EXPLANATION OF PLATE I.

GADUS MORRHUA. (*The Cod.*)

FIG. 1. Young cod 5^{mm} long showing the large supracephalic integumentary sinus *ss* over the head and body; *i*, intestine; *y*, yelk. Viewed from the side. x 32.

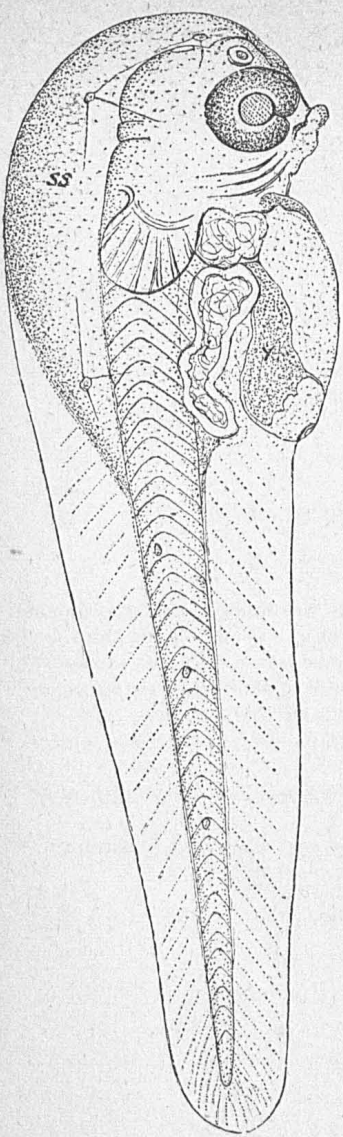
FIG. 2. Same, viewed obliquely from in front to show the size of the sinus *ss*.

FIG. 3. Position of cod's egg in the water shortly after impregnation, showing the polar cells, germinal plasma, and micropyle at inferior pole.

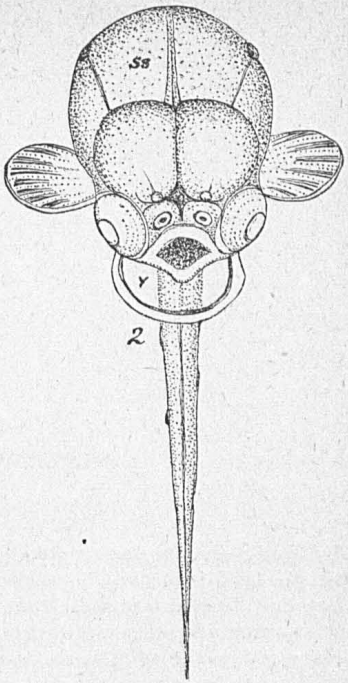
FIG. 4. Illustrating the inferior position of the blastodisk when the egg of the cod is at rest at the surface of the water.

FIG. 5. Illustrating the slight rotation of the egg as the embryo is gradually lengthened.

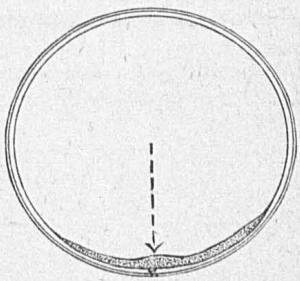
FIG. 6. Illustrating the quarter-rotation of the egg when the blastopore is about to close, bringing the embryo into an inferior position.



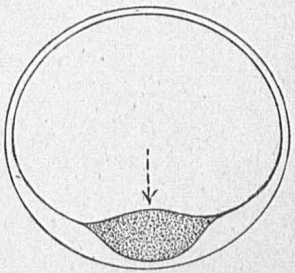
1



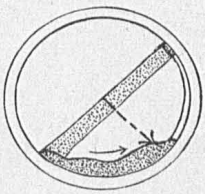
2



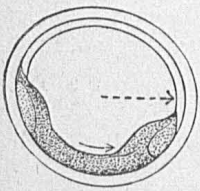
3



4



5



6

Blank page retained for pagination

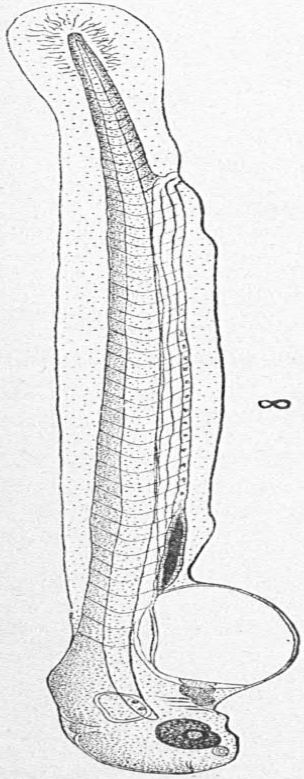
EXPLANATION OF PLATE II.

FIG. 8. Embryo *Clupea vernalis* on the second day after hatching. x 32.

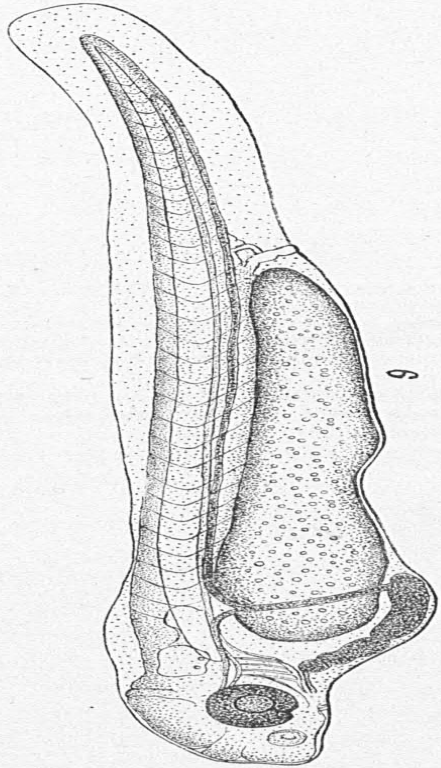
FIG. 9. Embryo golden ide, *Idus melanotus*, just hatched. 6.6mm long. x 20.

FIG. 10. Embryo gold-fish, *Carassius auratus*. Five and one-half days after hatching. x 21.

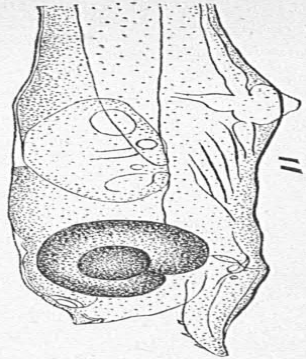
FIG. 11. Head of a larval fish; a hybrid between the shad and rock-fish, the former being the female and the latter the male parent. x 32.



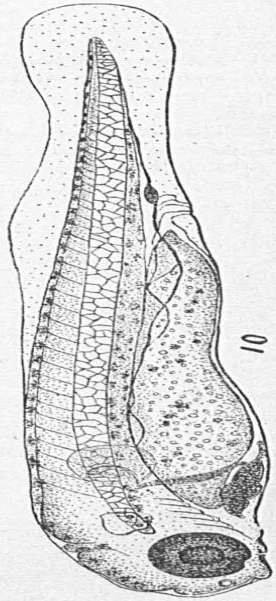
8



9



11



10

Blank page retained for pagination

EXPLANATION OF PLATE III.

Fig. 12. Head of young *Siphostoma fuscum*.

FIG. 13. Developing egg of *Elacate canada*, showing the spacious cleavage cavity *s s*, Kupffer's vesicle *kv*, the chorda *ch*, the segments *m m* of the embryo, and the limbs *br* of the concrescing blastopore, the oil-drop *o*, and the optic vesicles *op*.

FIG. 14. An earlier phase of the development of an egg of the same species.

FIG. 15. The unimpregnated ovum of the file-fish, *Monacanthus broccus*, showing the position of the oil-drops and the form of the blastodisk.

FIG. 16. The developing ovum of the gold-fish *Carassius auratus*, showing the extent to which the embryo embraces the circumference of the vitellus. x 32.

FIGS. 17 and 18. Other views of a similar stage of the same species.

12
15
16
13
s
op
s
m
ch
m
kv.
br
14
17
18

Blank page retained for pagination

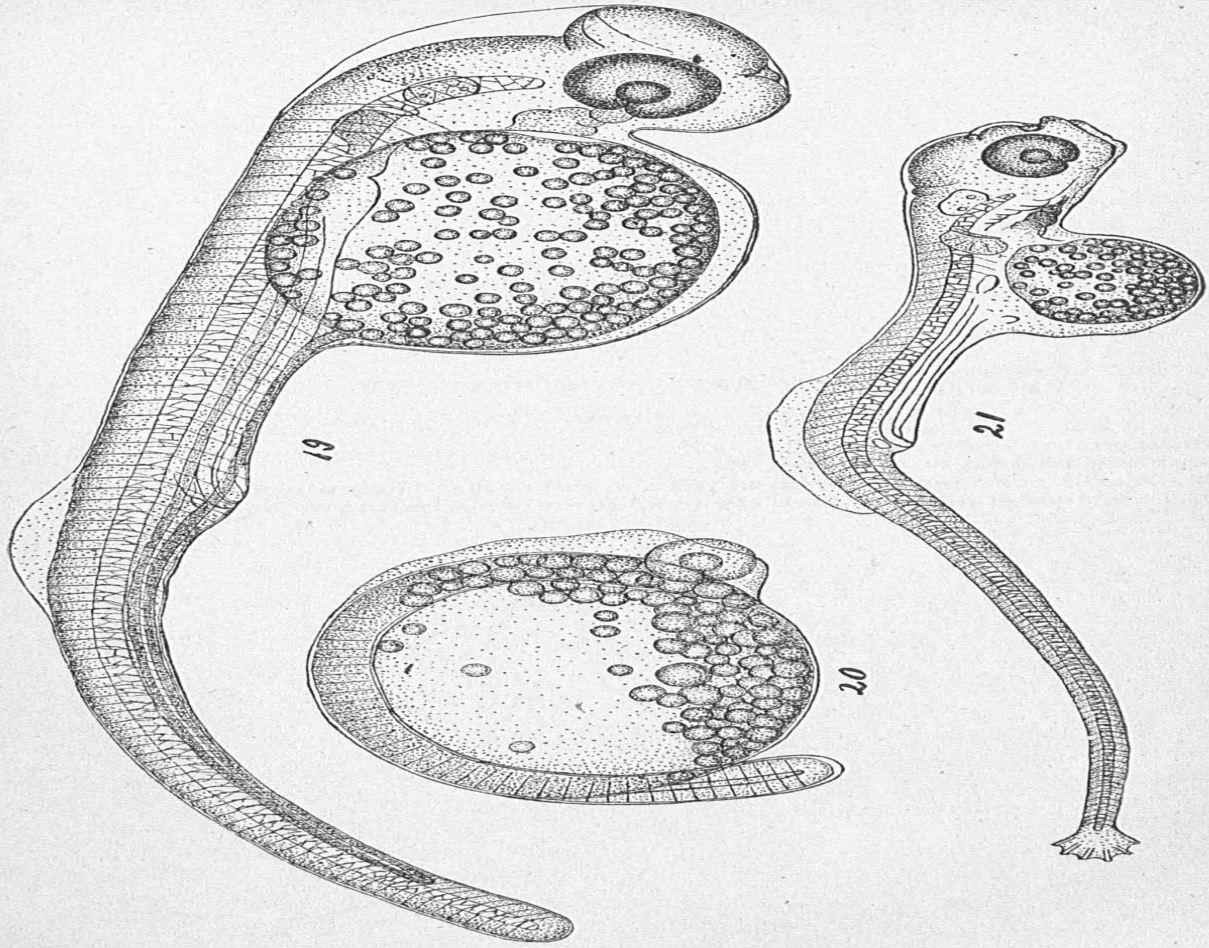
EXPLANATION OF PLATE IV.

SIPHOSTOMA FUSCUM. (*The Pipe-fish.*)

FIG. 19. A young embryo, in which the tail is still archicercal and the dorsal and pectoral fins are just developing.

FIG. 20. A still younger stage, in which the tail is just beginning to grow out.

FIG. 21. An older stage, in which the caudal fin is beginning to be formed.


19
20
21

Blank page retained for pagination

EXPLANATION OF PLATE V.

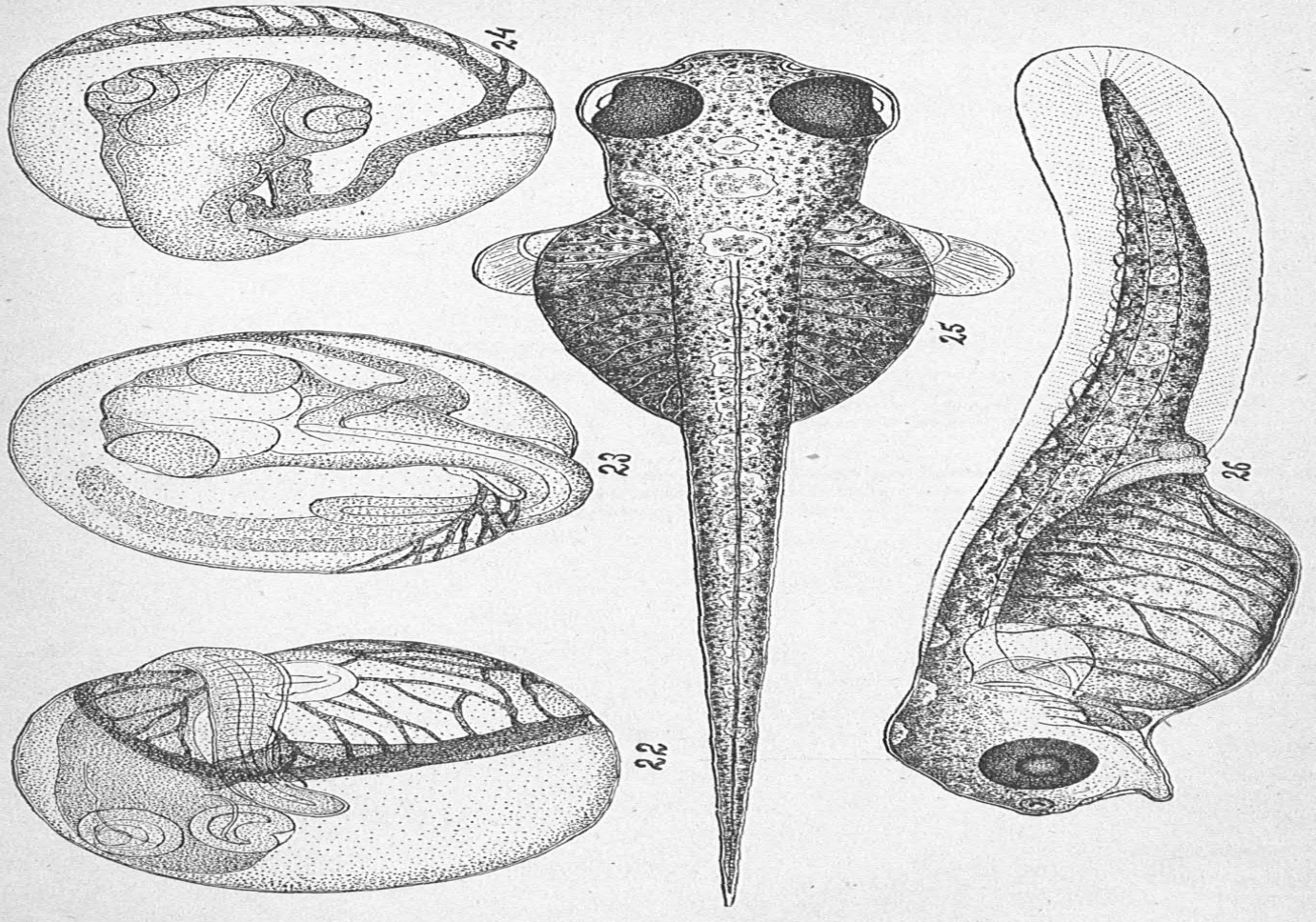
APELTES QUADRACUS. (*Four-spined Stickleback.*)

FIG. 22. Embryo in the egg, showing the asymmetrically disposed vitelline vessels.

