

CC3 UNIT 4: PISCES (Migration in fishes)



SEM III ZOOA

Ruksa Nur

Assistant Professor
Department of Zoology
Dinabandhu Andrews College
Kolkata-700 084

INTRODUCTION

Migration is a behavioural phenomena which involves mass movement of animals from one place to another.

The purposes for migration varies accordingly with the types of animals.

Migratory behaviour of fish is a **regular phenomenon**. Their journey is purposed mainly for feeding and reproduction.

Many type of fish migrate on a regular basis on time scale ranging from daily to annually or longer

They travel over distances ranging from few meters to thousands of kilometers

INTRODUCTION

According to baker (1998) it is 'the act of moving from one spatial unit to another'.

According to nikolsky (1963) – 'migration is an adaptation toward increasing the abundance of a species'.

Migration behaviour is of course one of the phenomena in the life histories of the fish directed toward reproductive success.

MIGRATORY SPECIES-

Several species are migrated for spawning and feeding. These are example of some notable migratory fishes-

1. The cod (*Gadus morhua*)
2. Herring (*Clupea harengus*)
3. Salmon (*Salmo sp.*)
4. Eel (*Anguilla anguilla, A. Rostrata and A. japonica*)
5. Hilsa (*Hilsa ilisa*)
6. Three- spined stickle back (*Gasterosteus aculeatus*)
7. The tunas (*Thunnus thynnus*)

Types fish migration on the basis of needs:

Alimentary or Feeding migration: migration for search of feeding ground. It occur when food resources get exhausted.

Gametic or spawning migration: it occur during breeding season in search for the suitable spawning ground.

Climatic or seasonal migration: migration in search for suitable climatic condition.

Osmoregulatory migration: migration for water and electrolytes balance from sea to fresh water and vice-versa.

Juvenile migration: it is larval migration from spawning ground to the feeding habitats of their parent.

Types of movement of fishes during migration:

- **Drifting movement:** It is a passive movement of fish along with water currents
- **Dispersal movement:** It is a random locomotory movement of fish from a uniform habitat to diverse direction
- **Swimming movement:** It is an orientated movement of fish either toward or away from the source of stimulus
- **Denatant and Contranatant movement:** It is an active swimming movement. Denatant movement is swimming with the water current while contrantant movement is swimming against water current

SHOALING & SCHOOLING:

When a large number of fishes come together and move socially it is called **shoaling**.

Sometimes migrating fishes exhibit high degree of coordination in their movements and carry out synchronized manoeuvres (a movement or series of moves requiring skill and care) to produce different types of shapes is called **schooling**. It is seen in tunas and sardines

PERIODICITY OF MIGRATION

Most of migration occurs at regular intervals and may be daily, monthly , seasonally, yearly bi-annually or longer.

Thus, pacific salmon may remain at sea for several years before returning to the spawning grounds.

Eel spend several years (up to 20) feeding in fresh water, before undertaking spawning migration to sea.

The periodicity thus varies between different species, and even within a species and appears to be due to many biotic and abiotic initiating factor.

MARKING AND TAGGING

Information about the pattern of fish migration, its direction and speed of movement, can be studied by marking and tagging of fish followed by capture.

The mark or tag must be easily identifiable and must stay with the till end of the study .

Many types of tags have been developed for attachment to the fish for easy recognition.

Types of fish migration

The migration of some fishes is a regular journey and is truly an innate animal behaviour.

The form or pattern of migration differs between species, as well as within a species, Myers (1949) has used the following terms to describe fish migration:

- 1. Diadromous migration**
- 2. Potamodromous migration**
- 3. Oceanodromous migration**

1. Diadromous migration:

It is the migration of fish between sea and fresh water.

It is known that, most of the fishes are restricted to either fresh water or sea water, changes in habitat may causes osmotic imbalance in those fishes.

