Breeding Habits and Embryology of Percina caprodes
M. S. Briscoe

1932

Percina caprodes belongs to the perch family (Percidae). It is commonly called the log-perch. The eggs of this fish which were used in this embryological study were collected [illegible] Michigan. Although these fish normally live in the deep part of this lake they come to the sandy shore to spawn during the breeding season which begins in may and terminates about the middle of July. The males can easily be distinguished due to the presence of a black stripe on the dorsal surface of their body.

The spawning habits of percina are very easily observed along the shore of Douglas Lake. About mid-day, when it is warm and the water is quiet, schools of these fish swim to the edge of the sandy shore and spawn. The male places its pectoral fins upon the back of the female. This is followed by a vigorous flapping of the caudal fins of both fish. The strong vibratory movements of the caudal fins tend to dig a small pit in the sand and probably aid in the expulsion of the eggs. Sperms immediately enter a number of the eggs and fertilize them. As the eggs become fertilized they also become sticky and fall into the pit. This stickiness enables them to adhere to the sand. In this way some are buried and thereby saved. Just as soon as a pair completes the spawning act a number of males rush to the spot and feed on the eggs. Due to this cannibalistic tendency on the part of the males quite a number of eggs are lost. It is evident that there is the least amount of parental care shown because the eggs are never gaurded.

The problem of sex recognition among these fish is an interesting one because the difference in the sexes is not great enough for the fish to notice. Reighard believes it is a matter of behavior and states the following concerning it: "The spawning behavior is of interest because it furnishes an instance in which sexual dimorphism in color occurs, and yet this difference is not the basis on which the fish themselves discriminate between the sexes. Young males in full color are often pursued by other males, and are apparently distinguished from them only by their failure to stop and behave like females. By the experimental

substitution of a male for a female it was shown that if such a male were moved rapidly and then stopped on the bottom it was treated by other males as a female."

For this embryological study the fish were stripped of the eggs and sperms from the females. The eggs and sperms were placed in finger bowls. This resulted in the immediate fertilization of the eggs. A small quantity of water from the lake was placed in the finger bowls after which they were taken to the laboratory for further study.

The egg (Fig. 1 and 2) is about 1½ mm. in diameter. It is spherical in shape and somewhat transparent. There is a spherical body near the center which is an oil droplet. The sphere which encloses the oil droplet is the yolk of the egg. It is obvious that the oil droplet is lighter than the yolk for it remains uppermost. A mass of protoplasm shaped somewhat like a cap lies against the yolk. This cap of protoplasm is known as the germinal disc. Egg membranes surround all the parts of the egg previously mentioned.

The spermatozoa are much smaller than the eggs (Fig. 1a). They have an elliptical head and a vibratory tail. The head of the sperm enters the egg through an opening called the micropyle and fuses with the egg nucleus in the germ disc thereby fertilizing the egg. As a result of this fertilization the fish develops from the germinal disc. During development it feeds on the yolk and the oil droplet and is protected by the egg membranes.

The germ disc enlarges about thirty minutes after fertilization (Fig. 3). A cleavage furrow appears on the disc (Figs 4 and 5), about one hour after fertilization has occured. This furrow extends around the disc and at the close of two hours it has separated the disc into two parts (Fig. 6). After sixty minutes more other furrows form. As a result of this the disc (Fig. 7), is divided into four parts. At the close of the fourth hour the furrows have divided the disc into eight parts. Each of these eight segments divides thereby dividing the disc into sixteen parts, (Fig. 9). These sixteen segments also divide but the process becomes irregular and results in the formation of a large number of segments (Fig. 10), which become smaller and smaller. The germinal disc has now become broken up into a number of small cells known as a blastoderm.

The blastoderm begins to spread over the yolk (Fig. 11),

and continues until the yolk is surrounded (fig. 12). The short lines running parallel to one another are somites.

The first trace of the embryo is seen on the second day (fig. 12). It extends a short length around the yolk. In fig. 13 it has almost completely encircled the yolk. At the anterior end of the embryo, on either side, is an optic vesicle. These vesicles mark the beginning of the formation of the eyes. The dark band further back on the embryo and in the middle line is the notochord. This is an embryonic structure which serves as the chief support of the embryo but is later replaced by the vertebral column. The olfactory pit has also formed at this time.

The heart can be seen at the beginning of the third day (fig. 13). It starts beating as soon as it is formed. Some of the vessels for circulation of the blood are also established at this time. The blood is practically colorless.

