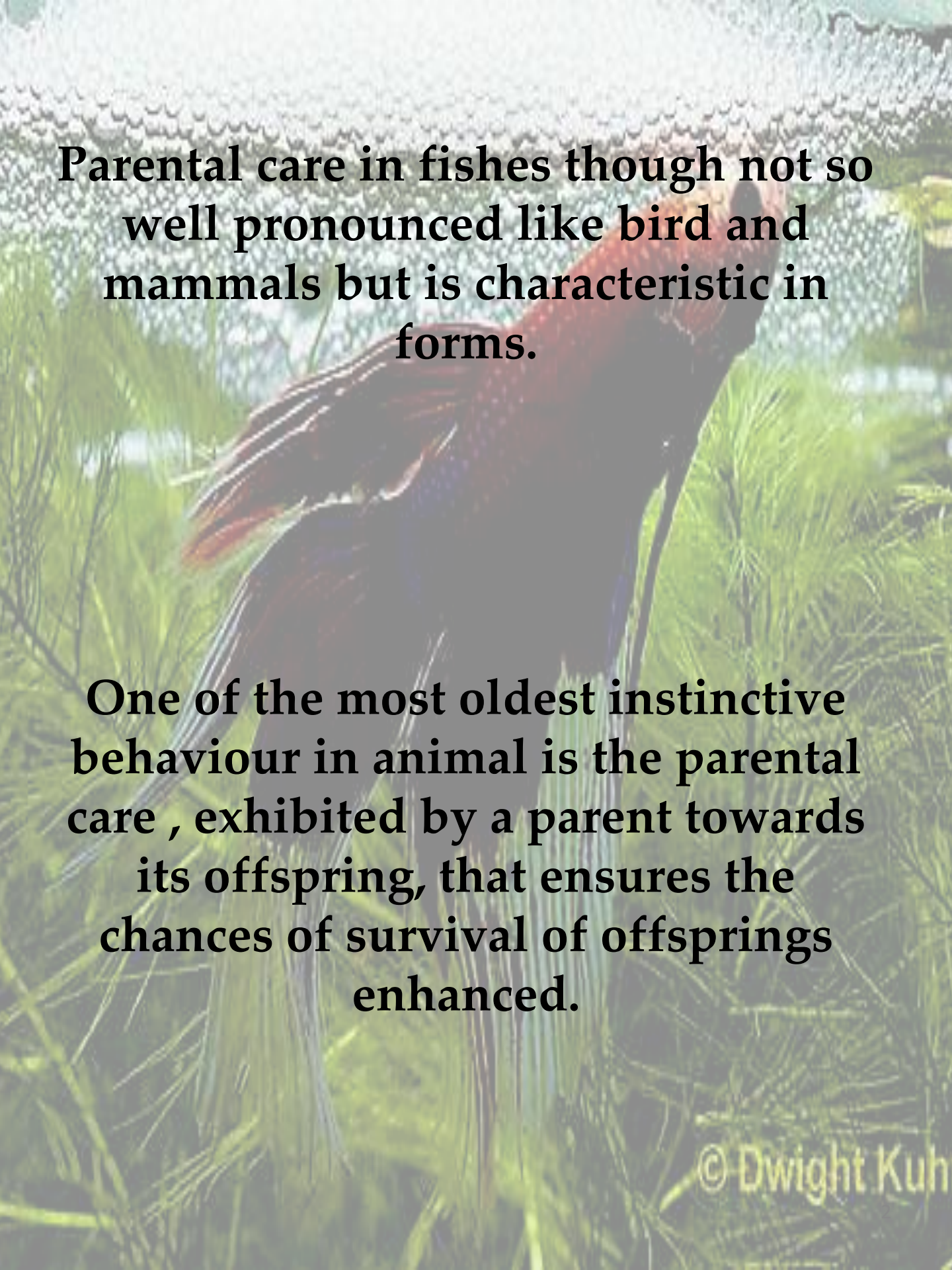


**SEMESTER III:H
ZOOLOGY:ZOOACOR05T
UNIT:04 - FISHES:
PARENTAL CARE**

Parental care is a type parental investment; One of the most elaborate and instinctive behaviour in animal world

Rituparna Maity; M.Sc.
Faculty Dept. of Zoology
HMMCW,Dakshineswar-35



Parental care in fishes though not so well pronounced like bird and mammals but is characteristic in forms.

