

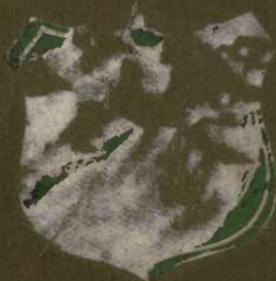
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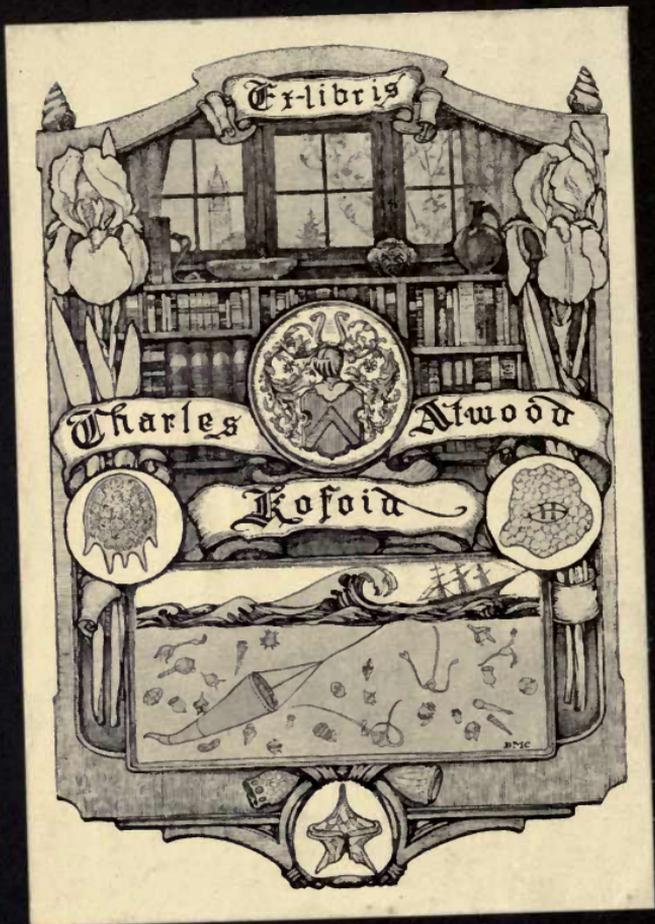
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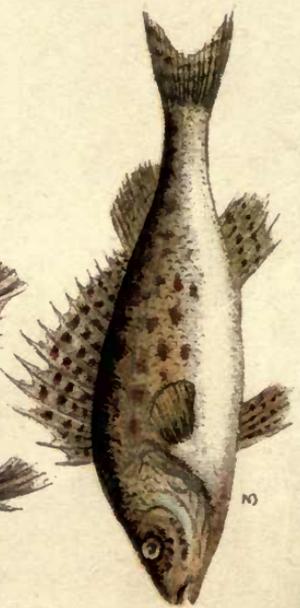
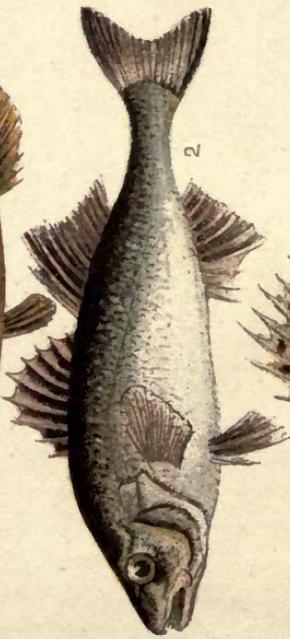
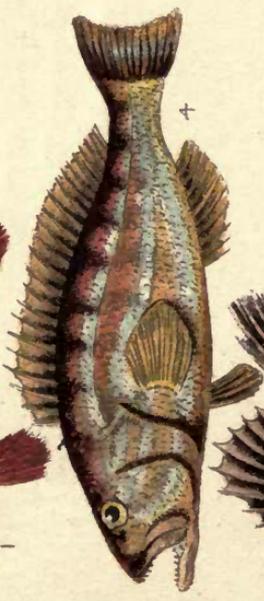
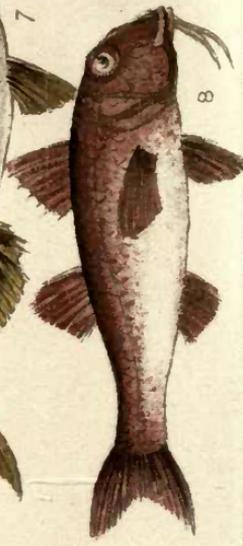
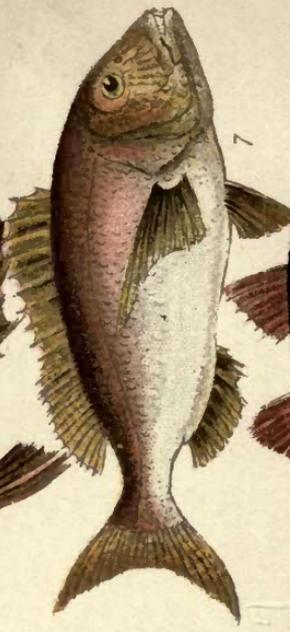
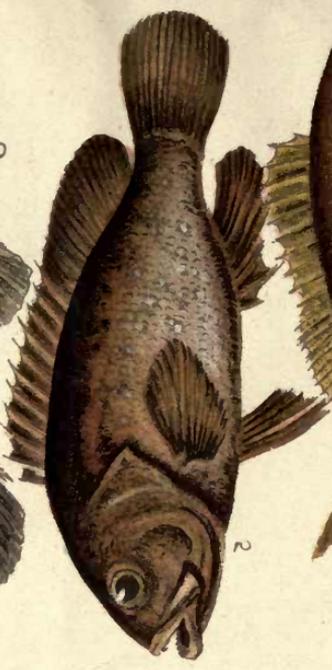






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OUR COUNTRY'S FISHES

AND

HOW TO KNOW THEM.

A Guide to all the Fishes of Great Britain.

BY

W. J. GORDON,

AUTHOR OF "OUR COUNTRY'S FLOWERS," "OUR COUNTRY'S BIRDS,"
"OUR COUNTRY'S BUTTERFLIES AND MOTHS,"
"OUR COUNTRY'S SHELLS," ETC.

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INTRODUCTION.



THIS handbook is on a different plan to that of any other of the very numerous books on fishes and fishing. Its object is the ready identification of our native species, whether sea-water, fresh-water, or estuarine, the method being similar to that of the other volumes of the series, of which this is the fifth. As the number of species found in British waters is not large, space has been found for a series of short notes, as in the case of *Our Country's Birds*, which not only confirm the identification but may prove useful to net and line fishermen of every degree.

The tabular chapters include a long index of local names, a systematic table of all the species, and a series of keys to the sub-classes, orders, families, genera, species, and noteworthy varieties, arranged in such a way that the task of finding out the fish can be begun at any point, the full description being obtained by combining the distinctive characteristics given at each step. The orders of the fishes are not difficult of recognition, the families soon become familiar, and in ordinary practice the fish it is desired to identify is not unlike another that is known, so that in most cases all that is needful is to refer to the specific or generic distinctions without having to traverse the whole of the ground; and of these only such are given in tabular form as are readily observable on the spot. The concluding chapter contains an alphabetical list of specific names, including many now going out of use, so that the book

may serve as a companion to the important works of Day, Couch, Yarrell, and others.

The classification of the fishes is still under revision, and is likely to remain so for a considerable time, but the system herein is based on the most recent, and was adopted as convenient for the purposes of the book. The list contains the usual number of species included on the strength of one occurrence only in the hope of more, but there seemed to be enough of these single specimen claims without recording the very latest which, though interesting, are certainly beyond the scope of a compact manual such as this.

W. J. G.

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CHAPTER I.

LOCAL AND POPULAR NAMES.

—◆—

THIS list contains all the names commonly borne by the British fishes. It will be noticed that some fishes have many names, and many have the same name, so that to be sure of the fish it would be as well to refer to all the numbers in cases where two or more are given. The numbers refer to the coloured plates, and are those adopted throughout.

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CHAPTER II.

THE COLOURED PLATES.

IN this list of the fishes appearing in our coloured plates the popular names are those which seem to be generally applied to them, but in many cases the fish may have other names, and in several the name given is, in a few localities, that of quite a different fish. Where no popular name is added the fish is too rare in this country to have one.

TELEOSTOMI.

ACTINOPTERYGII.

ACANTHOPTERYGII.

PERCIDÆ.

Plate I.

1. PERCA FLUVIATILIS—Perch
2. LABRAX LUPUS—Bass.
3. ACERINA VULGARIS—Ruff.
4. SERRANUS CABRILLA—Comber
5. SERRANUS GIGAS—Dusky Perch.
6. POLYPRION CERNIUM—Stone Bass.
7. DENTEX VULGARIS—Dentex.

MULLIDÆ.

Plate II.

8. MULLUS BARBATUS—Red Mullet.
9. MULLUS SURMULLETUS—Striped Mullet.

SPARIDÆ.

10. CANTHARUS LINEATUS—Black Sea Bream.
11. BOX VULGARIS—Bogue.
12. PAGRUS VULGARIS—Couch's Sea Bream.

PLATE II. (continued)—

13. PAGRUS AURATUS—Gilt-head.
14. PAGELLUS CENTRODONTUS—Sea Bream.
15. PAGELLUS BOGARAVEO—Spanish Bream.
16. PAGELLUS OWENII—Axillary Bream.
17. PAGELLUS ACARNE—
18. PAGELLUS ERYTHRINUS—Pandora

Plate III.

SCORPÆNIDÆ.

19. SEBASTES NORVEGICUS—Bergylt.

SCIÆNIDÆ.

20. SCIÆNA AQUILA—Shadow Fish.

XIPHIIDÆ.

21. XIPHIAS GLADIUS—Swordfish

TRICHIURIDÆ.

22. TRICHIURUS LEPTURUS—Hairtail.
23. LEPIDOPUS CAUDATUS—Scabbard Fish.

CARANGIDÆ.

Plate IV.

24. CARANX TRACHURUS—Horse Mackerel
25. NAUCRATES DUCTOR—Pilot Fish.
26. PAMMELAS PERCIFORMIS—Rudder Fish.
27. LICHIA GLAUCA—Derbio.
28. CAPROS APER—Boar Fish.

CYTTIDÆ.

29. ZEUS FABER—Dory

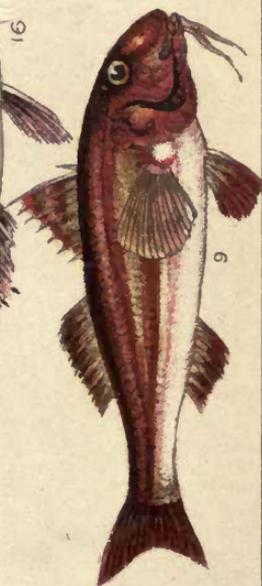
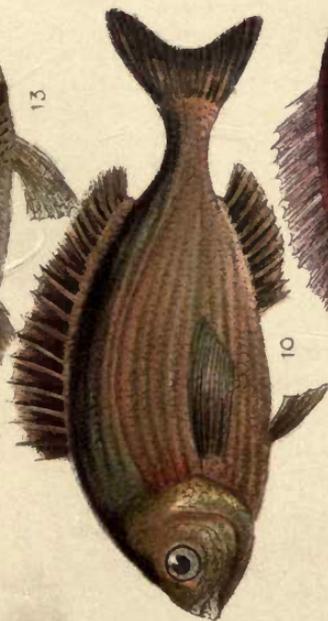
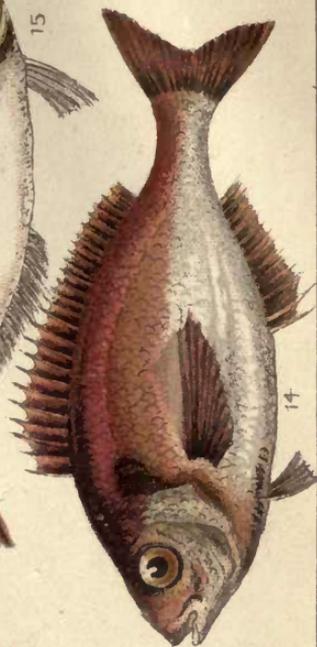
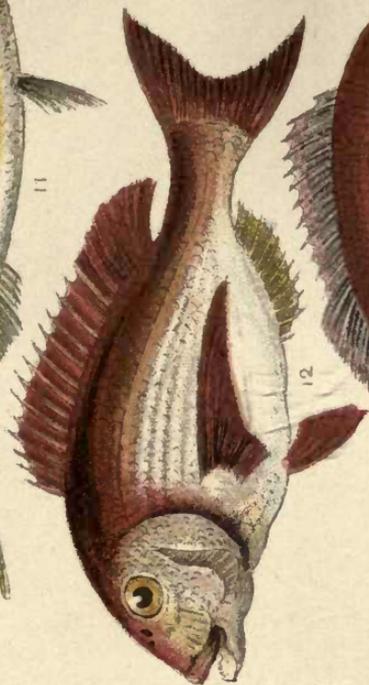
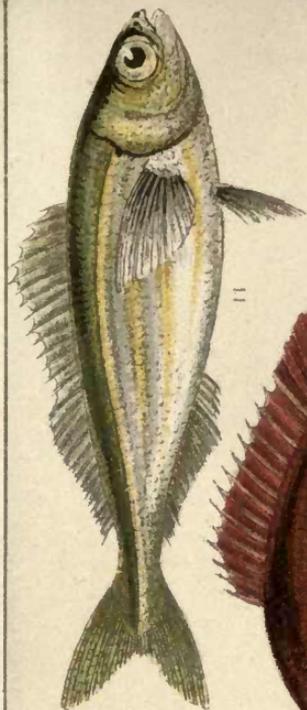
STROMATEIDÆ.

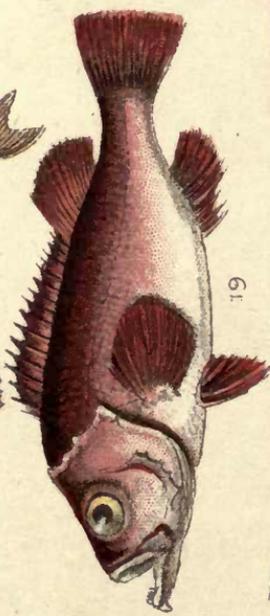
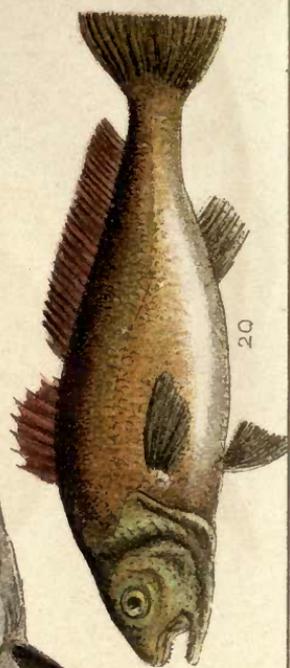
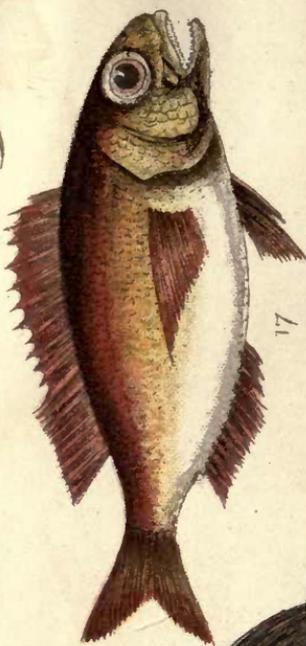
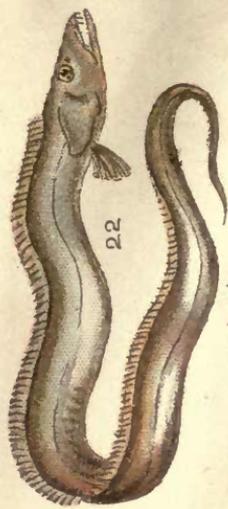
Plate V.

