

Pisces: Locomotion and Migration

Lecture for MSc.

Course Chordates: Structure, function and Evolutionary significance (ZOOL 4007)



**Dr. Amit Ranjan, Assistant Professor,
Department of Zoology MGCUB, Motihari, Bihar**

Locomotion in Fishes

- ❖ Locomotion of fishes means movement of fishes for their survival .
- ❖ It provides a number of interesting information to the Ichthyologists.
- ❖ The knowledge of the different methods of locomotion is yet not fully understood because fishes in aquaria or somewhere else other than their natural inhabitation tend to behave in a manner somewhat different from the normal.

There are three primary methods employed by fishes to produce forward movement in aquatic environment:

- ❖ Body movement due to alternate expansion and contraction of the myomeres (myosomes).
- ❖ Movement of the appendages (fins) and
- ❖ Movements caused by the action of jets of water expelled from the gill openings during the process of respiration.

Types of Locomotion in Fishes

Locomotion in fishes has been classified into three types:

- ❖ Anguilliform or eel like.
- ❖ Ostraciform or trunk-fish like.
- ❖ Carangiform or jack-like.

Anguilliform

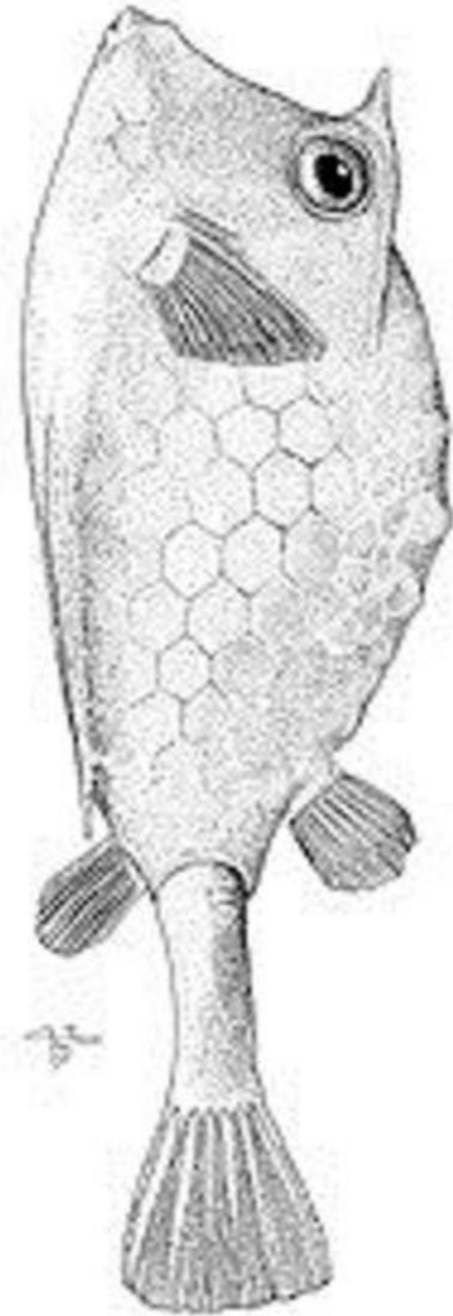
Anguilliform type of locomotion is serpentine or purely undulatory in nature and is found in **eels**. It is brought about by sequential, alternate contraction of the myotomes on each side of the body. In this most of the body participates



Ostraciform

It is a wig-wag motion, seen especially in the sculling action of the tail and found in **trunkfishes**. It is induced by simple alternate contraction of all the muscle segments on one side of the body and then on the other. The alternating contractions cause the tail to switch back and forth like a paddle behind the relatively rigid trunk of the fish. The body moves in a series of short cross arcs in the water as the fish progresses forward. We can say simply that it is due to

- ❖ Oscillation of caudal fin
- ❖ Assisted with pectoral fins



Carangiform

Carangiform is the most common type of locomotion. In this type, the fish drives itself forward by side-by-side sweeps of the tail region. It is actually an intermediate type between Ist and IInd types (e.g. Herrings, Sardines). In this

- ❖ Posterior body flexes
- ❖ Anterior $\frac{1}{2}$ or $\frac{2}{3}$ body inflexible



Non-swimming Locomotion

- **Jet propulsion** - water exhaled from the gill chambers; anglerfishes
- **Terrestrial locomotion** - fish can employ anguilliform motion over land
- **Walking** - batfishes
- **Burrowing** - eels, mudminnows
- **Jumping** - tarpon, manta rays
- **Gliding** - flying fish
- **Flying** - freshwater hatchetfishes, freshwater butterflyfish

Migration of Fishes

❖ Migration means movement for specific purpose and specific period of time.