One of the most oldest instinctive behaviour in animal is the parental care , exhibited by a parent towards its offspring, that ensures the chances of survival of offsprings enhanced.

Types/ grades of parental care in fishes: Based on degree of care offered to fertilized eggs and young by one or both sexes, parental care in fishes may be of various types or grades:

GRADE-I: **Eggs laid down in**

Protected state: This does not involved parents after laying eggs:

- **Embryos in shelled case:** Provision of a hard and impermeable egg shell with good yolk supply attached with sea-weeds by tendrils, looked like purses- '**Mermaid Purse**' Ex.- *Scyllium sp.*
- **Common covering of cocoon :** Protection afforded by a covering within which many eggs remains enclosed. Ex.- Lung-fishes
- **Eggs with adaptive power:** Eggs may float, either with or without little filamentous appendages; eggs in masses , Ex.- Perch or *Perca sp;*
- **Pelagic eggs-** transparent appearance that invisible to potential predators.
- **Eggs with sticky covering:** In carps, eggs are usually laid with some special sticky covering by means of which they are attached to each other or to stones, weeds etc.
- In yellow perch (*Perca flavescens*) eggs are deposited in a **rope-like structure** . The eggs are held together by a long floating membrane.
- Angler fish (*Lophius*) lay their eggs invested by a **gelatinous external coat**, that remain together to form a transparent mass of enormous size .
- Flying fishes, skippers, garfishes etc. secrete a **sticky thread-like substance from their kidney, on which the eggs remain attached**. The thread on one end remains adhered to any aquatic substratum while the other end remains free.



GRADE-II: Egg-laying in

Protective sites: One of the means is to get the eggs into right place in which development suitable the most.

1. Selection of spawning ground: Anadromous fish ascend fresh water streams to spawn egg. Ex.- Catadromous fish descend in Ocean to bring eggs into saltwater habitat. Ex.- *Anguilla*

2. Selection of spawning site:

•The selection of spawning site took place at spawning ground with process of great importance for successful reproduction on the perfect site chosen. Some fishes will fight to death to defend it.

•Anadromous fishes such as *Salmo solar*, *Acipenser*, *Oncorhyncus* etc., lay their eggs in suitable spawning grounds. They dig excavation in gravel substrate, lay their eggs in the pits, cover them with gravel.

• **Females of cyprinid family** deposit their eggs on the **dead shells of mussels**.

•In **Lumpsucker** (*Careproctus*) deposits her eggs beneath the **carapace of Kamchatka Crab**.

•In Anemone-fish females lay eggs at bottom or beside sea-anemone and they are protected by cost of the sea-anemone.

•**Ovipositing:** Females of European bitterling (*Rhodeus amarus*) **deposit eggs in the siphon of a fresh-water mussel** by means of a long tube acting as an ovipositor. This **ovipositor is a long tube drawn out from the oviduct**. After oviposition male *Rhodeus* immediately sheds the sperm over the eggs and then guards them. The male *Rhodeus*, interestingly, are not sexually excited by the presence of the female of its own species, but by the sight of the shell of the mussel in which the eggs have been deposited.



GRADE-III: Nest Building: nests of different types for the safe deposition and protection of eggs, and for the development of their young ones. • are broadly two kinds:
A. Those make nest and stay with it and guard it (either male or both):

- 1. Nest a circular depression:** In Bed of mud, silt, or sand often in and among roots of aquatic flowering plants.

