A. ephippus*, the white-maned *A. periderain*, and the Red Sea variety, *A. bicinctus*.



Range of the clownfish.

DISTRIBUTION

Species are found in the Red Sea, the Indian Ocean, and the tropical Pacific Ocean. *A. percula* is particularly common on Australia's Great Barrier Reef.

CONSERVATION

Having come under threat from the aquarium trade, many governments are restricting the removal of the fish from their natural environments.

CLOWNFISH AND THE SEA ANEMONE

The **clownfish** and the **sea anemone** have a *symbiotic* (or mutually beneficial) relationship. The clownfish attracts predators to the anemone in which it lives. The predator fish in turn become prey to the anemone.

The clownfish also chases away certain fish that are harmful to the anemone, such as the **butterfly fish**. This fish preys on the anemone, biting off the ends of its tentacles.





Clownfish belong to a group of small, brightly colored fish called damselfish.

These inshore reef-dwellers have developed a curious and potentially deadly relationship with the sea anemone.

DID YOU KNOW?

- The most common anemone to act as host to the clownfish is the large *stichactis* species.
- If the slimy mucus covering is wiped off of a clownfish before it returns to its host anemone, it will be stung or even killed by the anemone's tentacles.



SPECIAL ADAPTATIONS

It was once believed that the clownfish had a natural immunity to anemone's sting. However, studies have shown that this immunity must be developed.

The initial sting of an anemone causes the clownfish to secrete a slimy mucus, which covers its body and

immunizes it against future contact with the poison from the anemone's tentacles.

This covering protects the clownfish from its host anemone species, but it can still be stung and killed by any other species of anemone against which it has not developed an immunity.

BREEDING

Clownfish lay their eggs in batches on the clear coral or rock adjacent to the anemone, or at the base of the anemone's tentacles. The male guards the eggs until they hatch four to five days later. In some species of clownfish, the male cares for the young until they reach sexual maturity, at which time they leave to find their own host anemone.

Left: *The Red Sea species, A. bicinctus, is a bright yellow-orange with two white bars—one behind the eye and the other across the middle.*



Right: *Most clownfish spawn on coral near their host anemone or within the anemone itself.*

FOOD & FEEDING

The clownfish has a *symbiotic*, or mutually beneficial, relationship with the sea anemone. It catches most of its food by cooperating with its host anemone. The clownfish will leave the safety of the anemone's tentacles and swim out along a nearby reef. Its brilliant colors attract larger fish, who, lured by the hope of a meal, follow it back to the anemone and are stung by its tentacles. The anemone then consumes the fish, and the clownfish feeds on the remains.

In addition to other fish, the clownfish also feeds on planktonic crustaceans and algae that live in or grow on the reef. The clownfish also eats away debris and nibbles off the dead tentacles of its host anemone.

Right: *The blackish-yellow, two-banded variety of clownfish, A. akindynos, swims among the sea anemones, feeding on planktonic crustaceans and algae.*



CLOWNFISH & MAN

Far too small to be hunted by man for food, clownfish have lived undisturbed in the coral reefs for thousands of years. But more recently, they have become extremely popular as saltwater aquarium fish. The brightly colored species command a high price in Europe and the United States. Collectors, realizing the demand, have destroyed many reefs in search of prime specimens, often damaging or killing the host anemones in the process.

Fortunately, many local governments have imposed restrictions on the number of clownfish that can be taken from their habitats and the means by which they can be taken. And, because clownfish are a big attraction with snorkelers and scuba divers, the tourist industry has an interest in protecting them and ensuring that they be allowed to live and breed safely on the reef.

GREAT WHITE SHARK

CARD 12

GROUP 4: FISH



ORDER
Selachii

FAMILY
Isuridae

GENUS & SPECIES
Carcharodon carcharias



R&V Taylor/Ardea London

The great white shark is found in the warmer oceans throughout the world. It eats most types of fish and warm-blooded animals and is the most deadly of the man-eating sharks.

KEY FACTS



SIZES

Length: Averages 10-20 ft.
Weight: Averages 2,500 lb.



BREEDING

Little is known of the great white shark's breeding habits. The female is thought to give birth to a single live pup; still, no pregnant white shark has ever been captured.



LIFESTYLE

Habit: Solitary. Must move continuously.

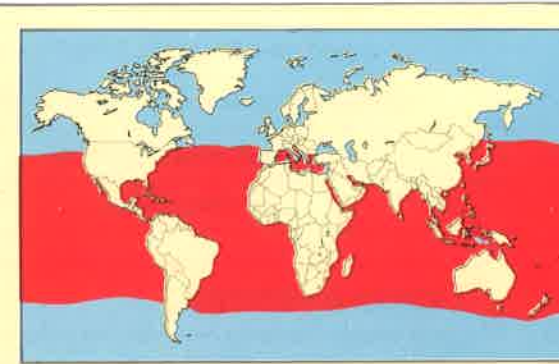
Diet: Almost any fish or warm-blooded creature it can catch.

Lifespan: Believed to be 30-40 years.



RELATED SPECIES

The whale shark (*Rhincodontypus*), over 60 ft. long, is considered the largest fish. The second largest, also a shark, is the basking shark (*Cetorhinus maximus*).



