S. S. College, Jehanabad

Department: Zoology

Class: M.Sc. Semester IV

Subject: Zoology

Topic: Development in fishes

Mode of teaching: Google classroom & WhatsApp

Date & Time: 20.08.2020 & 10:30

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Development :

In fish eggs, cleavage occurs only in the blastodisc, a thin region of yolk-free cytoplasm at the animal cap of the egg. Most of the egg cell is full of yolk. The cell divisions do not completely divide the egg, so this type of cleavage is called meroblastic (Greek, meros, 'part'). Since only the cytoplasm of the blastodisc becomes the embryo, this type of meroblastic cleavage is called discoidal. Scanning electron micrographs show beautifully the incomplete nature of discoidal meroblastic cleavage in fish eggs. The Calcium waves initiated at fertilization stimulate the contraction of the actin cytoskeleton to squeeze non-yolky cytoplasm into the animal pole of the egg. This converts the spherical egg into a more pear-shaped structure, with an apical blastodisc (Leung et al. 1998). Early cleavage division follow a highly reproducible pattern of meridional and equatorial cleavages. These division are rapid, taking about 15 minutes each. The first 12 division occur synchronously forming a mound of cells that sits at the animal pole of huge yolk cell. These cells constitute the blastoderm. Initially all the cells maintain some open connection with one another and with the underlying yolk cell so that moderately sized (17-kDa) molecules can pass freely from one blastomere to the next (Kimmel and Law, 1985).

Fig :-

Development

Most bony fish eggs are telolecithal which means that most of the egg cell cytoplasm is yolk. The yolky end of the egg is vegetal pole while the other end is animal pole. Cleavage in zygote is meroblastic and discoidal. The fish zygote is meroblastic meaning the early cell division are not complete. This type of meroblastic cleavage is called discoidal type because only the blastodisc becomes the embryo. Fish Embryo go through processes called mid-blastula transition which is observed around the tenth cell division in some fish species. During this time three cell populations become distinguished. the first population is the yolk syncytial layer. This layer forms when the cells of the vegetal pole of the blastoderm combined with the yolk cell. Later in development the yolk syncytial layer will be important in directing cell movement of gastrulation. The second cell population is the enveloping layer is form of single epithelial cells layer. The Third set of blastomeres are the deep cells. These deep cells are located between the enveloping layers and the yolk syncytial layer and eventually give rise to the embryo proper.

Germ layer formation

Once blastoderm cells have covered almost half of the yolk cell, thickening

throughout the margin of deep cells occurs. The thickening is referred to as the germ ring and is made up of a superficial layer, the epiblast which will become ectoderm and an inner layer called the hypoblast which will become endoderm and mesoderm. As the blastoderm cells undergo epiboly around the yolk the internalization of cells at the blastoderm margin start to form hypoblast. Presumptive ectoderm or epiblast cells do not internalize but the deep cells (inner layer of cells) do and they become the mesoderm and endoderm.

Table-1. Embryonic development of Pleuronectes platessa

Development stage	Time after spawning (hrs:mins)
Spawning	00:00
One-celled ovum	00:25
Two-celled ovum	00:45
Four-celled ovum	01:00
Eight-celled ovum	01:20
Sixteen-celled ovum	01:40
Thirty-two-celled ovum	02:10
Early morula	02:30
Late morula	03:00
Early blastula	03:30
Middle blastula	05:00
Late blastula	06:20
Early gastrula	07:30
Late gastrula	08:30
Appearance of embryo	10:10
Formation of optic vesicles	11:30
Appearance of Kupffer's vesicle	12:30
Closure of blastopore	14:20
Formation of auditory vesicles	16:00
Disappearance of Kupffer's vesicle	17:10

Beginning of heart beat ... 22:30 ;
Hatching ... 26:40 ;

Early Development of Plectropomus leopardus.