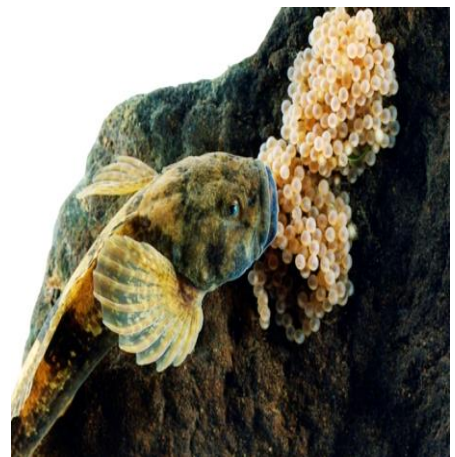
Example:

- In **Bowfin fishes (*Amia sp*) – circular nest-** the male keeps guarding until the eggs hatch and then keeps the young fish with them for sometimes.
- In ***Protopterus* – oval nest-** digs oval pits or holes at the base of tall swamp grasses and invites females to lay eggs. Male guard it and thrashes the surface to prevent water from entering the nest.
- In ***Lepidosiren* – hole/ burrow nest-** makes mud nest in basin of shallow water or estuaries, the inner wall of which are made smooth by caudal fin and both the parents care developing young but after that only male retain at nest.
- Fresh water sunfishes - **basin-like nest** - build by scooping out a shallow at the bottom of the impoundment by carefully removing pebbles and leaving behind large stones layer of fine sand remains attached with the eggs. Male guard the eggs till hatches.

2. Nest excavated under a stone/ other submerged object:

Fishes prepared such nest with gravels and female lays eggs underside it and leaves after it.

Example: *Ethostoma*, *Cottus*



3. Nest made with plant-materials:

With the shape of spherical or mound-shaped made of weeds, alga or submerged plant materials and mud or sand

Example:

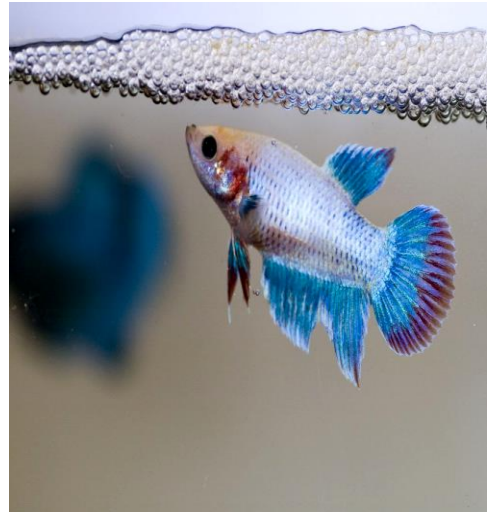
- In **Sticklebacks** (*Culaea*, *Gasterosteus*) – **Barrel nest** - The male makes a barrel/tunnels like leaf-nest with the help of sticky secretion from their kidneys. After catching mature females into the tunnels and through elaborate courtship rituals induces the female to lay eggs. Then females are driven out and male takes the responsibility to guard the fertilized eggs from intruders in fierce manner till hatch.
- African Osteoglossid make a nest by clearing a space in aquatic vegetation with wall made of grass of 2'×4' and eggs are deposited there.



4. Nest a tunnel: In bank or bottom of a waterbody where eggs are deposited.

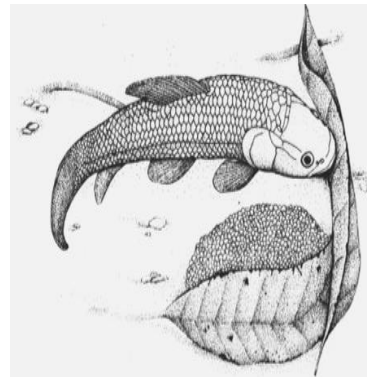
Example: Channel Catfish

5. Nest a surface-bubble: foamy nest- the male secrete **excessive mucus and blows air bubble forming floating mass of foam at the surface of water** –the nest, where the eggs are deposited by male and defend it at cost of their life. Example- **the male paradise fish (*Macropodus*), fighting fish (*Beta*)**.