~~At this time~~

In fig. 14 it can be seen that the head of the embryo touches the oil droplet. The embryo is quite motile and moves from one part of the egg to the other.

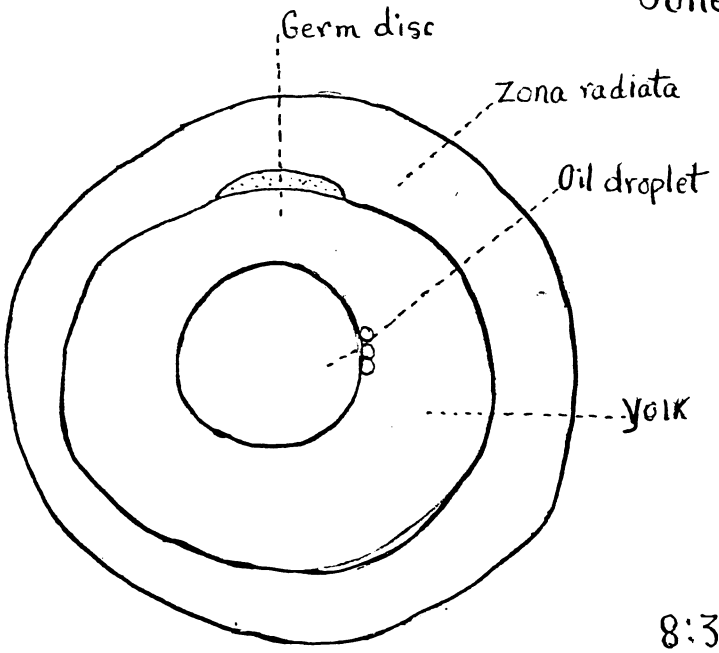
Each optic vesicle (fig. 15), is converted into a sac and appears to be shaped like a shallow cup called the optic cup. A dark colored pigment is clearly visible. This is the retinal layer. Cavities of the auditory pit have made their appearance. These cavities grow larger and develop into internal ears.

At the end of the sixth day (fig. 16), the embryo has completely surrounded the yolk. The somites have increased in number and the retinal layer of the optic cups has enlarged. In the posterior region of the embryo a number of black spots with irregular processes have developed. These are chromatophores. The cavities of the auditory vesicles have grown larger and the olfactory pit has also increased in size.

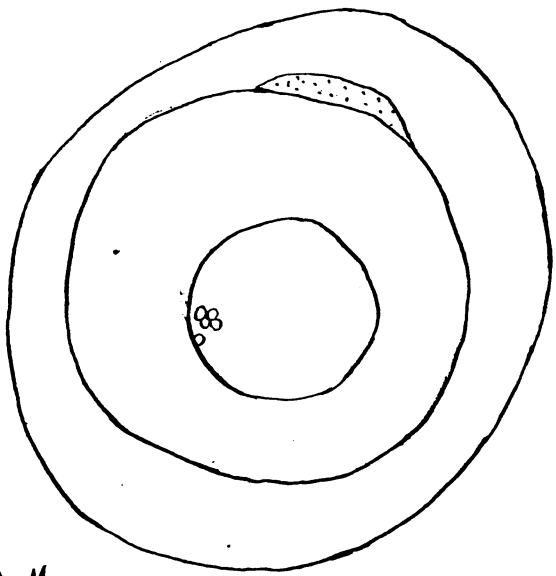
The embryo frees itself from the egg membranes on the seventh day (fig. 17). The anterior portion is still attached to the yolk but the posterior region is free. The chromatophores have developed over the yolk as well as along side of the tail. In a course of time the yolk disappears and the fish may be observed darting around in the finger bowl apparently in search of food.