FIGS. 23 and 24. Other views of the same stage, showing the lateral position of the heart.

FIG. 25. Dorsal view of a recently hatched embryo, showing the distribution of the brown pigment blotches on the median line and the symmetry in the distribution of the vascular channels on the dorsal side of the yelk.

FIG. 26. Side view of the same stage, showing the pigmentation and vascular loops in the dorsal fin-fold.


24
23
22
25
26

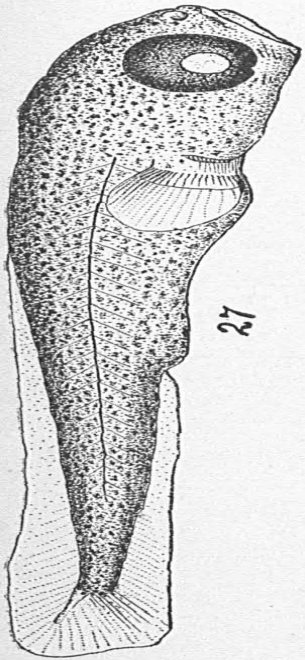
Blank page retained for pagination

EXPLANATION OF PLATE VI.

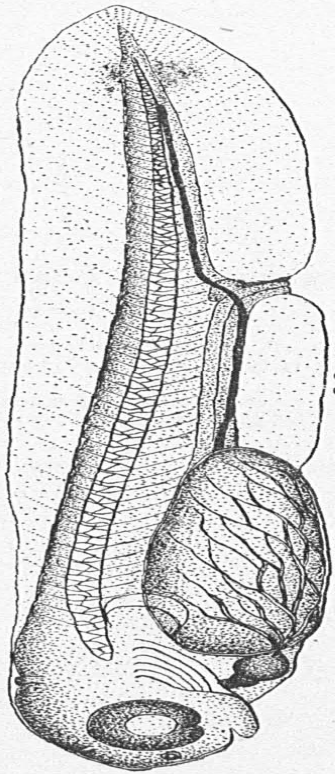
FIG. 27. Young *Apeltes* one week old, with the lower lobe of the caudal developing and becoming heterocercal.

FIG. 28. Recently hatched embryo of *Esox reticulatus*, showing the wide median finfolds, the distribution of vitelline vessels, and the course of the caudal and subintestinal veins.

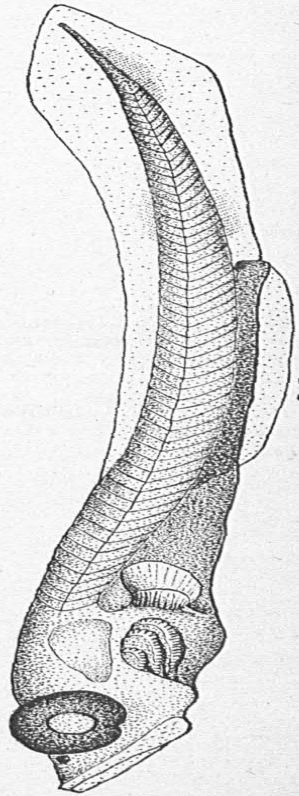
FIG. 29. A much older stage of *Esox reticulatus*, in which the flat snout is becoming apparent and the rudiments of the caudal, anal, and dorsal fins are becoming evident.



27



28



29

Blank page retained for pagination

EXPLANATION OF PLATE VII.

(Species No. 1.)

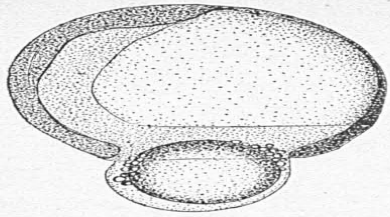
FIG. 30. Showing developing egg removed from its membrane. The spreading blastoderm has greatly constricted the yelk.

FIG. 31. A somewhat earlier stage of the same in its membrane, over a part of which the adhesive covering of the latter has collected and formed a disk-like mass, by which it adhered to a piece of leather.

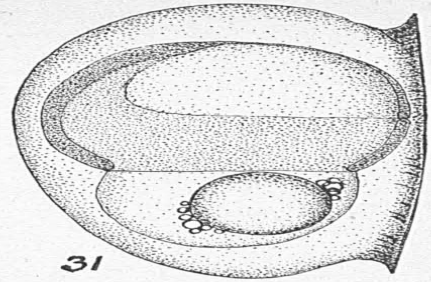
FIG. 32. A more advanced stage of the same.

FIG. 33. A still more advanced stage, in which the distribution of the oil-drops is evident and Kupffer's vesicle is developed under the posterior end of the embryo.

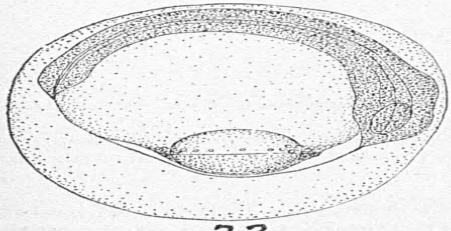
FIG. 34. A larva which was developed from this same lot of eggs, three days after hatching, showing the distribution of the pigment on the body, tail, and at the junctions of the vessels of the yelk-sack.



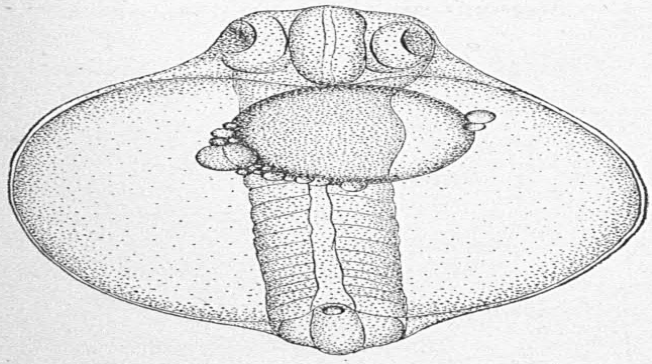
30



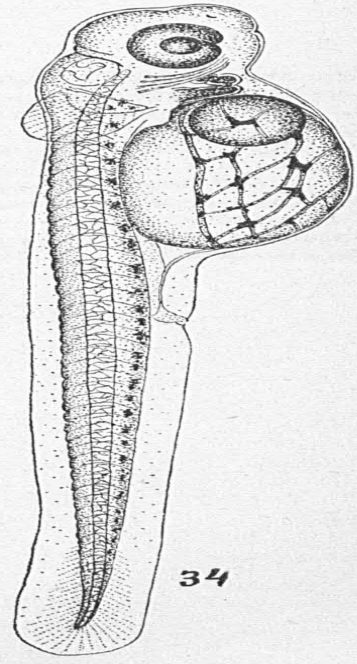
31



32



33



34

Blank page retained for pagination

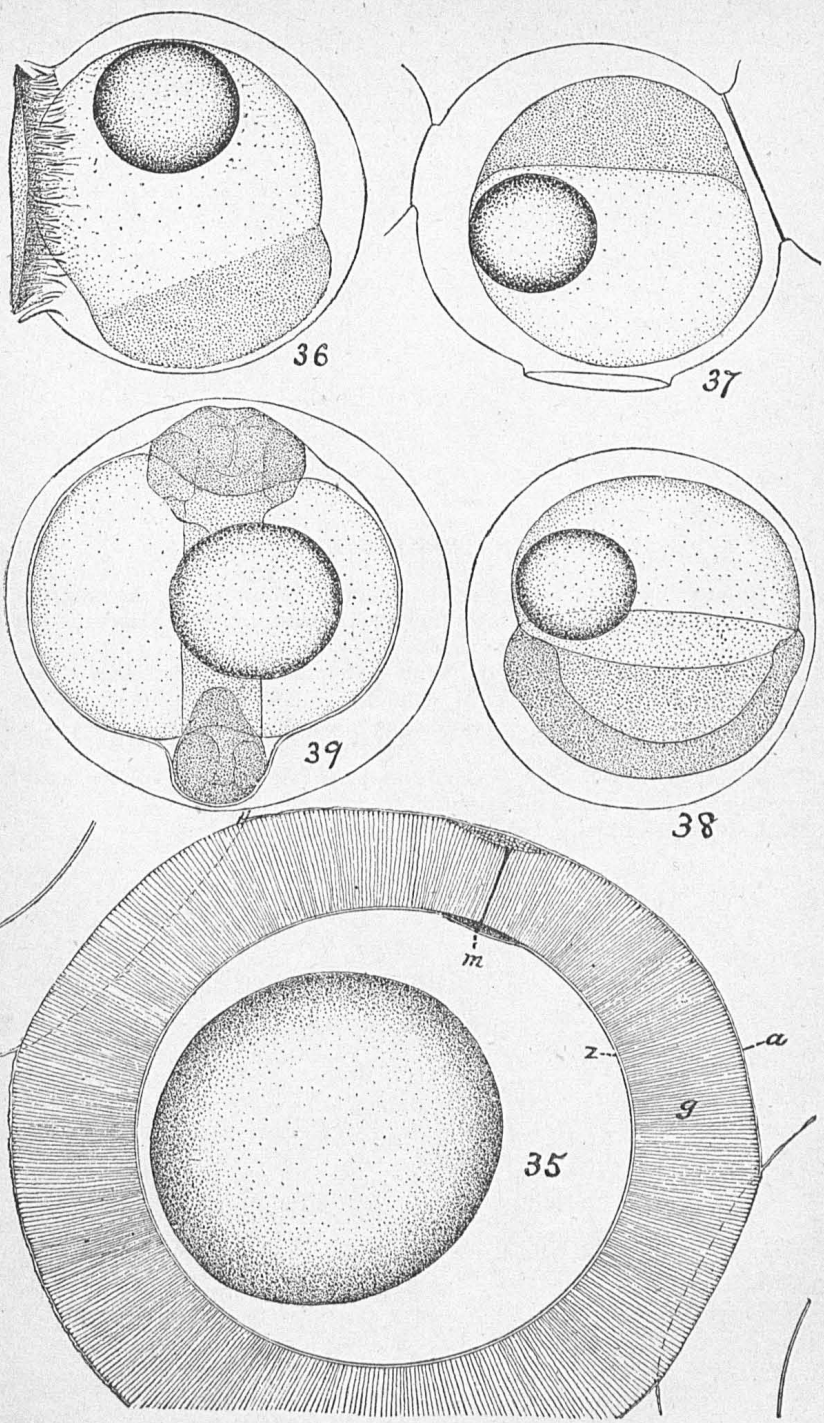
EXPLANATION OF PLATE VIII.

FIG. 35. Magnified view of an egg of the common yellow perch, showing the micropyle *m*, the thin zona radiata *z*, the thick, elastic, canaliculated or fibrillated layer *g*, and the outer adhesive layer *a*.

FIGS. 36 and 37. Views of ova of the white perch, in which the large blastodisk is formed; also showing the way in which the adhesive covering of the egg forms disk-like accumulations where they come in contact with each other or with flat surfaces.

FIG. 38. A more advanced stage of the development of the same species, showing the very thick blastoderm in optic section.

FIG. 39. A still more advanced stage of the same species.

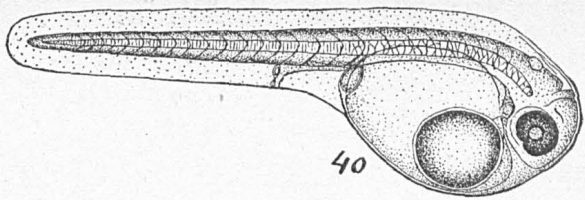

36
37
39
38
m
z
a
g
35

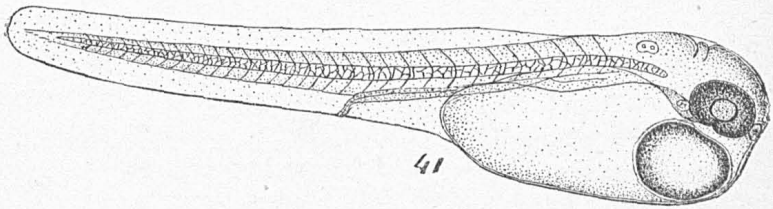
Blank page retained for pagination

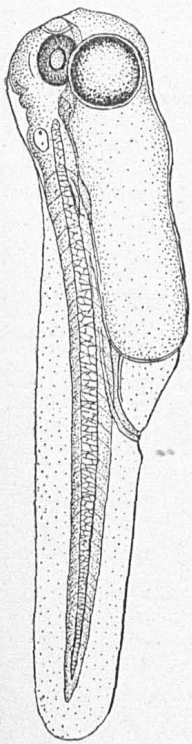
EXPLANATION OF PLATE IX.

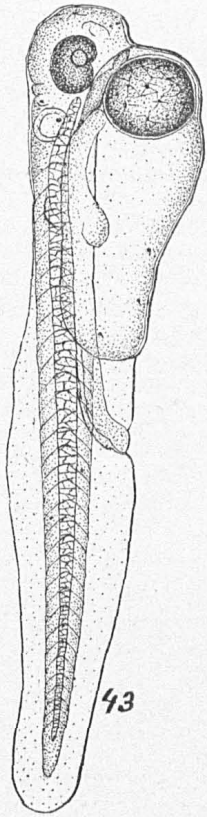
ROCCUS AMERICANUS. (*The White Perch.*)

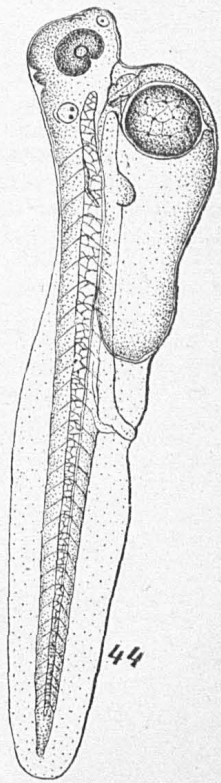
FIG. 40. The just hatched embryo. x 32.
FIG. 41. The young white perch one day old. x 32.
FIG. 42. The same, three days old. x 32.
FIG. 43. The same, five days old. x 35.
FIG. 44. The same, six days old. x 32.


