

A large school of silver fish, possibly silver pompano, swimming in clear blue water. The fish are arranged in a loose, coordinated pattern, moving towards the left side of the frame. The water is a deep blue, and the fish have a metallic sheen.

FISH MIGRATION

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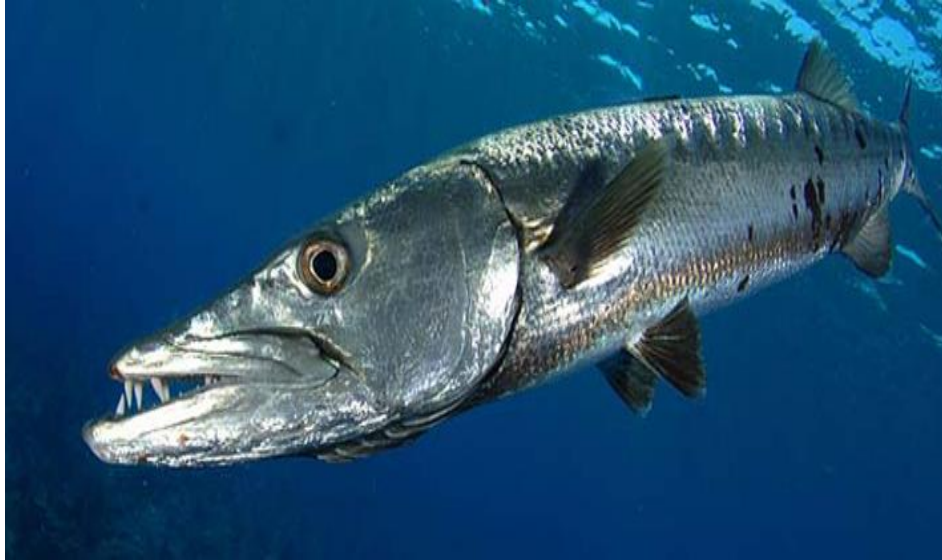
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Types of migration

- **1. Latitudinal Migration**
- **2. Vertical Migration**
- **3. Spawning Migration**
- **4. Feeding Migration**
- **5. Overwintering Migration**
- **6. Shoreward Migration**

Latitudinal Migration

- This is performed by fishes like barracudas (Sphyraena) and swordfish (Xiphius) of the warm tropical seas. They migrate to north in spring and to south in autumn.



VERTICAL MIGRATION

- This is performed by many marine and freshwater fishes and is related to light, search of food, protection and also to spawning. The mackerel rises into the surface waters when there is a rich development of plankton. They eat on plankton and go to deep layers after feeding.



SPAWNING MIGRATION

- This is the migration in fishes for breeding, and so it is related to life cycle. Spawning migration is an adaptation for ensuring the most favourable conditions for the development of the eggs and the larvae. This also gives protection to early stages of fishes from predators.
- There are two major types of spawning migrations. Movement from freshwater to saltwater for spawning is called catadromous migration. The reverse movement, that is, from saltwater to freshwater is termed anadromous migration.

CATADROMOUS MIGRATION

- The most famous examples of catadromous fish is the eels, *Anguilla rostrata*, the European eel and *Anguilla vulgaris*, the American eel. For eel, the river serves as the feeding ground while the sea serves as the spawning ground. The stimulus for the start of migration in eel is the ripening of its gonads in rivers.
- Before it enters the sea, the eye of the eel becomes enlarged, sometimes becoming four times as large as the eye of freshwater eels. Its face becomes sharper and its colouration changes the back becomes darker, while the belly changes from yellow to a silvery colour. The eel starts its migration in a wellfed condition.
- During migration it spends enormous amount of energy so it becomes very thin. The migrating eel does not feed. Its alimentary canal degenerates considerably. Osmotic pressure of its blood rises and size of its swim-bladder decreases.
- The eels migrate about 4500 km westwards from Europe or eastward from America and reach the breeding place in the Sargasso Sea off Bermuda. The adult die immediately after spawning in deep waters.
- The fertilized eggs hatch out into transparent, ribbon like larvae, called the leptocephali. These were erroneously called glass fishes and placed in the genus *Leptocephalus*. They lead a pelagic life for a year or more and undergoes metamorphosis into elvers (glass eels).
- The elvers then start ascending the rivers in shoals and grow for some years to become adult eels. The adult eel, on maturity start moving towards sea, again the cycle is repeated.
- Catadromous migration is also performed by certain members of the families *Galaxiidae* and *Gobiidae*. But their migration is considerably shorter than those of the eel. They usually pass from the lower reaches of the rivers to the adjacent shallow parts of the sea.