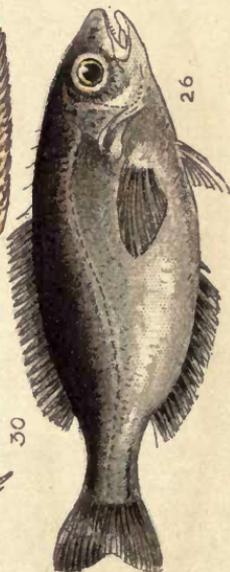
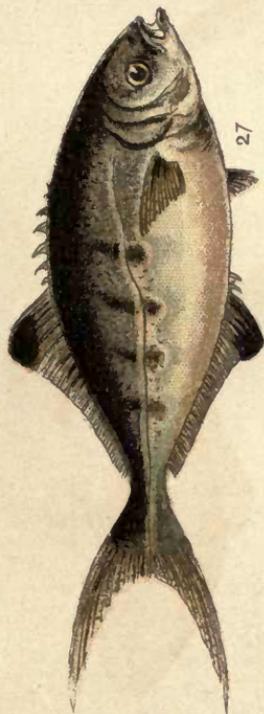
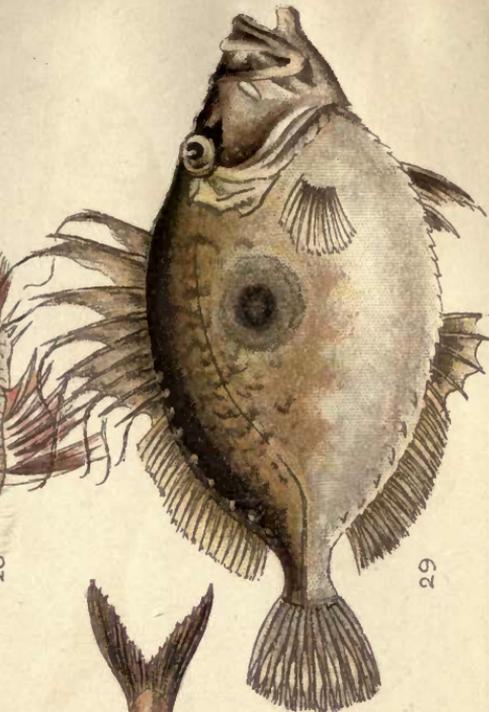
30. CENTROLOPHUS BRITANNICUS—Cornish Centrololphus.
31. CENTROLOPHUS POMPILUS—Black Fish.

CORYPHÆNIDÆ.

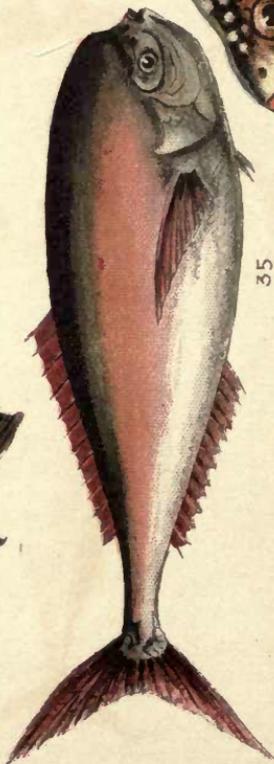
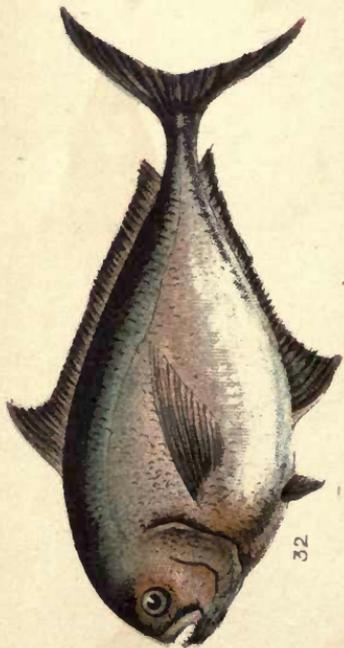
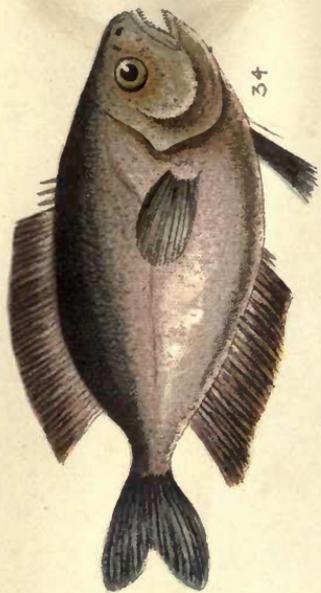
32. BRAMA RAII—Ray's Bream.
33. LAMPRIS LUNA—Opah.
34. SCHEDOPHILUS MEDUSOPHAGUS—
35. LUVARUS IMPERIALIS—

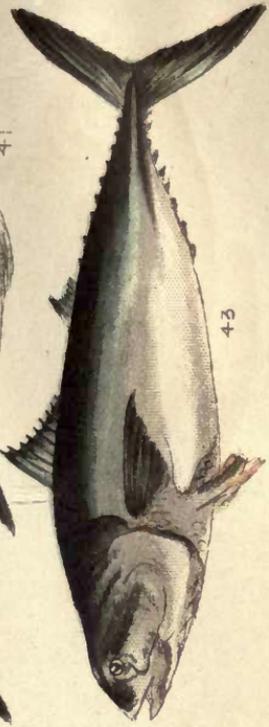


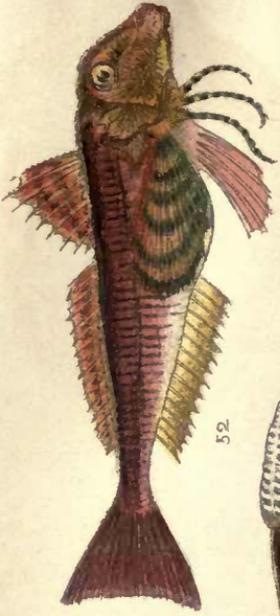












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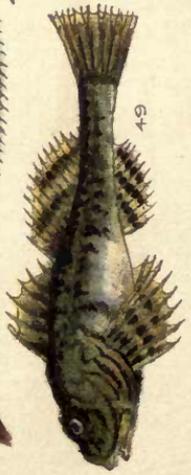
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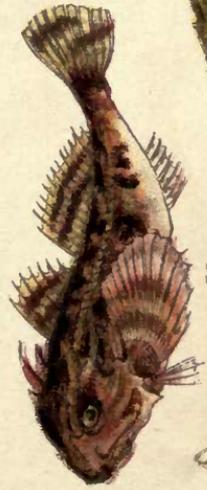
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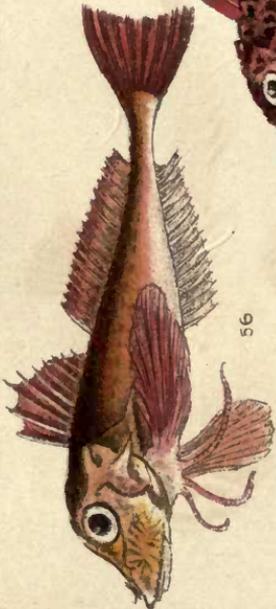
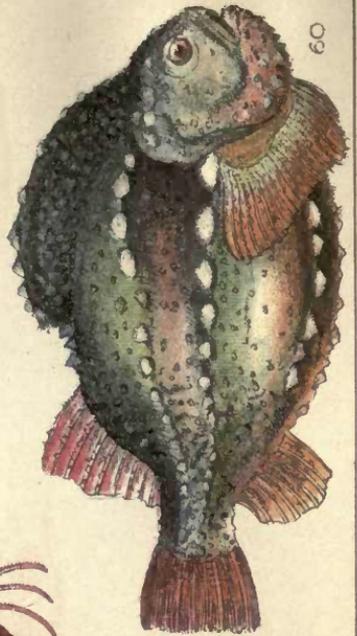
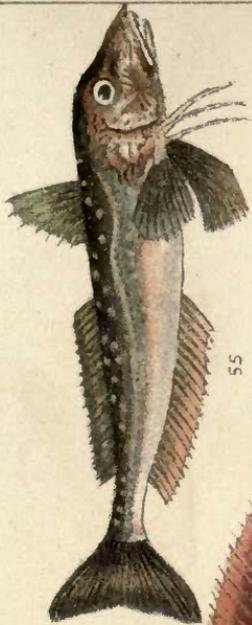
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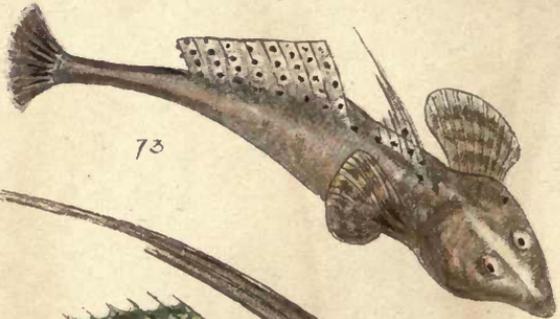
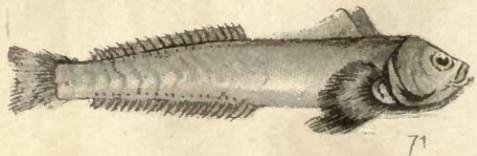
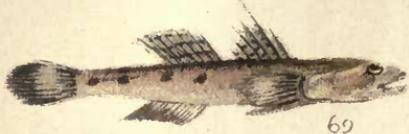
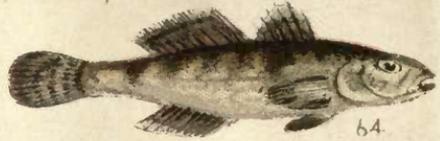


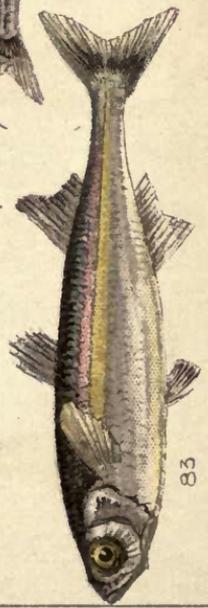
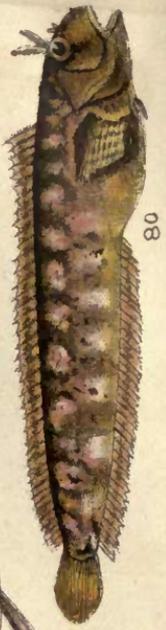
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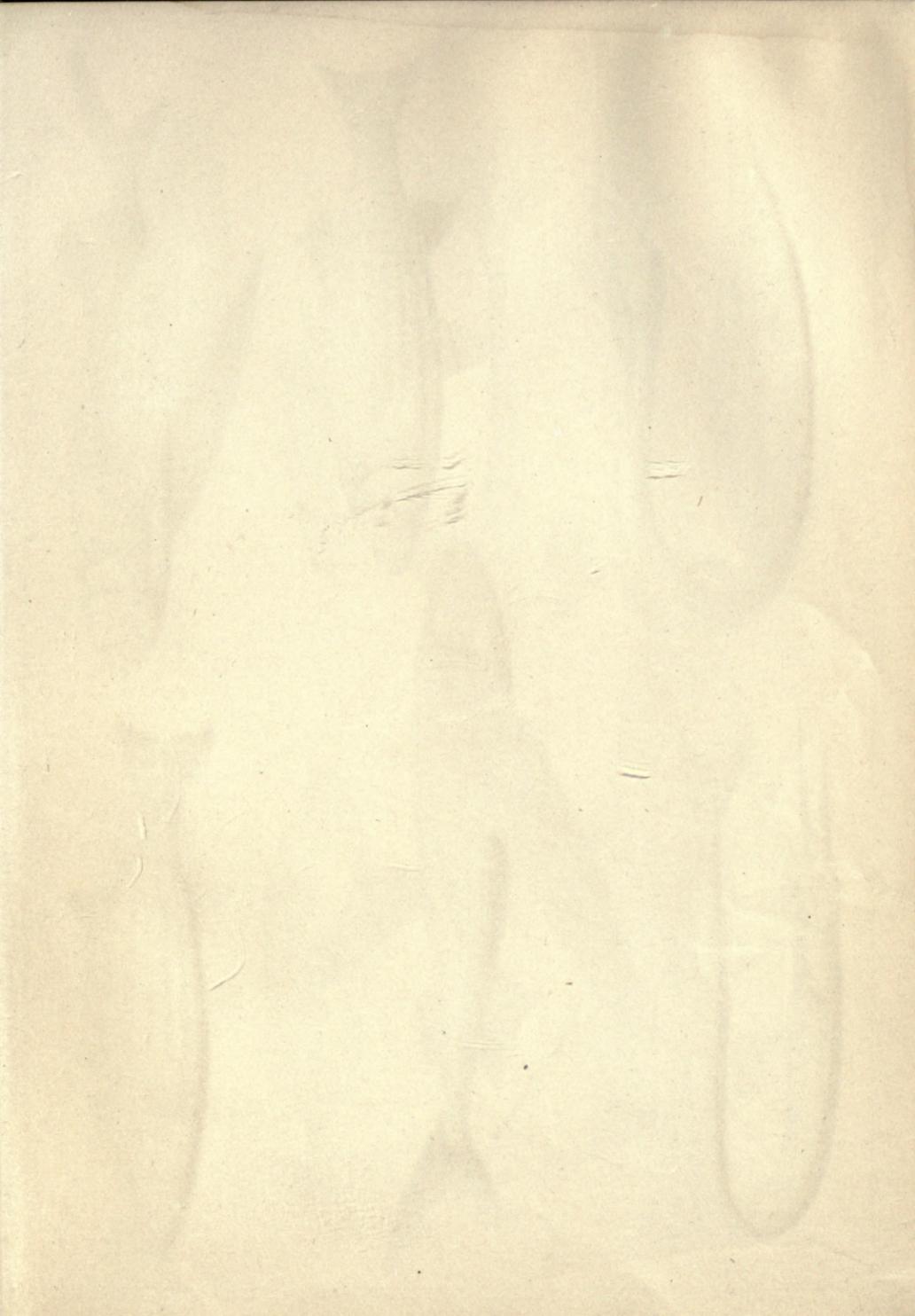