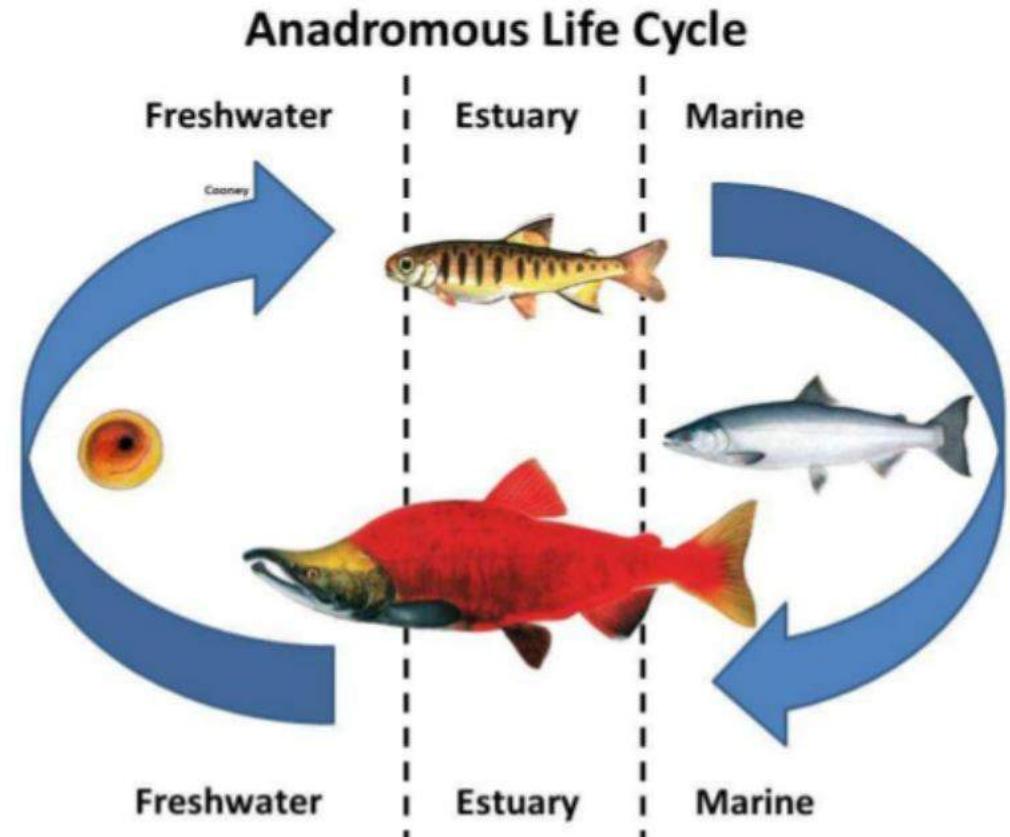
However some fishes regularly migrate between sea and fresh water and have perfect osmotic balance, they are the true migratory fish.

Diadromous migration is of three types-

- i. Anadromous migration**
- ii. Catadromous migration**
- iii. Amphidromous migration**

i. Anadromous migration-

- It is the migration of marine fishes from sea to fresh water for spawning.
- Fishes spend most of their life living and feeding in sea.
- They only migrate during breeding season to the river for spawning ground. Eg. *Salmon*, *Hilsa* etc.
- Salmon migrate for breeding during winter from sea to river. While migrating, some physiological changes occurs:
 - – stops feeding during journey
 - – changes colour from silver to dull reddish brown
 - – gonads mature
- They select suitable spawning ground and make a saucer-like nest in which female lays eggs and male releases smelt over them.
- Juvenile larva hatched out from the egg known as Alevins.
- Alevins then transform into parr and metamorphosed into adult when return to the sea.



ii. Catadromous migration-

- It is the migration of fresh water fishes from river to sea during breeding season for spawning. Eg. Eel (*Anguilla* spp)