Examples: American eel, European eel, inanga, shortfin eel, longfin eel



Anadromous migration

- Anadromous migrations are performed by lampreys, sturgeons, salmon, some shads, cyprinoids etc. The best examples are Atlantic salmon (*Salmo salar*) and Pacific salmon (*Oncorhynchus nerka*).
- In winter, the both sexes leave their feeding ground at sea to ascend the freshwater mountain streams, reaching the identical spot where they originally grew some years ago. The total distance travelled may be even upto 3600 km, at a speed of 30-40 km. per day.
- They stop feeding, alimentary tract undergoes changes into a thin thread with feebly developed pyloric caecae. Change in colour and weight too occurs. Sexual dimorphism becomes evident. The male is characterized by the possession of enlarged front teeth.
- After the selection of suitable spawning grounds, the salmons segregate into pairs and produce shallow saucer-like nest where spawning takes place.
- Very young salmons are known as “alevins” and they remain mostly among stones. Alevins develop into next stage called “parr” and finally to adult.
- After fertilization, salmons are very exhausted. They are called “kelts”. The males seldom return to the sea. The females recover and after a period in the sea they return to breed again. This process may be repeated several times.
- Some fishes do not perform significant movement like salmon. They migrate from seas to estuaries or lower reaches of river, for spawning. Such fishes are classified as fluvial anadromous (Semimigratory) fishes. Examples are many whitefishes and cyprinoids.
- Many freshwater fishes leave the lakes to spawn in the river. This is called as limnodromous migration. One of the common examples of this is the whitefish *Coregonus lavaretus*.

Examples: salmon, smelt, American shad, hickory shad, striped bass, lamprey, gulf sturgeon



AMPHIDROMOUS

Amphidromous fish are born in freshwater/estuaries, then drift into the ocean as larvae before migrating back into freshwater to grow into adults and spawn.

Examples: bigmouth sleeper, mountain mullet, sirajo goby, river goby, torrentfish, Dolly Varden



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POTAMODROMOUS

Potamodromous fish are born in upstream freshwater habitats, then migrate downstream (still in freshwater) as juveniles to grow into adults before migrating back upstream to spawn.

Examples: sicklefin redhorse, lake sturgeon, robust redhorse, flathead catfish



OCEANODROMOUS

Oceanodromous fish are born near spawning grounds, then drift on ocean currents as larvae before settling as juveniles to grow into adults before migrating back to spawning grounds.

Examples: black grouper, mutton snapper, goliath grouper



Feeding Migration

- This is the movement from spawning or overwintering grounds to the feeding grounds. Feeding migration can be passive or active. In many fishes the feeding migration even begins in the egg stage. It is a passive feeding migration of eggs and embryos from spawning to feeding ground.
- Active feeding migration is performed by many marine fishes like cod. Horizontal feeding migration of cod comprises regular journeys, going from one good feeding ground to another.

COD



Overwintering Migration

- Overwintering and hibernation in fishes are a part of the life cycle of a fish. It is characterized by reduced activity, reduction or stoppage of food consumption, lack of food, poor oxygen condition, low temperature, drought etc. Overwintering do not occur in all fishes.
- Overwintering migration is a movement away from feeding to wintering grounds. It occurs only in those fishes which have a wintering ground.
- In the wintering ground, fish is in a state of relative inactivity and reduced metabolic rate. It requires protection against predators which are common in feeding ground. Overwintering migration is performed by marine fishes like flatfishes and freshwater fishes like grass-carp.

Flatfish



Shoreward Migration

- In this type of migration there is a temporary movement of fishes from water to land.
- For example, the common eel travel from one pond to another through moist meadow grass.
- The mud-skipper, *Periophthalmus* make temporary migration to land by means of modified pectoral fins.
- The climbing perch, *Anabas* migrates from water to land and even climbs trees to the height of several feet by means of the strong spines on its pelvic fins and gill covers.

Mud-skipper

