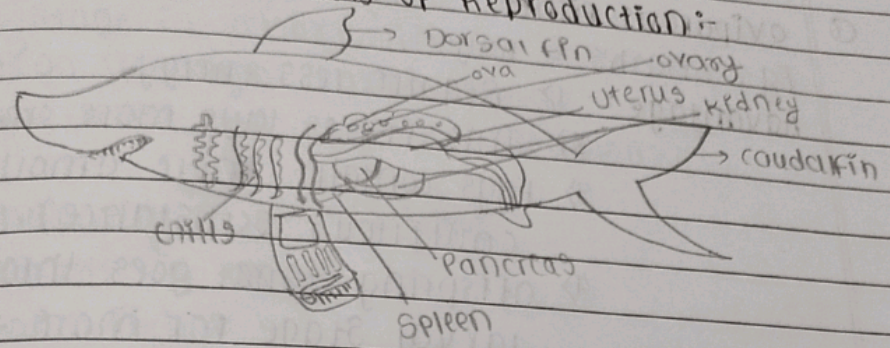


* Types of fishes on basis of Reproduction:-

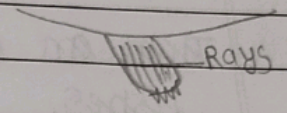


organs in female fish body

→ Reproduction is essential component of life.
→ Diverse no. of productive strategies more in sea water fish

There are 3 types

- 1) oviparous fish
- 2) viviparity fish
- 3) ovo-viviparity fish



	oviparous	viviparity	ovo-viviparity
Defi:	female fish which lay eggs in spawning period are called oviparous fishes	female fish in which development of embryo takes place inside the mother's uterus but there is presence absence of placenta (connection bet ^w mother & embryo)	Female fish in which development of embryo takes place inside the mother's uterus in presence <u>absence</u> of placenta
Energy	Energy require for female fish less	Energy require for female fish is more	Energy require more

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① oviparous fishes :-

Eg: sharks & rays

- Advantage :-
- 1) Require less energy
 - 2) This fishes lays more amount^{no} of eggs
 - 3) Eggs contain more amount of yolk (nutritious substance)
 - 4) offspring ~~do not~~ goes through the larval stage for more time
 - 5) Increase in population

There are diverse no. of reproduction strategies in fishes.

- The most common reproductive strategy in marine ecosystem is oviparity (which release eggs outside the body approximately 90% bony fishes & 40% cartilaginous & fishes shows oviparity)
- oviparity release more no. of eggs.
eg: ocean sunfish (lays 300 million eggs)
300 million = 30 crore = 30,00,00,000

Disadvantage :- Larval stage is disadvantage because they do not have the fix habitat of their own, more larvae eat by other consumers, they do not & can't tolerate the current of marine water they flow with water
larvae is primary consumer in food chain

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→ sharks & rays have more amount of yolk, larval stage is short in in this fish can release (clad) the eggs on seafloor.

② ovo-viviparity :- (no placenta)
Eg: sharks & Rays
 ↳ Rock fish

- characters / Advantages :-
 - Born live
 - Internal fertilization occur in it
 - Having high degree of protection
 - offsprings are advanced
- Disadvantage :-
 - There is no direct nourishment by mother
 - fewer individuals are born.
 - Require more energy.

③ viviparity :- (having placenta)
Eg: sharks & surperches

Advantages :-

- Internal fertilization & development occur
- Embryo receive direct nourishment from mother
- Give birth to live young