40


41


42


43


44

Blank page retained for pagination

EXPLANATION OF PLATE X.

SCOMBEROMORUS MACULATUS. (*Spanish Mackerel.*)

FIG. 46. Cross-section through nasal region of young embryo; *na*, nasal pit. x 65.

FIG. 47. Cross-section through region of the optic crus. x 65.

FIG. 48. Cross-section through mid-brain, trabeculæ cranii *tr*, and eyes. x 65.

FIG. 49. Section through a segmental sense-organ of the lateral line. x 250.

FIG. 50. Cross-section through back part of mid-brain, infundibulum, eyes, and optic nerves. x 65.

FIG. 51. Cross-section through fore part of medulla oblongata. x 65.

FIG. 52. Cross-section through the auditory vesicle *au*, a segmental sense-organ *ss*, front end of chorda, heart, and branchial region. x 65.

FIG. 53. Longitudinal vertical section through the head of an embryo near the median line; *h*, heart; *p*, periblast; *pc*, pericardiac cavity; *tr*, cranial trabecula; *o*, space of oil-drop. x 65.

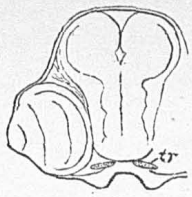
FIG. 54. Cross-section through the pectoral region; *sd*, segmental duct; *p*, periblast; *p'*, pectoral fin. x 65.

FIG. 55. Cross-section through the tail. A segmental sense-organ has been cut through at one side. x 65.

FIG. 56. Longitudinal nearly median vertical section through the head, trunk, and yelk-sack of an embryo; *ch*, chorda; *m*, myotomes; *sd*, segmental duct; *al*, urinary bladder; *pn*, pronephric funnel; *i*, intestine; *p*, periblast; *o*, space occupied by oil-drop; *h*, heart; *pc*, pericardiac cavity; *tr*, cranial trabecula. x 65.

46

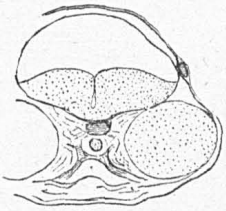
47



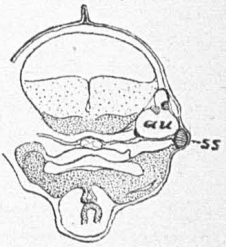
48

49

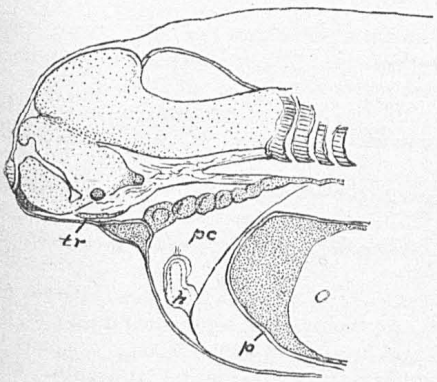
50



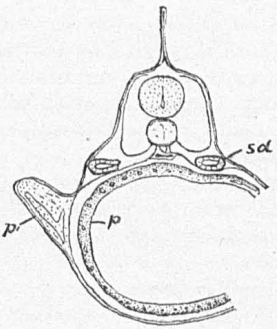
51



52

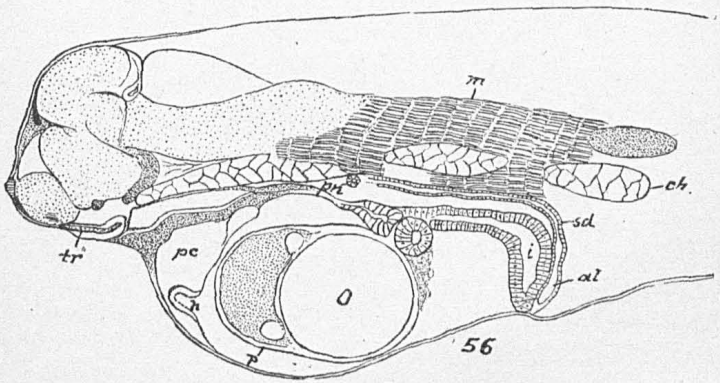


53



54

55



56

Blank page retained for pagination

EXPLANATION OF PLATE XI.

CHÆTODIPTERUS FABER. (*The Moonfish.*)

FIG. 57. Blastodisk of an unimpregnated egg, viewed from the side.

FIG. 58. Mature egg, showing the position of the oil-drop, and with the blastodisk formed.

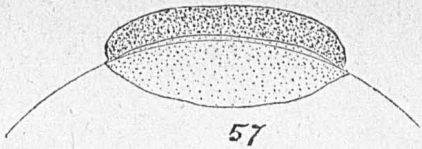
FIG. 59. Blastodisk, with about 32 cells, viewed from above, and showing the subquadrate form usually assumed at this stage.

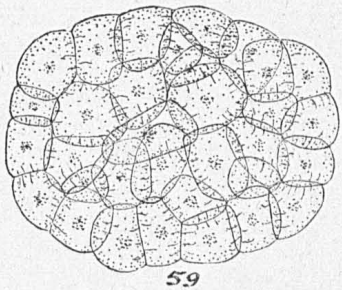
FIG. 60. Entire egg, with the blastodisk developed to about the condition represented in the preceding figure.

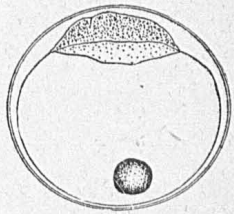
FIG. 61. The blastodisk of *Chætodipterus* more advanced in development, with the large marginal, flattened cells very apparent.

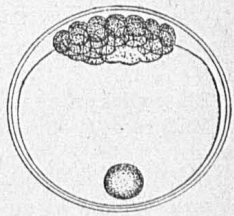
FIG. 62. An egg in which the embryo is apparent, the oil-drop covered by periblast cells, pigment cells developed, and Kupffer's vesicle formed.

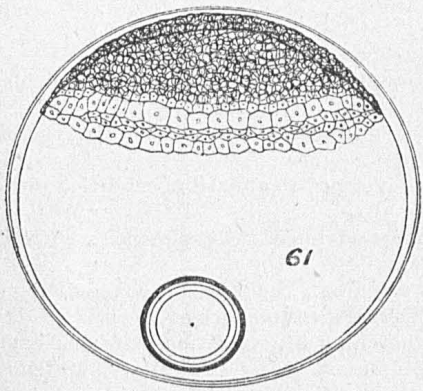
FIG. 63. An embryo sixteen hours after hatching, showing the increased capacity of the cleavage space *sc*, due to the rapid absorption of the yelk; the pigment cells aggregated at definite points.

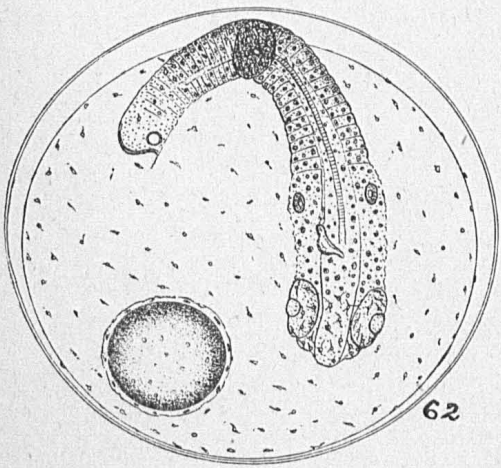

57

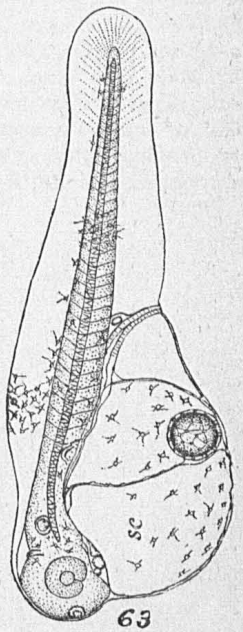

59


58


60


61


62



63

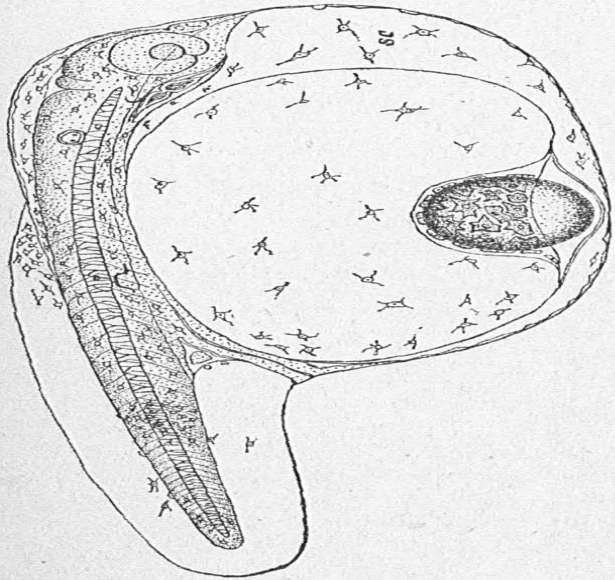
Blank page retained for pagination

EXPLANATION OF PLATE XII.

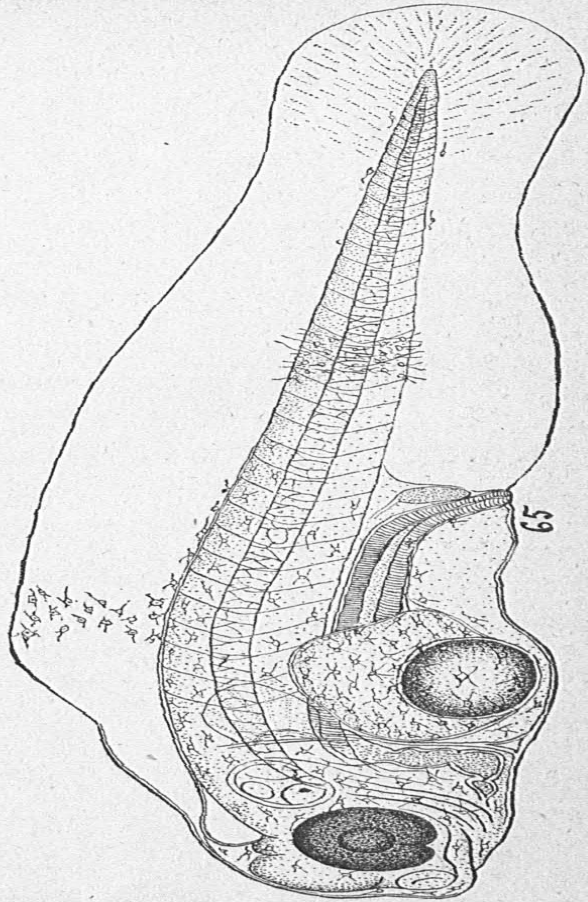
CHÆTODIPTERUS FABER. (*The Moonfish.*)

FIG. 64. Young fish just hatched, with the oil-drop lying at the inferior side of the yelk, partly invested by cells derived from the periblast.

FIG. 65. Young fish twenty-eight hours after hatching, showing the yelk nearly absorbed.



64



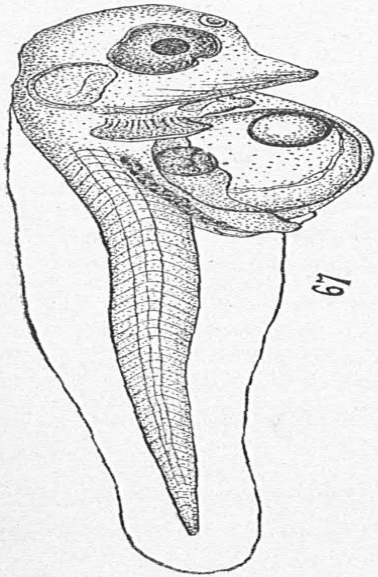
65

Blank page retained for pagination

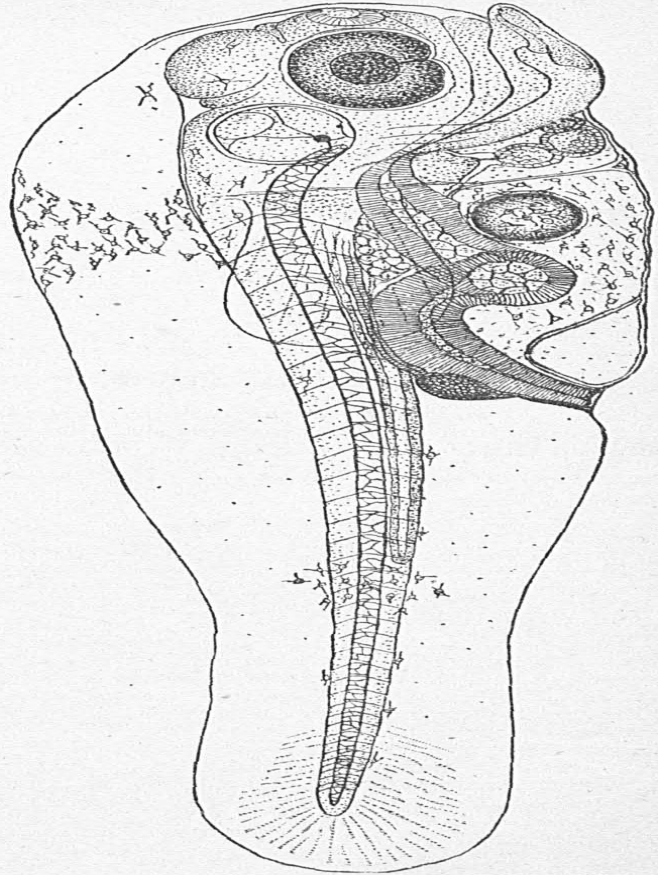
EXPLANATION OF PLATE XIII.

FIG. 66. Young *Chætodipterus faber*, sixty-three hours after hatching.

FIG. 67. Young tom-cod, *Gadus tomcod*, just after hatching, drawn from a dead specimen, the mouth being thrown wide open. x 24.



67



99

Blank page retained for pagination

EXPLANATION OF PLATE XIV.

