



HOMING BEHAVIOUR

Fish Migration (Homing)

Generally fishes live in a constant habitat but there are many others which migrate from fresh water to sea or vice-versa and travel long distance. This phenomenon is characterised by regular periodic movements like homing. According to Cohen (1970) about 8,000 fresh water species, 12,000 marine and 120 diadromous species (moving between fresh water and sea water) show regular migration. Approximately 70% of total migrants are found in tropical (warm) waters. . Nearly all fish move in shoals (groups of fish with similar size and biological conditions; also known as schools) generally with no leader. Shoals have a definite shape which is hydrodynamically suited for movement.

Homing

Homing is a complex, instinctively and physiologically dictated behaviour of migratory fish which compels the fish to return to its original locality, after undertaking migratory journeys; this instinct is seen most prominently in the 'Salmon'. Fish inhabiting smaller water bodies such as lakes, ponds and pools also have this remarkable instinct and if displaced, they can return to their home territories. Gerking (1959) has defined homing as "the return to a place formerly occupied, instead of going to other equally probable new places."

Types of migratory fish

According to Myers (1949) migratory fish can be classified into three main categories -

1. Diadromous fish
2. Potamodromous fishes
3. Occanodromous fish

1. **Diadromous fish.** These fish migrate between fresh water and sea water. These can further be sub-divided into three types -

(a) **Anadromous fish.** These fish migrate from sea to fresh waters for breeding (spawning) purpose e.g. Salmon, Striped bass, Shad, Lampreys and Hilsa.

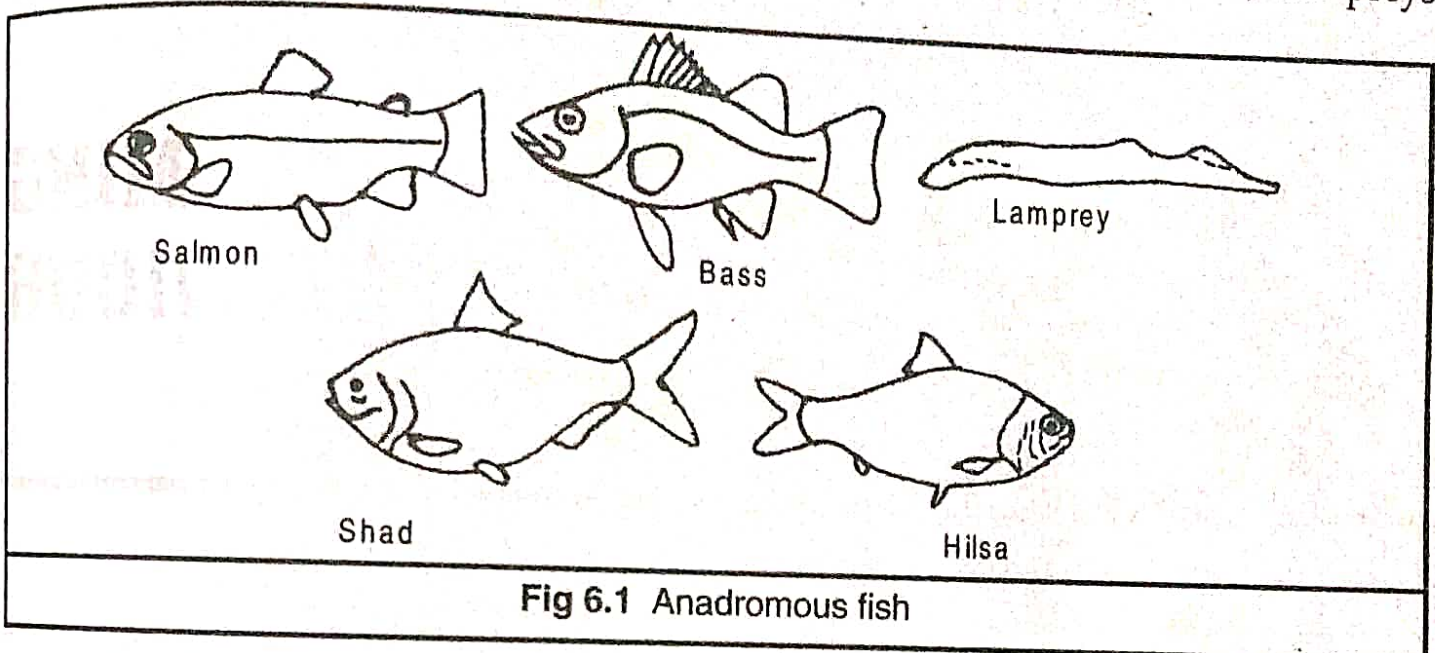


Fig 6.1 Anadromous fish

(b) **Catadromous fish.** These fish migrate from fresh water to the sea, chiefly for spawning e.g. European eel, American eel.