B. Those make nest and desert it after spawning:

Fishes prepare a well-defined structure in gravelly bottom and leave the nest after spawning. Example. – lampreys (*Petromyzonidae*), trouts, salmon (*Oncorhynchus*)

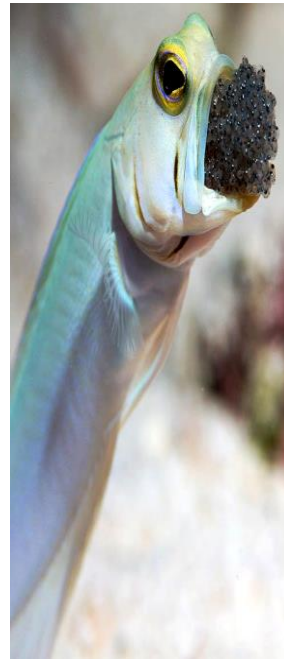
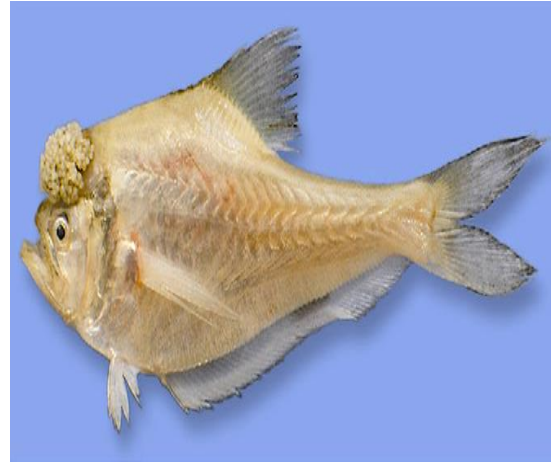


GRADE IV : **Care rendered by carrying eggs or youngs**

(Balar,1975): Achieve with or without structure in body and carriers may be broadly of two types:

A. External Carriers: Those bear eggs and or youngs on external surface of body , as follows:

1. **Forehead breaders:** The male nursery fish (*Kurtus*) of New Guinea, carries the mass of eggs on the forehead, held in a **cephalic hook-like** depression until it hatches out.
2. **Mouth-brooders:** In many cichlids, *Tilapia*, the female broods; the fertilization incubation and hatching of eggs takes place in her mouth. After hatching she allows the young to take refuge in her buccal cavity in times of danger. In most marine cat fishes (*Arius*) and cardinal fishes, the male carries the eggs and young ones in his mouth without food during this period.
3. **Labial Incubation:** In case of the Brazilian cat-fish (*Loricaria typus*), the male has an enlarged lower lip forming a sort of pouch in which labial incubation takes place ensuring safety. During this act, the male fish do not take any food. Even after that hatchings remain near the father and enter the buccal cavity of father at the slightest disturbance.
4. **Coiling round eggs/Egg-balls:** The male *Pholis* guards by coiling round the eggs rolled in balls till the hatching of youngs.
5. **Integumentary pouch:** *Aspredo* and *Platystacus* eggs and youngs are kept into integumentary sacs/cups/pouhes. Immediately after the eggs are fertilized, the female presses her body against the eggs in such a manner that each egg becomes attached to the skin by a small, stalked cup. The eggs remain fixed in this position till hatching.
6. **Attachment of hatchling:** The female obstetrical catfish, attaches the hatchlings in her belly, till she finds a suitable place for hatchlings out.



B. Internal Carriers: Those bear eggs and young inside their body, as follows with some modifications:

1. Brood-pouches: In sea horse

(*Hippocampus*) fertilized eggs are transferred by the female into the brood pouch of the male. The brood pouch is found on the lower surface of the abdomen. During the males so called 'pregnancy', he provides nutrients and oxygen to the fertilized eggs for several weeks; also observed in male **pipe fish**, in which male evolved two flaps of skin at abdomen and female lay eggs there.

2. Rearing in Intestine: In *Tachysurus*, the hatchlings are reared within intestine.



GRADE V: Ovo-viviparity and

Viviparity: occurs in live-bearing

fishes, The highest degree of parental care is exhibited by those species which are **viviparous**. They have **evolved internal incubation and give birth to young ones**, thereby providing maximum protection.