❖ Few species travel long distance moving from place to place in search of food or for breeding. This movement of a large number of fishes for the purpose of feeding or spawning is known as Migration.

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

Example of migratory Fishes:

- ❖ **The cod** (*Gadus morhua*)
- ❖ **Herring** (*Clupea harengus*)
- ❖ **Salmon** (*salmo sp.*)
- ❖ **Eel** (*Anguilla anguilla*, *A. Rostrata* and *A. Japanica*)
- ❖ **Hilsa** (*Hilsa ilisa*)
- ❖ **Three- spined stickle back** (*Gasterosteus aculeatus*)
- ❖ **The lampreys** (*Petromyzon marinus*)
- ❖ **The tunnas** (*Thunnus thynnus*)

PURPOSE OF MIGRATION

Migration may be for the following reasons

❖ **ALIMENTORY MIGRATION:** This is in search of food and water.

❖ **GAMETIC MIGRATION:** For reproduction.

❖ **CLIMATIC MIGRATION:** To secure more suitable climatic conditions.

❖ **OSMOREGULATORY MIGRATION.** To maintain physiological activity of body.

FORMS OF MIGRATION:

The 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 FISHES

- ❖ Anadromous (salmon and hilsa)
- ❖ Catadromous (anguilla)
- ❖ Amphidromous

2. POTAMODROMOUS FISHES

3. OCEANODROMOUS FISHES

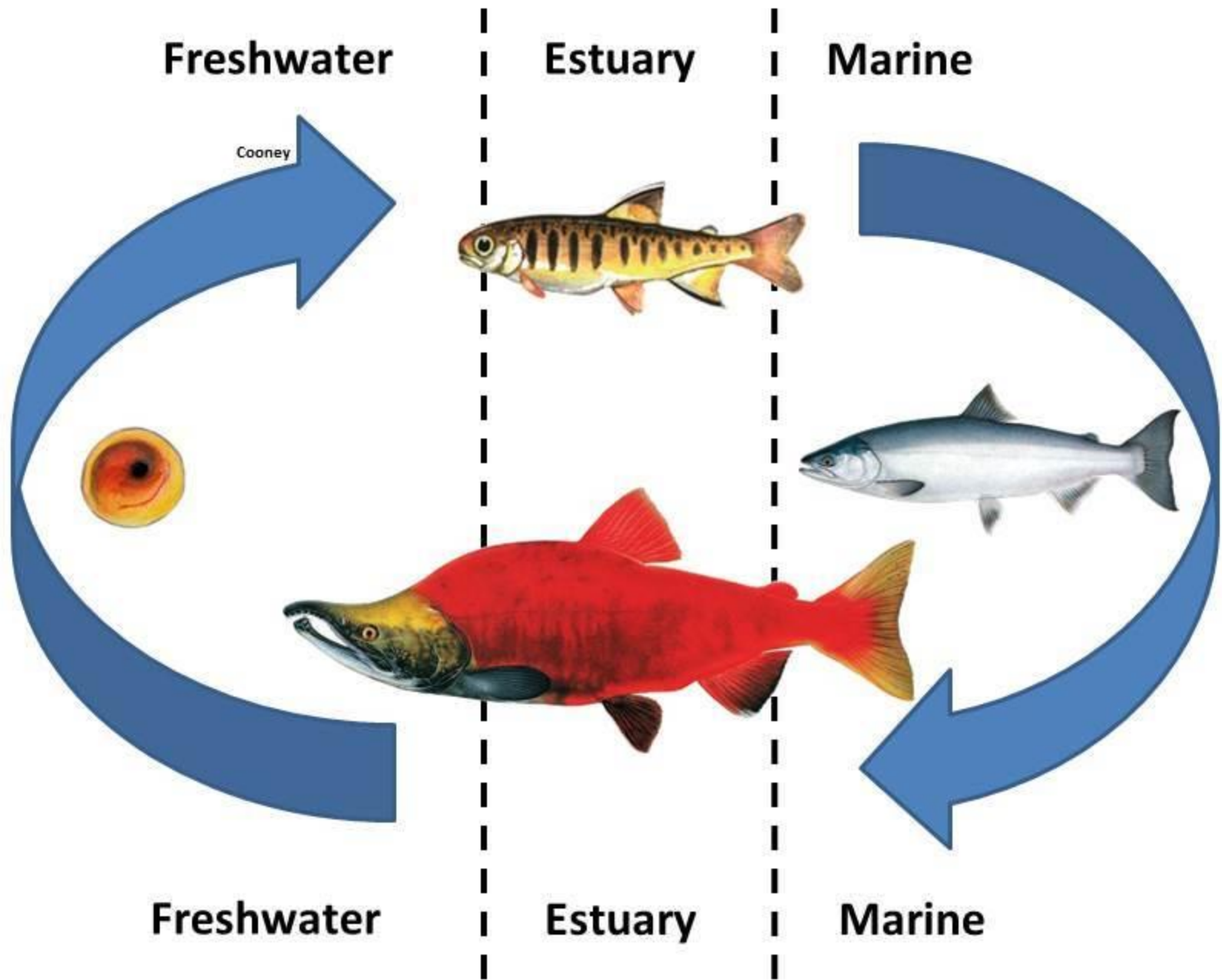
1. DIADROMOUS (Dia: through, Dromous: running)