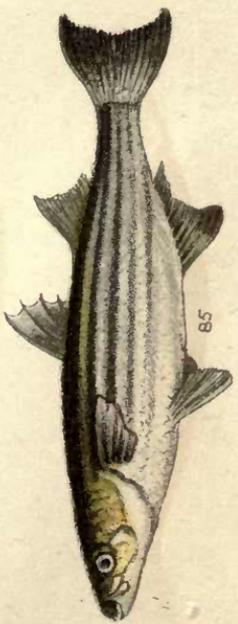
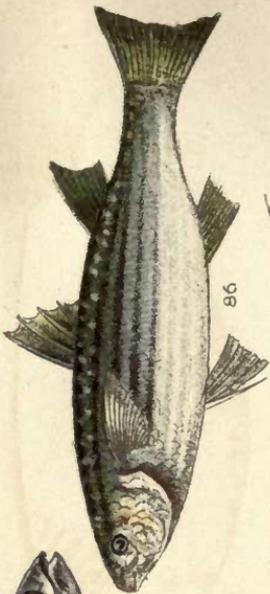
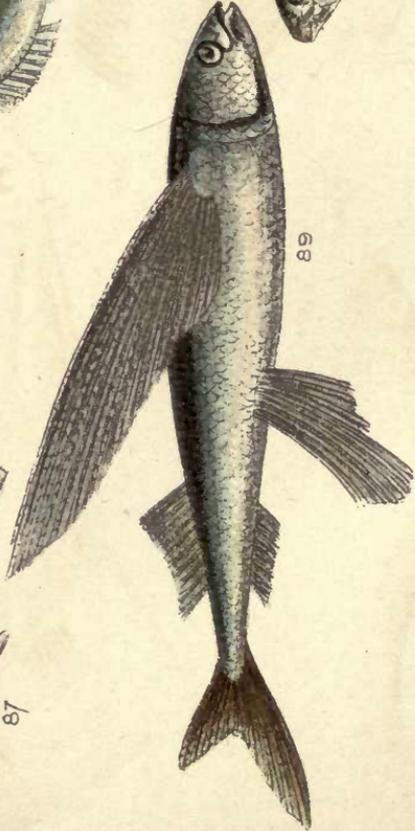
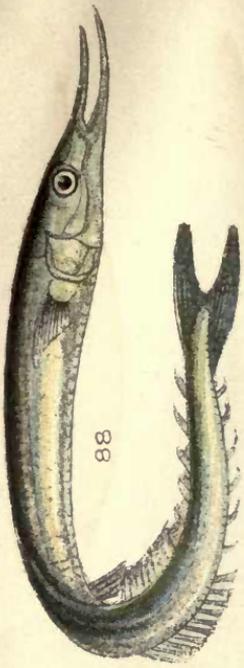
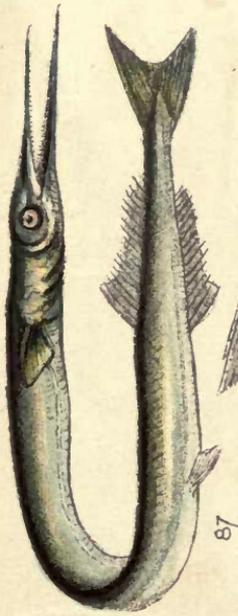
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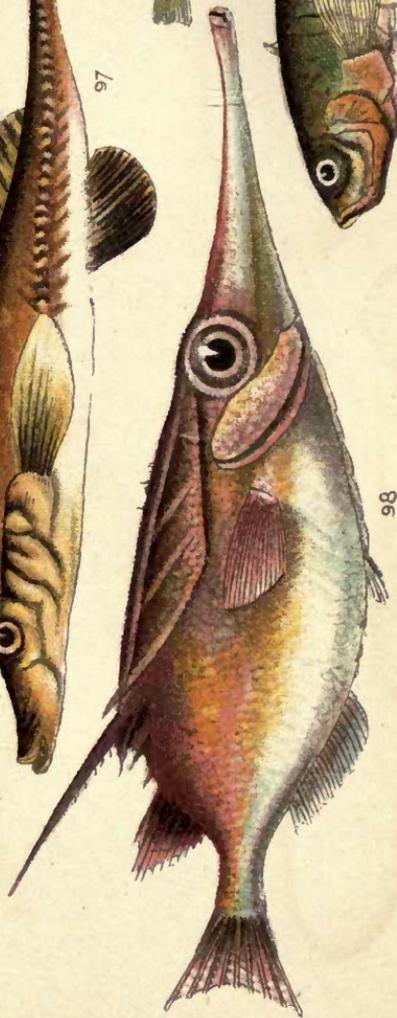
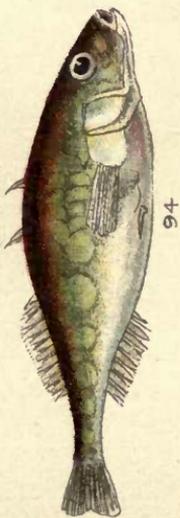
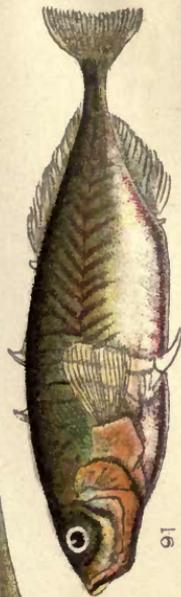












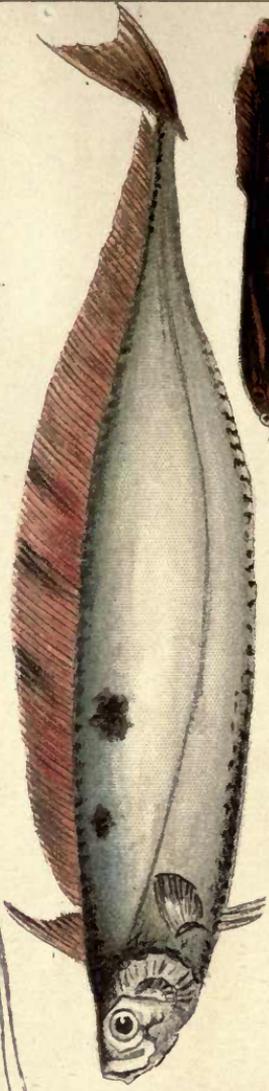




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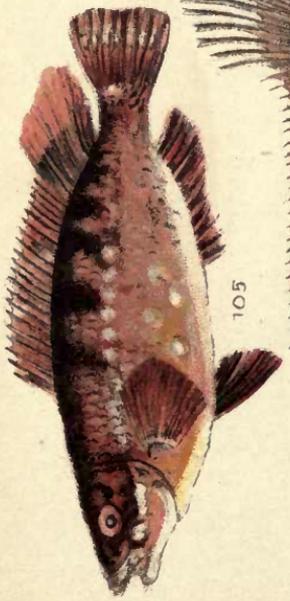
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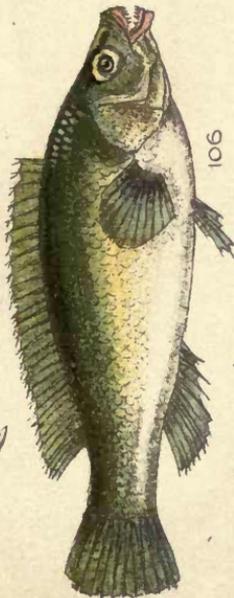
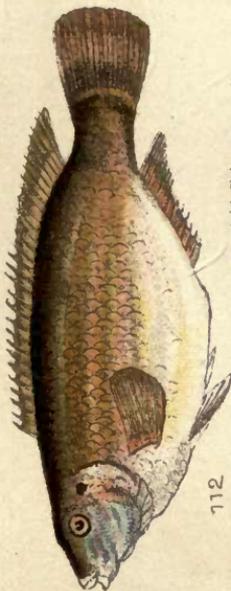
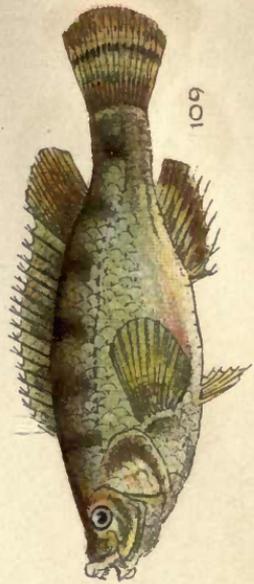
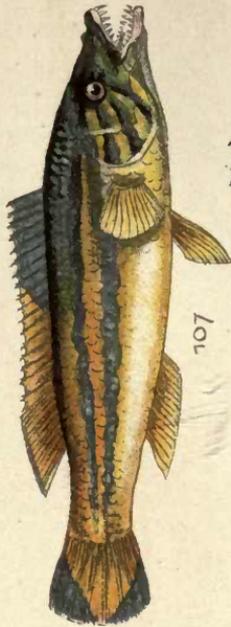
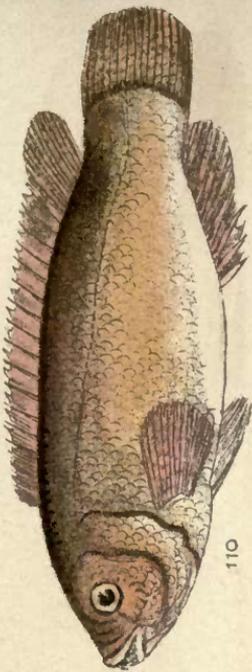


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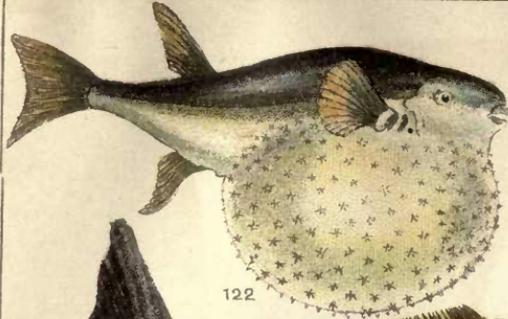


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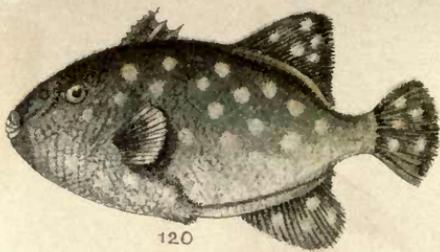