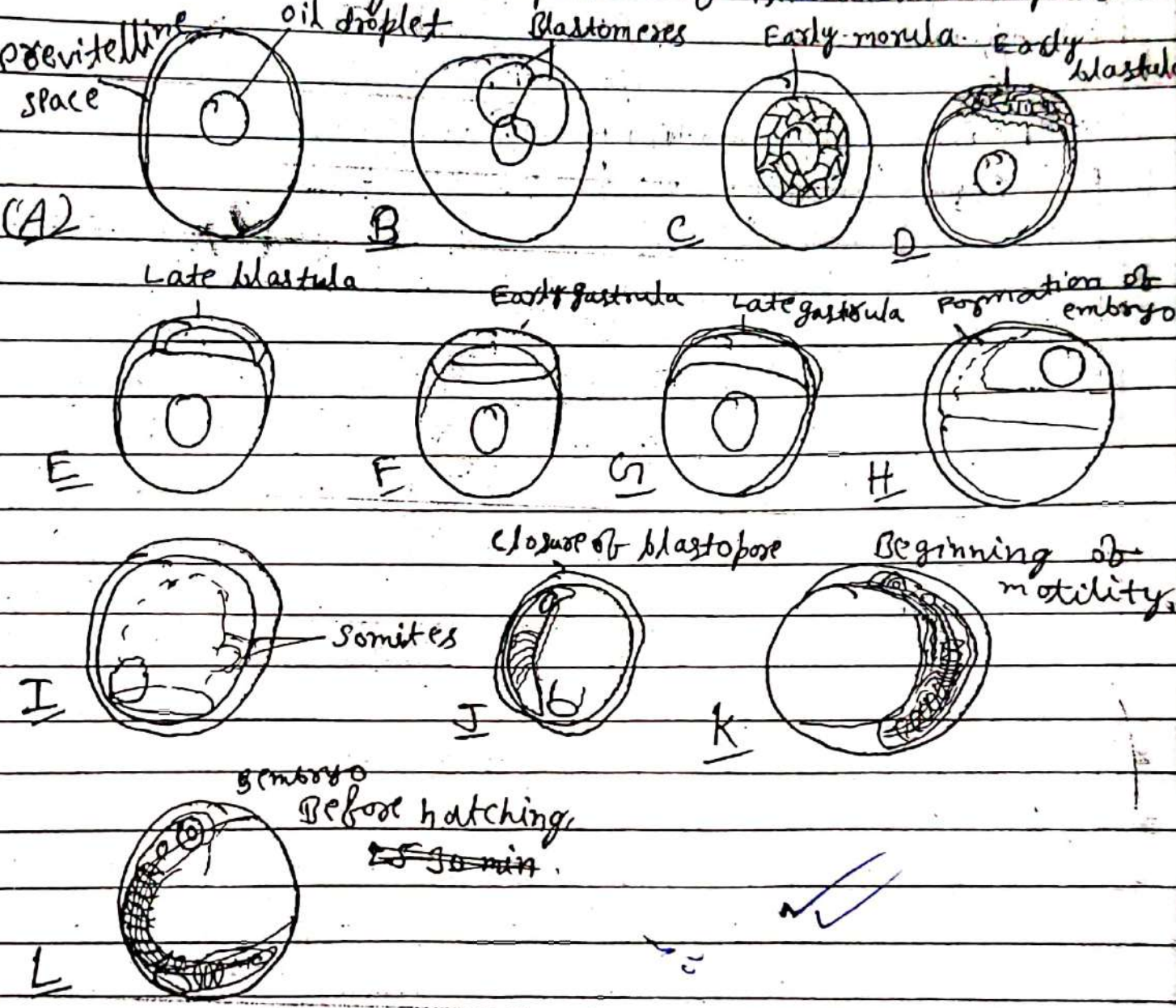

Fig. Embryonic development of Plectropomus leopardus.
(A) Fertilized ovum. 6 min after spawning.
(B) Two-celled ovum 45 min.
(C) early morula, 2hr 30min.
(D) Early blastula, 3h 30 min