Embryology of Percina caprodes

June 28, 1932



1



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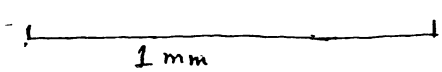
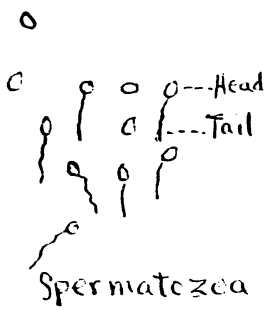
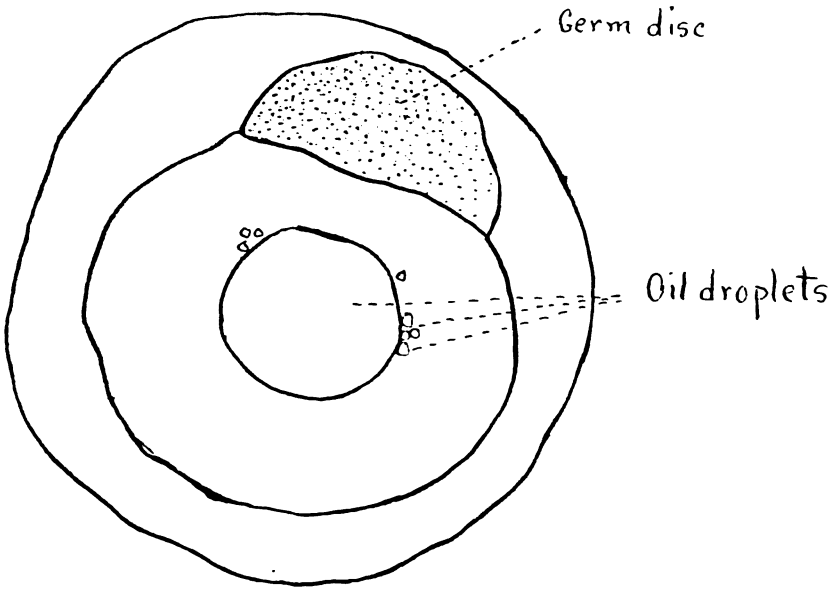


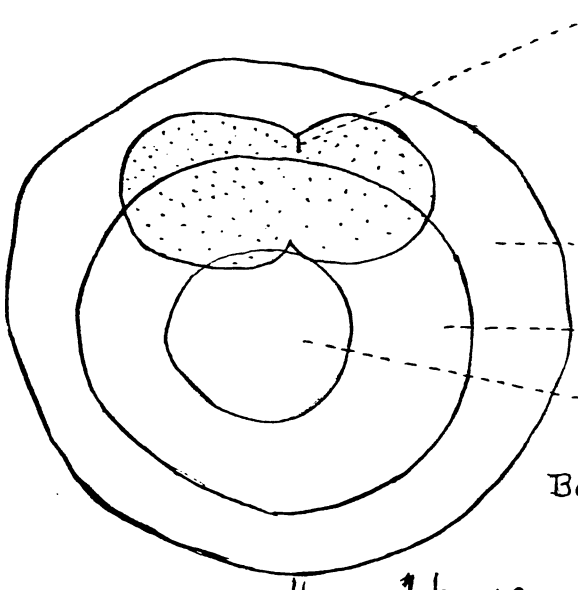




3

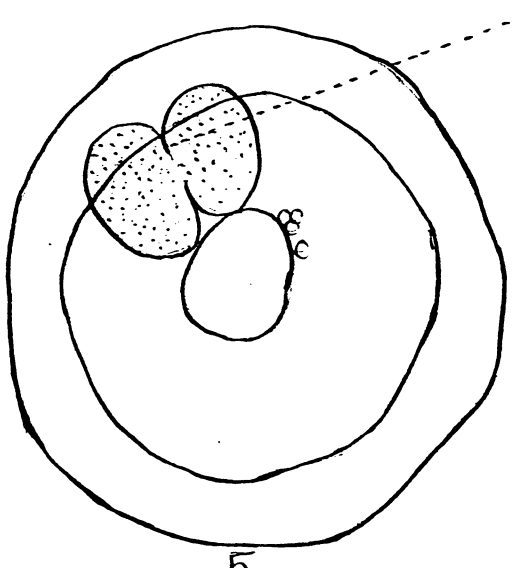
9:A.M.

Percina



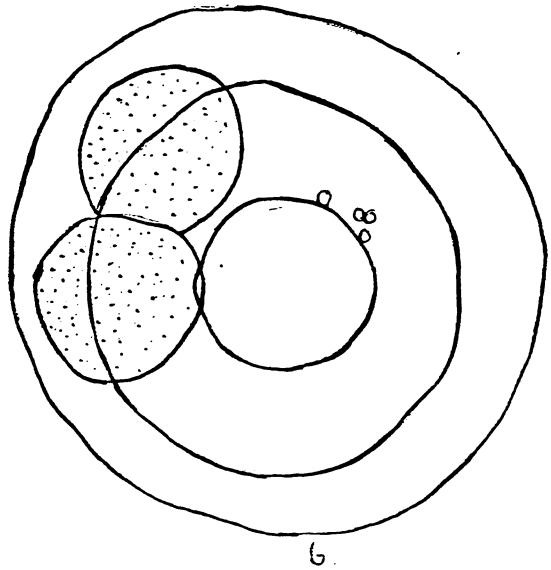
Beginning of cleavage

4. 1 hour



5.