CLUPEA SAPIDISSIMA. (*The Common Shad.*)

FIG. 68. The freshly extruded egg enlarged, showing its envelope much wrinkled and its surface covered with small round vesicles.

FIG. 69. An optic section of the periphery of the preceding more enlarged, showing the *zona z*, the cortical layer *cl*, with its embedded vesicles, and the large yelk-spheres *y* surrounded by their films of protoplasm.

FIG. 70. A shad's egg, showing the vitellus and distended egg-membrane, natural size.

FIGS. 71, 72, and 73. Represent three stages in the development of the blastodisk of the shad's egg at the lateral pole of the vitellus.

FIG. 74. Shows the gradual accumulation of the germinal matter at one pole of the egg, the polar prominence externally, and the presence of plasmic processes extending down through the vitellus.

FIG. 75. Shad ovum with the blastodisk just forming, viewed from above.

FIG. 76. Shad ovum with the blastodisk formed and with protoplasmic processes passing from its under surface down into the vitellus.

FIGS. 77 and 78. Views in optic section of shad ova at the time the first cleavage furrow is developed.

FIG. 79, *a*, *b*, *c*, *d*, *e*, *f*. The changes which the polar prominence shown in fig. 74, underwent at short intervals of time, during half an hour, till the polar cells were detached.

FIG. 80. Surface view from above of the blastodisk of the shad, at the time of the first cleavage.

FIG. 81. A similar view of an older blastodisk at the time of the completion of the second cleavage.

FIG. 82. Side view of a similar stage.

FIG. 83. Side view of blastodisk which has abnormally segmented into five cells.

FIG. 84. Blastodisk actively segmenting, and rapidly approaching the sixteen-celled stage. The irregularities in the form of the cells is due to the unequal contractions of their plasma.

FIG. 85. Blastodisk composed of four cells at the time of the second cleavage; side view.

FIGS. 86 and 87. Oblique views of two different blastodisks at the end of the third cleavage after eight cells have been developed.

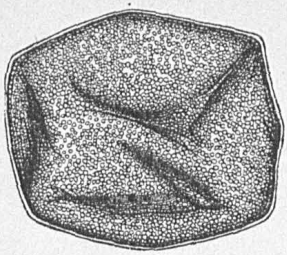
FIG. 88. Side view of a blastodisk at the same stage as the preced

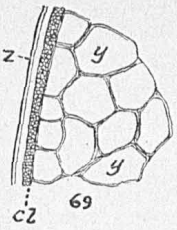
FIG. 89. Side view of a blastodisk during the active stage of the fourth cleavage.

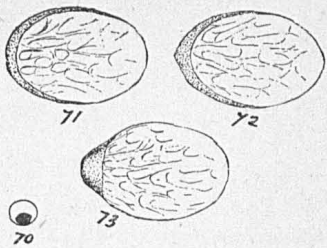
FIG. 90. Surface view of a blastodisk which has advanced somewhat beyond the fifth cleavage, or thirty-two celled stage.

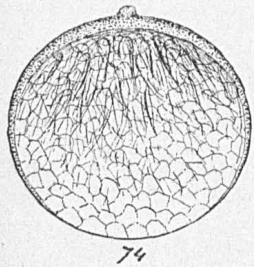
FIG. 91. Optic section through a still more advanced stage of the development of the blastodisk, when the latter is composed of three to four layers of cells.

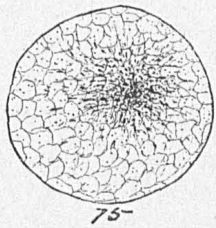
FIG. 92. Blastodisk at the time it has assumed the lenticular form, and is composed of very small cells, just before it begins to spread over the yelk. Optic section.

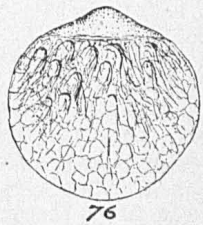

68

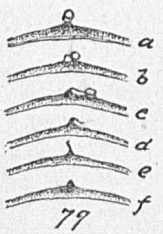

z
y
y
cz
69

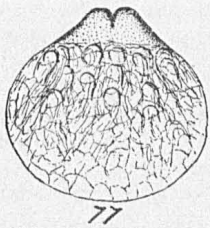

71
72
73
70

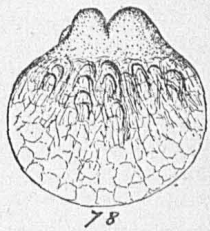

74

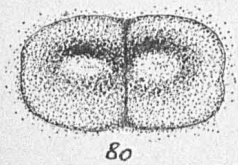

75

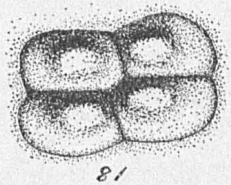

76

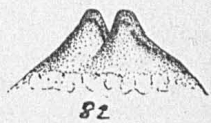

a
b
c
d
e
f
79

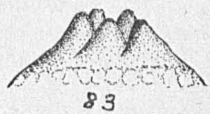

77

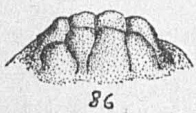

78

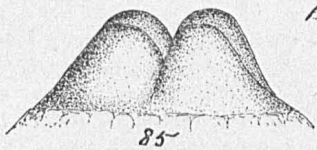

80


81

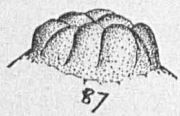

82

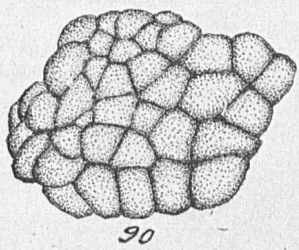

83

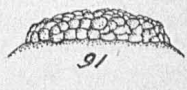

86


85

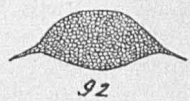

84


87


90


91


88


92


89

Blank page retained for pagination

EXPLANATION OF PLATE XV.

CLUPEA SAPIDISSIMA. (*The Common Shad.*)

FIG. 93. Section through the blastodisk of an egg at a stage intermediate between those represented in figs. 91 and 92.

FIG. 94. A section of the germinal pole, same egg, near the edge of the blastodisk, showing the thick layer of periblast just under its margin.

FIG. 95. Section through a blastodisk somewhat older than that shown in fig. 92, showing the epidermal layer differentiated and with large nuclei at one side embedded in the periblast.

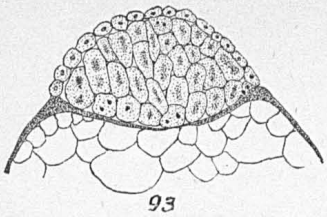
FIG. 96. Sagittal section through a more advanced stage, showing the cleavage cavity *sc* beneath the central portion of the epiblast *e*, and the inflected hypoblastic layer *h* just within the lips *o o* of the blastopore.

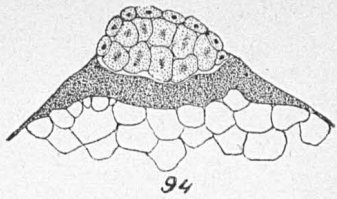
FIG. 97. Portion of a longitudinal vertical section of the side of the body of an embryo at the stage represented in fig. 98, to show that the solid myotomes *M M M* are more intimately united to the hypoblast *h* than to the epiblast *e*. Very much enlarged.

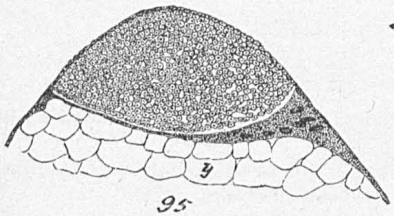
FIG. 98. Semidiagrammatic longitudinal median section through an embryo after the blastopore has closed, to show the position of the first myotomes and the continuity of the chorda *ch* posteriorly with the lower or hypoblastic layer; *sc*, cleavage cavity.

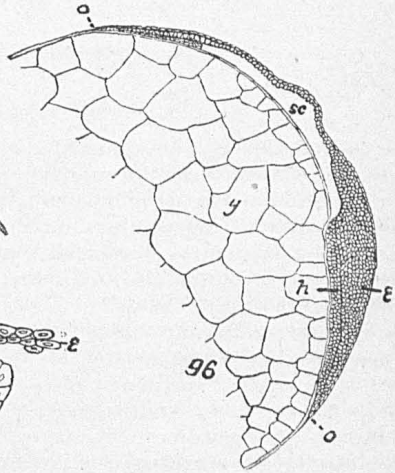
FIG. 99. Median longitudinal section through the head of a more advanced embryo, through the nasal pit, eye, gill-arches, brain, and chorda, and showing the relations of the periblast *p*.

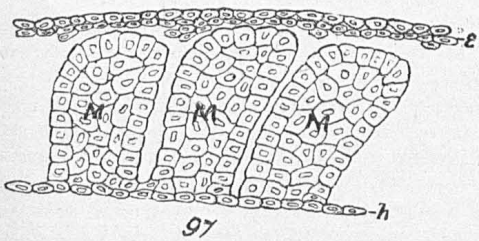
FIG. 100. A similar section of the same stage somewhat off of the median line. The auditory capsule *au* is cut through, also the gill-arches, the heart *h*, and the oral cavity *b* above the latter.

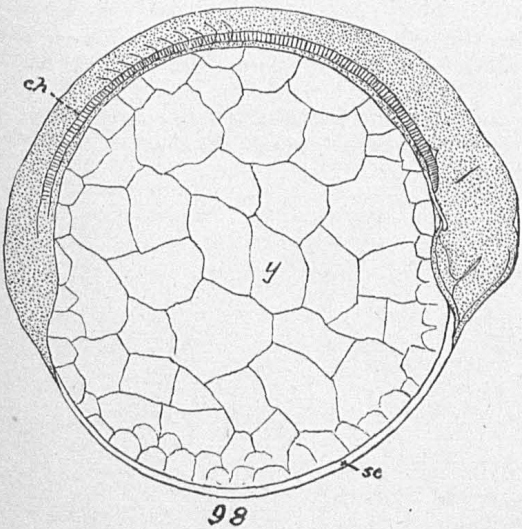

93

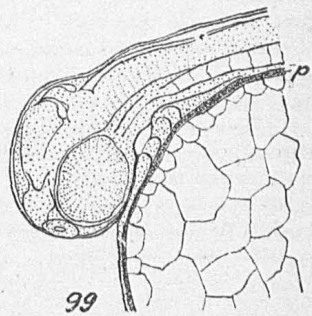

94

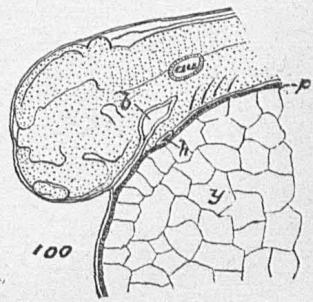

y
95


o
sc
y
h
ε
96
o


ε
M
M
M
h
97


ch
y
sc
98


p
99


au
p
h
y
100

Blank page retained for pagination

EXPLANATION OF PLATE XVI.

CLUPEA SAPIDISSIMA. (*The Common Shad.*)

FIG. 101. An embryo shad, somewhat older than the stage represented in section in fig. 98, in its natural position in its spacious enveloping membrane. From a photograph.

FIG. 102. An embryo of the same age drawn without details, and showing the position of Kupffer's vesicle at *kv*, and the heart *h*.

FIG. 103. A still more advanced embryo, showing the hind gut *hg* just under the outgrowing tail.

FIG. 104. Cross-section through the budding tail of an embryo of the preceding stage, showing the relations of the muscle plates *m m* to the nervous cord *N*, the chorda *ch*, and the post-anal section of the intestine *i*. The median fin-folds are still quite rudimentary, and are developed as very slight, ridge-like folds of the skin above and below in the median line.

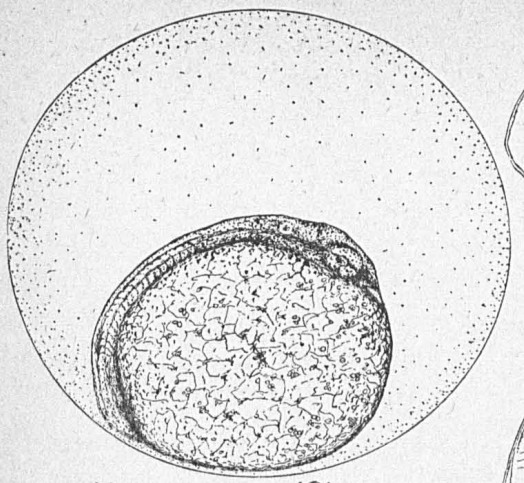
FIG. 105. A similar cross-section of an embryo of the same age, somewhat farther forward.

FIGS. 106 and 107. Cross-sections through the body of an embryo somewhat younger than that represented in fig. 102. The hypoblastic layer has not yet been differentiated into the intestine at *i*. The nervous cord *N* is still continuous with the epiblast *e* of the embryo. The chorda *ch* and muscle plates have been differentiated.

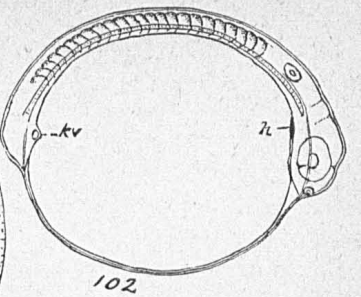
FIG. 108. A similar cross-section through the anterior part of the trunk of an embryo of the same age as that from which the preceding sections were prepared.

FIGS. 109, 110, 111, and 112. Four cross-sections through different regions of the body cavity of a much more advanced embryo, the first being the most anterior. The nervous cord *N* is detached from the skin, the segmental ducts are well defined, and the intestine *i* has a narrow lumen.

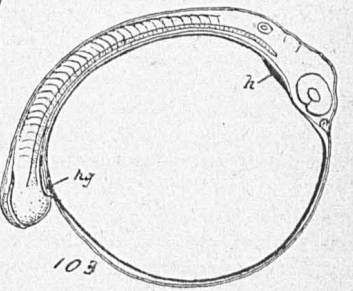
FIG. 113. Diagrammatic representation of an embryo of about the age of the one represented in fig. 103, but unrolled from the vitellus, to show the course of the segmental ducts *sd* and the extension outward of the pectoral plates *pp*, which are intimately concerned in the development of the pectoral fins.