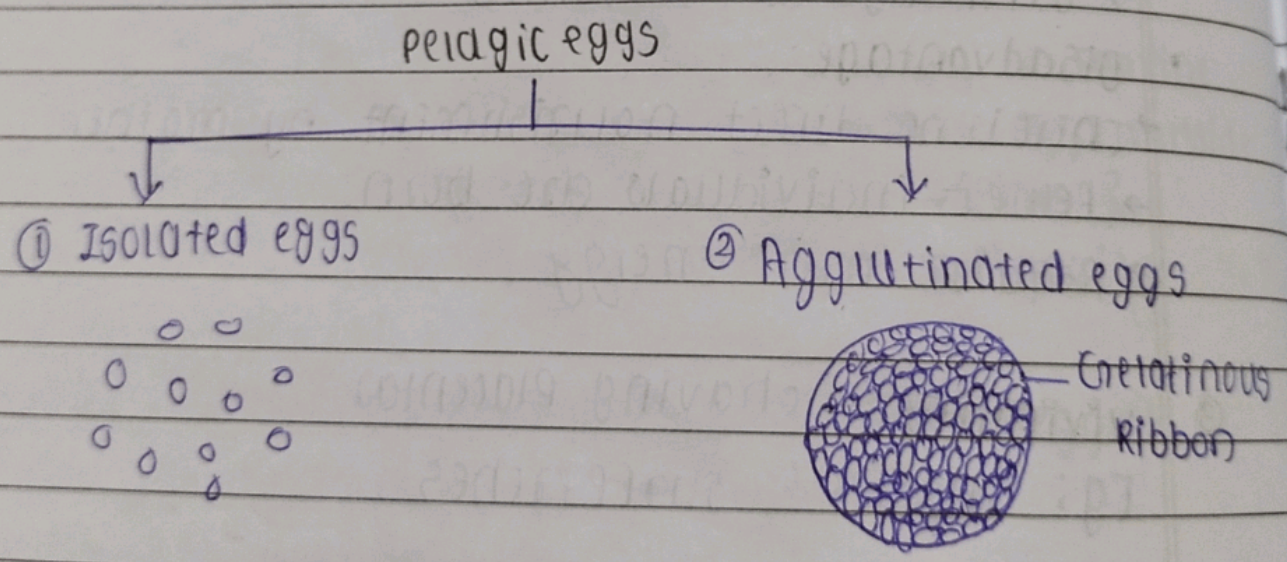
- fully advanced at birth
- Having greater chance of survival

Disadvantage :-

- If mother dies the offspring are likely to die
- Mother is vulnerable to predators.

* Types of Egg in fishes :-

① Pelagic Eggs :-



- Having ^{forming any} not mass
- Isolated in form

- forms a mass
- Inclosed in gelatinous ribbon

characters of pelagic eggs.

- small in size measuring about 0.1 mm to 1.5 mm in size diameter
- some species range from 1.6 mm & 2.6 mm in diameter
- All pelagic eggs are transparent in form
- eggs are practically spherical in shape
- floating ~~times~~ of these types of eggs
- do not have adhesive membrane.
- smaller than the demersal eggs
- adhesive membrane - one type of glue - to coat nanofiber membrane.
- These are buoyant maintain the buoyancy by the single oil globule inside egg.
- If oil globule is absent in that space which is important that presence of water to maintain the buoyancy inside the egg the ^{presence of} water

Disadvantages of Pelagic eggs:

- High mortality rate - \rightarrow predation
- 2) eggs are ^{exposed to} unfavourable condition

To reduce these disadvantages fish must have to increase fecundity rate

② Demersal eggs:-

Demersal egg

Adhesive eggs (filaments)

Non adhesive eggs (Sargassum)

↓
Adhesive to substratum with the help of adhesive egg membrane. (conus)

↓
These are the larger than pelagic eggs.

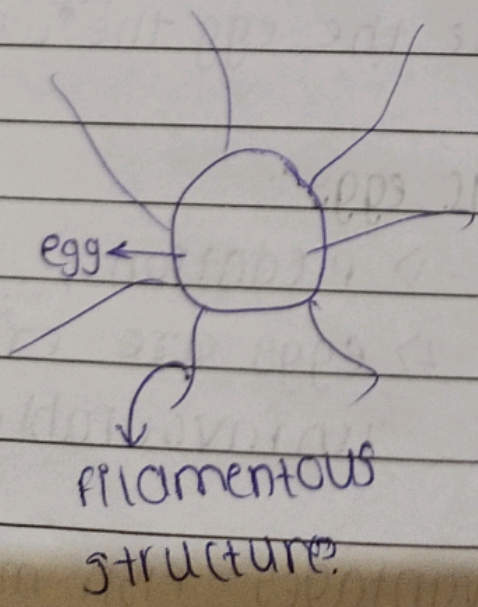
↓
eggs are sticks to the surrounding things like stone, phytoplankton, etc

↓
May be laid in masses or singly

↓
nanofibres membrane.