Cleavage furrow prominent

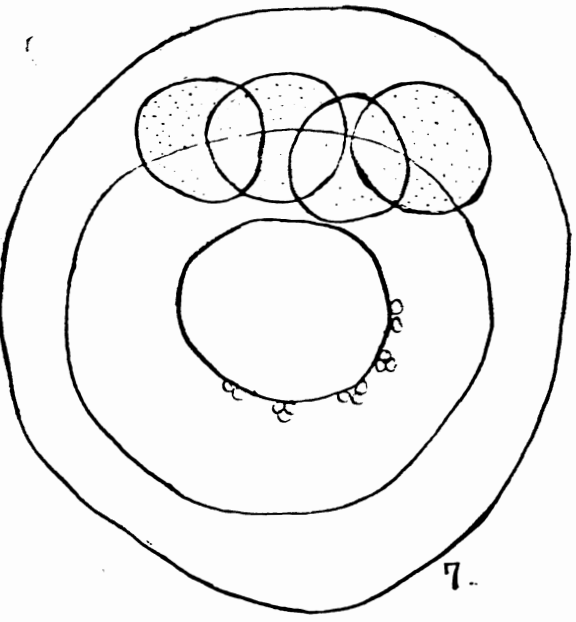


6.

Two cell stage –

2 hrs.

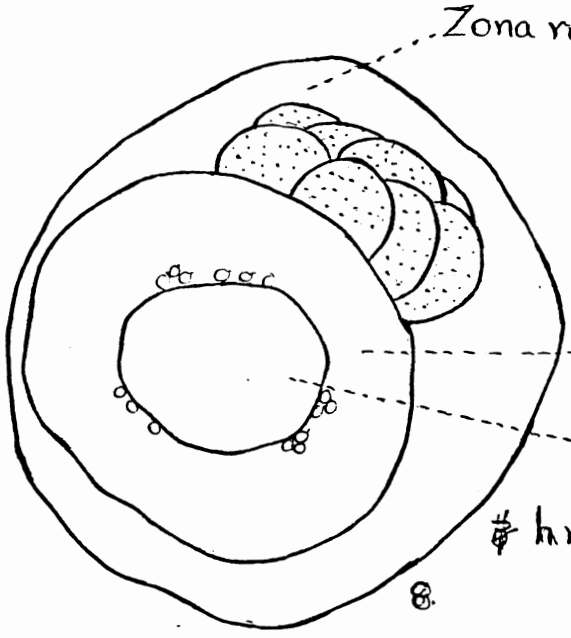
Percina



3 hrs.

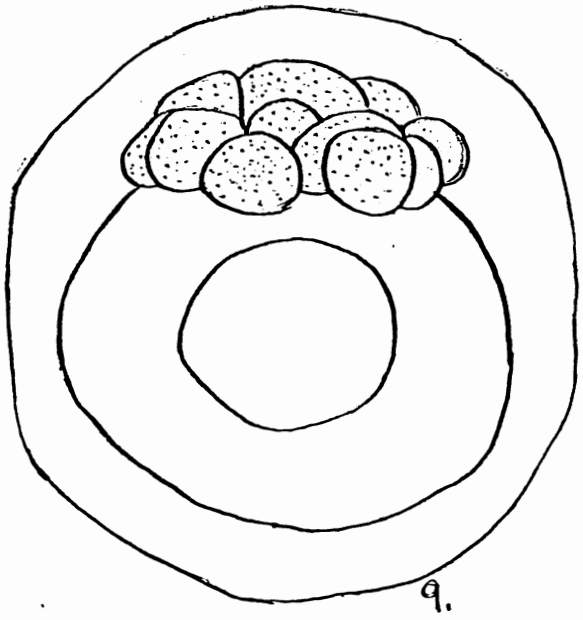
7.

Four cell stage



8.