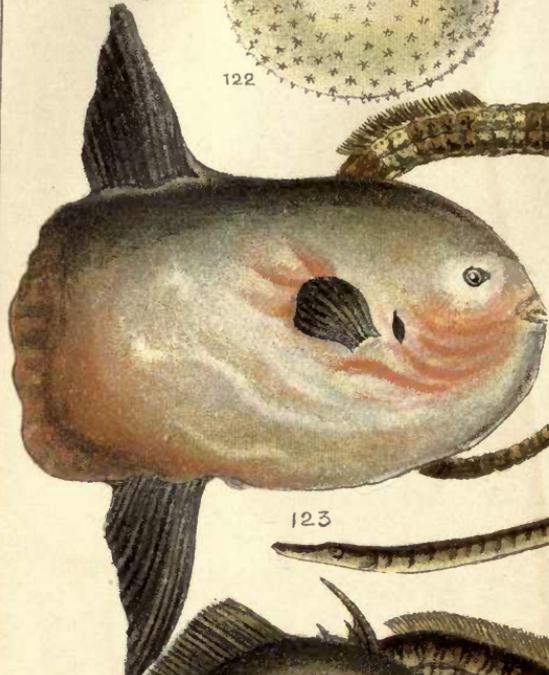




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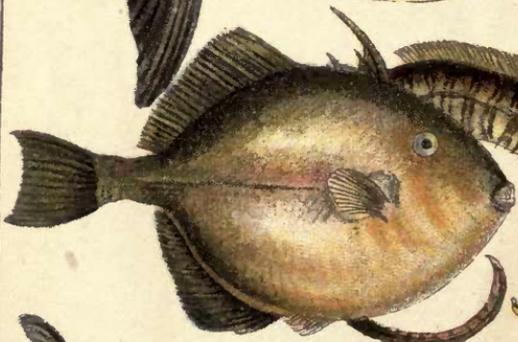
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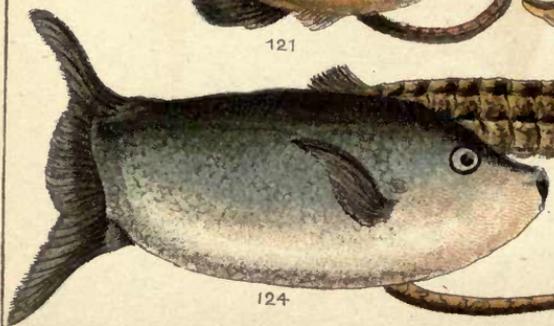
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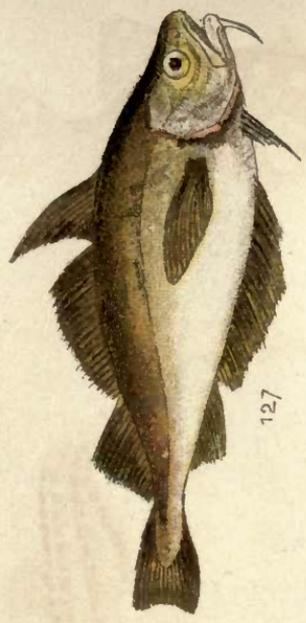
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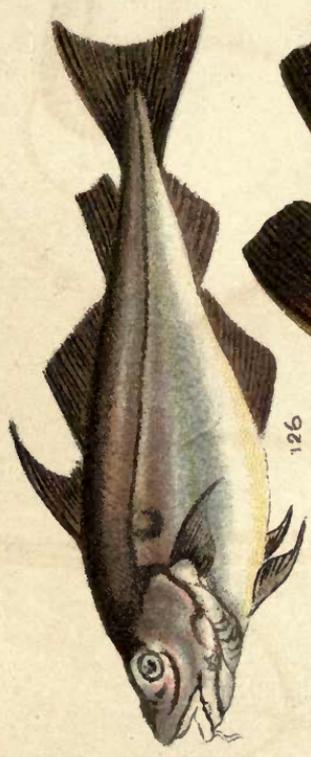
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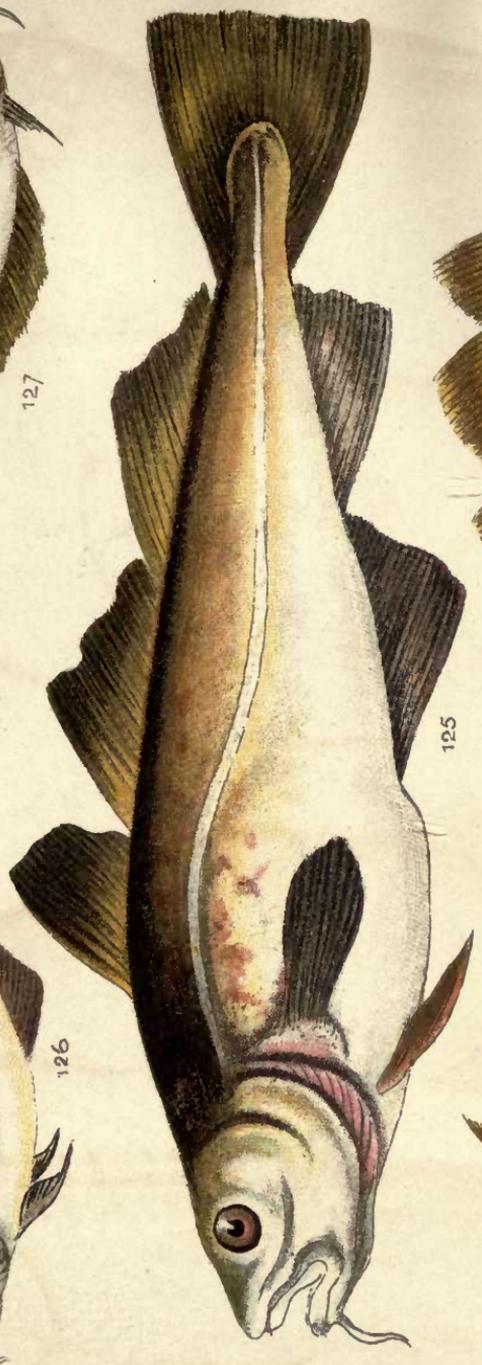
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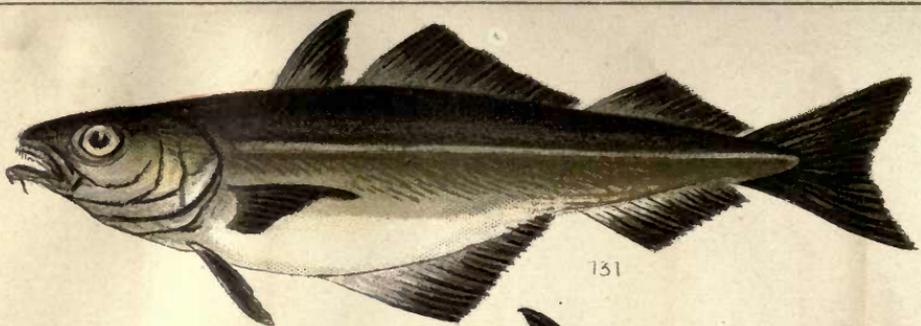
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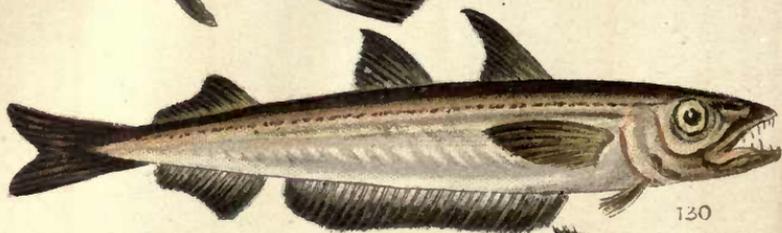
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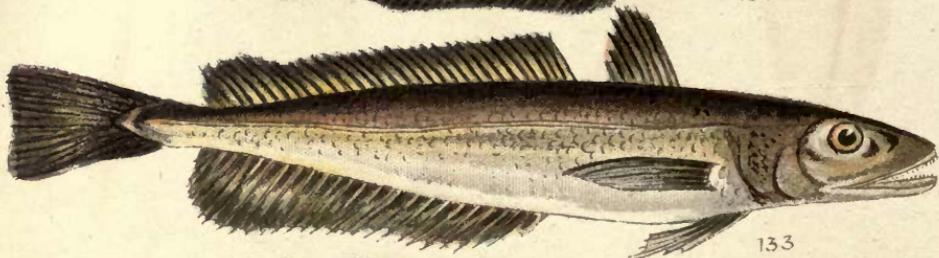
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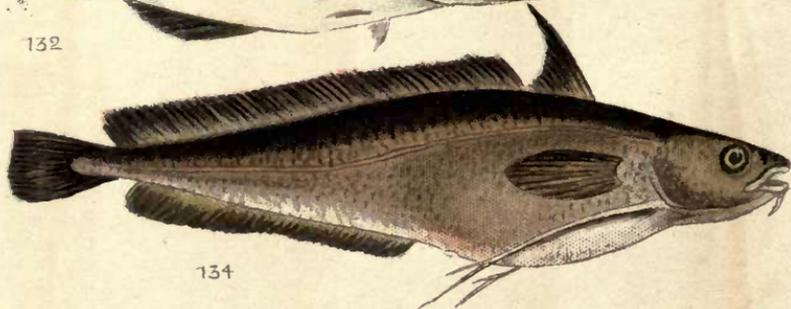
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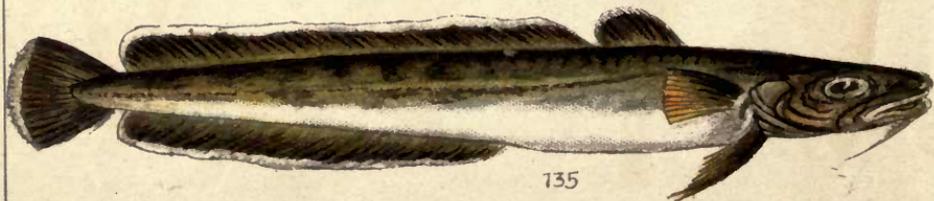
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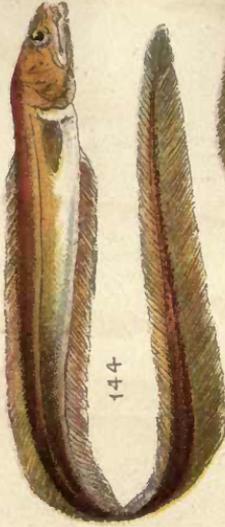
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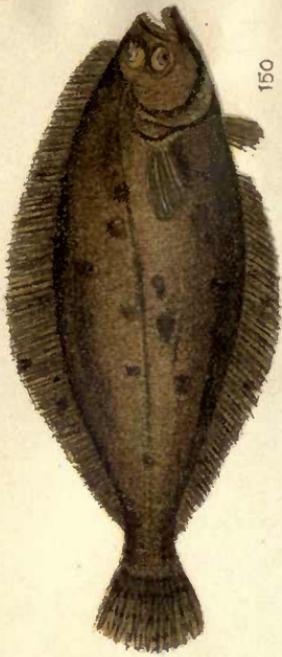
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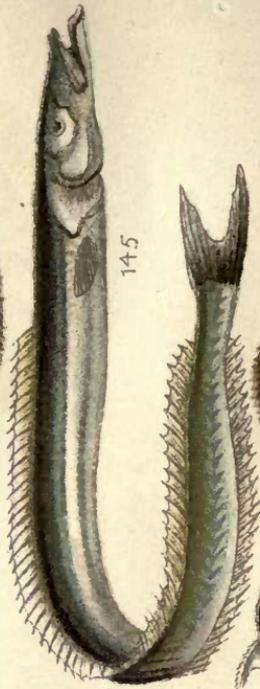
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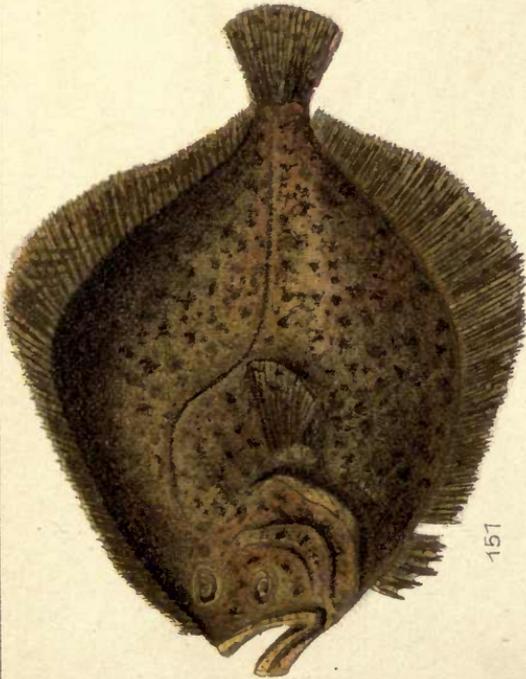
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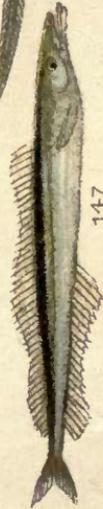
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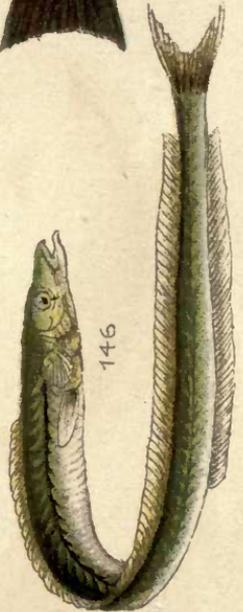
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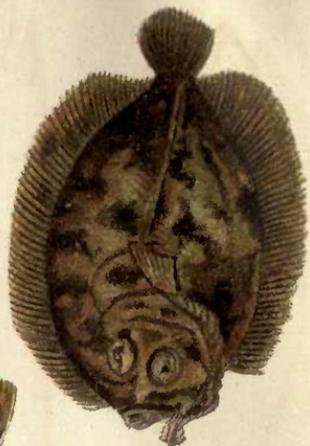
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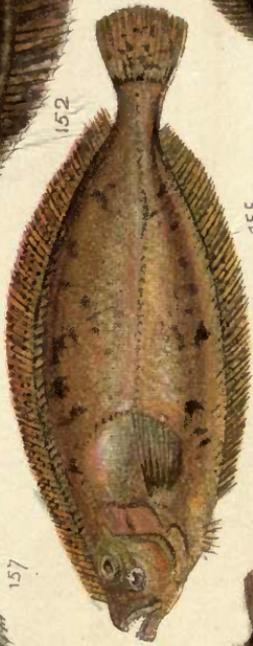
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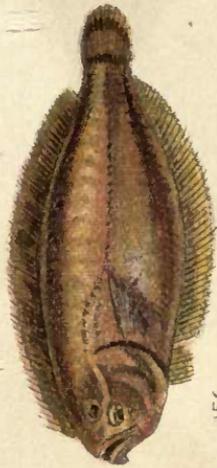
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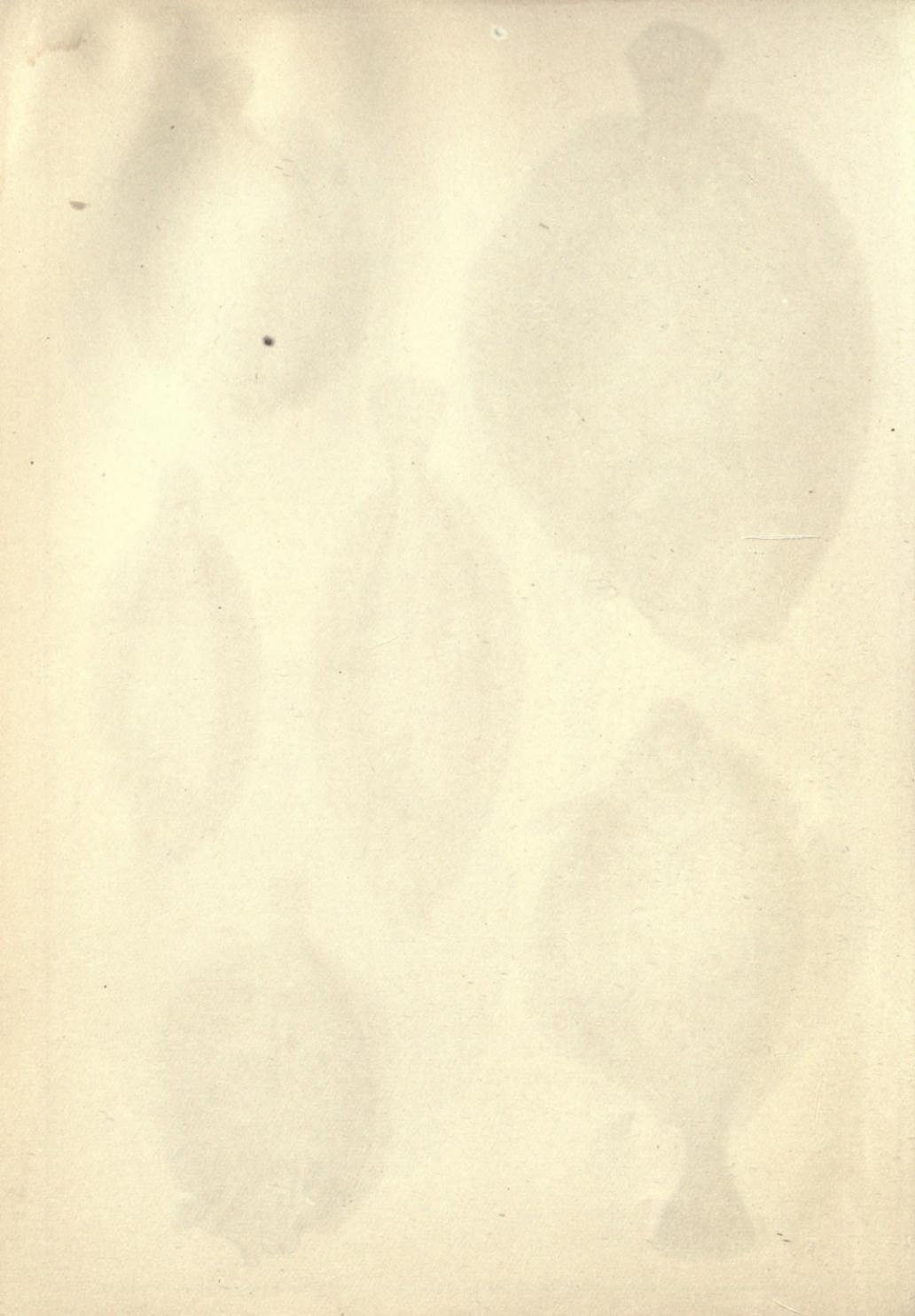
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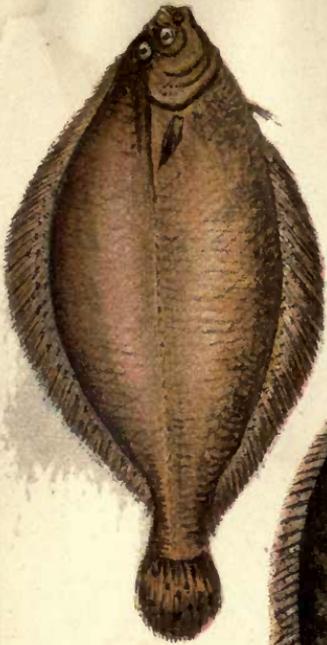