- 1. Viviparity in elasmobranchs:** Among the sharks, viviparity has been witnessed in more than a dozen families. Fertilization and development both are internal. In case of *Scoliodon*, *Mustelus* etc., eggs develop in the **uterus-the enlarged oviduct**. The mucous lining of the uterus forms fluid-filled protective compartments, one for each embryo. Nourishment in the form of **embryotrophe or uterine milk** is received by each embryo from the uterine tissue through the yolk-sac placenta .
- 2. Viviparity in Bony -fishes:** In teleosts, species (*Zoarces*, *Gambusia* and *Poicilia*) belonging to the orders Cyprionodonts and Perciformes show internal fertilization and the young ones develop within the ovary, evolving a chorion, but are not attached to its wall. The embryos develop freely in a sac inside the ovary, feeding upon an **“embryotrophic” material**, apparently produced by the discharged ovarian follicles. The sac becomes highly vascular and remains as such during the months of pregnancy.



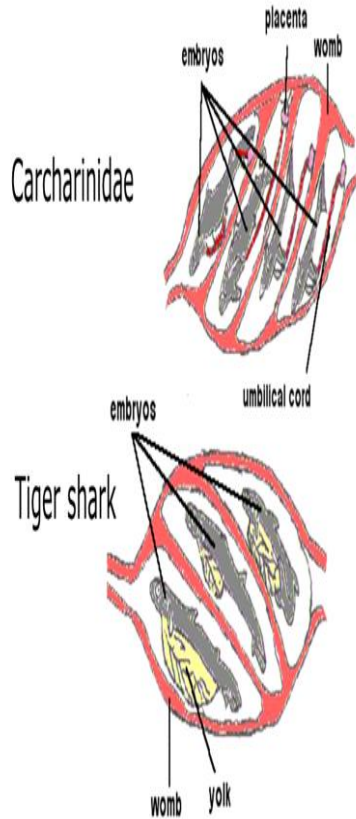


FIGURE - Viviparity in elasmobranchs
 From upper right to bottom left: Reef shark giving birth, shark-embryo with placenta, Two types of embryonic conditions in elasmobranchs, Tiger shark with yolk sac