FISHES: Truly migratory fishes which migrate between the sea and fresh water and are three types:

A. Anadromous (Ana: Up):

- ❖ **Diadromous fishes which spend a major part of their lives in the sea but migrate to fresh water during breeding period for spawning (Process of laying eggs).**
- ❖ **Thus, many marine fishes like *the Salmon shad Lampray and Hilsa*, travel long distances in the sea and run up the river to spawn in fresh water .**
- ❖ ***Salmon and Hilsa have been found to travel several thousand km in the sea, then several hundred km in land to reach the spawning ground , after egg laying , the spend fishes return to feeding places in the sea.***

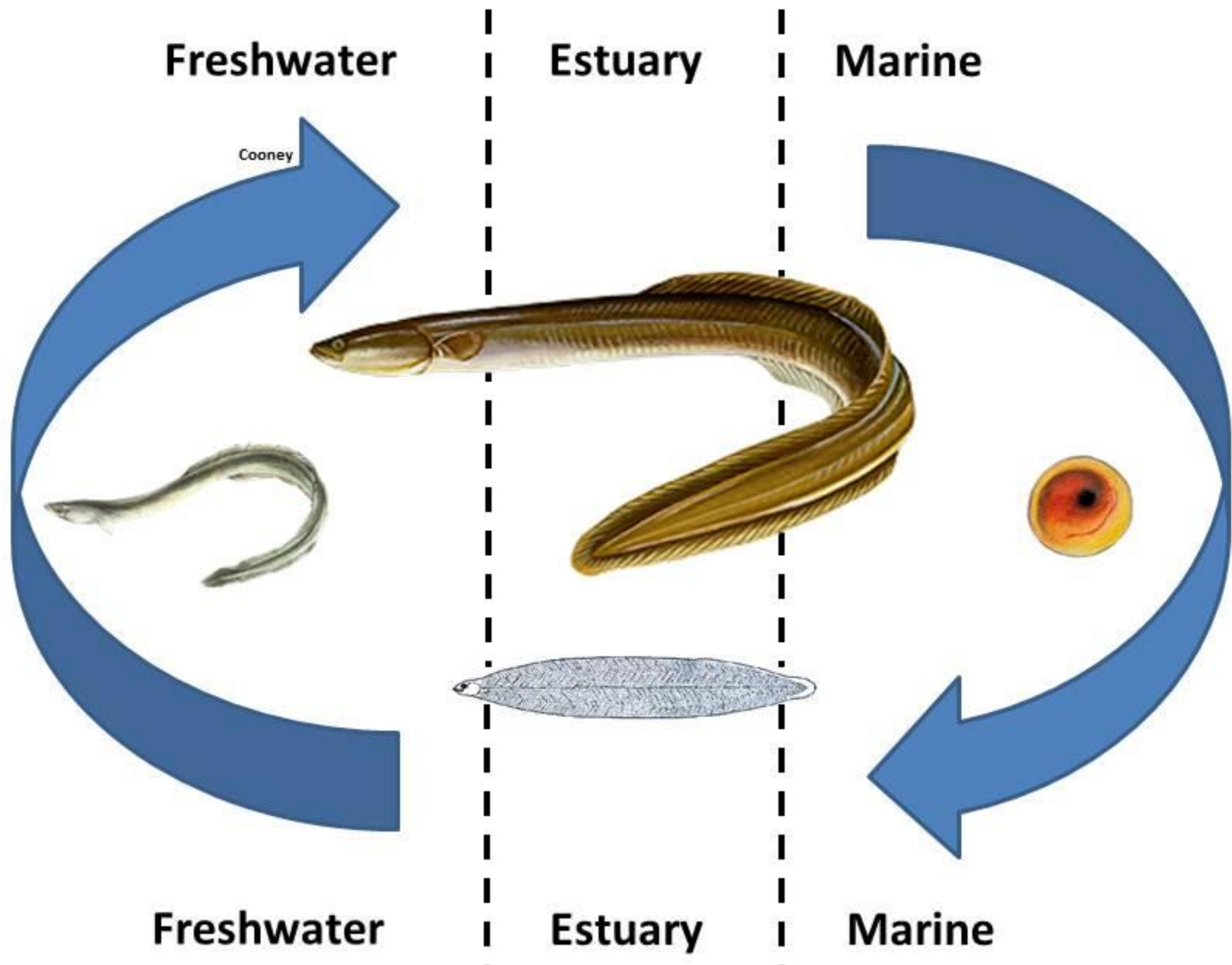
Anadromous Life Cycle



B. Catadromous (Kata; Down):

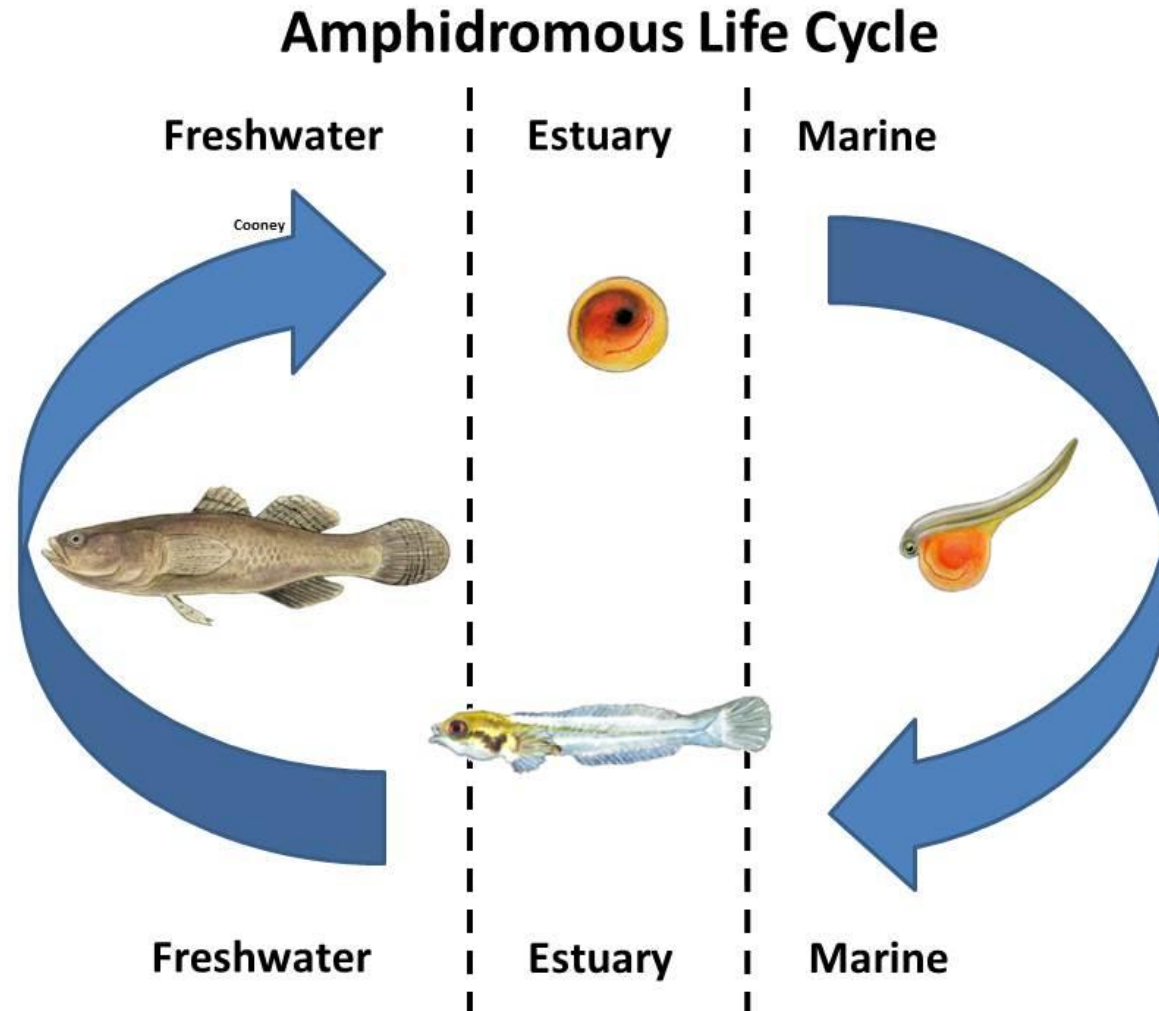
- ❖ This group including didromous fishes which spend a major of their lives in fresh water but migrate to the sea for breeding purpose.
- ❖ Thus the fresh, water eel *Anguilla* travels several thousand km starting from the rivers and reaching the spawning grounds in the sea.
- ❖ After egg laying, the river die and the young larvae drift and swim back towards the fresh water , taking three years in reaching the rivers.
- ❖ Here ,they become adult , and on reaching maturity start their seaward migration again.