Eight cell stage

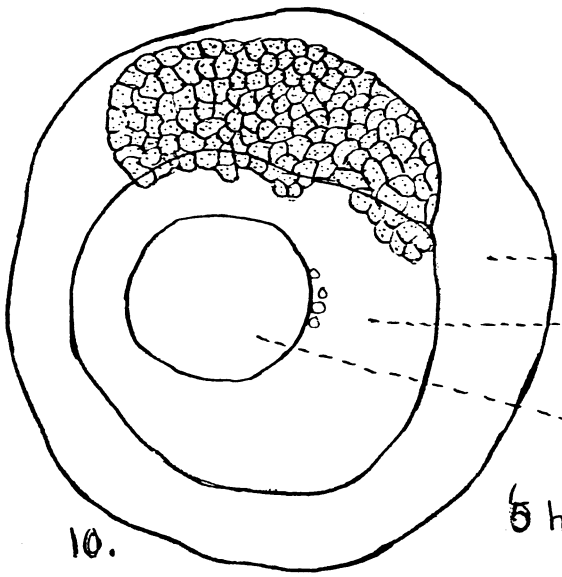


5 hrs.

9.

16 cell stage

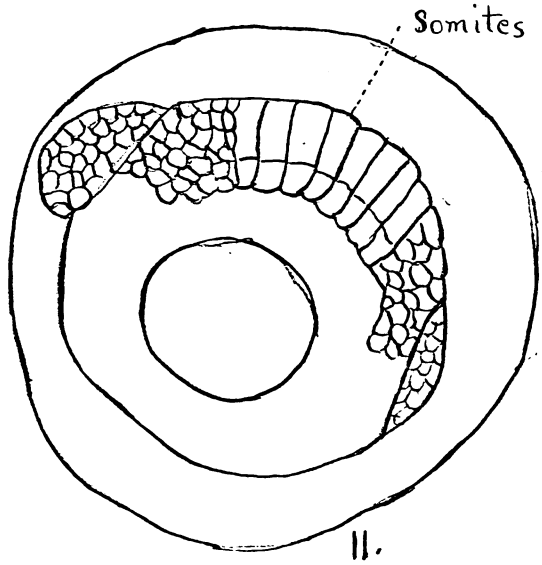
Percina



5 hrs.

10.

Many cell stage

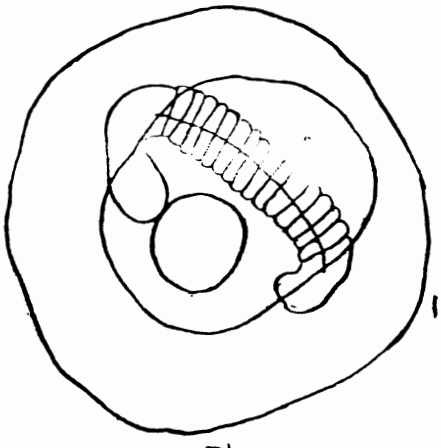


11.

28 hrs.

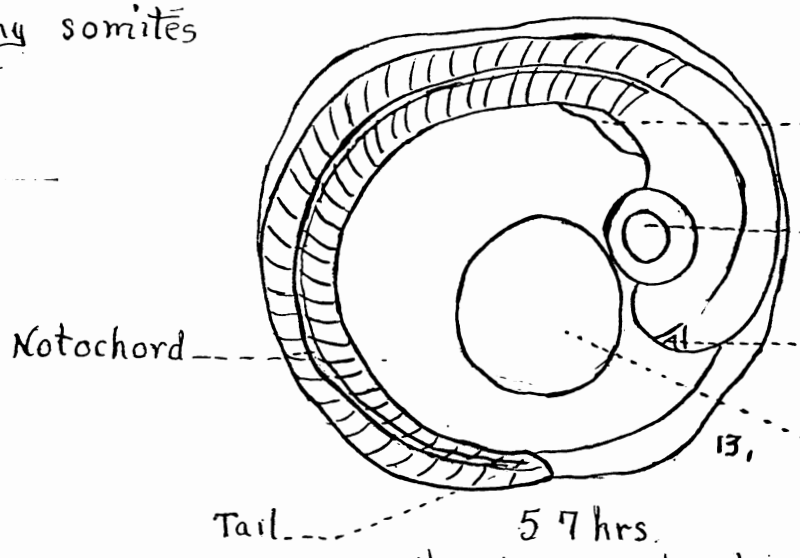
Showing eight somites

Percina

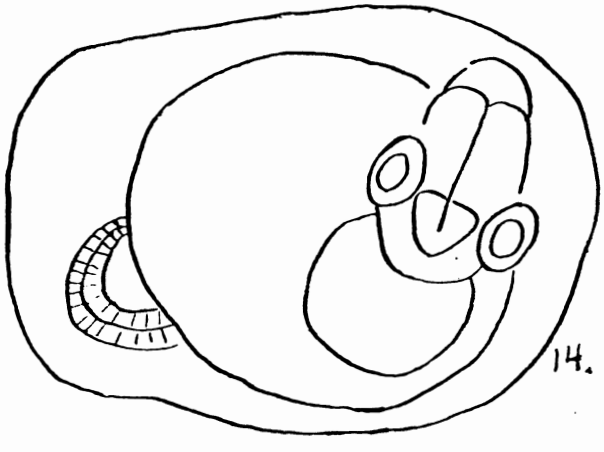


12.