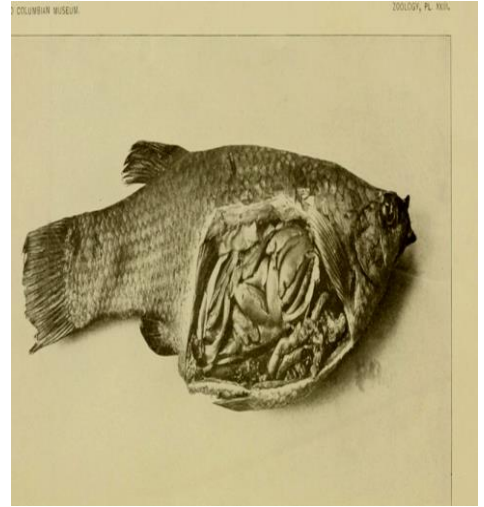


Fig. 1

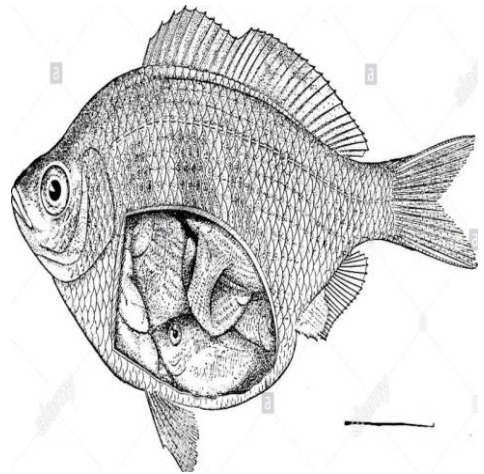


Fig. 2

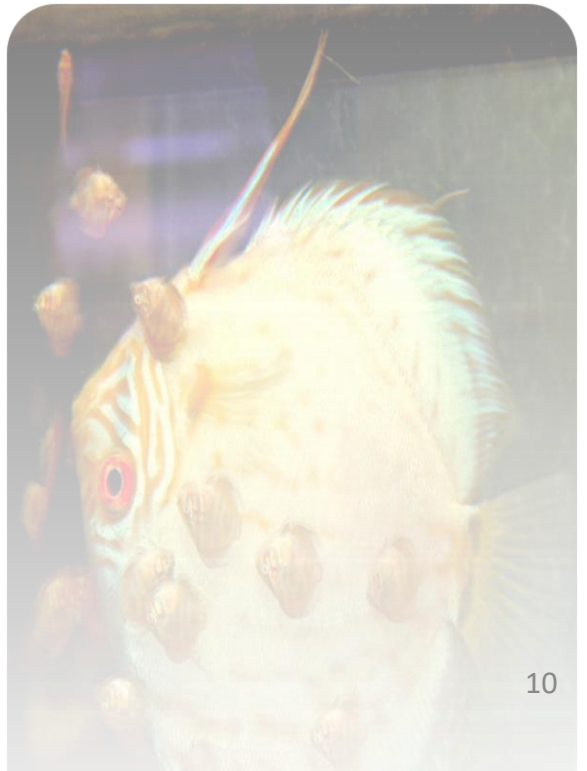
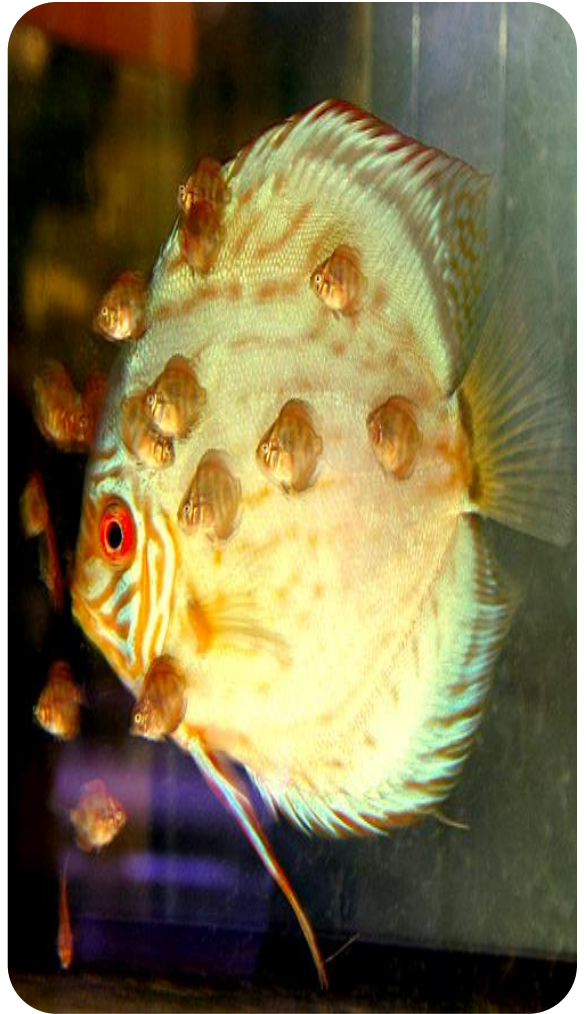
FIGURE - Viviparity in Bony fishes
 Fig.1 goodea fish with rearing young in uterus
 Fig. 2 Shinner Perch with hatchlings

3. Ovoviviparity: An intermediate condition between oviparous and viviparous is observed in the case of nurse shark (*Gingly mostoma*), called ovo-viviparous. Here the eggs are covered by a horny case and the development takes place in the uterus. The fully developed young ones hatch out by breaking the shell inside the uterus.

Care of Independently Swimming Young's:

In the members of some families such as Gasterosteridae, Centachidae and Ictaluridae, parental care does not stop with the caring of the eggs. These fishes defend their young ones by placing them in a safe place, away from predators and enemies.