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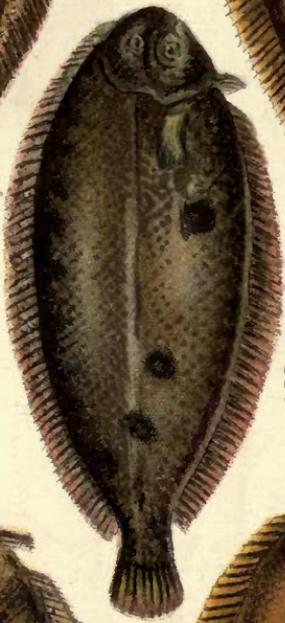
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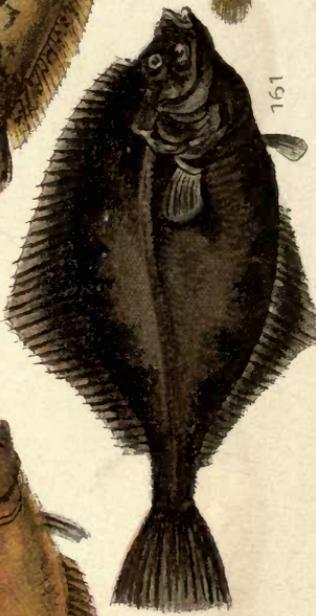
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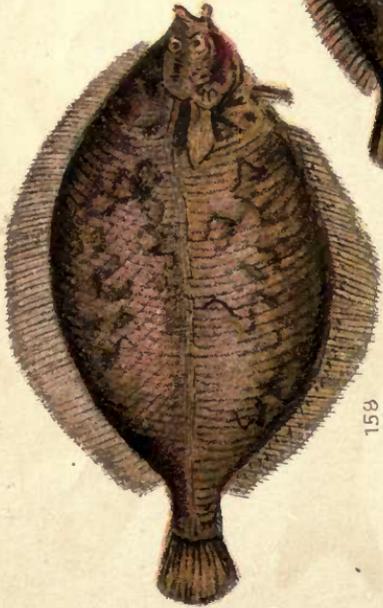
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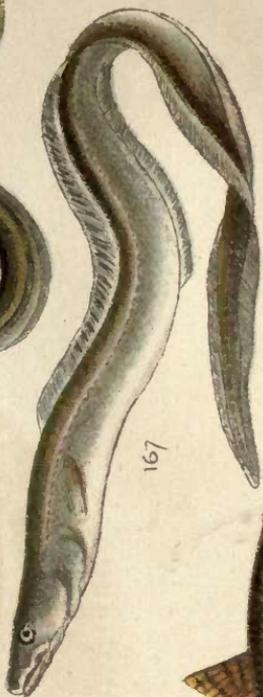
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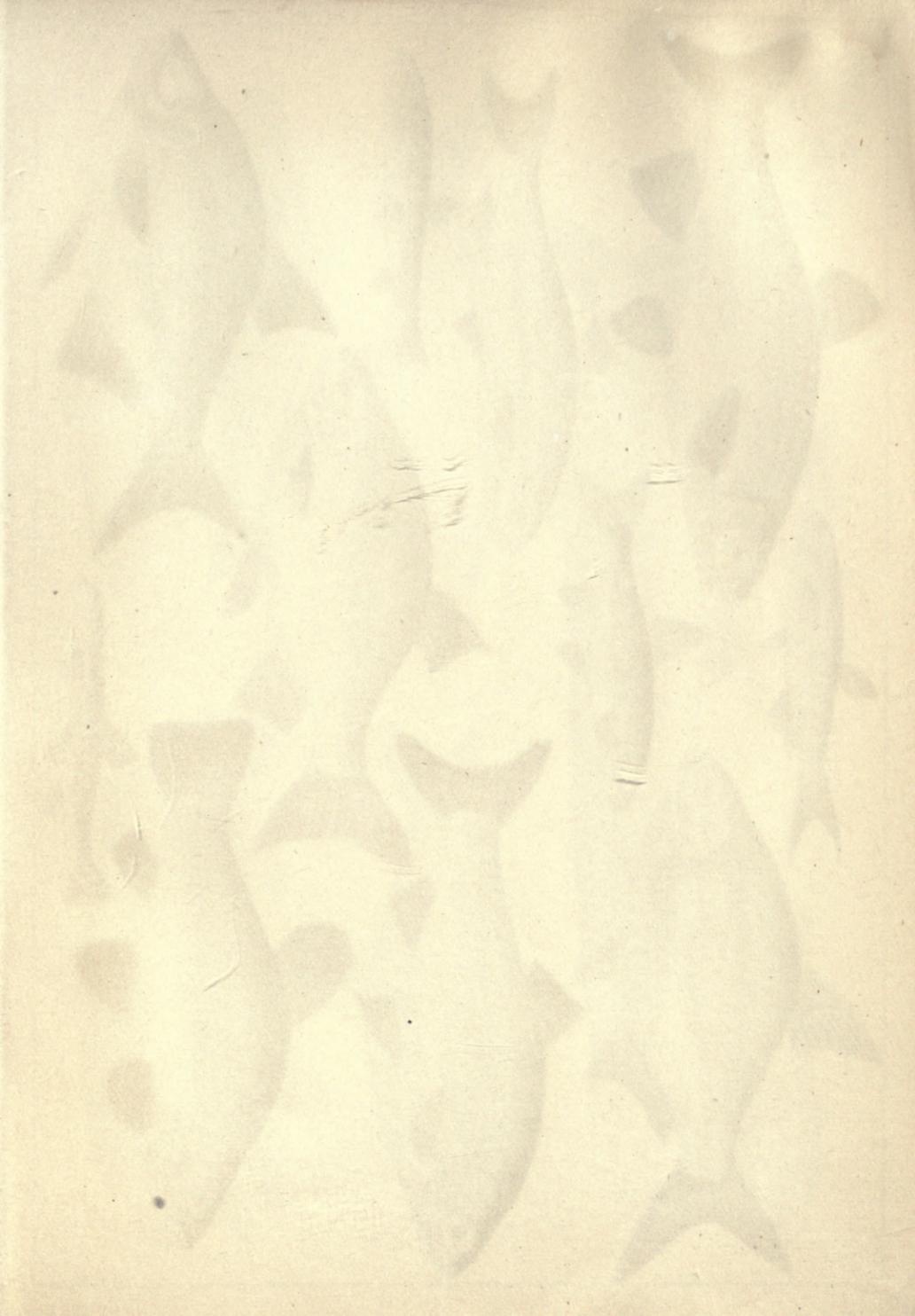
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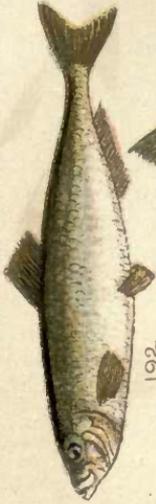
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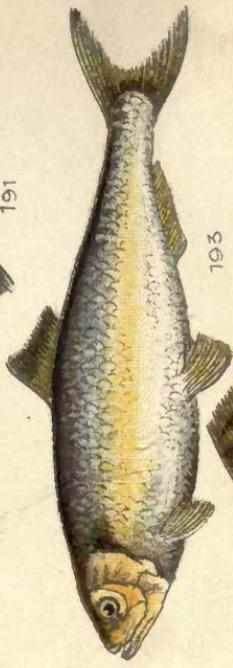




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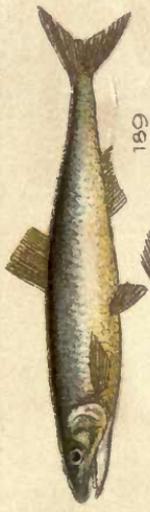
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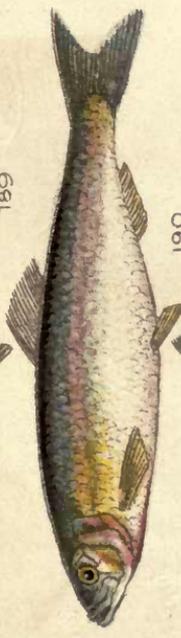
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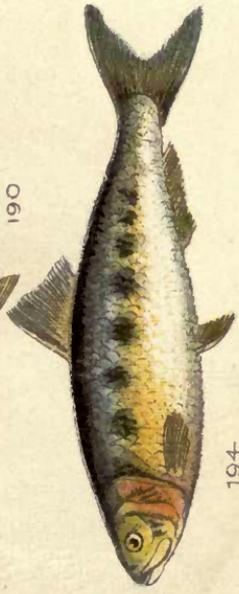
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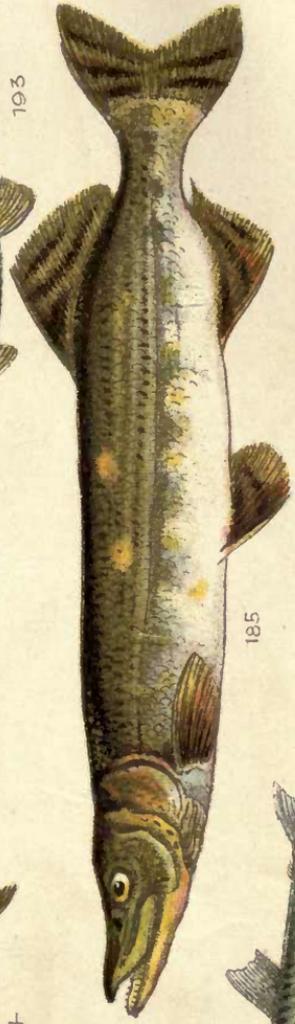
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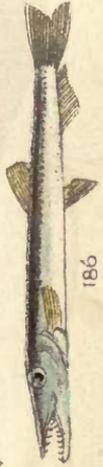
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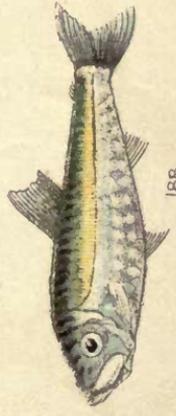
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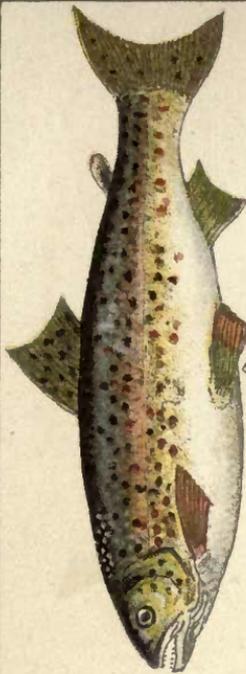
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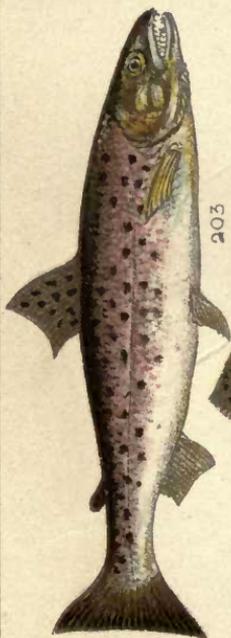
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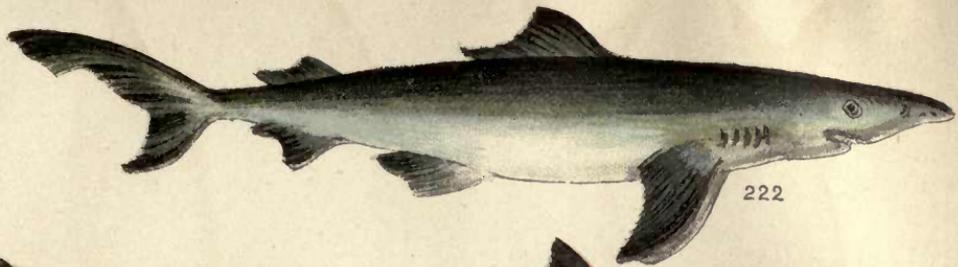
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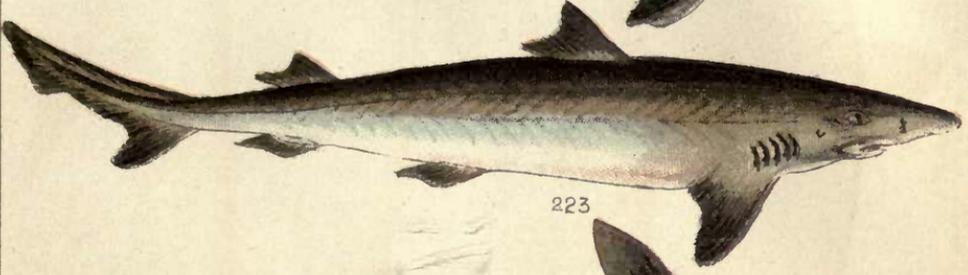
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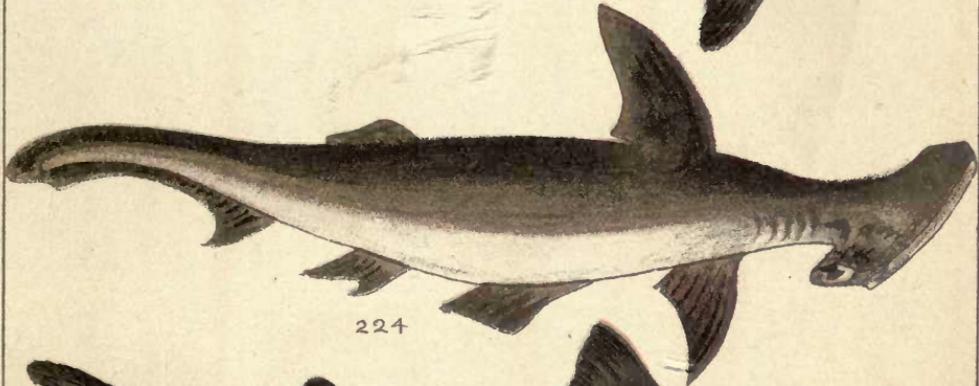