33hrs
Many somites



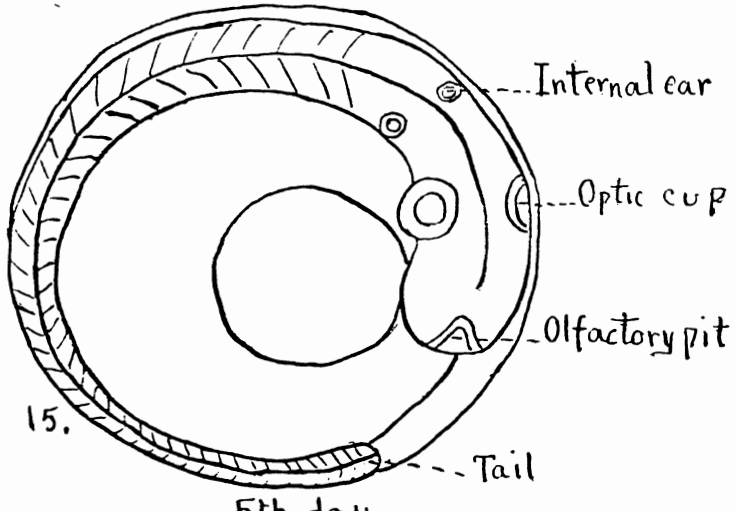
57 hrs.
Heart now beating
Optic vesicles and olfactory pit formed.



14.

4th Day

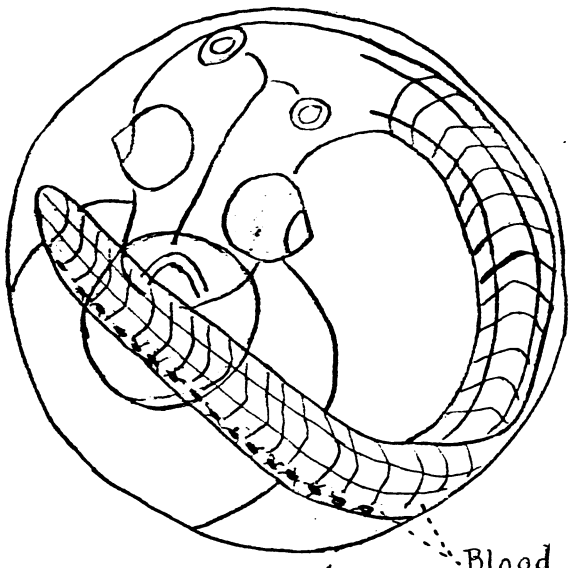
Colorless blood visible in blood vessels. Embryo quite motile.



5th day

Optic vesicles much darker. Internal ears forming.