As has been dealt with earlier, the young ones of Tilapia, seahorse and pipe fish are protected by their parents either in the oral cavity of mother or in the brood pouch of the father. In the case of cichlid fish, both male and female secrete a nutritious substance from their body, which are taken up by





A Special Case:

In the case of shiner-perch (*Cymatogaster aggregata*) the eggs also are fertilized in the ovarian follicles, but are soon released into the ovary cavity and are nourished by a secretion- yolk-sac placenta from the ovary . The young are retained in the ovary until they become sexually matured.

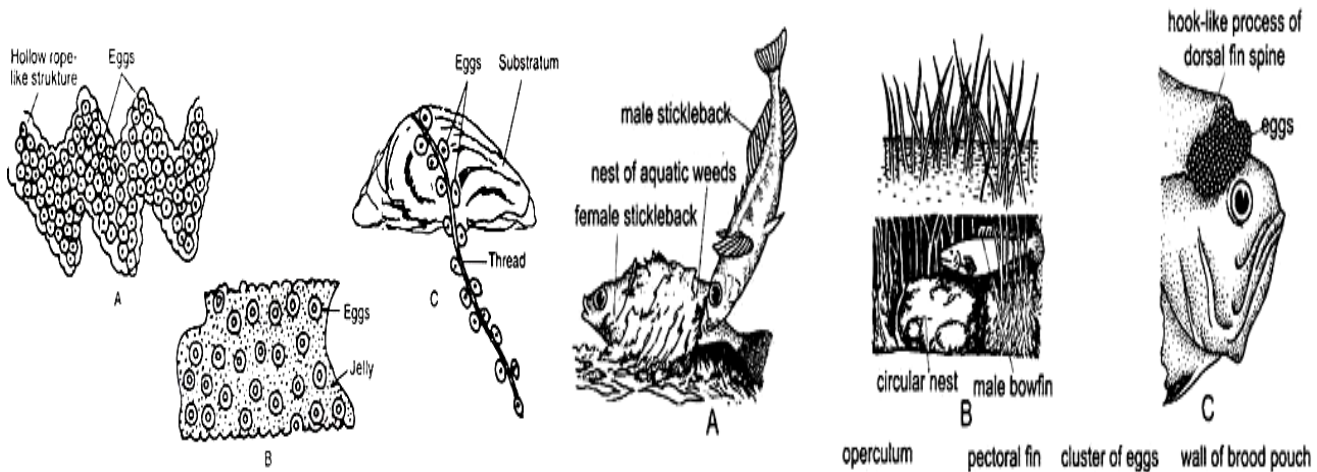


FIGURE- a-c Gelatinous egg-masses

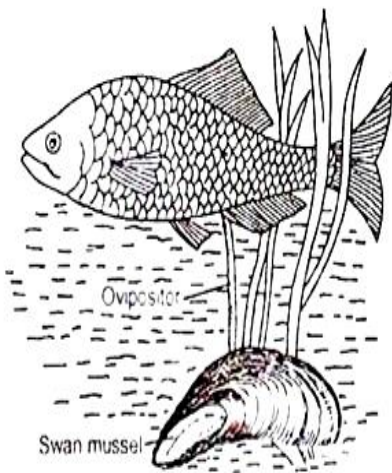
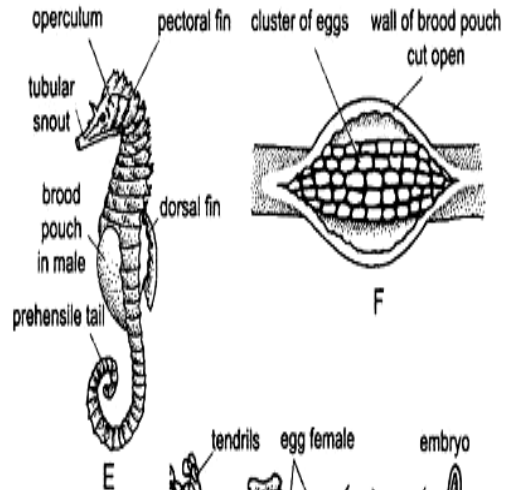