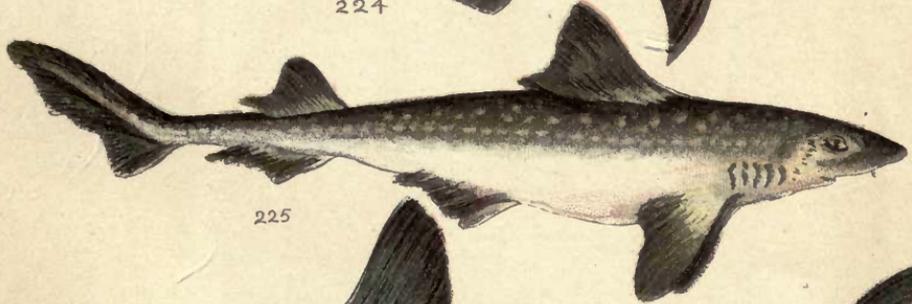
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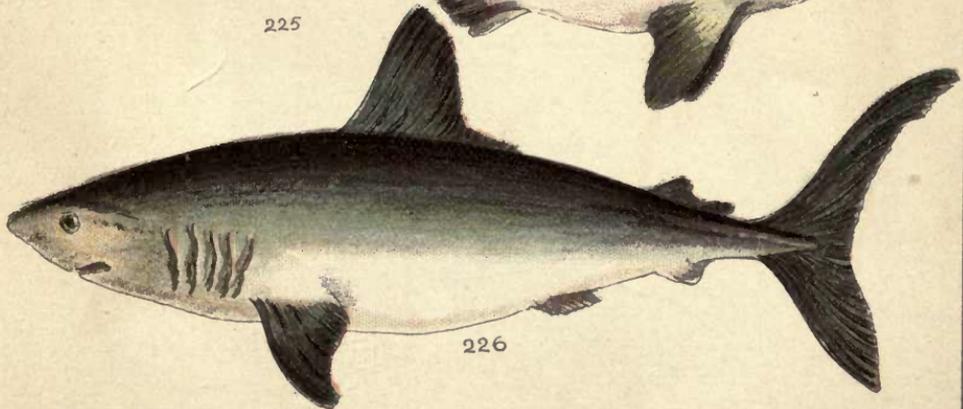
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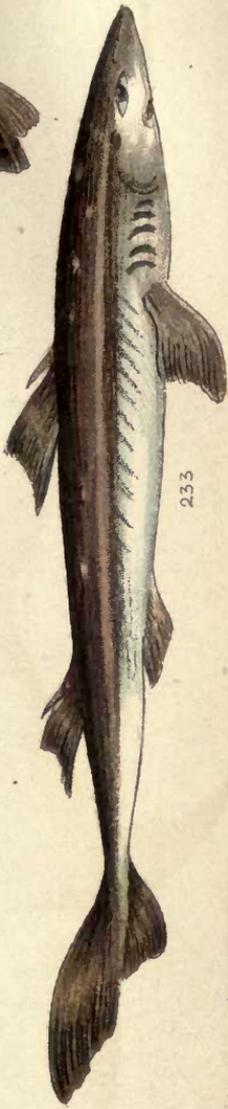
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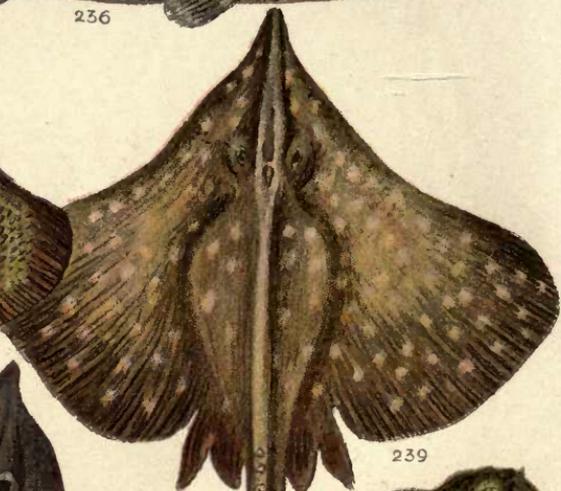
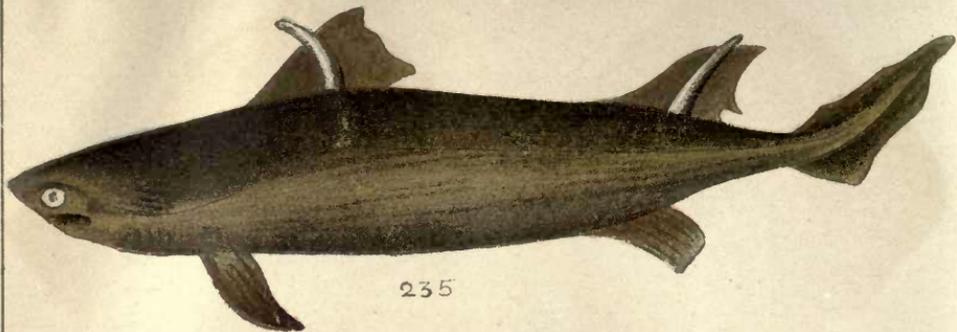
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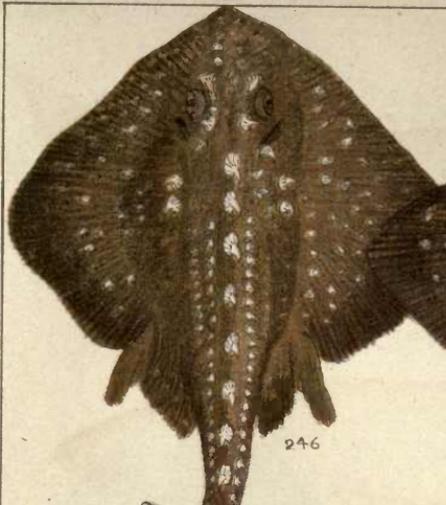


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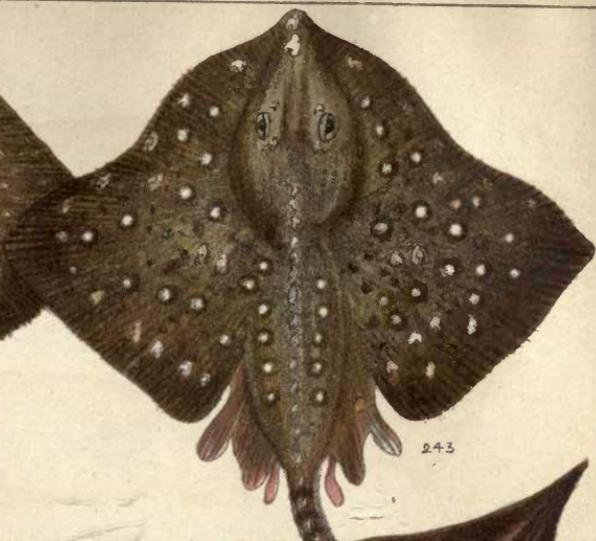


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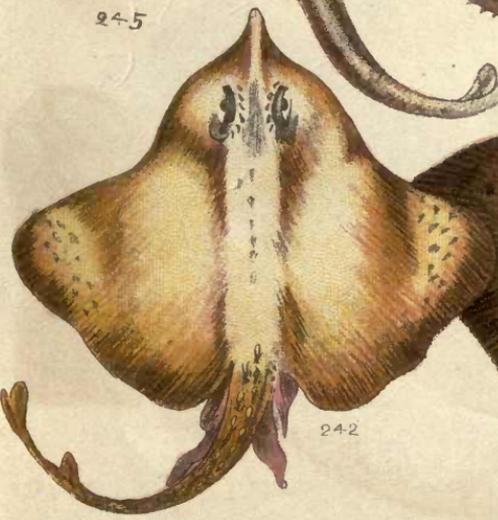
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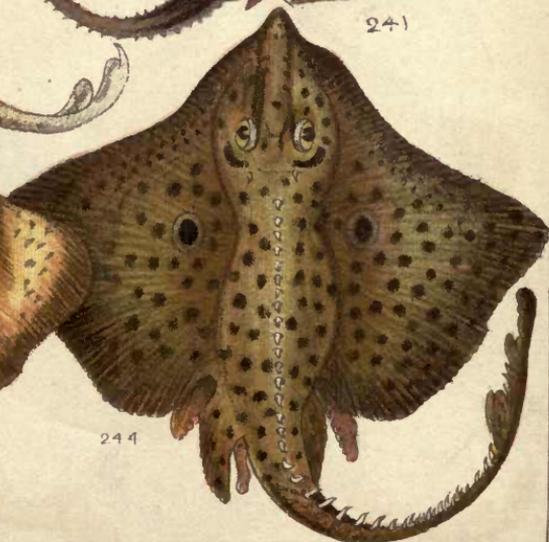
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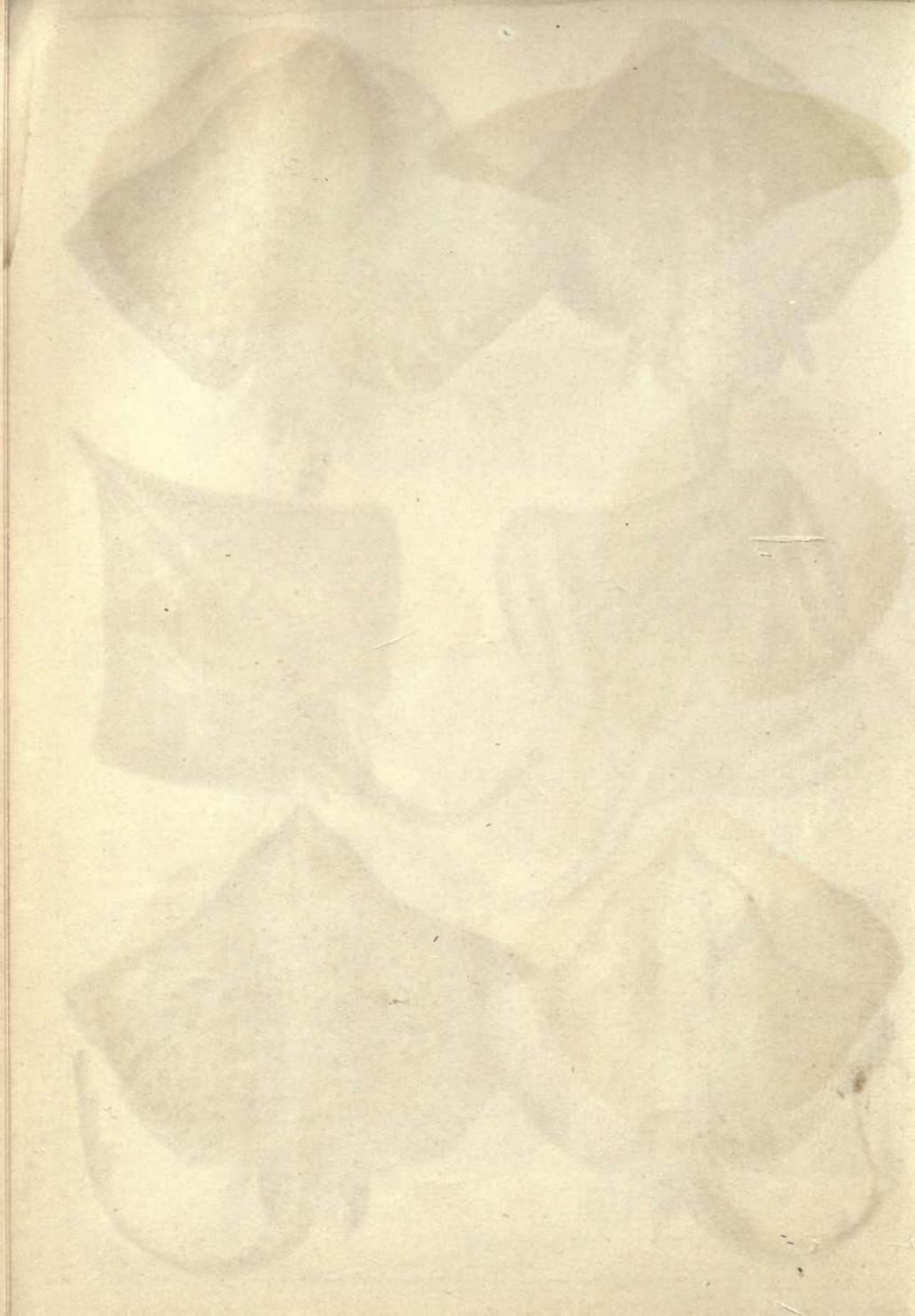
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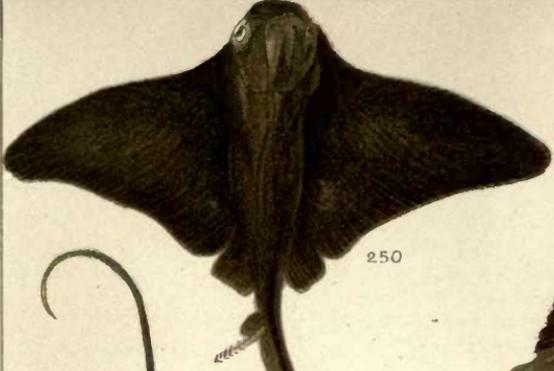


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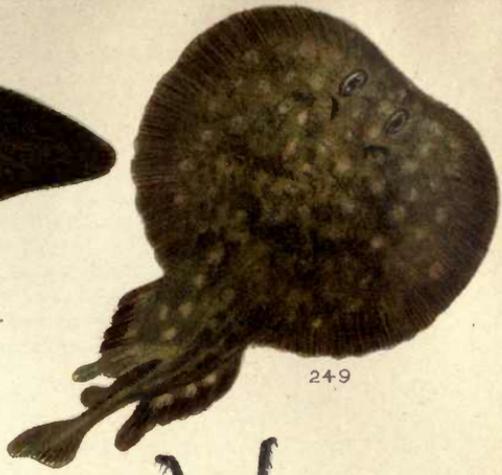


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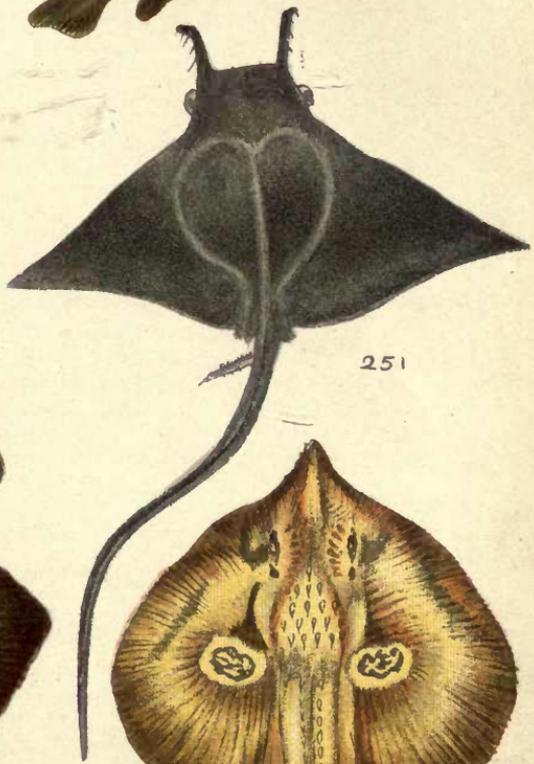
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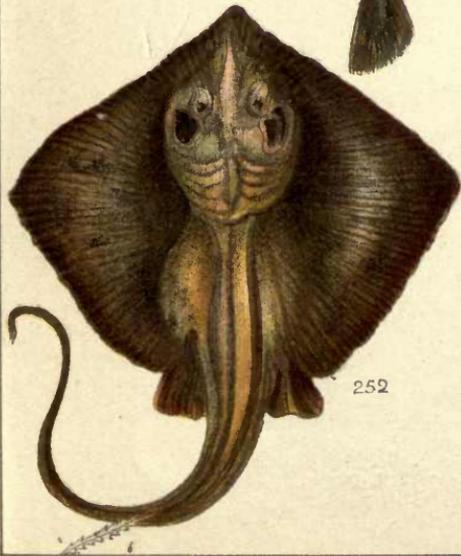
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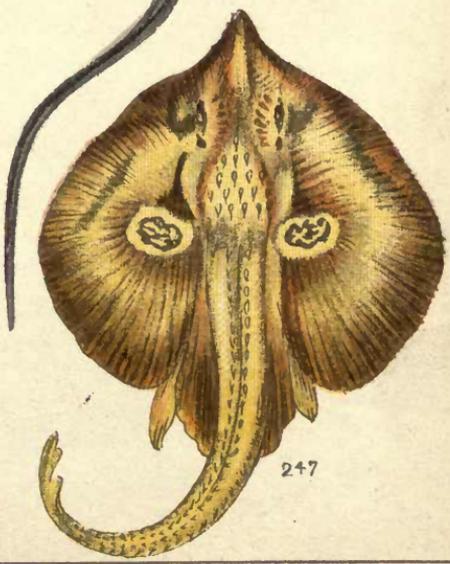
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SCOMBRIDÆ.**Plate VI.**

36. SCOMBER VERNALIS—Mackerel.
37. SCOMBER PUNCTATUS—Speckled Mackerel.
38. SCOMBER COLIAS—Spanish Mackerel.
39. ORCYNUS THYNNUS—Short-finned Tunny.
40. ORCYNUS GERMO—Long-finned Tunny.
41. THYNNUS PELAMYS—Bonito.
42. PELAMYS SARDA—Belted Bonito.
43. AUXIS ROCHEI—Plain Bonito.
44. ECHENEIS REMORA—Remora.