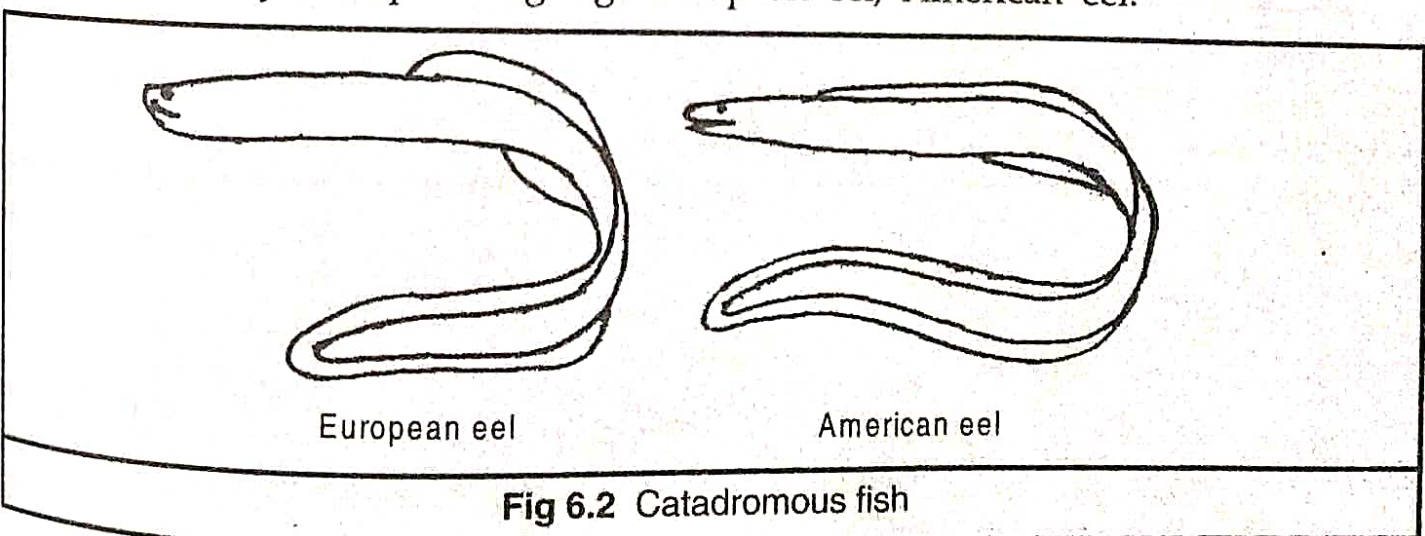


Fig 6.2 Catadromous fish

(c) **Amphidromous fish.** These fish migrate from sea water to fresh water and vice-versa but not for breeding, this may be for food etc. This movement may occur regularly at some definite stage of their life cycle e.g. Gobies undertake migration for food.

Semi-migratory- Some fish, however, do not show any significant movement from oceans to fresh water, these may move only upto estuaries. In such cases migratory changes are not too marked. These are called 'semi-migratory' fish e.g. Roaches, White fishes.

2. Potamodromous fish. These fish live and migrate only within fresh waters e.g. Carps, Trouts. Carps and trouts travel long distances in large rivers in search of suitable spawning grounds.