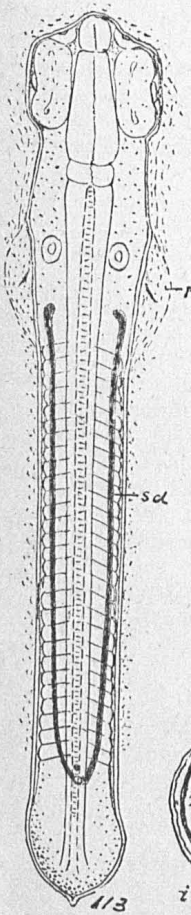
101



102

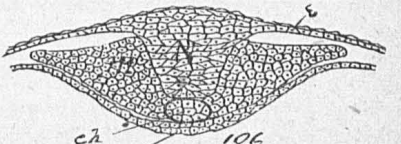


103

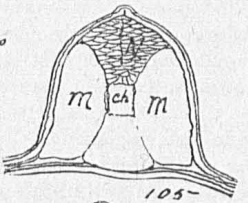


113

104

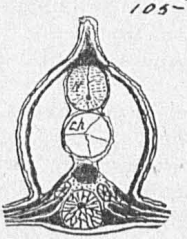


106

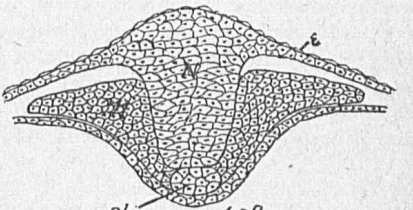


105

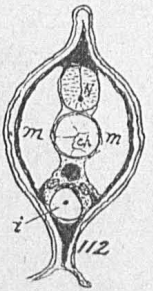
107



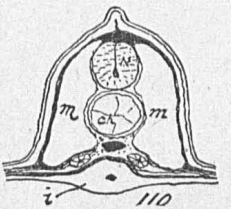
111



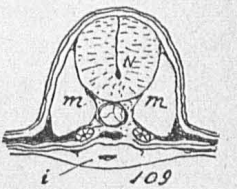
108



112



110



109

Blank page retained for pagination

EXPLANATION OF PLATE XVII.

CLUPEA SAPIDISSIMA. (*The Common Shad.*)

FIGS. 114, 115, 116, and 117. Four views of successive stages of the development of the head and optic lobes of the embryo shad, commencing with the stage when the front end of the head of the embryo is visibly differentiated when viewed as a transparent object with transmitted light.

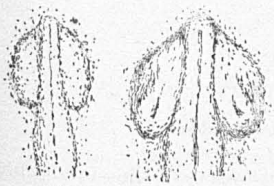
FIG. 118. Section through the spreading blastoderm of the shad at a somewhat earlier stage than that shown in fig. 96; *h*, hypoblast; *e*, epiblast; *sc*, segmentation cavity; *o o*, lips of the blastopore.

FIG. 119. Diagrammatic sagittal section through the embryonic axis *e* of a shad egg, the blastoderm of which has enveloped one-half of the vitellus. The jagged line represents the lateral limit of the cleavage cavity *sc*.

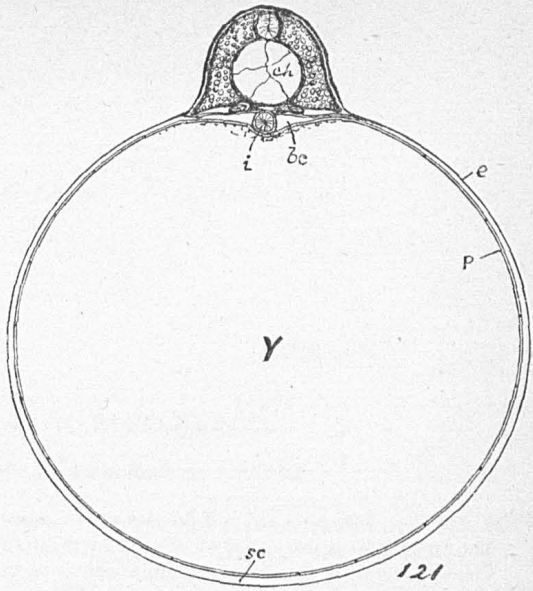
FIG. 120. Egg of the shad in which the blastopore has just closed. Only four myotomes have been developed in the mid-region of the embryonic axis.

FIG. 121. Cross-section through the body and yelk-sack of a young shad in about the condition of development represented in fig. 127; *ch*, the thick chorda; *i*, intestine; *bc*, body cavity; *p*, periblast or splanchnopleure investing the yelk *y*; *sc*, cleavage cavity; *e*, thin outer epiblastic investment of the yelk.

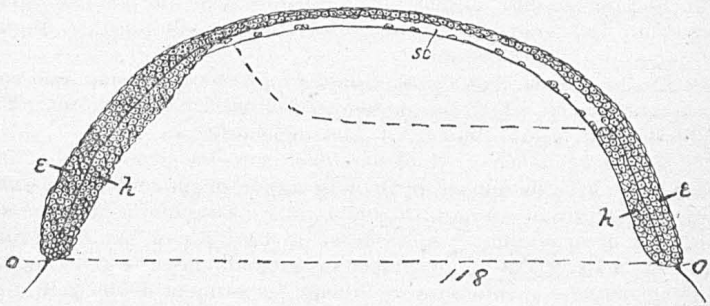
114 115



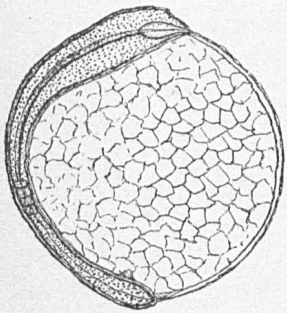
116 117



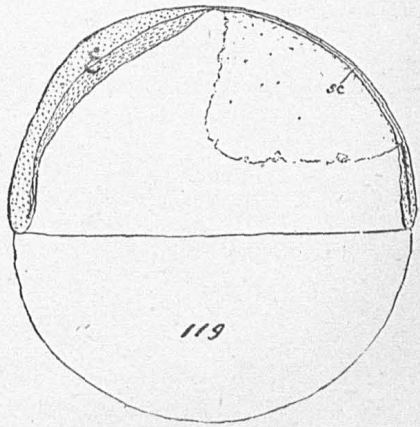
121



118



120



119

Blank page retained for pagination

EXPLANATION OF PLATE XVIII.

CLUPEA SAPIDISSIMA. (*The Common Shad.*)

FIGS. 122 and 123. Two views of unhatched embryos of nearly the same age, which developed in a temperature of 45° F., producing distortions of the tail and notochord. From photographs.

FIG. 124. Egg which was impregnated at a normal temperature and which developed the blastodisk in a normal way, but subsequently, exposed to a temperature of 45° F., the blastodisk was distorted as here shown. From a photograph.

FIG. 125. Transparent view from below of front end of an embryo at about the time the mouth is formed.

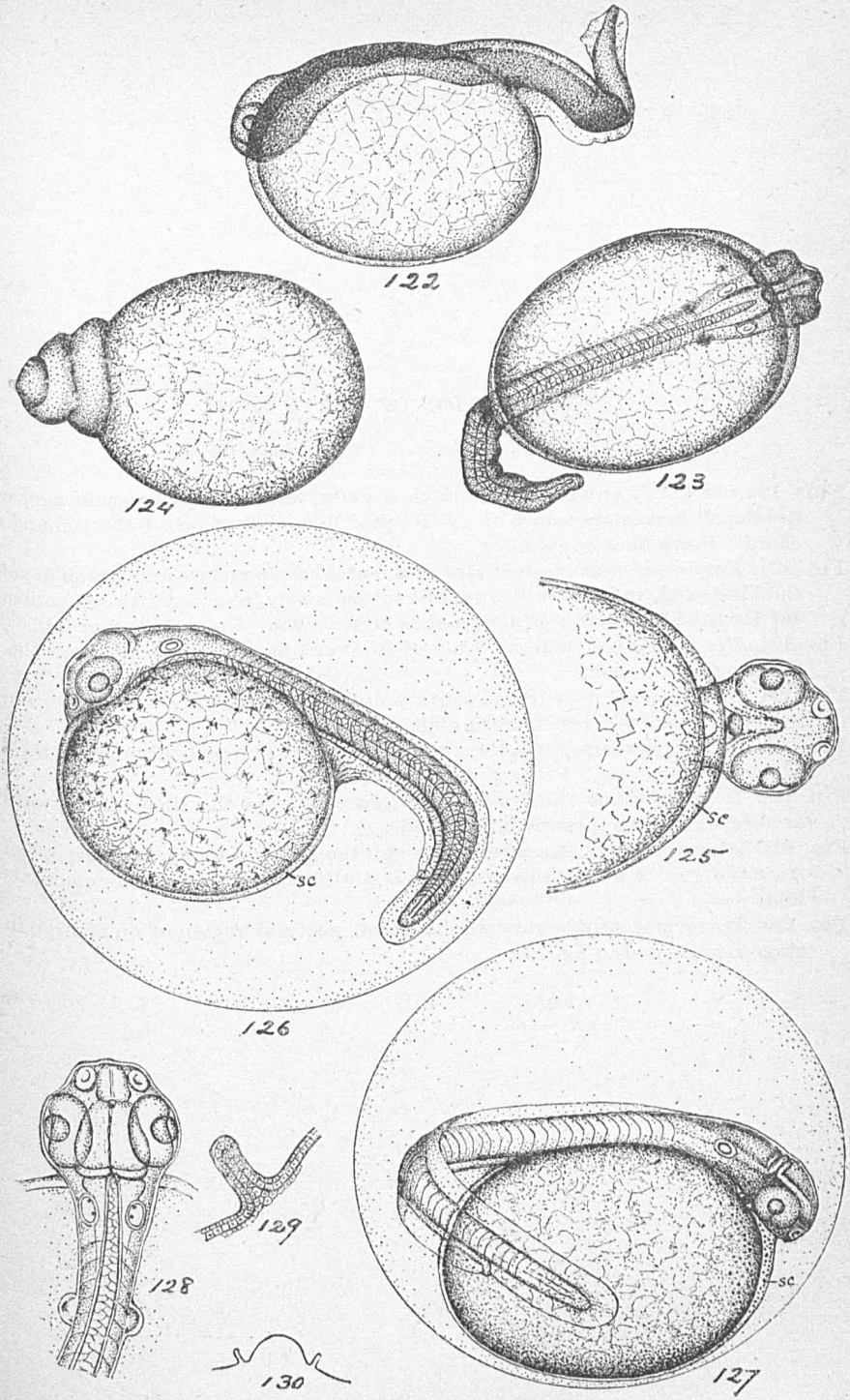
FIG. 126. An egg-envelope with its contained embryo, forty-four hours after impregnation, viewed as a transparent object.

FIG. 127. An egg-envelope with its contained embryo at the beginning of the third day of development. From a photograph.

FIG. 128. Dorsal view of the front part of an embryo at the time the pectoral fins are beginning to appear as lateral folds.

FIG. 129. Diagrammatic cross-section through the pectoral fin of an embryo, to illustrate the way in which the mesoblast is proliferated into the integumentary finfold.

FIG. 130. Transverse profile view of the dorsal pectoral region of an embryo in the stage represented in fig. 128.


122
123
124
sc
125
sc
126
128
129
130
sc
127

Blank page retained for pagination

EXPLANATION OF PLATE XIX.

CLUPEA SAPIDISSIMA. (*The Common Shad.*)

FIG. 131. Pneumatic duct *pn*, rudimentary stomach *st*, pylorus *py*, and swollen anterior part of hind gut *I*, and back part of œsophagus *oe*, of a young shad 22mm long, which had acquired ventral fins. From a specimen three weeks old reared in confinement.

FIG. 132. View from above of the head of a young shad fourteen days old, showing the relations of the auditory capsules, brain, and eyes.

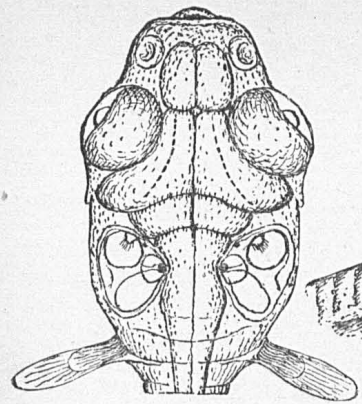
FIG. 133. Side view of a young shad thirteen days old, viewed as a transparent object. *ab* rudimentary air-bladder, *L* liver, *Gb* gall-bladder.

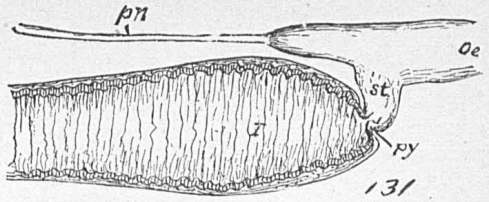
FIGS. 134 and 135. Two views of the heads of embryos nearly ready to hatch, showing the rudimentary gill-arches and pectoral fin, nasal pits, wide oral fossa, and short lower jaw. Drawn from opaque specimens hardened in chromic acid.

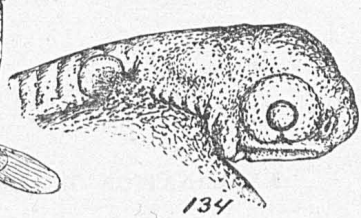
FIG. 136. An embryo in its envelope, on the third day of development, nearly ready to hatch.

FIGS. 137, 138, and 139. A lateral, a posterior, and a view from above of the blastoderm of the shad, just at the time the cleavage cavity, *so*, is beginning to be evident, the tail swelling, *s*, formed, and the hypoblast developed by inflection of the edge of the blastoderm.

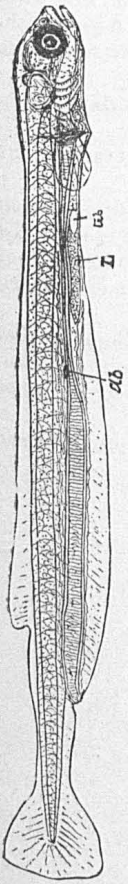
FIGS. 140 and 141. Two views of an egg after the blastoderm has spread considerably and the embryonic area *e* is well defined. From photographs.