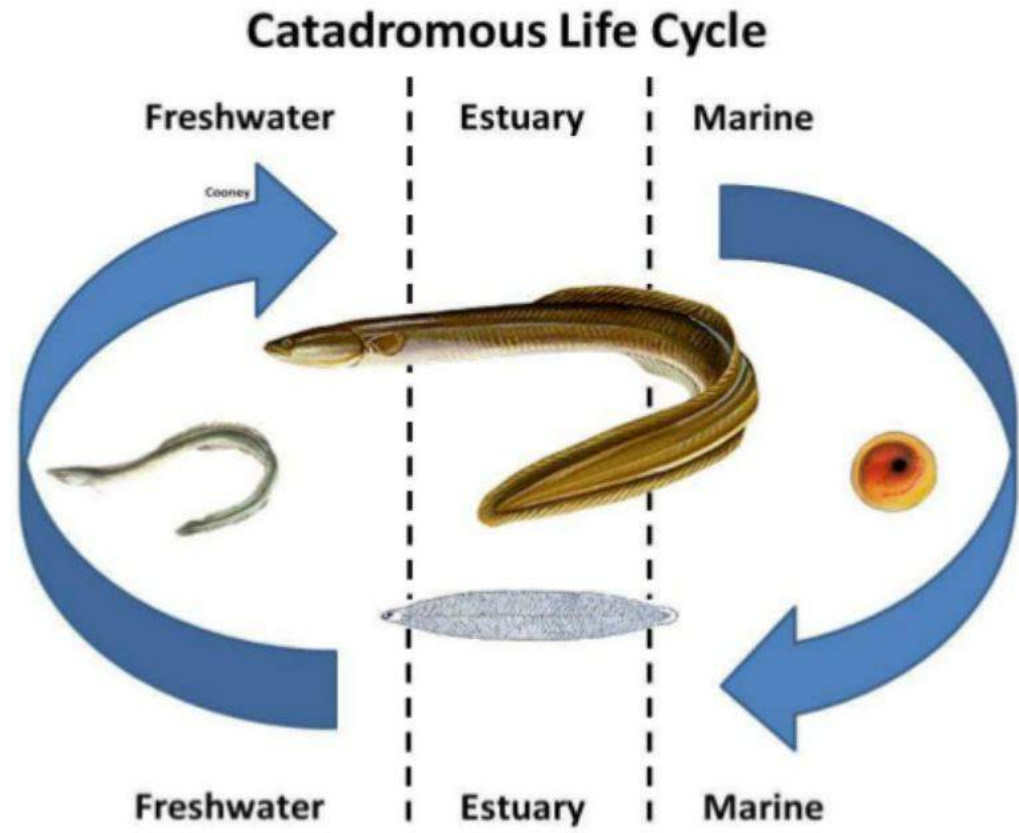
- Both European eel (*Anguilla anguilla* or *Anguilla vulgaris*) and the American eel (*Anguilla rostrata*) migrate from the continental rivers to Sargasso Sea off Bermuda in south Atlantic for spawning, crossing Atlantic Ocean.

- Before and during migration some physiological changes occur in their bodies:

- deposit large amount of fat in their bodies which serves as reserve food during the journey
- Colour changes from yellow to metallic silvery grey.
- Digestive tract shrinks and stops feeding
- Eyes get enlarged and vision sharpens. Other sensory organs also become sensitive.
- Skin serves respiratory organ.
- Gonads get matured and enlarged.

- They lay eggs in suitable spawning ground and are fertilized by males. After spawning they die.

- The larva hatch out and develop into young eel and finally return to river.



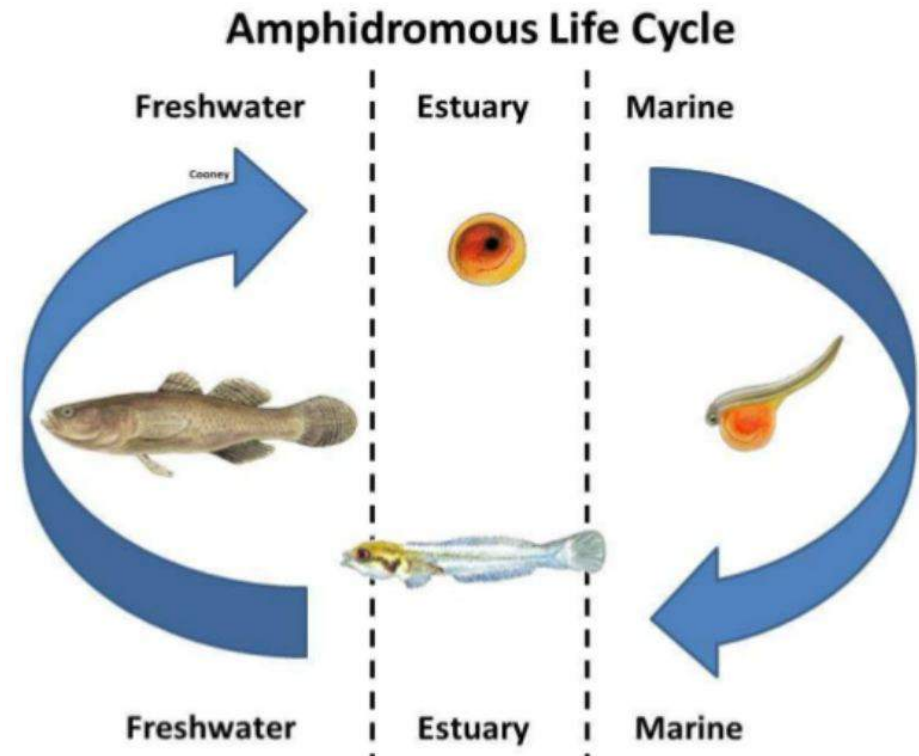
iii. Amphidromous migration-

Type of migration which involves movement from fresh water to the sea or vice versa, is not for the purpose of breeding.