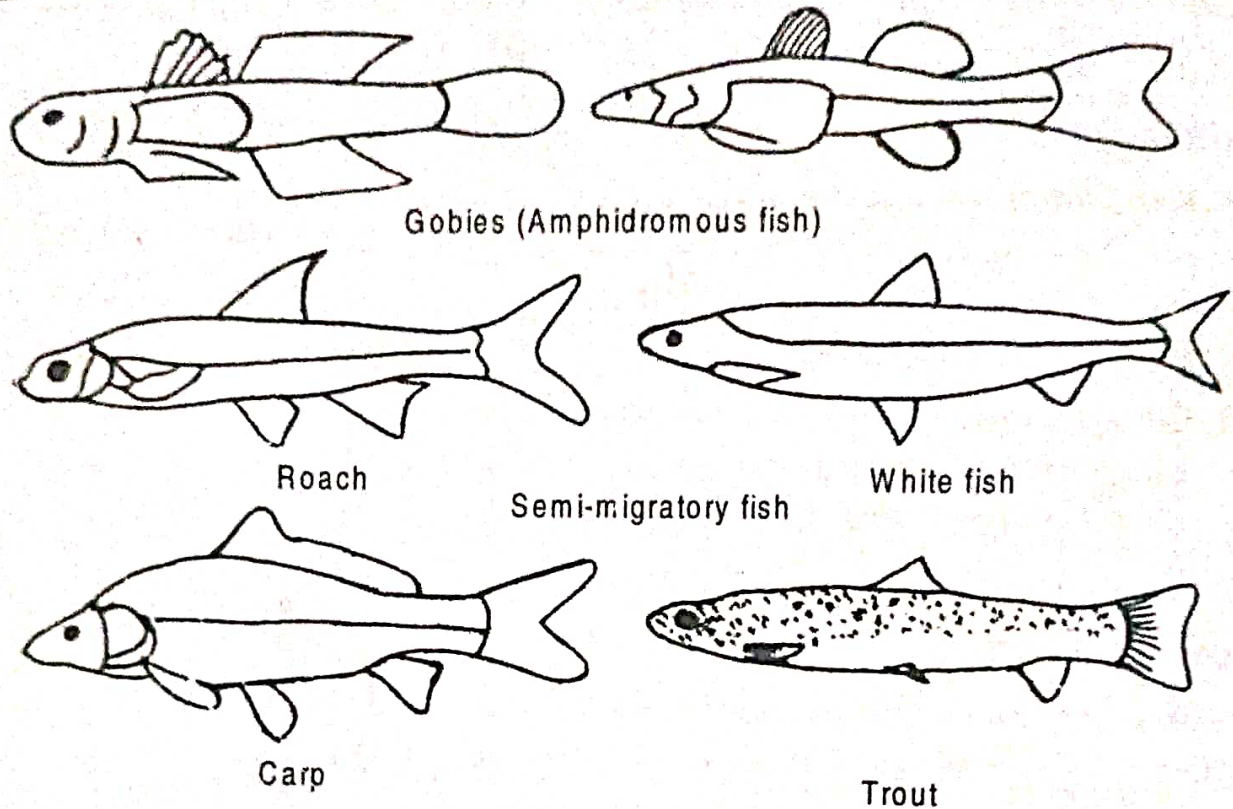


Fig 6.3 Potamodromous fish.

3. Oceanodromous fish. These fish which live and migrate only within the sea are called oceanodromous fish e.g. Atlantic herring, sardines, mackerel and Tuna. These fish generally migrate to colder water regions for the purpose of spawning, and then return to their parent area.

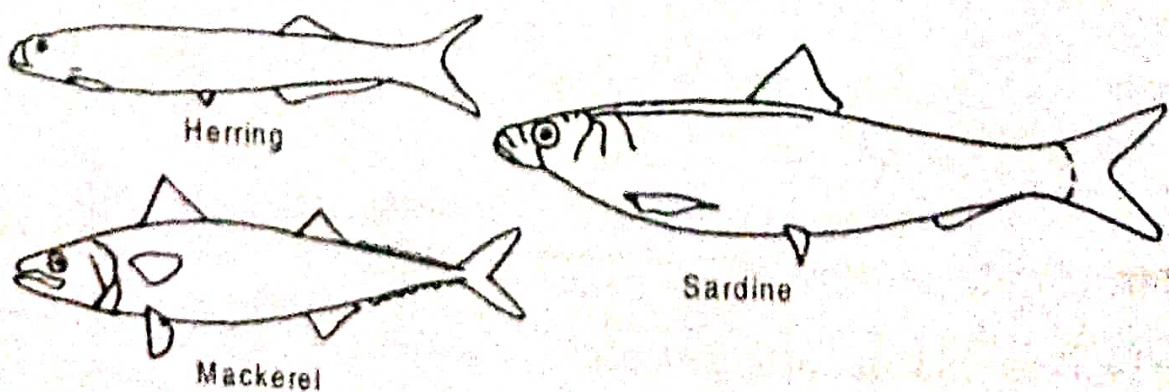


Fig 6.4 Oceanodromous fish

in some migratory species like Salmon, the young ones do not show migration, whereas in others like the Shad, both adults and the young ones show migration.