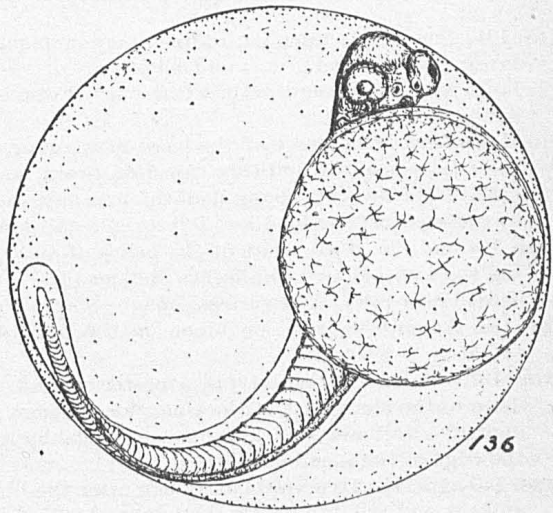

132


pn
Oe
st
py
131

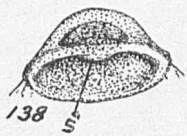

134

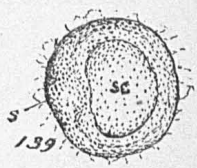

135

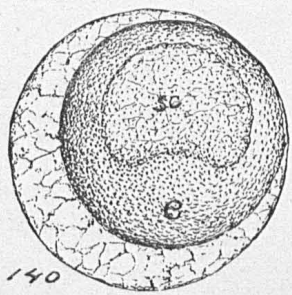

ab
D
ab
133

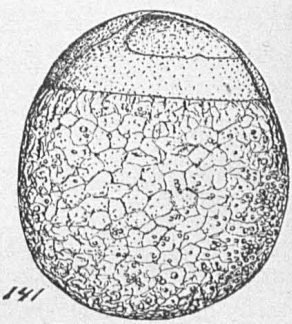

136


137
s


138
s


sc
s
139


sc
e
140


141

Blank page retained for pagination

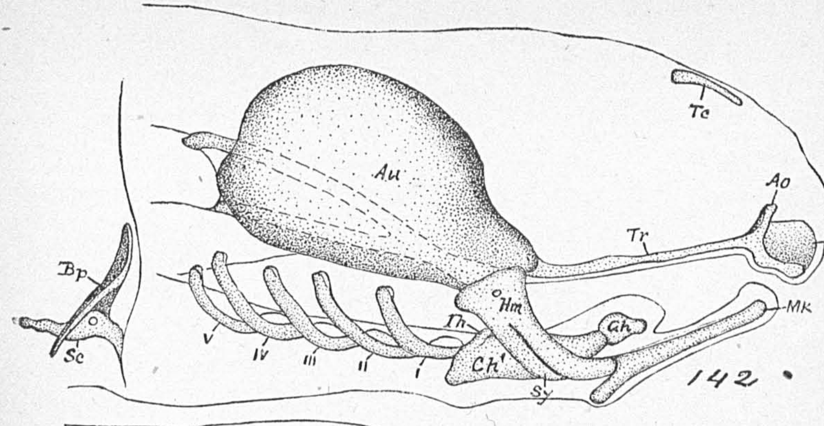
EXPLANATION OF PLATE XX.

CLUPEA SAPIDISSIMA. (*The Common Shad.*)

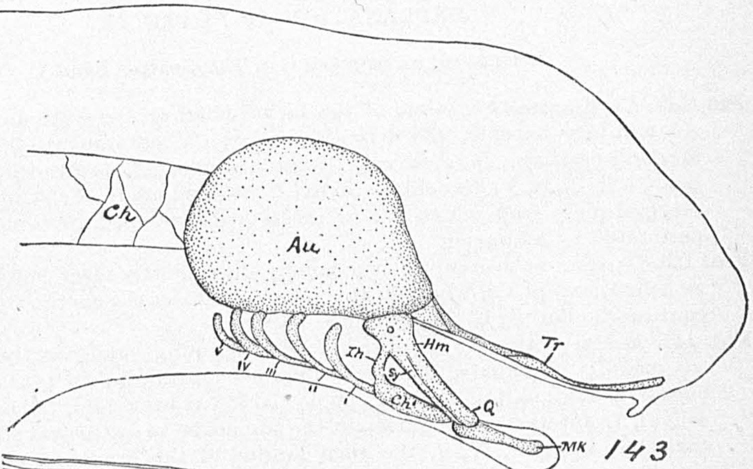
FIG. 142. Cartilaginous cranium of the larval shad on the sixth day after hatching. *Au* auditory capsule, *Hm* hyomandibular, *Ch'* ceratohyal, *Gh* glossohyal, *Mk* Meckel's cartilage, *Ih* interhyal, *Tr* cranial trabecula, *Ao* autorbital process, *R* rostrum, i, ii, iii, iv, v, branchial arches; *Te* tegmen cranii, *Sy* symplectic, *Bp* basipterygial plate from which the actinosts are developed, *Sc* coraco-scapular plate perforated by a foramen.

FIG. 143. Cartilaginous cranium of a young shad shortly after hatching. Lettering as before, except *Ch*, which in this figure indicates the chorda; *Q* the quadrate, *a* continuation of the hyomandibular.

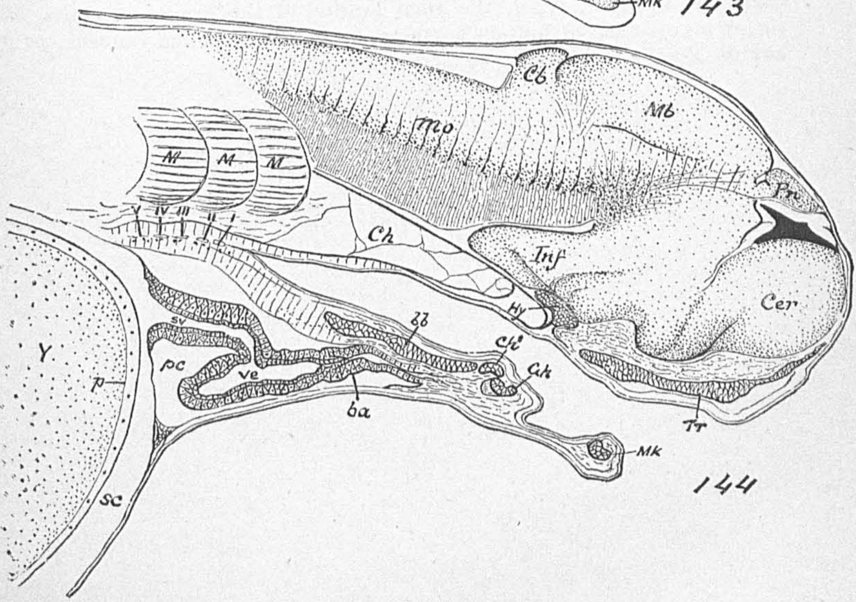
FIG. 144. Mesial section through the head of a young shad shortly after hatching. *mo* medulla oblongata, *Cb* cerebellum, *mb* mid-brain, *Pn* pineal body, *Cer* cerebrum, *Inf* infundibulum, *Hy* hypophysis, *bb* basibranchial, *Ch'* basihyal, *Gh* glossohyal, *Tr* anterior prolongation of the trabeculæ as the rostral plate, *Mk* Meckel's cartilage, i, ii, iii, iv, v, the open lumina of the branchial clefts, *M M M* anterior myotomes, *ba* bulbus aortæ, *ve* ventricle, *sv* sinus venosus, *pc* pericardia cavity, *Y* yelk, *p* periblast, *sc* cleavage cavity.


Tc
Au
Ao
Tr
R
Bp
Sc
Hm
Mk
Gh
Ih
V
IV
III
II
I
Ch'
Sy

142


Ch
Au
Hm
Tr
Ih
Sy
Ch'
Q
Mk
V
IV
III
II
I

143


Cb
Mb
Mo
M
M
M
Pn
V
IV
III
II
I
Ch
Inf
Cer
Hy
Y
p
sv
pc
ve
bb
ba
Ch'
Gh
Tr
Mk
sc

144

Blank page retained for pagination

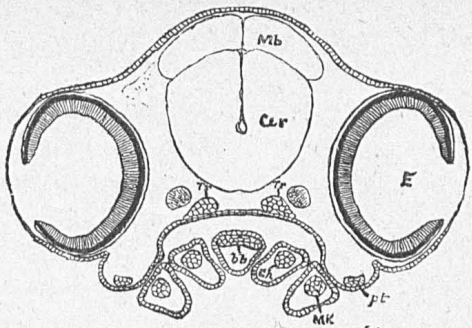
EXPLANATION OF PLATE XXI.

CLUPEA SAPIDISSIMA. (*The Common Shad.*)

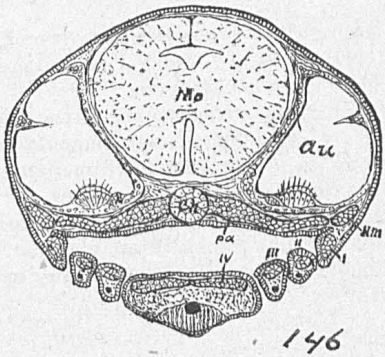
FIG. 145. Cross-section through the region of the eyes of an embryo ten days old; *bb* basibranchial, *ch* ceratohyal, *MK* Meckel's cartilage, *pt* palatine, *Tr* trabeculæ cranii, *E* eye, *Mb* mid-brain, *Cer* cerebrum.

FIG. 146. Cross-section through the anterior part of the auditory region of the same embryo; *au* auditory vesicle with acoustic macula or end organ in its lower wall, *Mo* medulla oblongata, *Ch* chorda, *Hm* upper end of hyomandibular, *i*, *ii*, *iii*, and *iv* branchial arches, *pa* parachordal cartilages.

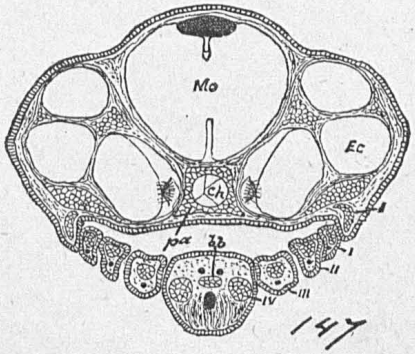
FIG. 147. Cross-section through the posterior part of the auditory region of the same; lettering the same, except that the basibranchial bar *bb* is cut through, as well as the whole five branchial arches, also the auditory canals and vestibule of the membranous labyrinth.



145



146



147

Blank page retained for pagination

EXPLANATIONS OF PLATE XXII.

CLUPEA SAPIDISSIMA. (*The Common Shad.*)

FIG. 148. Young fish on the third day after hatching, viewed as a transparent object to show the extension of the segmental duct forward; the chorda *ch*, and liver *L*.

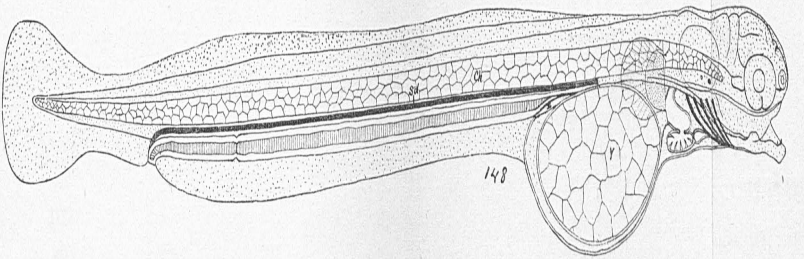
FIG. 149. Young fish immediately after hatching, viewed as an opaque object and somewhat obliquely from one side, so as to display the relations of branchial and hyomandibular arches, and the position of the pectoral fin.

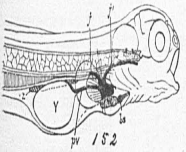
FIG. 150. Young fish seventeen days after hatching, viewed partly as an opaque and partly as a transparent object; *py* pylorus and rudimentary air-bladder above it; *I* intestine, filled with the remains of ingested food. The opercula are already so far developed as partly to conceal the branchiæ.

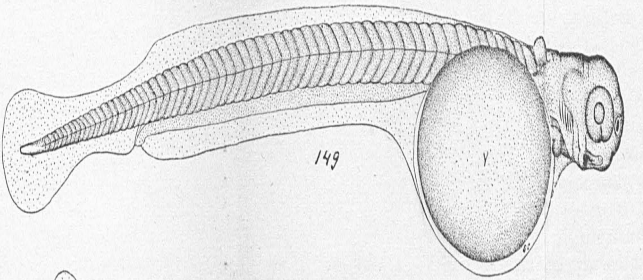
FIG. 151. Young fish five days after hatching, very much enlarged, and viewed as an opaque object. Only a slight remnant of the yelk-sack *Y* remains.

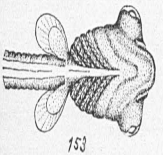
FIG. 152. Anterior portion of a young fish on the fourth day. To show the relations of the liver *L* to the yelk *Y*, over which the portal vessel *pv* passes forward to empty into the venous sinus, in common with the anterior and posterior jugulars *j'* and *j*, *ba* bulbus aortæ, *ve* ventricle.

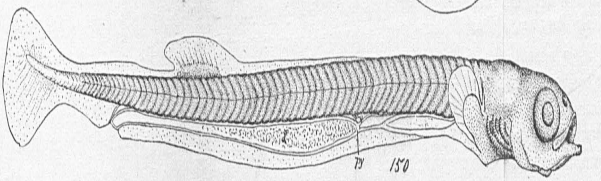
FIG. 153. View of the fore part of a young fish seventeen days old, from the ventral side.

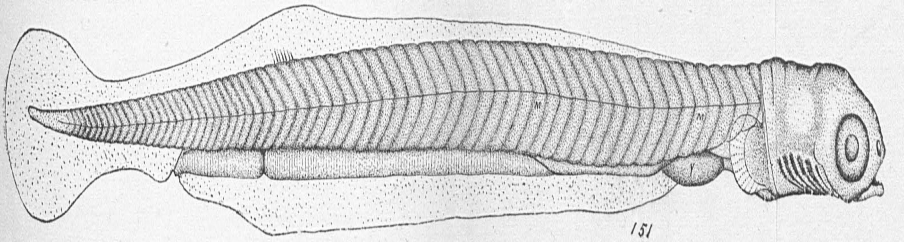

148


152


149


153


150


151

Blank page retained for pagination

EXPLANATION OF PLATE XXIII.

ICTALURUS ALBIDUS. (*White Cat-fish.*)

FIG. 154. Embryo of the second day removed from its envelope; *b* rudimentary branchial arches and clefts, *e* eye, *m m* myotomes, *p* pectoral plate or thickening. Drawn from a hardened specimen. x 24.

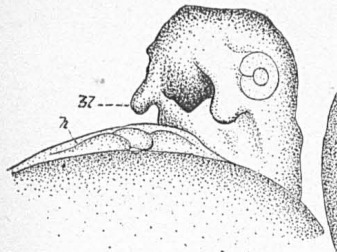
FIG. 155. Living embryo of the second day freed from its envelope, and viewed as a transparent object. x 16.

FIG. 156. Head of embryo on the third day, viewed from in front and somewhat obliquely; *h* heart, *bl* maxillary barbel. x 16.