↓
Eggs are heavy & dense
Eggs are link to bottom

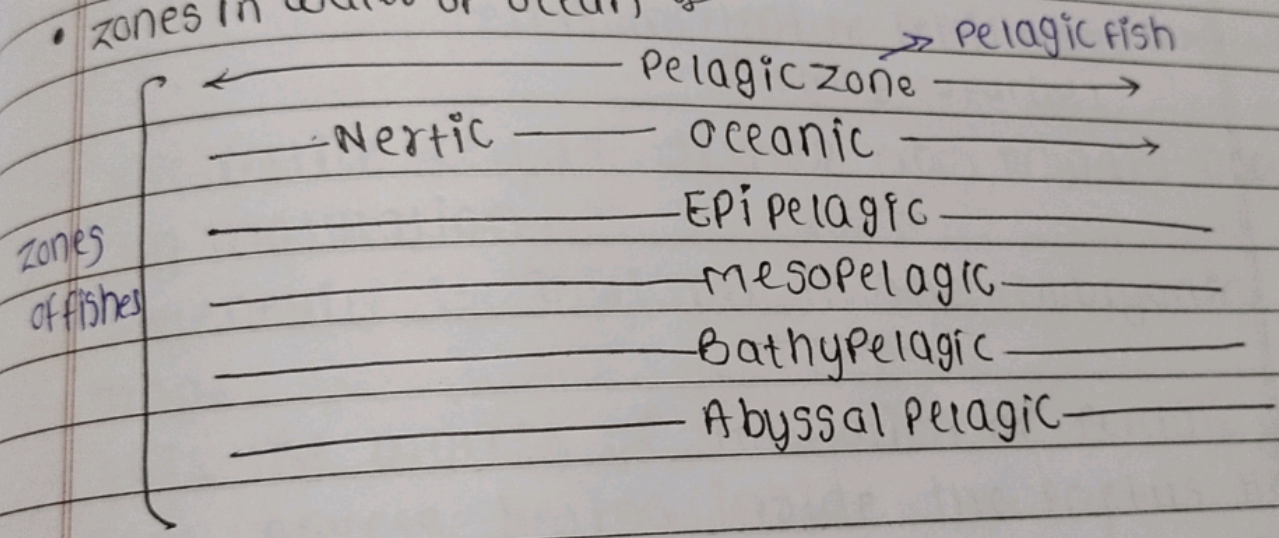
↓
These eggs are provided with adhesive membrane



↓
Eggs are provided with filamentous structure stick to other objects

→ There is no relation betw habitat & types of egg produced.
eg; Pelagic ^{fish} eggs can produce demersal types of eggs
Demersal fish can also produce pelagic types of eggs

• zones in water of ocean &

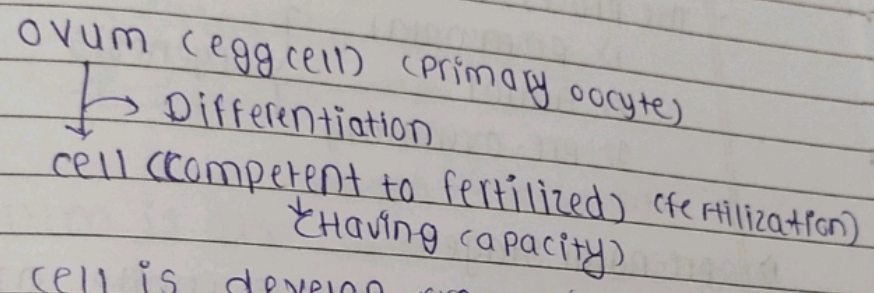


* Spermatogenesis :-

→

* oogenesis :-

→ Differentiation of ovum (egg cell) into a cell competent to further development where fertilised



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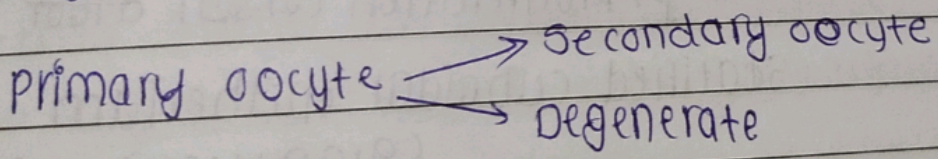
→ The fertile cell is develop from primary oocyte by maturation