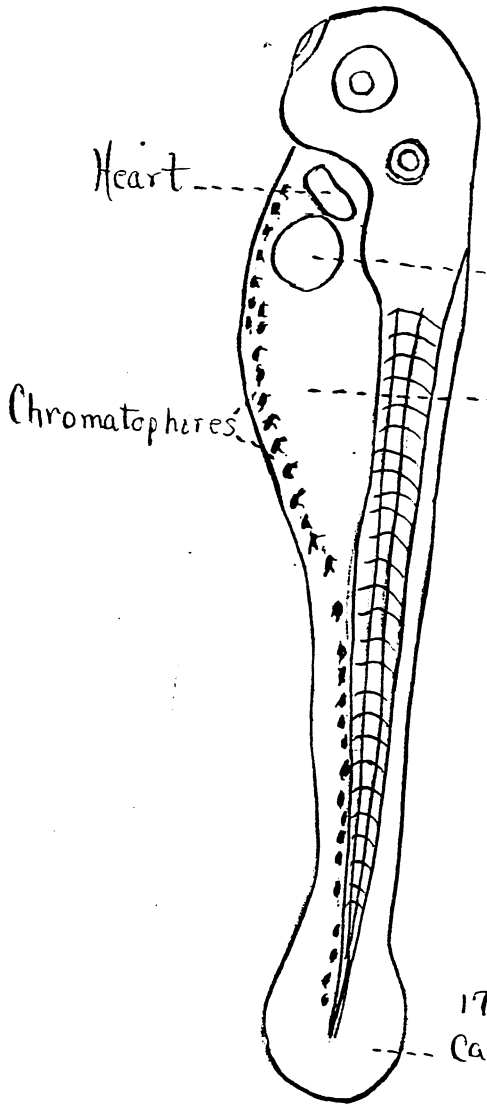
Percina



16.