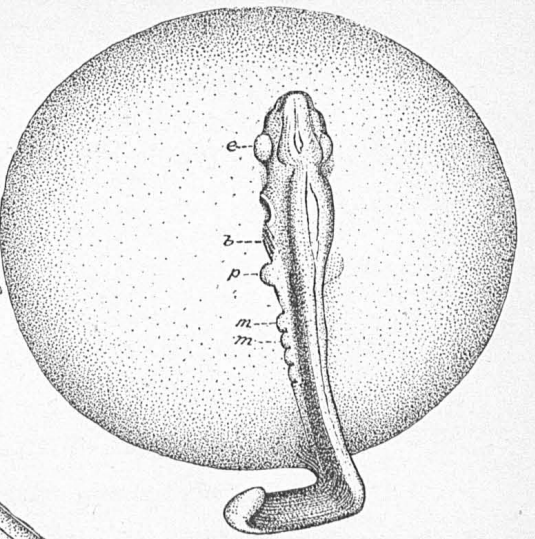
FIG. 157. Head of embryo on the third, from in front, viewed as an opaque object; *bl* maxillary barbels, *h* heart, *n* nasal grooves. x 24.

FIG. 158. Head of embryo on the third day, from the side, viewed as an opaque object; *b* branchiæ, *bl* barbels, *m* myotomes, *p* pectoral. x 24.

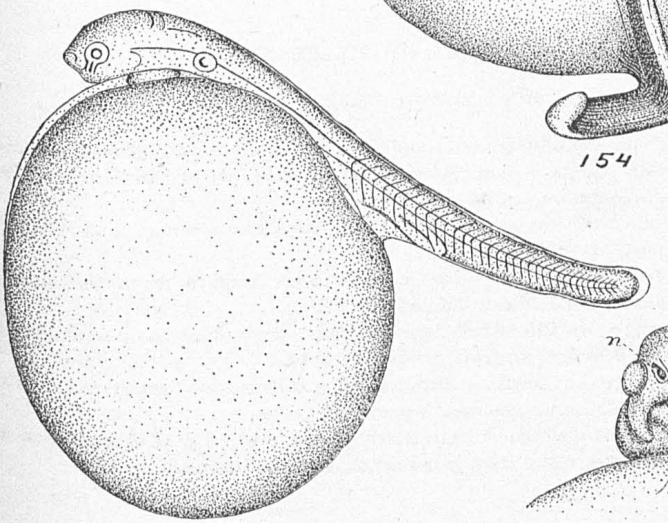
FIG. 159. Embryo of third day freed from its envelope, and viewed from above, as an opaque object; *op* opercular fold, *p* pectoral, *m m* myotomes. x 24.



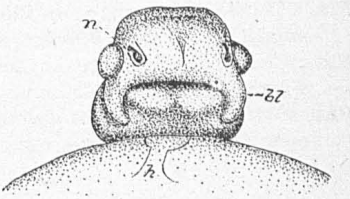
156



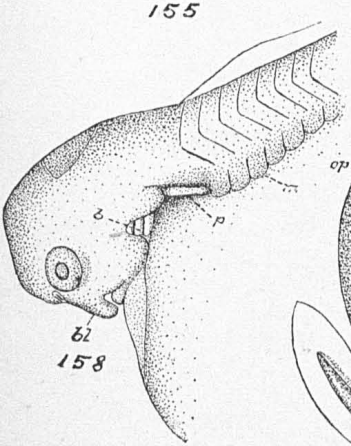
154



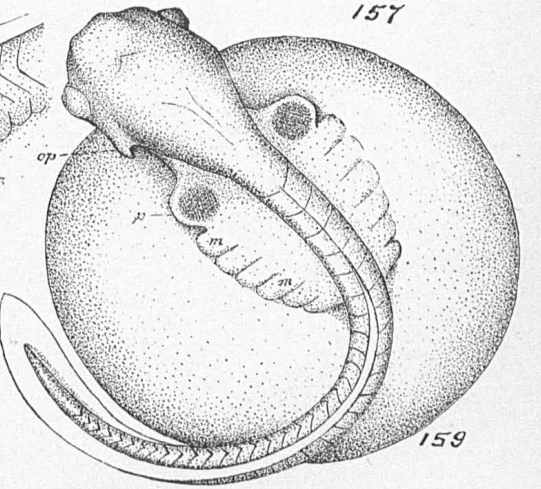
155



157



158



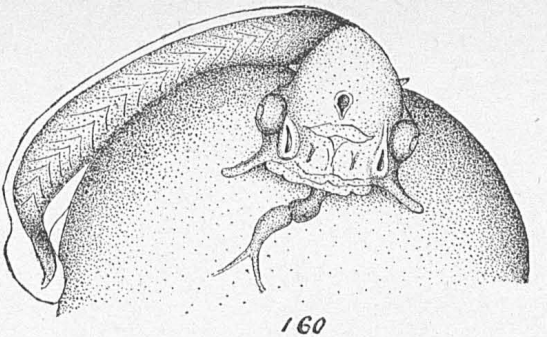
159

Blank page retained for pagination

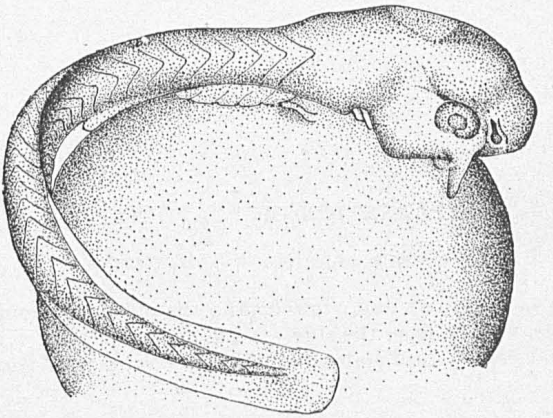
EXPLANATION OF PLATE XXIV.

ICTALURUS ALBIDUS. (*White Cat-fish.*)

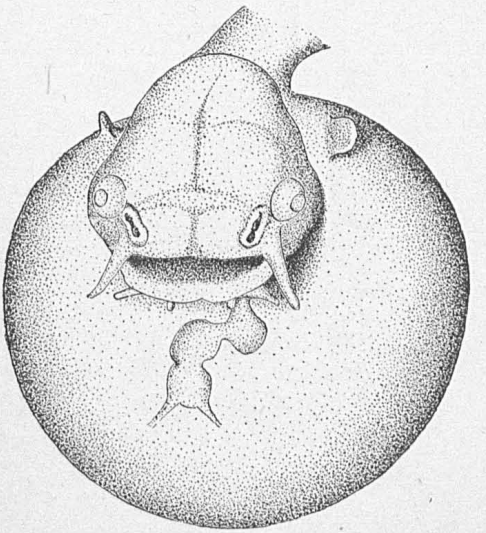
FIG. 160. Embryo on the fourth day, viewed as an opaque object from the front. × 24.
FIG. 161. The same, viewed from the side. × 24.
FIG. 162. Head and yelk-sack of embryo on the fifth day, viewed from in front. × 24.



160



161



162

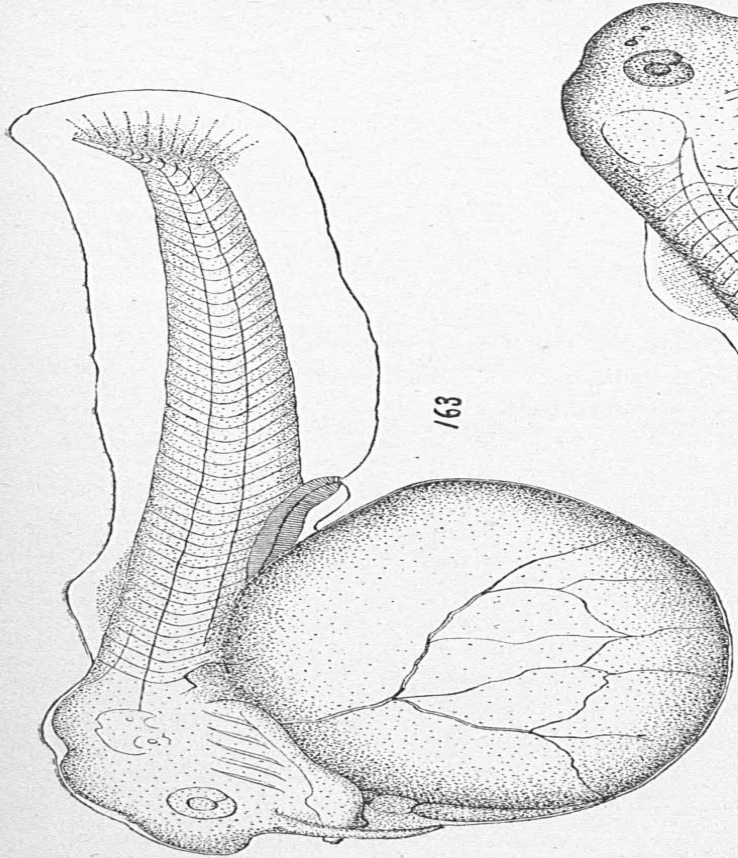
Blank page retained for pagination

EXPLANATION OF PLATE XXV.

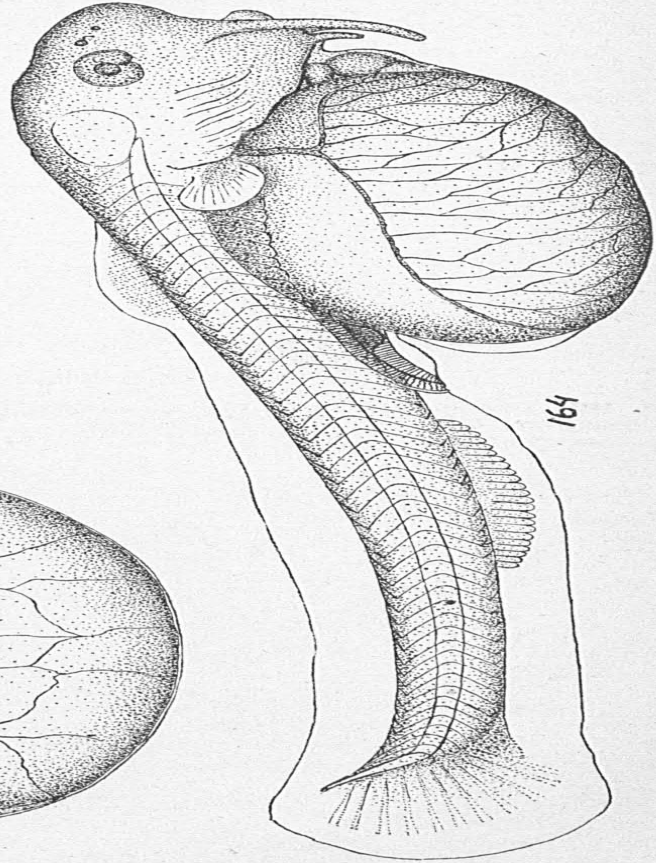
ICTALURUS ALBIDUS. (*White Cat-fish.*)

FIG. 163. Young cat-fish of the sixth day, just hatched, viewed as a transparent object. x 16.

FIG. 164. Young cat-fish of the seventh day, viewed as a transparent object. x 16.



163



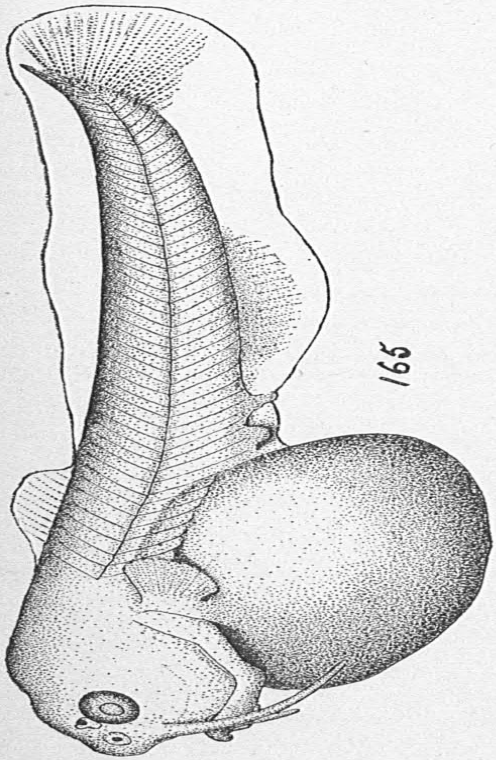
164

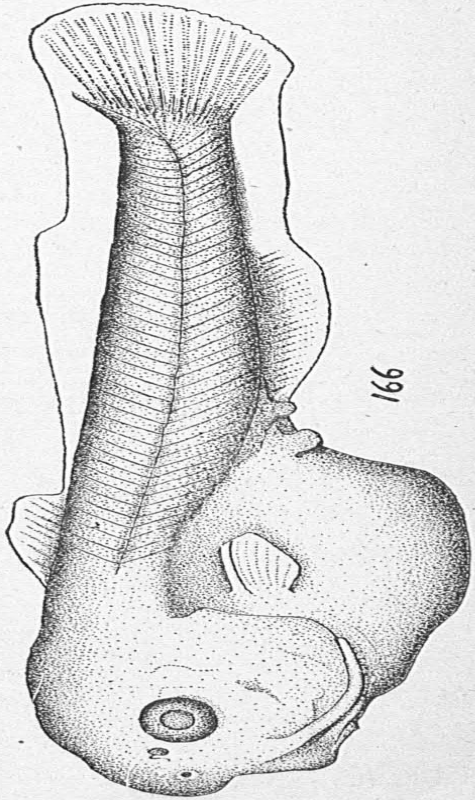
Blank page retained for pagination

EXPLANATION OF PLATE XXVI.

ICTALURUS ALBIDUS. (*White Cat-fish.*)

FIG. 165. Young cat-fish, eight days old, viewed as an opaque object. x 16.
FIG. 166. Young cat-fish, nine days old, viewed as an opaque object. x 16.


165

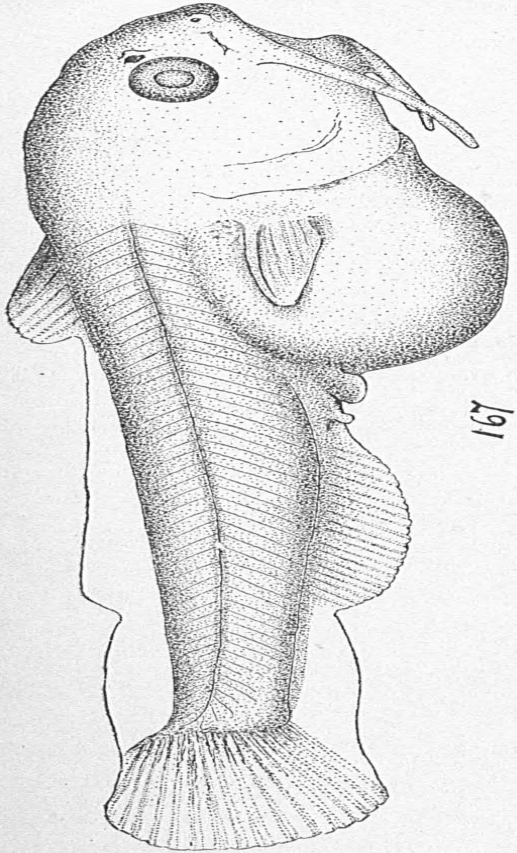

166

Blank page retained for pagination

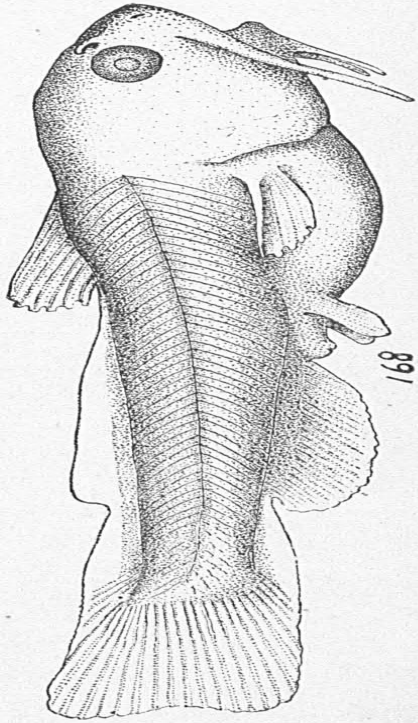
EXPLANATION OF PLATE XXVII.