→ oogenesis is initiated in the embryonic stage

→ It is the process of formation of female gamete

→ This process begins inside the foetus before birth
Primary oocyte -

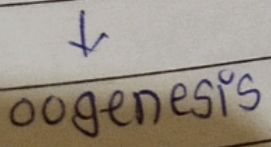
→ Primary oocyte do not divide further



→ oogenesis occur in outermost layers of ovaries

→ oogenesis starts with germ cells called oogonium

Germ cell oogonium



→ oogonium (germ cell)
↓ mitosis
increase the no. of oogonium

→ The process of oogenesis takes place in 3 stages
1) pre-natal
2) Antral
3) pre-ovulatory } oogenesis

1) pre-natal stage:-

→ Primary oocyte grows while arrested in meiosis first (meiosis-I)

Primary oocyte
↓ prenatal stage
meiosis I

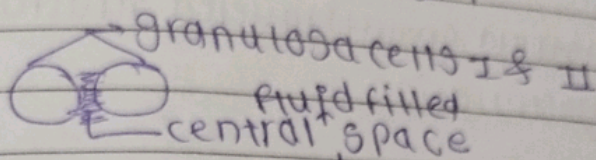
→ Follicular cells proliferate & form a stratified cuboidal epithelium

Follicular cell
↓ proliferation (संख्या बढ़ने)

stratified cuboidal epithelium
(granulosa cell)

secrete glycoprotein
form a zona pellucida around
Primary oocyte.

- 27 Antral stage :-
- The fluid filled area present between granulosa cells, combines to form a central fluid space called antrum



Antrum → secondary follicle

2003

- These antrum is also called as secondary follicle.

- Every month cycle secondary follicle is

forms

- for ~~forms~~ ^{development} the secondary follicle the LH & FSH (follicle stimulating hormone) is required.

3) Pre-ovulatory stage :-

- This stage is induced by LH surge
- In this stage meiosis I is complete.
- Two haploid cells are forms (unequal sizes) within follicle.

Pre ovulatory stage



Haploid cells are forms

↓
unequal sizes
within follicle.

* Gastrulation:-

- Early stage of embryonic development
- Blastula is organised

↓
Gastrula (multi-layered structure)

- Before gastrulation

↓
Embryo is in the form of epithelial sheet cell.

- End of gastrulation

↓
Three layer structure is form (Ecto, meso, Endo)

- Three layer of gastrula (Ecto, meso, Endo) called germ layer

→ Ecto meso Endo
 ↓ ↓ ↓
 outer middle inner

- The mesoderm layer is absent, only endo & ectoderm is present these are in Cnidaria, Tenophora

- Gastrulation takes place after cleavage & formation of blastula

- Gastrulation is followed by organogenesis within newly formed germ layer (formation of organs)

- Each layer gives rise to specific tissue.

From specific tissue organs are formed in developing embryo

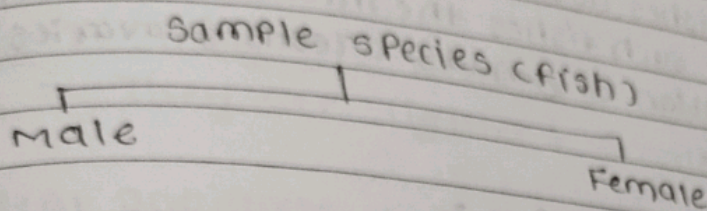
- Ectoderm gives rise to epidermis, nervous system, neural crest (vertebrates)
- Endoderm gives rise to epithelium associated with digestive system, organs (digestive pancreas)
- Mesoderm gives rise to many cells (muscles, heart, blood vessels, vertebrates cartilage, vertebrae, dermis)
- Five basic types of cell movement in gastrulation
 - 1) Invagination
 - 2) Involution
 - 3) Ingression
 - 4) Delamination
 - 5) Epiboly
- ⇒ Term gastrula & gastrulation in 1872 Ernst Haeckel he experiment on sponges
- Epiboly → first cell movement of gastrulation blastoderm cells moves towards over yolk surface
- Epiboly - initial phase
 - ↳ Deep blastoderm cells moves outward intercalate with more specific cell (convert into) move on yolk surface in final phase

* formation of 3 germ layer

- Thickening occur cmargin of blastoderm called germ ring
- Germ ring the superficial layer the epiblast is formed from this layer
- from inner layer the hypoblast is formed.

UNIT III * Reproductive Biology

* Sexual dimorphism :-



→ on the basis of phenotypical characters
colour, weight, size, shape, etc.