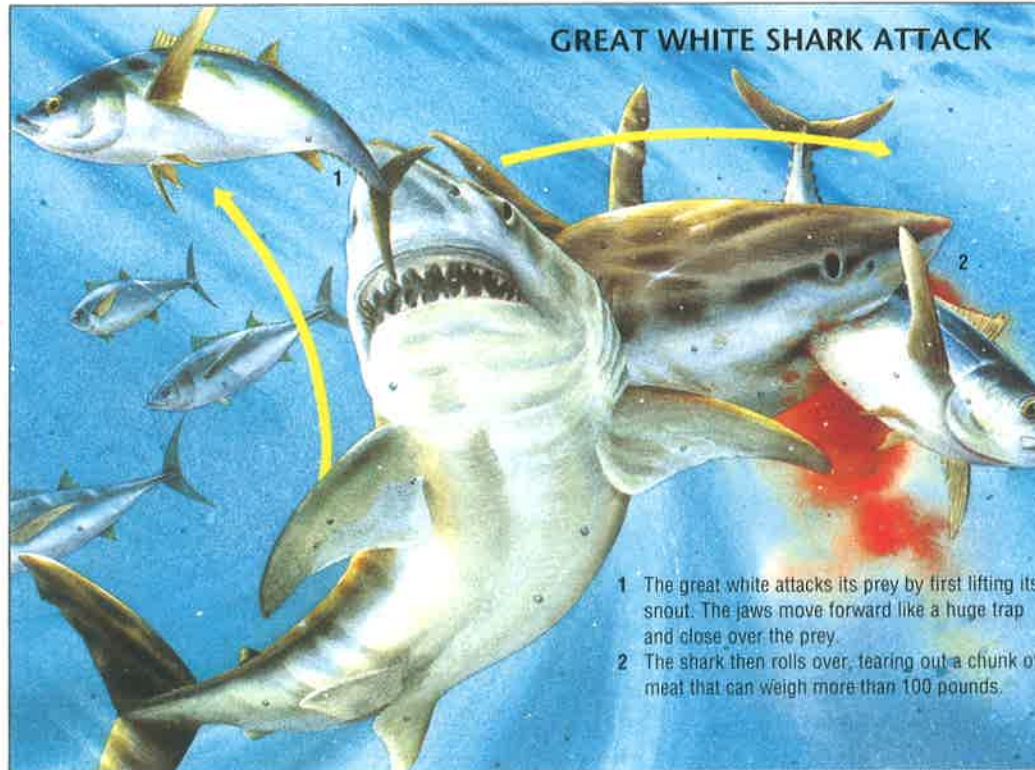
Range of the great white shark.

DISTRIBUTION

In oceans worldwide, but mainly warm or temperate seas. Still, specimens have been found in the cooler waters off Nova Scotia, Iceland, and southern Australia.

CONSERVATION

Because the great white shark is always on the move, it is impossible to monitor its numbers, and no population figures are available. It is thought to be rare.



GREAT WHITE SHARK ATTACK

- 1 The great white attacks its prey by first lifting its snout. The jaws move forward like a huge trap and close over the prey.
- 2 The shark then rolls over, tearing out a chunk of meat that can weigh more than 100 pounds.

The great white shark is a solitary animal and joins with other sharks only to feed on a large kill. It must swim continuously throughout its life to allow enough oxygen to enter its bloodstream.

FOOD & HUNTING

The great white shark preys on most ocean-going animals. It regularly eats such fish as tuna, marlin, and broadbill swordfish, as well as sea lions, seals, and dolphins.

After eating large prey, the shark can survive for a month without eating again. The great white may feed whenever prey is available, not just when the shark is hungry. Still, as its *metabolic* (body process) rate increases, especially in warmer waters, it eats more.

Most great white sharks hunt alone. But groups of sharks, attracted by blood

released from a kill, often gather to feed on dead prey.

The great white shark locates its prey with its sharp sense of smell. Within its *rostrum*, or snout, are thousands of tiny holes that make up the shark's main nerve center. Thus, the great white is able to detect even the smallest amounts of blood in the water.

The great white also finds prey by *echolocation*, releasing sound waves that bounce back to the shark and enable it to determine an animal's exact location.



R&V Taylor/Ardea London

Left: A great white shark takes a lure from a boat.



Above: The shark's sensitive snout is its nerve center.

Right: The great white shark's body is massive and very strong.

GREAT WHITE SHARK & MAN

The great white shark has been responsible for many of the shark attacks on people. Its role in these attacks has been confirmed by positive identification of great white shark tooth fragments recovered from damaged surfboards and boats.

The great white shark is considered a prize catch by sport fishermen. The shark is easily recognized by its high, triangular dorsal fin and crescent-

shaped tail.

Although the great white shark is killed for sport, it is not hunted for its meat. Because the shark expels urine through its tissues and out of its body through its skin, its meat cannot be eaten.

Remarkably little is known about the great white shark. Attempts to study it in its natural habitat have failed because it is constantly on the move. It has also been impossible to keep the shark in captivity, so little study has been done.



SPECIAL ADAPTATION

The great white shark has triangular teeth that grow as long as three inches. Serrated edges enable the shark to grip its prey firmly. Like all sharks, the great white replaces lost teeth: a previously unused tooth emerges to replace the missing tooth.



R. Shastri/Planet Earth Pictures

HABITS

Scientists believe that when a great white shark exceeds a certain length-to-weight ratio, it abruptly retreats to the ocean depths, where it remains for the rest of its life.

It is also believed that great white sharks, like blue marlin and wrasse, change sex when they reach a

certain size: the males become females. The reason for the sex change is not known, but it may ensure that all larger sharks give birth. This would increase their chances of producing healthy offspring. The majority of the larger sharks caught have been female.



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DID YOU KNOW?

- The great white shark is able to detect a single drop of blood in more than a million gallons of water.
- The great white shark must swim at a minimum speed of

two miles an hour, 24 hours a day, to get enough oxygen into its bloodstream.

- If a great white shark is dragged backward, it drowns in minutes.