Catadromous Life Cycle



C. Amphidromous:

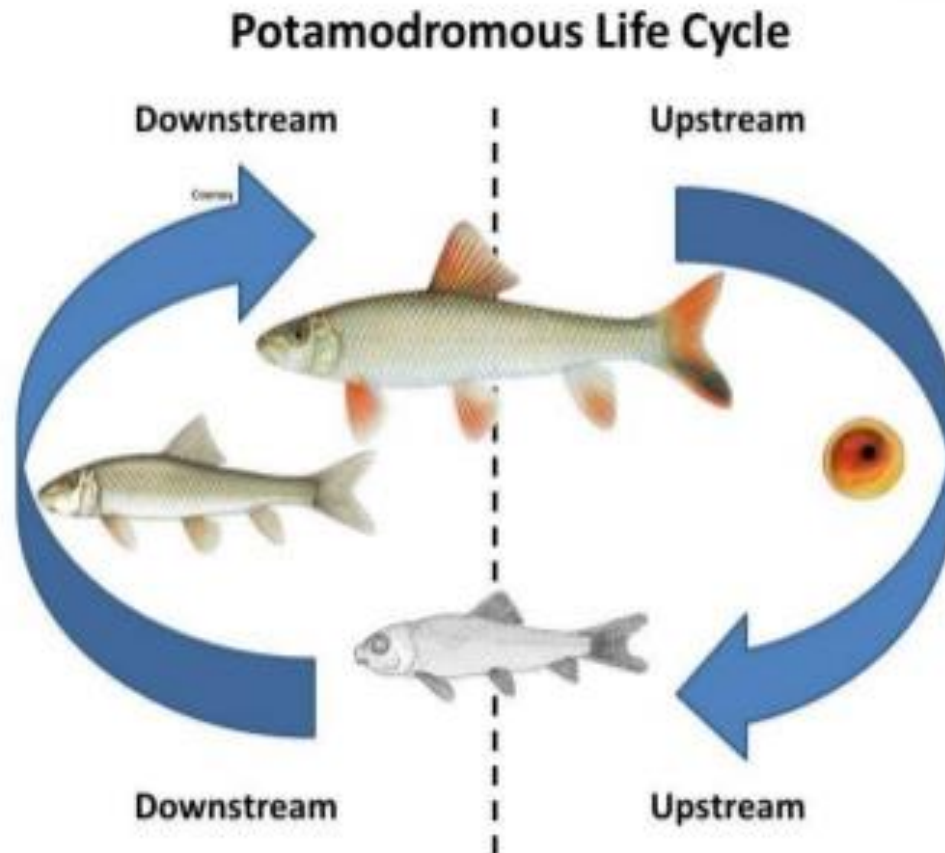
- ❖ These are diadromous fishes in which migration from fresh water to the sea or *vice versa* is not for the purpose of breeding.
- ❖ But occurs regularly at some other definite stage of the life cycle.