Methods of migratory movements:

1. **Denatant and cotranatant:** Migratory movements are of two types (i) along with the water currents, called Denatant or against the water current, called cotranatant. Some species may partly resort to both means. Movement in fish can be caused by.

2. **Drift:** When the fish are carried passively by the water currents. This type of movement is most commonly employed by larvae and rarely by adults.

3. **Swimming:** This is of following two types:

(i) **Random locomotory movement:** This may lead to a haphazard or random divergence of the species or it may lead to aggregation of the species specially if there are differences in environmental fields such as light, temperature etc.

(ii) **Orientated locomotry movement:** When movement is caused by a particular stimulus leading to migration of the species either towards or away from the source. Speed is an important factor in magrating fish.

Speed of the fish

The speed at which different species of fish move during migration is influenced by a number of physiological and environmental factors.

1. **Maximum speed:** The maximum speed at which a fish can move is ten times its body length per second ($\text{body length} \times 10/\text{sec}$). This speed can, however, not be maintained by the fish for more than one minute; they have to slow down to regain stamine and may again the maximum speed.

2. **Maximum sustainable speed:** This speed can be sustained by the fish over long periods of time. It is three times body length per second ($\text{body length} \times 3/\text{sec}$) e.g. in Herring of 25 cm size, maximum sustainable speed will be $25 \times 3 = 75$ cm/sec. in a cod of 80 cm this speed will be $80 \times 3 = 240$ cm/sec.

Spectacular migrants like the Salmon, Cod and Eel breed in one area but grow up and feed in another area. Interestingly, the distance between the feeding and spawning grounds may be over 700 miles.

Causes of Migration

According to Heape (1961) fish mainly migrate for three primary reasons, thereby giving rise to :

1. **Gametic migration (Spawning/breeding migration):** This type of migration according to Vasnetsov (1953) is undertaken by a fish to ensure better

survival and proper development of their eggs and larvae, e.g. *Hilsa ilisa*. Anadromous migration is more commonly noted in fish while catadromous migration is relatively uncommon as seen in Eels.

2. **Alimental migration (Feeding migration):** This type of migration occurs for the purpose of search of food, e.g. Chanos, Harpodon etc.
3. **Climatic migration (Wintering migration):** This type of migration to secure more suitable climatic conditions, e.g. sturgeons, Atlantic salmons etc.

Later Myers (1963) added another category

4. **Osmoregulatory or Protective migration (for water and mineral balance):** This type of migration takes place for osmoregulation.

1. Catadromous Migration in European Eel

Catadromous migration is migration of freshwater fishes to sea for spawning. It is exhibited by two species of eels : European eel (*Anguilla rostrata*) and American eel (*Anguilla vulgaris*).

Eels live in freshwater rivers. During breeding season (in autumn), their colour changes from yellow to metallic silver. Their alimentary canal shrinks and feeding is stopped. Eyes become large and snout sharper with thin lips. Gonads become fully mature and eels are reproductively mature. The silver eels descend the river, enter the sea and migrate about 4500 kilometers from Europe or America to their spawning place, the Sargasso Sea off Bermuda. They lay eggs in deep water and die immediately after.

The eggs hatch into small transparent, leaf-like flattened pelagic larvae, called **leptocephali**. These are less than 5 mm long and have sharp needle-like teeth. Leptocephali start their journey homeward drifting on the sea waves. These grow into **elvers** or **glass eels** which are now about 8 cm long and have cylindrical body.

On reaching land, the female elvers ascend in the river water, feed and grow into yellow eels. The males remain behind in the brackish water.

Until their real identity was discovered, the leptocephali were called **glass fishes** and were classified as a separate genus, *Leptocephalus*.

2. Anadromous Migration in Salmon

In anadromous migration, the marine fishes migrate to freshwater for spawning. A single species of Atlantic salmon, *Salmon salar*, five species of Pacific salmon, *Oncorhynchus* and *Hilsa* exhibit anadromous migration.

During winter, both the sexes start migrating from their feeding ground (sea) to freshwater mountain streams to their breeding grounds. They stop feeding, change to dull reddish brown from silver. Salmon then make a crude nest by excavating shallow saucer-shaped pit in the bottom gravel. After spawning, the adults die. In some Atlantic species of Salmon a few adults may survive.

After hatching, the larvae feed and grow in the rivers only for a short period. Afterwards they migrate to sea. The strong olfactory sense determines its homing stream and the original birth place because different streams have different odour.