ICTALURUS ALBIDUS. (*White Cat-fish.*)

FIG. 167. Young cat-fish, ten days old, viewed as an opaque object. x 16.
FIG. 168. Young cat-fish, eleven days old, viewed as an opaque object. x 10.



167



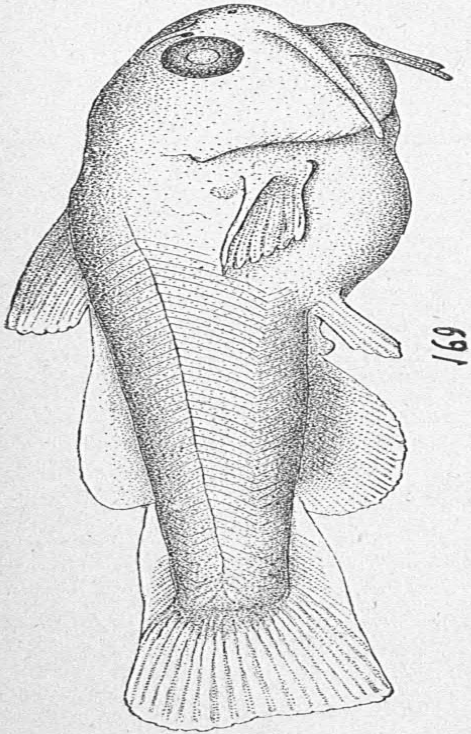
168

Blank page retained for pagination

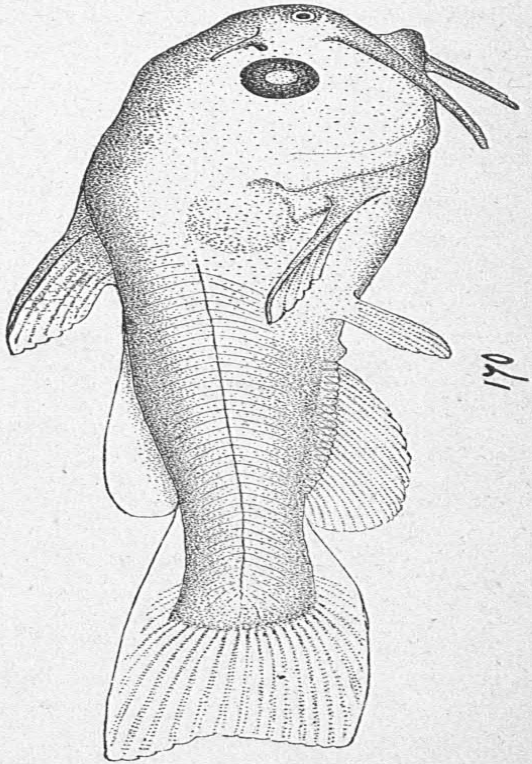
EXPLANATION OF PLATE XXVIII.

ICTALURUS ALBIDUS. (*White Cat-fish.*)

FIG. 169. Young cat-fish, twelve days old, viewed as an opaque object. x 10.
FIG. 170. Young cat-fish, twenty days old, viewed as an opaque object. x 10.



169



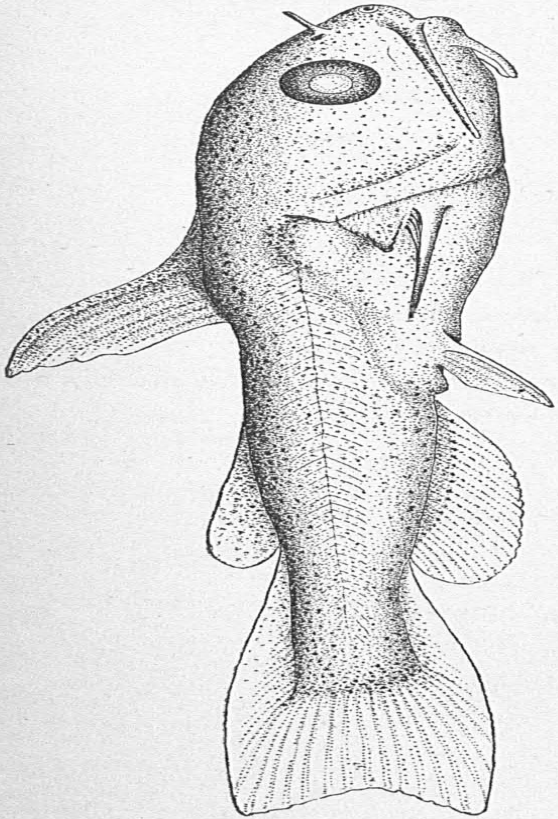
170

Blank page retained for pagination

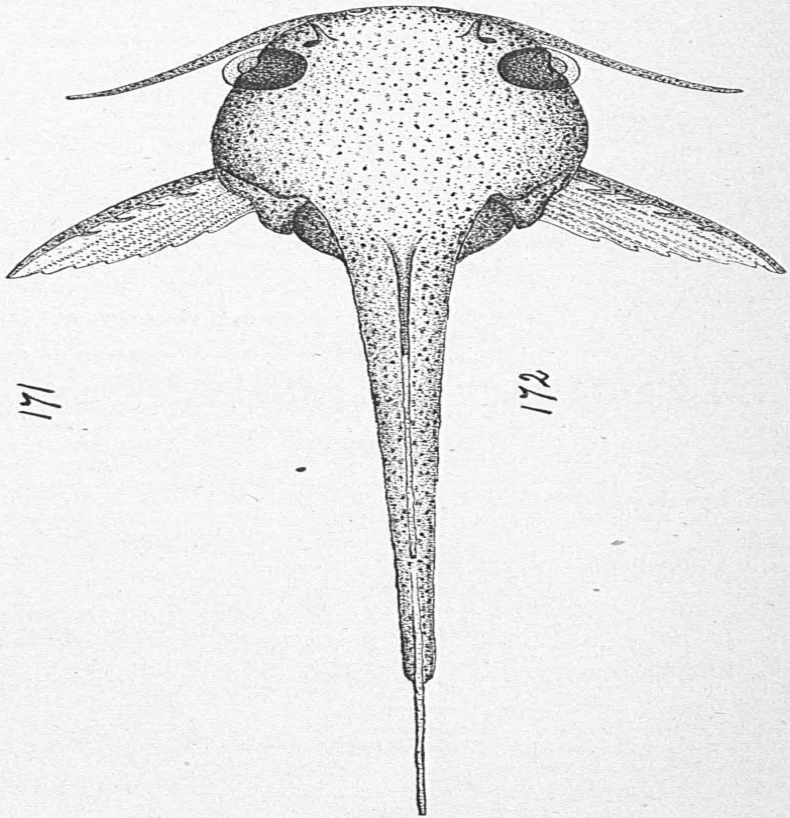
EXPLANATION OF PLATE XXIX.

ICTALURUS ALBIDUS. (*White Cat-fish.*)

FIG. 171. Young cat-fish, eighty-eight days old, viewed as an opaque object. x 8.
FIG. 172. The same, viewed from above. x 8.



171



172

Blank page retained for pagination

EXPLANATION OF PLATE XXX.

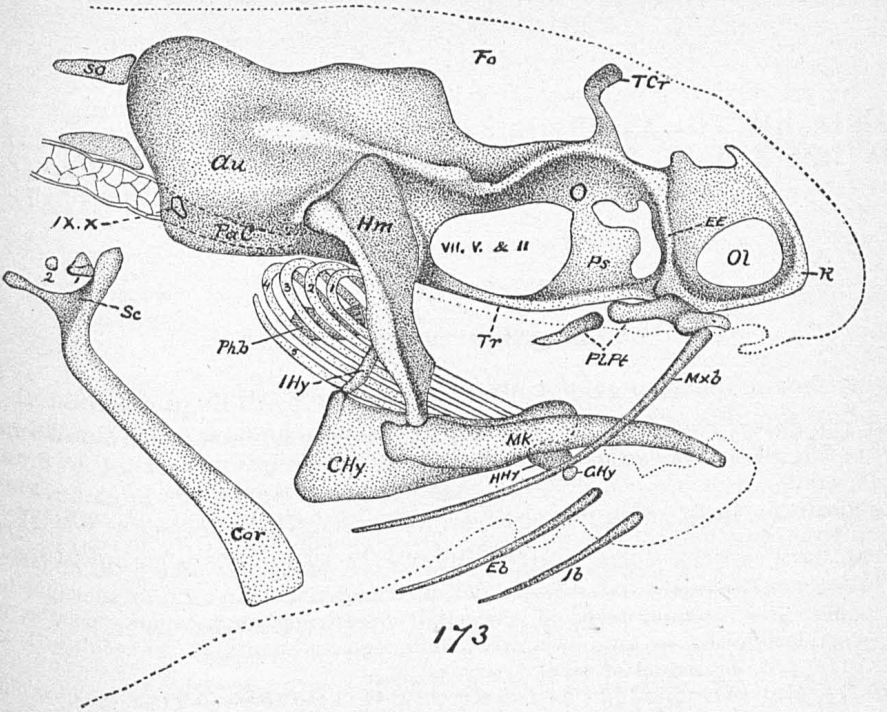
ICTALURUS ALBIDUS. (*White Cat-fish.*)

FIG. 173. Cartilaginous cranium of young fish, ten days old, constructed from a series of longitudinal vertical sections. x 35.

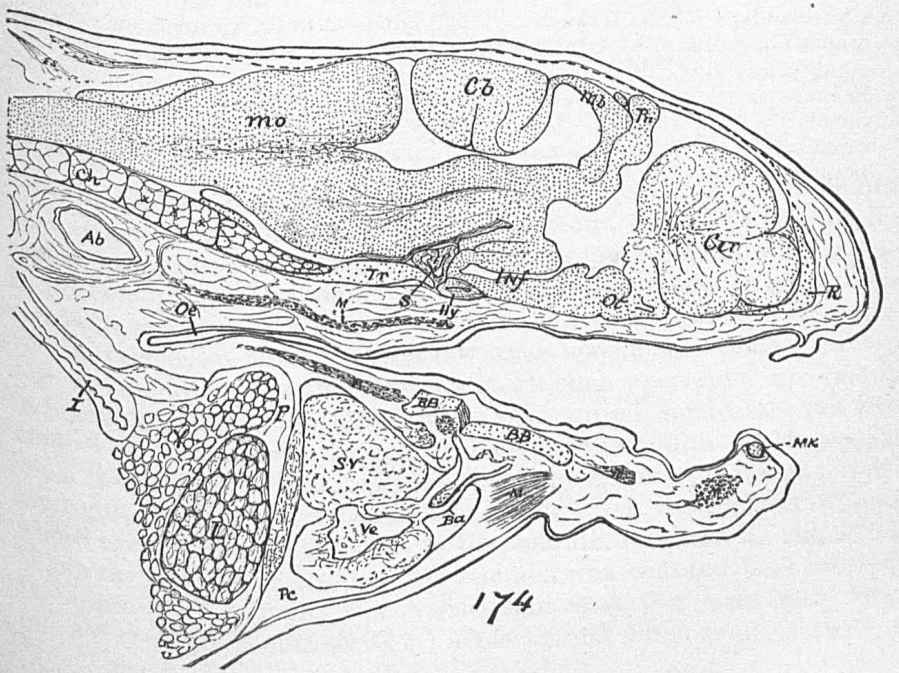
Au, auditory vesicle; *CHy*, ceratohyal; *Cor*, coracoid; *EE*, ectethmoid ridge; *Eb*, cartilage of external chin barbel; *Fo*, fontanelle; *GHy*, urohyal; *Ib*, cartilage of internal chin barbel; *IHy*, interhyal; *Hm*, hyomandibular; *HHy*, hypohyal; *Mk*, Meckel's cartilage; *Mxb*, cartilage of maxillary barbel; *O*, orbit; *Ol*, olfactory fossa; *PaC*, parachordal region; *Phb*, pharyngobranchials; *Ps*, presphenoid lamina; *PlPt*, palatopterygoid elements; *R*, rostrum; *Sc*, scapular portion of shoulder-girdle; *so*, supraoccipital; *TCr*, tegmen cranii; *Tr*, trabecula; II, V, VII, IX, X, foramina for cranial nerves.

FIG. 174. Median longitudinal vertical section of the head of a young fish, ten days old. x 35.

Ab, air-bladder; *BB*, basibranchials; *Ba*, bulbus aortæ; *Cb*, cerebellum; *Cer*, cerebrum; *Ch*, chorda; *ES*, erector spinæ; *Hy*, hypophysis; *I*, intestine; *Inf*, infundibulum; *L*, liver; *M*, pharyngeal and œsophageal muscles; *mb*, mid-brain; *MK*, Meckel's cartilage; *mo*, medulla oblongata; *Oe*, œsophagus; *Ot*, optic tract; *P*, periblast; *Pc*, pericardiac cavity; *Pn*, pineal body; *R*, rostrum; *S*, sacculus vasculosus; *SV*, sinus venosus; *Tr*, trabecula; *Ve*, ventricle; *x x x*, rudiments of anterior co-ossified vertebræ; *Y*, yelk.


So
Fo
TCr
Au
IX. X
PaC
Hm
VII. V. & II
O
Ps
EE
Ol
R
Sc
Phb
IHy
Tr
PLPt
Mxb
MK
CHy
HHy
GHy
Cor
Eb
Ib

173


mo
Cb
Hb
Th
Ch
Ab
Tr
Hyf
Oe
M
S
Hy
Ot
Cer
R
I
P
BB
BB
MK
Sy
Ba
Ve
Pc

174