Plate VII.**TRACHINIDÆ.**

45. TRACHINUS DRACO—Greater Weever.
46. TRACHINUS VIPERA—Viper Weever.

LOPHIIDÆ.

47. LOPHIUS PISCATORIUS—Angler.

COTTIDÆ.

48. COTTUS GOBIO—Miller's Thumb.
49. COTTUS SCORPIUS—Father Lasher.
50. COTTUS BUBALIS—Long-spined Cottus.
51. COTTUS QUADRICORNUS—Four-horned Cottus.
52. TRIGLA LINEATA—Streaked Gurnard.
53. TRIGLA CUCULUS—Red Gurnard.
54. TRIGLA HIRUNDO—Sapphirine Gurnard.
55. TRIGLA GURNARDUS—Grey Gurnard.
56. TRIGLA LYRA—Piper.
57. TRIGLA OBSCURA—Lanthorn Gurnard.

Plate VIII.**DACTYLOPTERIDÆ.**

58. AGONUS CATAPHRACTUS—Pogge.
59. PERISTETHUS CATAPHRACTUM—Armed Gurnard.

CYCLOPTERIDÆ.

60. CYCLOPTERUS LUMPUS—Lump Fish.
61. LIPARIS VULGARIS—Sea Snail.
62. LIPARIS MONTAGUI—Montagu's Sucker.

GOBIIDÆ.**Plate IX.**

63. GOBIUS RUTHENSPARRI—Two-spotted Goby.
64. GOBIUS PAGANELLUS—Paganellus.
65. GOBIUS NIGER—Rock Goby.
66. GOBIUS MINUTUS—One-spotted Goby.

PLATE IX. (continued)—

- 67. GOBIUS PARNELLI—Speckled Goby.
- 68. GOBIUS PICTUS—Painted Goby.
- 69. GOBIUS QUADRIMACULATUS—Four-spotted Goby.
- 70. APHIA PELLUCIDA—Transparent Goby.
- 71. CRYSTALLOGOBIUS NILSSONII—

CALLIONYMIDÆ.

- 72. CALLIONYMUS LYRA—Dusky Skulpin.
- 73. CALLIONYMUS MACULATUS—Sordid Dragonet.

CEPOLIDÆ.

- 74. CEPOLA RUBESCENS—Red Band Fish.

BLENNIIDÆ.

Plate X.

- 75. ANARRHICHAS LUPUS—Cat Fish.
- 76. BLENNIUS GATTORUGINE—Tompot.
- 77. BLENNIUS GALERITA—Montagu's Blenny.
- 78. BLENNIUS PHOLIS—Shanny.
- 79. BLENNIUS OCELLARIS—Butterfly Benny.
- 80. CARELOPHUS ASCANII—Yarrell's Blenny.
- 81. CENTRONOTUS GUNNELLUS—Butter Fish.
- 82. ZOARCES VIVIPARUS—Viviparous Blenny.

ATHERINIDÆ.

- 83. ATHERINA PRESBYTER—Atherine.
- 84. ATHERINA BOYERI—Boyer's Atherine.

MUGILIDÆ.

Plate XI.

- 85. MUGIL CAPITO—Grey Mullet.
- 86. MUGIL CHELO—Lesser Grey Mullet.

SCOMBRESOCIDÆ.

- 87. BELONE VULGARIS—Garfish.
- 88. SCOMBRESOX SAURUS—Skipper.
- 89. EXOCÆTUS VOLITANS—Greater Flying Fish.
- 90. EXOCÆTUS EVOLANS—Flying Fish.

GASTEROSTEIDÆ.

Plate XII.

- 91. GASTEROSTEUS ACULEATUS—Three-spined Stickleback.
- 92. GASTEROSTEUS TRACHURUS—Rough-tailed Stickleback.
- 93. GASTEROSTEUS SEMIARMATUS—Half-armed Stickleback.
- 94. GASTEROSTEUS GYMNRUS—Smooth-tailed Stickleback.
- 95. GASTEROSTEUS SPINULOSUS—Four-spined Stickleback.
- 96. GASTEROSTEUS PUNGITIUS—Nine-spined Stickleback.
- 97. GASTEROSTEUS SPINACHIA—Fifteen-spined Stickleback.

PLATE XII. (*continued*)—**CENTRISCIDÆ.**

98. CENTRISCUS SCOLOPAX—Trumpet Fish.

GOBIESOCIDÆ.

Plate XIII.

99. LEPADOGASTER GOUANII—Cornish Sucker.
-
100. LEPADOGASTER DECANDOLLII—Sucker.
-
101. LEPADOGASTER BIMACULATUS—Doubly-spotted Sucker.

TRACHYPTERIDÆ.

102. TRACHYPTERUS ARCTICUS—Deal Fish.
-
103. REGALECUS BANKSII—Ribbon Fish.

LABRIDÆ.

Plate XIV.

104. LABRUS MACULATUS—Ballan Wrasse.
-
105. LABRUS DONOVANI—Comber Wrasse.
-
106. LABRUS LINEATUS—Green Wrasse.
-
107. LABRUS MIXTUS—Striped Wrasse.
-
108. CRENILABRUS MELOPS—Conner.
-
109. CRENILABRUS CORNUBICUS—Goldsinny.
-
110. CTENOLABRUS RUPESTRIS—Jago's Goldsinny.
-
111. ACANTHOLABRUS PALLONI—Scale-rayed Wrasse.
-
112. CENTROLABRUS EXOLETUS—Rock Cook.
-
113. CORIS JULIS—Rainbow Wrasse.

LOPHOBRANCHII.**SYNGNATHIDÆ.**

Plate XV.

114. SIPHONOSTOMA TYPHLE—Broad-nosed Pipe Fish.
-
115. SYNGNATHUS ACUS—Greater Pipe Fish.
-
116. NEROPHIS ÆQUOREUS—Ocean Pipe Fish.
-
117. NEROPHIS OPHIDION—Straight-nosed Pipe Fish.
-
118. NEROPHIS LUMBRICIFORMIS—Worm Pipe Fish.
-
119. HIPPOCAMPUS ANTIQUORUM—Seahorse.

PLECTOGNATHI.**BALISTIDÆ.**

120. BALISTES MACULATUS—Trigger Fish.
-
121. BALISTES CAPRISCUS—File Fish.

DIODONTIDÆ.

122. TETRODON LAGOCEPHALUS—Globe Fish.
-
123. ORTHAGORISCUS MOLA—Sun Fish.
-
124. ORTHAGORISCUS TRUNCATUS—Oblong Sun Fish.

ANACANTHINI.

GADIDÆ.

- Plate XVI. 125. GADUS MORRHUA—Cod.
 126. GADUS ÆGLEFINUS—Haddock
 127. GADUS LUSCUS—Whiting Pout.
 128. GADUS MINUTUS—Power.
 129. GADUS MERLANGUS—Whiting.
- Plate XVII. 130. GADUS POUTASSOU—Couch's Whiting.
 131. GADUS VIRENS—Coal Fish.
 132. GADUS POLLACHIUS—Pollack.
 133. MERLUCCIUS VULGARIS—Hake.
 134. PHYCIS BLENNOIDES—Greater Forkbeard.
 135. MOLVA VULGARIS—Ling.
- Plate XVIII. 136. LOTA VULGARIS—Burbot.
 137. MOTELLA MUSTELA—Five-bearded Rockling.
 138. MOTELLA CIMBRIA—Four-bearded Rockling.
 139. MOTELLA TRICIRRATA—Three-bearded Rockling.
 140. MOTELLA MACROPTHALMA—
 141. RANICEPS RAMINUS—Lesser Forkbeard.
 142. BROSMIUS BROSME—Torsk.

OPHIDIIDÆ.

143. OPHIDIUM BARBATUM—Bearded Ophidium.
 144. FIERASFER DENTATUS—Drummond's Echiodon.
- Plate XIX. 145. AMMODYTES LANCEOLATUS—Sand Eel.
 146. AMMODYTES TOBIANUS—Lesser Sand Eel.
 147. AMMODYTES CICERELLUS—Smooth Sand Eel.

MACRURIDÆ.

148. CORYPHÆNOIDES RUPESTRIS—

PLEURONECTIDÆ.

149. HIPPOGLOSSUS VULGARIS—Halibut.
 150. HIPPOGLOSSOIDES LIMANDOIDES—Long Rough Dab.
 151. RHOMBUS MAXIMUS—Turbot.
- Plate XX. 152. RHOMBUS LÆVIS—Brill.
 153. ZEUGOPTERUS UNIMACULATUS—One-spotted Topknot
 154. ZEUGOPTERUS PUNCTATUS—Brown.
 155. LEPIDORHOMBUS MEGASTOMA—Megrim.
 156. ARNOGLOSSUS LATERNA—Scald Fish.
 157. PLEURONECTES PLATESSA—Plaice.
- Plate XXI. 158. PLEURONECTES MICROCEPHALUS—Lemon Sole.
 159. PLEURONECTES CYNOGLOSSUS—Witch.
 160. PLEURONECTES LIMANDA—Dab.

PLATE XXI. (continued)—

161. PLEURONECTES FLESUS—Flounder.
 162. SOLEA VULGARIS—Sole.
 163. SOLEA LASCARIS—Sand Sole.
 164. SOLEA VARIEGATA—Thickback.
 165. SOLEA LUTEA—Solenette.

PHYSOSTOMI.

MURÆNIDÆ.

- Plate XXII. 166. ANGUILLA VULGARIS—Eel.
 167. CONGER VULGARIS—Conger.
 168. MURÆNA HELENA—Murry.

CYPRINIDÆ.

169. CYPRINUS CARPIO—Carp.
 170. CARASSIUS VULGARIS—Crucian Carp.
 171. CARASSIUS AURATUS—Gold Fish.
 172. BARBUS VULGARIS—Barbel.
 173. GOBIO FLUVIATILIS—Gudgeon.
 Plate XXIII. 174. LEUCISCUS RUTILUS—Roach.
 175. LEUCISCUS CEPHALUS—Chub.
 176. LEUCISCUS VULGARIS—Dace.
 177. LEUCISCUS ERYTHROPHthalmus—Rudd.
 178. LEUCISCUS PHOXINUS—Minnow.
 179. TINCA VULGARIS—Tench.
 180. ABRAMIS BRAMA—Bream.
 181. ABRAMIS BLICCA—White Bream.
 182. ALBURNUS LUCIDUS—Bleak.
 183. COBITIS TENIA—Spiny Loach.
 184. NEMACHILUS BARBATULA—Loach.

ESOCIDÆ.

- Plate XXIV. 185. ESOX LUCIUS—Pike

SCOPELIDÆ.

185. PARALEPIS COREGONOIDES—

STERNOPTYCHIDÆ.

187. ARGYROPELECUS HEMIGYMNUS—
 188. MAUROLICUS PENNANTII—Pearlsides.

PLATE XXIV. (*continued*)—**CLUPEIDÆ.**

189. ENGRAULIS ENCRASICHOLUS—Anchovy.
 190. CLUPEA HARENGUS—Herring.
 191. CLUPEA PILCHARDUS—Pilchard.
 192. CLUPEA SPRATTUS—Sprat.
 193. CLUPEA ALOSA—Allis Shad.
 194. CLUPEA FINTA—Twait Shad.

SALMONIDÆ.

Plate XXV.

195. SALMO SALAR—Salmon.
 196. SALMO TRUTTA—Sea Trout.
 197. SALMO ALBUS—Blue Poll.
 198. SALMO ERIOX—Bull Trout.
 199. SALMO CAMBRICUS—Sewen.
 200. SALMO LEVENENSIS—Loch Leven Trout.
 201. SALMO FARIO—Trout.

Plate XXVI.

202. SALMO ORCADENSIS—Grey Trout.
 203. SALMO FEROX—Lake Trout.
 204. SALMO STOMACHICUS—Gillaroo Trout.
 205. SALMO NIGRIPINNIS—Hog-backed Trout.
 206. SALMO ALPINUS—Alpine Char.
 207. SALMO PERISII—Torgoch.
 208. SALMO WILLUGHBII—Windermere Char.
 209. SALMO KILLINENSIS—Killin Char.
 210. SALMO GRAYI—Gray's Char.
 211. SALMO COLII—Cole's Char.
 212. SALMO FONTINALIS—American Char.

Plate XXVII.

213. OSMERUS EPERLANUS—Smelt.
 214. COREGONUS OXYRHYNCHUS—Hautin.
 215. COREGONUS CLUPEOIDES—Gwyniad.
 216. COREGONUS VANDESIUS—Vendace.
 217. COREGONUS POLLAN—Pollan.
 218. THYMALLUS VULGARIS—Grayling.
 219. ARGENTINA SPHYRÆNA—Argentine.

CHONDROSTEI.**ACIPENSERIDÆ.**

220. ACIPENSER STURIO—Sturgeon.

HOLOCEPHALI.**CHIMÆRIDÆ.**

221. CHIMÆRA MONSTROSA—Chimæra.

ELASMOBRANCHII.

SELACHOIDEI.

CARCHARIIDÆ.

- Plate XXVIII. 222. CARCHARIAS GLAUCUS—Blue Shark.
 223. GALEUS VULGARIS—Tope.
 224. ZYGÆNA MALLEUS—Hammerhead.
 225. MUSTELUS VULGARIS—Smooth Hound.

LAMNIDÆ.

226. LAMNA CORNUBICA—Porbeagle.
 Plate XXIX. 227. ALOPECIAS VULPES—Thrasher
 228. SELACHE MAXIMA—Basking Shark.

NOTIDANIDÆ.

229. NOTIDANUS GRISEUS—Brown Shark.

SCYLLIIDÆ.