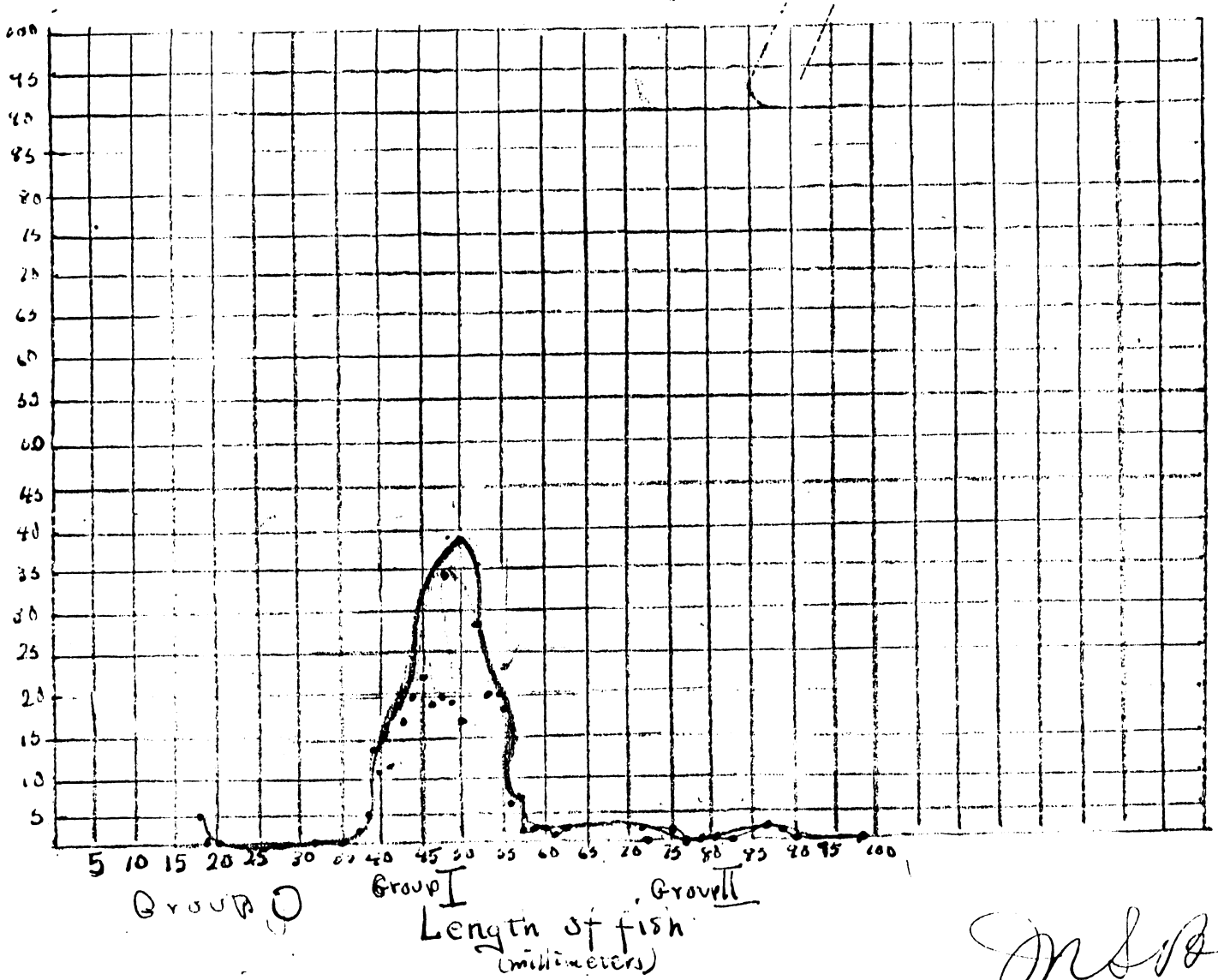
6th day

Blood faint yellow in color

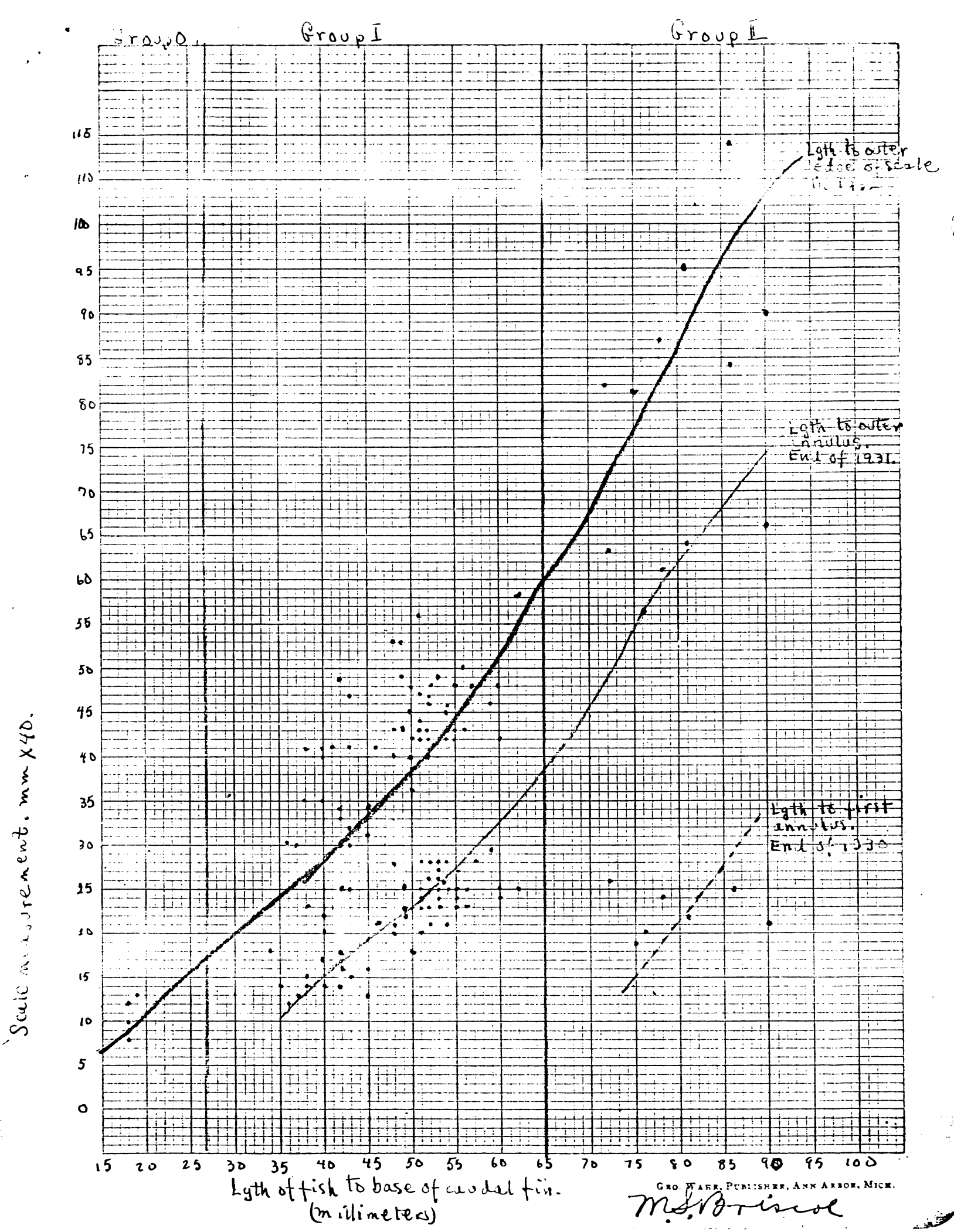


17.

7th day



Length frequency.


Group I
Group II
Lgth to outer edge of scale
Lgth to outer annulus. End of 1931.
Lgth to first annulus. End of 1930
Lgth of fish to base of caudal fin. (millimeters)
Scale measurement. mm X 40.
GEO. WAHR, PUBLISHER, ANN ARBOR, MICH.
M. S. Bristol