Sexual Dimorphism

~~Ref~~ Permanent Temporary
→ separation of male & female from same species of fish at one set of maturity

Temporary :- at the time of spawning
→ separation of male & female from same species of fish at the time of spawning

* Common characters :-

1) Fresh water,

→ Permanent ex :- fighting fish
onset of maturity

→ Temporary ex :- *Cyprinus carpio*

- Some fishes do not exhibit sexual dimorphism in that such fishes the internal examination i.e. observation of gonads (testis & ovaries) is seen
- ~~polymer~~

* Sexual Polymorphism :-

- Both male & female distinguished by one or more characters
- eg: salmon fish

sexual polymorphism

primary characters

secondary characters

↓
Associated with reproductive process

↓
Advantage → more useful because there is not need to be killed

↓
eg: Males - Testis & ducts
Female - ovaries & ducts

↓
It requires mature fish only but no relation with reproductive process

↓
In this they can be found by dissecting the fish

↓
Required additional structure

↓
- class first
eg: claspers, Monopodium

* characters of sexual dimorphism:

1) Body shape:

- Female :- They are heavier & larger in size
- Male :- They are lighter & smaller in size.

2) Genital papillae:-

It is small tube cloacal aperture

3) Pearl organ:-

- Male :- Horny short structure snout & head region
- Female :- It is absent in it.

* The structure ^{Horny short} is disappear once the spawning is over.

eg of pearl organ - is common carp, minnow

4) Fins:

Male :-> Larger fins are present

1) Pectoral fin - rough & graddy grainy

eg: Indian major carp

2) Caudal fin -> sword tail

1) has lower lobe is much longer than upper lobe.

Female :- smaller fins are present

5) colouration:-
Male:- brightly coloured & more intense attractive
Female:- dull coloured

Male egi: 1) parrot fish
(aquarium fish)

2) Bow fish (Amia)

- In Juvenile stage the coloured circular spot in caudal fin

* parental care in fishes :-

- Association between parent & offsprings because of (Bonding) to increase the chances of survival of young ones
- In fishes, the post spawning care by parent (Releasing egg)
- Most fishes do not care their egg
- Both the parents leaving the spawning ground after spawning in some fishes
 - more ^{no. of} eggs are produced by female in it
 - as well as male produce more no. of sperms.

• Devices used by fishes for parental care :-

- Devices used by the fish to ensure proper development of egg into adult for this both the parents in this process can one or both sexes they are participate in the process

Devices

- 1) selection of suitable site
- 2) Nest building
- 3) various methods other methods of protection of larvae
- 4) those

- Those fishes the parental care is absent -
- ↳ Egg possess various mechanism for attachment to stone or aquatic vegetation.
- The eggs are prevented from being wash

• Types of parental caring :- (Devices)

↳ Nest Building :-

- Some fish prepare crude nest for egg laying
- Suitable place for preparing the nest is selected.
- Some species may defend the place upto death.

eg: Male - Darters

Sunfish

cichlids



Prepare Basin-like Nest

for laying egg by female.

- Stones & pebbles

↓
Removed from the nest

↓
Male keeps close watch over the egg till hatching

- ~~Some~~ fishes in fresh water - prepare the crude nest - aquatic vegetation (phytoplanton) & lay the eggs.

eg: 1) Protopterus & Lepidosiren

↓
prepare the deep hole

↓
In that the female lay the egg.

↓
male protect nest till development is completed

27 *Amia calva* (bowfin fish) - crude circular nest among aquatic vegetation

→ Male - fertilised ova are protected by guarding the nest
All young ones are hatched - Young ones are allowed to leave the nest under protection of father)

→ eg; 1) catfish :- barbels are present
- catfish from North America - Both male & female prepare the crude nest in the mud for egg laying.

- Nest provided with protective cover, made up of logs & stones

2) Stickle back (fresh water fish)

- Nest - dead aquatic weeds are used for preparing nest

- For weeds are joined together by sticky secretion produced from the kidney. (male)

3) Betta & Macropodus

→ Foamy nest - blowing of bubbles of air + sticky mucous

- Adhesion of betw blowing of bubbles of air & sticky mucous to form foam.

- Foam is floating mass.

- Male keeps the eggs in mouth cavity & through the eggs them in such a way eggs can adhere to lower surface of foam.