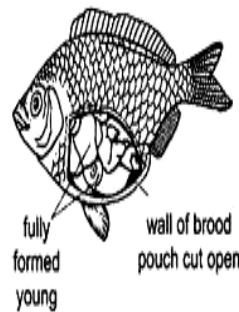
FIGURE - Ovipositing Bitterling



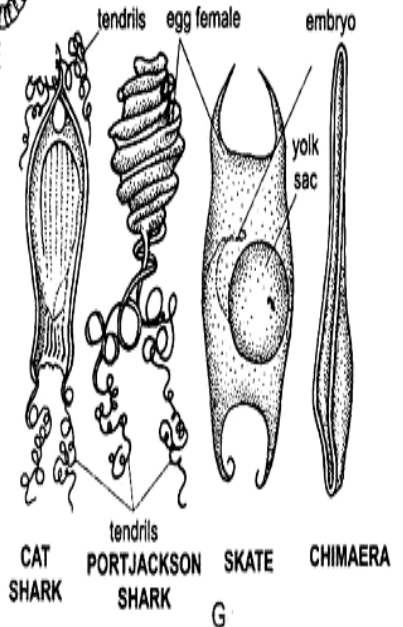
D



E



H



G



FIGURE - Attachment of hatchling to mother

FIGURE - A. Stickleback's barrel nest, B. Bowfin circular nest
C. Cephalic hook *Kurtus*

D. Mouth-brooder E. Sea-horse's brood-pouch F. Pipe fish's abdominal flap

G. Mermaid purses H. Shinner Perch's brooding young

Conclusion:

Therefore Parental care in fishes may be arranged in evolutionary grades from simple egg-laying place selection to complex viviparity with placenta formation, though it does not hint any inference or phylogeny and parental care in fishes evolved independently. This is mainly mechanical instinct rather than learned behaviour in case of mammals.

Significance:

Parental Care in fishes has immense significance as because it ensures the survival of fishes by:

- Protecting the broods, both eggs and youngs, from predators.
- Placing the eggs in right places suitable to developmental machinery.
- Enhancement of chance of successful fertilization.
- Making the eggs transparent, Pelagic Eggs, which are not thus easily recognizable to the predators.

Rituparna Maity; M.Sc.
Faculty Dept. of Zoology
HMMCW, Dakshineswar-35

Q uestions:

1. What do you mean by parental care?
2. Describe the parental care in case of elasmobranchs.
3. How does a fish select a perfect potential site/ ground for laying eggs? Or, Elaborate the strategies of fishes for ideal ground selection for breeding.
4. How does a fish ovipositing into a mussels?
5. What is significance/role/function of egg cocoon and gelatinous covering of eggs?
6. What do you mean by Mermaid purse?
7. Describe the site selection of anadromous/catadromous fish to lay eggs. Or, How can a fish selected their breeding site between ocean and river.
8. Briefly describe : circular nest, basin nest, burrow nest, barrel nest in fish.
9. Can a fish be pregnant? Why? Give reasons for your answer.
10. Describe the nest building habit of fishes.
11. Briefly state parental care taken by stickleback fish/ Sea-horse/ fighting fish/ paradise fish/ bowfin fish/ *Lepidosiren*/ *Protopterus*/ Brazillian Cat fish
12. what is viviparous and ovoviviparous development?
13. Narrate the Viviparity found in elasmobranchs and bony-fishes. Or, Give example of uterine rearing of hatchling in case of fish. Or, Which fish show both internal fertilization and development of hatchlings? Describe.
14. How do a shinner perch care for hers young? Or, Write a the name / give example of fish who develop a yolk-sac placenta or care give/ raised of her young into adulthood.
15. What are the brood-pouches developed by a Sea-horse? And why?
16. Describe the symbiotic relationship observed in case of fish's parental care/egg-laying behaviour.
17. Briefly narrate the means/ strategies a fish can take for carrying her young or eggs.
18. What are labial compartments in brazillian cat-fish? In what purpose they use it?
19. How a fish can carry eggs at his forehead?

Rituparna Maity; M.Sc.
Faculty Dept. of Zoology
HMCCW, Dakshineswar-35