2. POTAMODROMOUS FISHES:

❖ Truly migratory fishes whose migration remain confined to fresh water , *e.g. the carps and the trout travels long distance in large rivers in search of spawning grounds.*

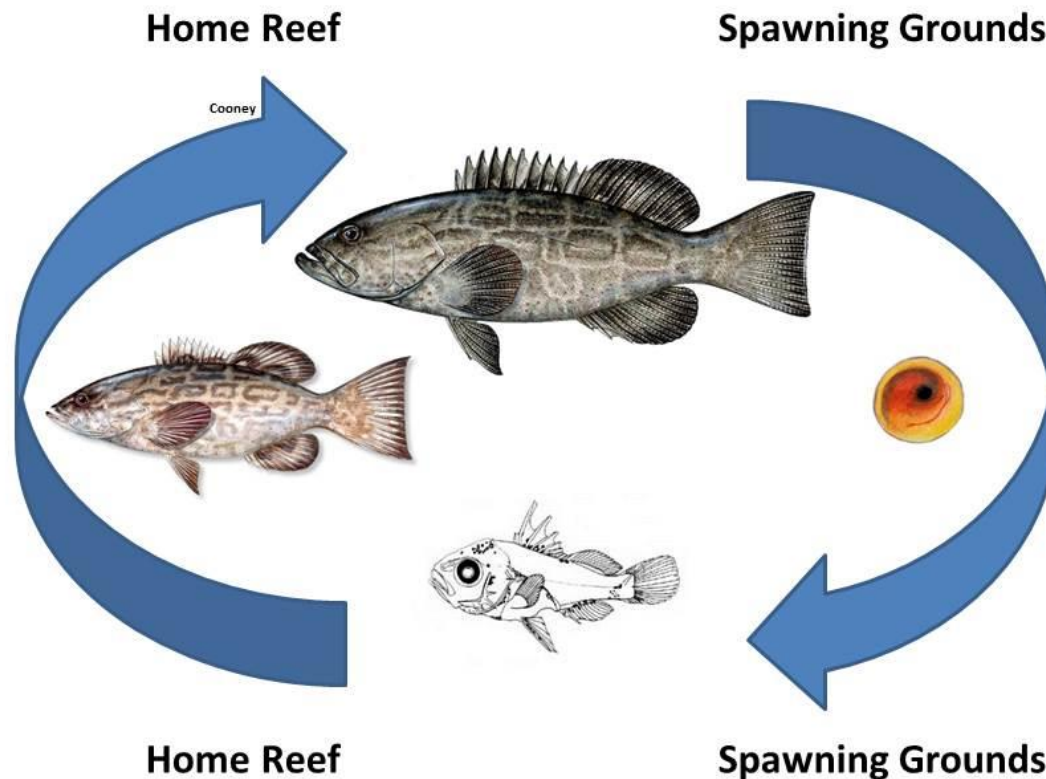
❖ After egg laying at suitable places they return to the feeding area.