But this migration occurs regularly at some definite stage of the life cycle.

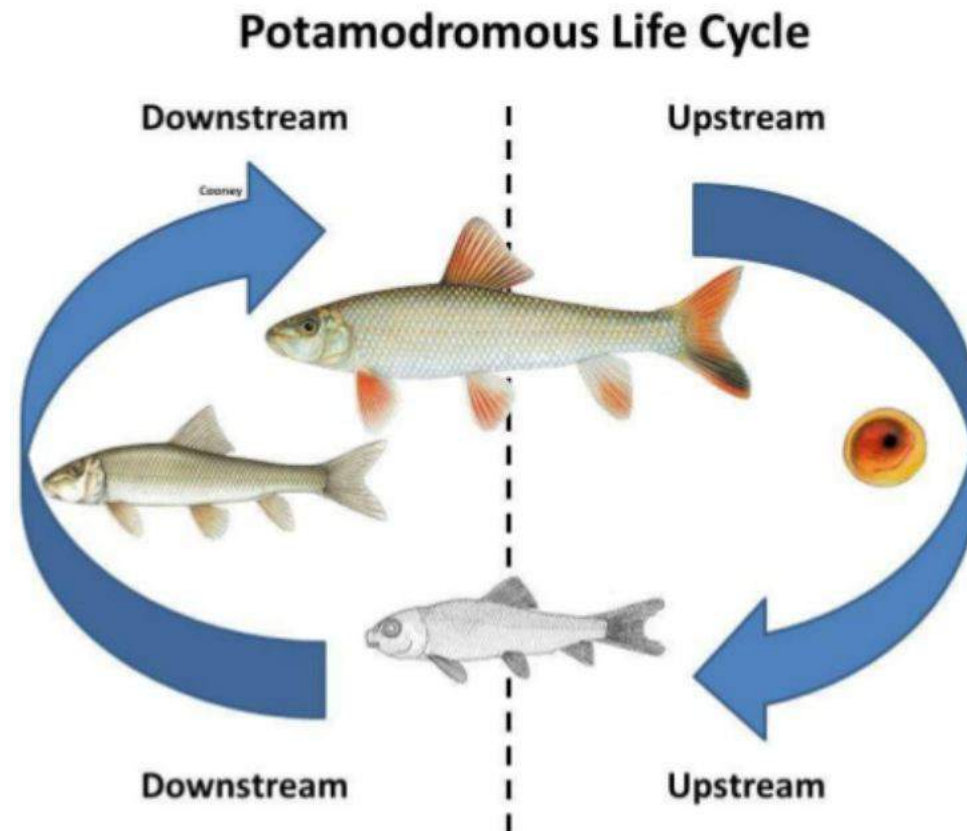
Myer suggests that the migration of some gobies might fall into this category.

Other examples includes Bigmouth sleeper, mountain mullet, torrentfish, Dolly Varden



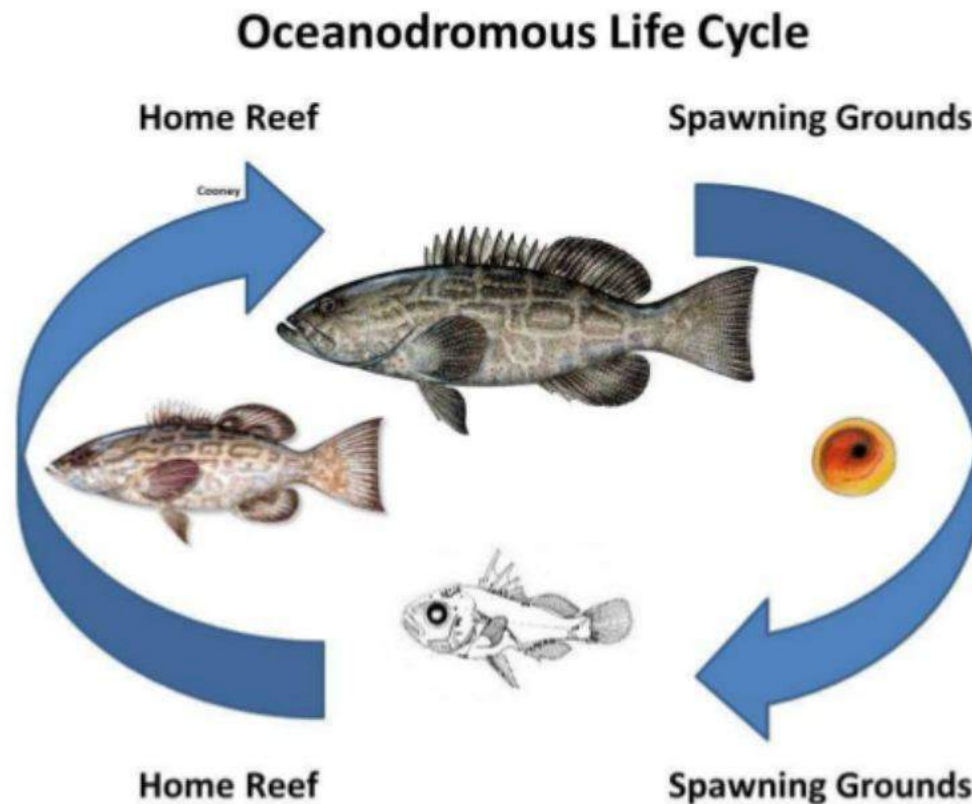
2. Potamodromous migration:

- Movement is confined to fresh water . These species travel long distances in river to locate suitable spawning grounds .
- 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: catfish, cyprinidies, etc.



3. Oceanodromous migration:

- Truly migratory fishes which live and migrate in the sea.
- Many marine fishes like the cod , the herrings (*Clupea*), mackerels (*Scomber*) and the tunnas (*Thunnas*) travel long distance in the sea to deposit their eggs, and later return to the feeding grounds.



Other forms of fish migration are classified into following types:

4. Latitudinal migration:

- it is the migration of fish from north to south and vice-versa.
- It is a climatic migration.
- Eg. Sword fish migrate north in spring and south in autumn.

5. Vertical migration:

- it is a daily migration of fish from deep to the surface and vice-versa for food, protection and spawning.
- Eg. Sword fish usually move vertically downward to greater depth for food.

6. Shoreward migration:

- it is the migration of fish from water to land. However it is a temporary migration.
- Eg. Eel migrate from one pond to another pond via moist meadow grass.

MECHANISM OF ORIENTATION

The mechanism of orientation during fish migration has been reviewed by Hasler (1971) and Able (1980).

Orientation means arranging of an animal in a given direction.

Homing- a fish may recognise its home site by a direct sensory stimulus vision or olfaction . This is called ' homing ' or ' piloting'.

'navigation' refers to the mechanism by which an animal can find direction towards a desired area.

Homing ability of a fish required a knowledge of some kind of ' map', whose information might be stored in the central nervous system

fish can use the sun for orientation during migration the fishes are observe the changing angle of the sun, relative to the horizontal and vertical planes.

During night, fish might use the position of moon for orientation

some species might make use of the magnetic and electrical field for orientation , and have the ability to produce and receive electric signals and exhibit the power of electrolocation.

Causes of Fish Migration

To avoid unfavorable conditions

To enhance the survival of the offspring

To exploit the available food in feeding areas.

Population pressure is also considered a possible cause of migration.

The fish migrate in search of new suitable areas where food is abundant & competition is minimum.

Factors Influencing Migration

Factors like physical, chemical and biological factors influence the migrations in fishes.

Physical factors like depth of water, temperature, light penetration, photoperiod, turbidity, velocity of current may cause migration.

Chemical factors like pH and salinity.

Biological factors are hormonal action , maturity of gonads, food, blood pressure etc. sometimes presence of predators in the area also may influence the migration of fishes.

Salinity of water plays an important role in fish migration. Most of the fresh water fishes remain in fresh water as they are stenohaline i.e. they cannot tolerate great variations in salinity. But the species which are euryhaline like Anguilla, salmon, hilsa under take migration as they can tolerate a wide range of salinity.

Factors Influencing Migration (contd.)

Intensity and duration of light also effect the migration. Fishes like Herrings migrate during full moon and sturgeon fishes migrate in night time.

Water currents also influence the phenomenon. Eggs and tiny young ones lead a pelagic life and drifted by currents.

After breeding the spent fishes of salmon are carried into the sea by the currents produced in the river.

But most important factor that controls migration among fishes can be referred to maturity of gonads and hormones secreted by endocrine glands like pituitary.

Significance of fish migration

to find suitable feeding and spawning ground

for protection from predators

survive from extreme climatic conditions

increases genetic diversity

it is an adaptational characters for survival and existences,
as it ensures reproductive success of the group

Thank you