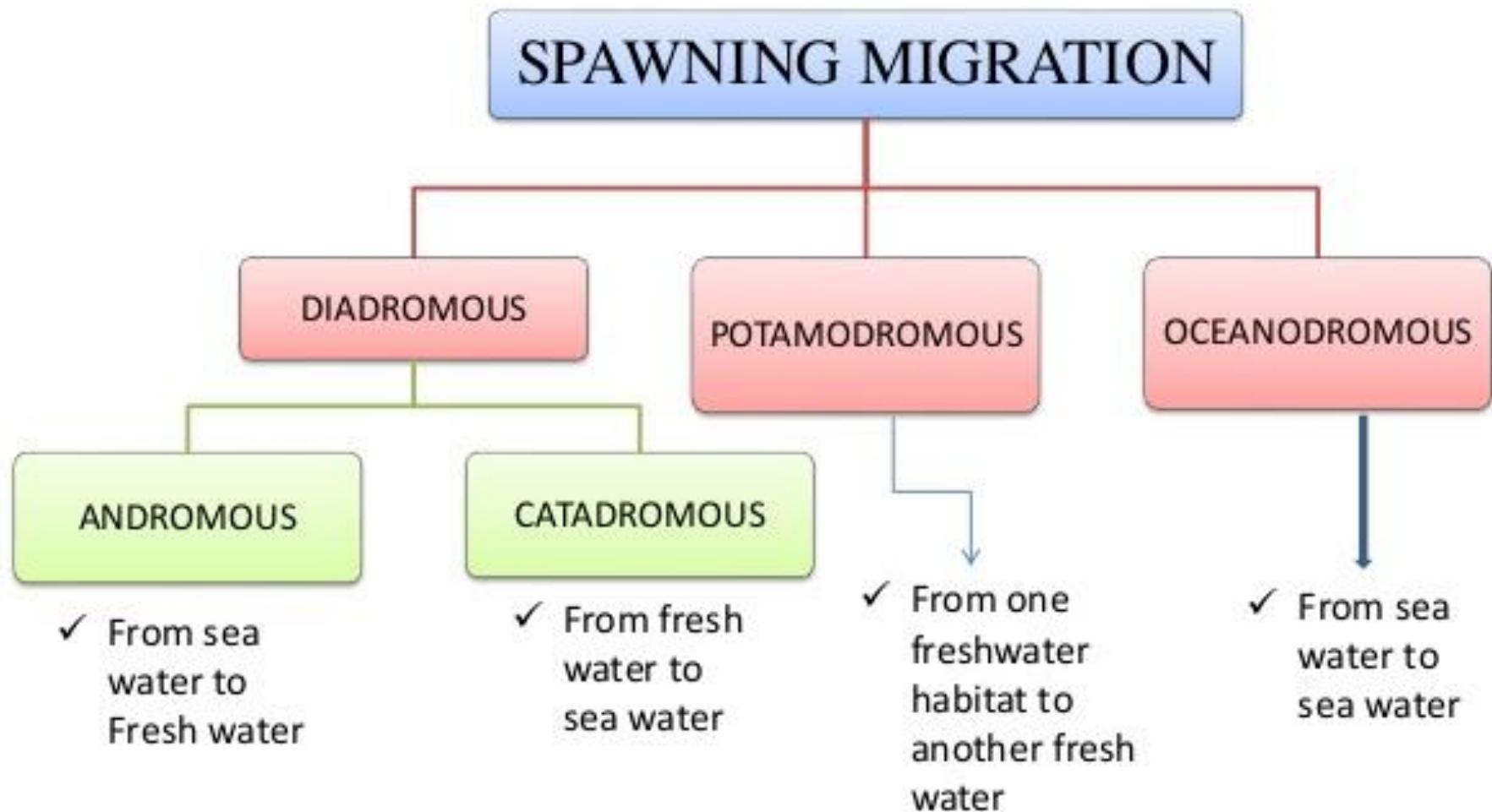
3. OCEANODROMOUS FISHES:

- ❖ 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.

Oceanodromous Life Cycle



Types of Migration



Influencing Factors Of Migration:

Migration are influenced by several factors which may be physical, chemical and biological.

Physical:

- ❖ **Bottom materials**
- ❖ **Depth of water**
- ❖ **temperature**
- ❖ **light intensity**
- ❖ **Photoperiod**
- ❖ **Current turbidity**

Chemical

- ❖ **salinity**
- ❖ **pH**
- ❖ **Smell and taste of water.**

Biological :

- ❖ Migration are the sexual maturity
- ❖ Blood pressure
- ❖ Food
- ❖ Memory
- ❖ Physiological clock
- ❖ The endocrine glands
- ❖ Presence or absence of the predators and competitors may also be considered as the biological factors governing migration of fishes.

REASON OF MIGRATION-:

- 1) To optimize feeding
- 2) To avoid unfavorable condition,
- 3) To enhance reproductive success , and
- 4) Possibly to promote colonization.

❖ the strategy of fish is to exploit rich food source , to enhance food intake which is necessary for increased growth rate , fecundity and survival.

ADVANTAGES:

- ❖ **Migration is an adaptation towards abundance.**
- ❖ **It would be an advantage to have separate spawning , nursery and feeding grounds.**
- ❖ **A species whose adults return to spawn in an area where the environmental condition were similar to those under which they themselves survived when young.**
- ❖ **Thus a better egg and larvae survival would lead to a greater number of spawners on a particular ground.**

References:

1. <http://www.fishfarmingtechniques.com/fishes/locomotion/locomotion-in-fishes-general-principles-types-and-modes-fisheries/13452>
2. <https://slideplayer.com/slide/13435965/>
3. <https://www.slideshare.net/BalwantSingh16/migration-of-fishes>
4. <https://www.slideshare.net/40024/fish-migration-and-fish-passes-62529744>

*Thank
You*