230. SCYLLIUM CANICULA—Rough Hound.
 Plate XXX. 231. SCYLLIUM CATULUS—Nurse Hound.
 232. PRISTIURUS MELANOSTOMUS—Black-mouthed Dog Fish.

SPINACIDÆ.

233. ACANTHIAS VULGARIS—Spur Dog Fish.
 234. LÆMARGUS BOREALIS—Greenland Shark.
 Plate XXXI. 235. CENTRINA SALVIANI—
 236. ECHINORHINUS SPINOSUS—Spinous Shark.

SQUATINIDÆ.

237. RHINA SQUATINA—Monk Fish.

BATOIDEI.

RAIIDÆ.

238. RAI A BATIS—Skate.
 239. RAI A MACRORHYNCHUS—Flapper Skate.
 240. RAI A ALBA—White Skate.
 Plate XXXII. 241. RAI A OXYRHYNCHUS—Long-nosed Skate.
 242. RAI A FULLONICA—Shagreen Ray.
 243. RAI A CLAVATA—Thornback.

PLATE XXXII. (*continued*)—

244. RAI A MACULATA—Spotted Ray.
245. RAI A MICROCELLATA—Painted Ray.
246. RAI A RADIATA—Starry Ray.

Plate XXXIII. 247. RAI A CIRCULARIS—Cuckoo Ray.

TORPEDINIDÆ.

248. TORPEDO MOBILIANA—Torpedo.
249. TORPEDO MARMORATA—Marbled Torpedo.

MYLIOBATIDÆ.

250. MYLIOBATHS AQUILA—Whip Ray.
251. CEPHALOPTERA GIORNÆ—Ox Ray.

TRYGONIDÆ.

252. TRYGON PASTINACA—Sting Ray.

CHAPTER III.
SORTATION.

THERE is no better way of knowing a fish than by a personal introduction, in which a sufficient acquaintanceship is made to enable it to be recognised whenever and wherever it may chance to be met with. But as an introducer is not always available, and there are over two hundred and fifty fishes claimed as British, it is evident that to know them by name another means must be adopted. Let us, therefore, take a familiar species, and, by ascertaining what it is not, discover what it is.

In doing this, we need not at the present stage restrict ourselves to the systematic distinctions which, in many cases, concern themselves with internal structure invisible without dissection. To begin with, let us avail ourselves of external characters, and, later on, use the systematic grouping to confirm our diagnosis. Here, then, is a fish, an ordinary fish, with nothing eccentric about it in colour, shape, or fins, a fish that is known in every kitchen, and comes to table with little alteration in its natural appearance. It is not a flat fish, but, as the term flat-fish is, as a rule, restricted to fishes like the sole and turbot, and does not include the skate and its allies, which are also undeniably flat, let us say that its body is vertical and not horizontal, the reference being to the position in the water of the middle section when fully grown.

As we have lighted on these horizontal bodies, we may as well spend a few minutes with them, noting at the outset that they are divisible into two groups :—

1. Those like the sole.
2. Those like the skate.

In the second group, both eyes are on the upper surface, the mouth is on the under surface, and instead of gill covers like those in our example, there are mere slits.

In one species on the British list, which happens to be the only representative of its genus and family, these slits are lateral, as they are in the sharks; in fact, this is an abnormal sort of shark, a peculiarly ugly animal unmistakable under any circumstances, with a broad, flat body tapering gradually into the tail, the eyes very wide apart, and the paired fins large enough to be compared to the wings of an angel or the cowl of a monk, whence it is known as the angel-fish or monk-fish (*Rhina squatina*).

With *Rhina* out of the way, we are left with the rays, of which the skate is the commonest kind. These have the gill openings

"inferior," that is, on the under-side of the body, and they are divisible into two well-marked groups—

1. Those in which the tail has no longitudinal fold.
2. Those in which the tail has a longitudinal fold.

In both groups the back fin or "dorsal" is either placed on the tail or, as in one genus, is absent altogether. The genus having no dorsal belongs to the first group. It is *Trygon*, and the only species found in British waters, and that not a frequent one, is *T. pastinaca*, the sting-ray, which has the long spine sticking out of the tail that has often done duty as a spear-head in the hands of Telegonus and others, it being a weapon to beware of, and much more curious to look at than pleasant to make acquaintance with.

In the same small group are two genera, both comprising what are known as devil-fishes, in which the tail carries a dorsal fin. In one, *Cephaloptera*, that fin is between the ventrals; in the other, *Myliobatis*, it is beyond the ventrals. Of each genus there is but one species on our list, and they are strikingly different in appearance, the first, *C. giornæ*, the ox-ray, having a stumpy tail behind and two horn-like projections on the head; the other, *M. aquila*, the whip-ray or eagle-ray, having a long whip-like tail, a projecting snout, and no horns. Both species attain large dimensions, but not in British waters; the whip-ray has been caught fifteen feet long, and the ox-ray runs larger, but not so large as another North Atlantic species, *C. diabolus*, which, off the coast of Florida, has swallowed an anchor as if it were a fish-hook, and swum out to sea with the luckless craft that only recovered its independence when its captor died.

As we have talked about dorsals and slipped by ventrals without explanation, we had better pause for a moment for a few words on the fin question. The typical fish has two sets of fins, the unpaired or "vertical" or "median" fins, and the paired fins, which are the homologues of the limbs of the higher vertebrates, the "pectorals" answering to the arms and the "ventrals" to the legs. The ventrals are not happily named; they shift their position considerably, and, as we shall subsequently find, their position is an important aid in identification. It is becoming customary to call them "pelvics," but, unfortunately, there is what is called a "fin formula" in ichthyology—D. P. V. A. C., in which D stands for dorsal, P for pectorals, V for ventrals, A for anal, and C for caudal, a formula which would be all the better were it to read D. A. C. P. V., as we have made it do further on, in which the vertical or body-fins come first, and the paired or limb-fins last. If we use pelvic instead of ventral we shall have two P's, and a source of confusion when comparing with previous books that has led us to retain the old style though preferring the new.

In the earlier, as in many of the existing fishes, the vertical fins are all in one. In time the one continuous fin became divided up into "dorsal," the back fin; "caudal," the tail fin; and "anal," the fin between the vent and the tail; and in some cases the dorsal became divided into two or even three portions. Examples

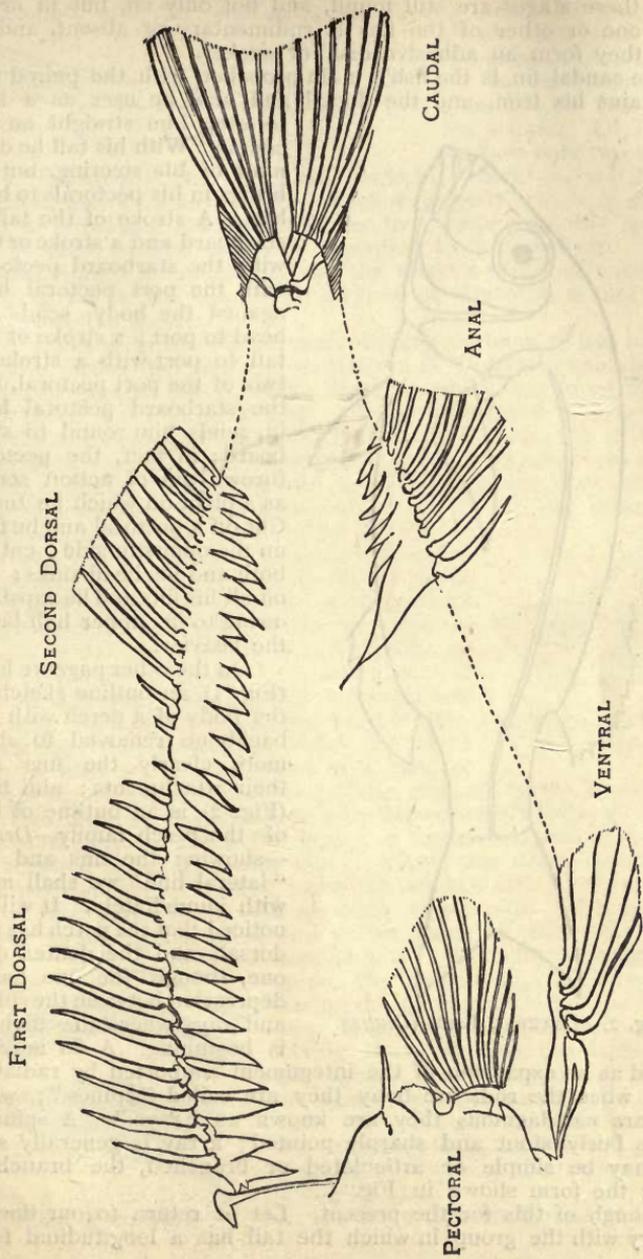


Fig. 1.—FINS OF PERCH.

of all these stages are still found, and not only so, but in many cases one or other of the fins is rudimentary or absent, and in some they form an adhesive disk or sucker.

The caudal fin is the fish's main propeller, with the paired fins he retains his trim, and the dorsal and anal he uses as a keel to keep him straight on his course. With his tail he does most of his steering, but he brings in his pectorals to help him. A stroke of the tail to starboard and a stroke or two with the starboard pectoral, with the port pectoral held against the body, sends his head to port; a stroke of the tail to port with a stroke or two of the port pectoral, and the starboard pectoral held in, sends him round to starboard; in fact, the pectoral thrown out of action serves as a pivot on which he turns. Cut off a pectoral and he falls on the opposite side; cut off both and his head sinks; cut off all his fins and he capsizes, owing to his upper half being the heavier.

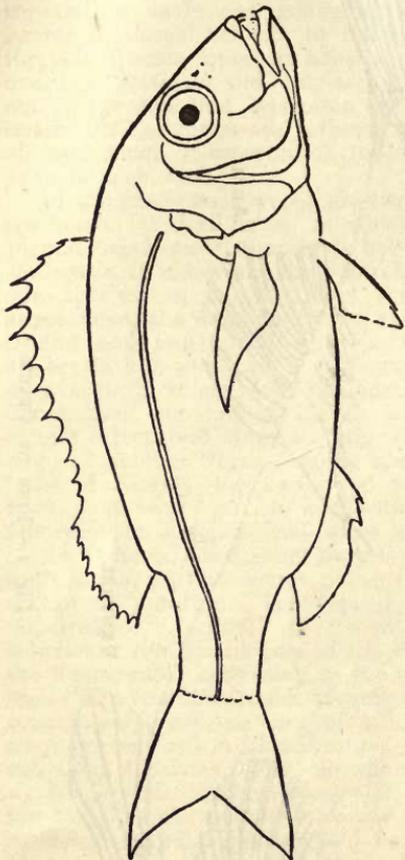


Fig. 2.—LATERAL LINE (*Dentex*).

On the other page we have (Fig. 1) an outline sketch of the body of a perch with the backbone removed to show more clearly the fins and their attachments; and here (Fig. 2) is an outline of one of the perch family—*Dentex*—showing the fins and the "lateral line" we shall meet with immediately. It will be noticed that the perch has two dorsals and the *dentex* only one, though the one has a depression between the spines and rays where the division is beginning. A fin may be defined as an expansion of the integument supported by radiating rods; when the rods are bony they are called "spines"; when they are cartilaginous they are known as "rays." A spine is always fairly stout and sharply pointed; a ray is generally soft, and may be simple or articulated or branched, the branching taking the form shown in Fig. 3.

Enough of this for the present. Let us return to our line of enquiry with the group in which the tail has a longitudinal fold.

It contains but two genera. In one, *Torpedo*, the caudal is well developed, and the side fins, let us call them the wings, are

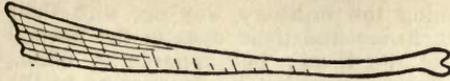


Fig. 3.—BRANCHED RAY.

almost semi-circular; in the other, *Raia*, the tail fin is rudimentary or absent, and the wings are angular. Of *Torpedo* we have only two species

—*T. marmorata*, the marbled torpedo, which is mottled or spotted, and *T. nobiliana*, the common torpedo, which is greyish, with or without a few blotches, the two being probably varieties of the same species coloured according to environment. These, it need hardly be mentioned, are the electric rays that have given their names to the submarine engines of destruction that in no way resemble them.

A genus of greater importance, though perhaps of less interest, is *Raia*, which has ten representatives in British waters, divisible into two groups, five in each, those in which the snout is short and those in which it is long. Of the long-nosed rays, one only has the under-surface brownish, that being *R. batis*, the skate that is generally eaten, though several of the other species are equally edible and are frequently sold as substitutes, the rays being the chief constituents of the mysterious "roker" of the Billingsgate Market report. The other four consist of the long-nosed skate, *R. oxyrhynchus*, in which the lower surface is grey; the flapper skate, *R. macrorhynchus*, in which it is white with black spots; the white skate, *R. alba*, in which it is pure white, there being no row of spines round the eye, but a central row of spines on the tail with a lateral row on each side of it; and, finally, the shagreen ray, *R. fullonica*, in which the lower side is also white, and there is a row of spines round the eye but no middle row of spines on the tail.



Fig. 4.—SCALE OF THORNBACK.

Two of the short-snouted rays are brown underneath—*R. radiata*, the starry ray, in which the brown is unspotted, and *R. maculata*, in which it is spotted with black. Three are white underneath, the most strikingly marked being the cuckoo-ray, *R. circularis*, in which the under surface is generally edged with black and the upper surface has a black and yellow patch on each side of the median line. The other two are both spiny, the painted ray, *R. microcellata*, having the spines confined to the median line, and the thornback, *R. clavata*, having them all over the body; and the spines are unmistakable, as can be seen by the sample (Fig. 4). They are almost as remarkable as the crushing-teeth, as shown in the diagram of those in the male's upper jaw (Fig. 5).

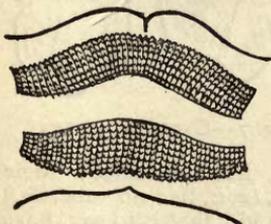


Fig. 5.—UPPER JAW OF MALE THORNBACK.

We have now to devote our atten-

tion to the flat-fish generally so called. As the skates pass through a shark stage in early life, so the flat-fish start as very thin youngsters swimming the ordinary way up, with their mouths like those of other fishes and their eyes in the normal places, one on each side of the head; but apparently, failing to thrive under these conditions, they betake themselves to the ground, where their exposed part takes on the colour of their surroundings and their head turns over so as to bring both eyes on the top, and, in some cases, their mouth becomes more developed on one side than the other.

In some cases they have subsided to the right, in others to the left, and by this we know them. Holding them head foremost towards us we have—

1. Eyes to the left.
2. Eyes to the right.

In the "eyes left" division are four genera. One, *Arnoglossus*, will be found to have a couple of spines behind the left ventral; there being but one species, *A. laterna*, the scald-fish or scald-back, so called from its skin rubbing off in the trawl, as if it had been scalded. In the other genera there are no spines behind the ventrals. In one of them the tail is conspicuously long, the fin by itself being the same length as the distance between the ventral and the tip of the snout; this is *Lepidorhombus*, of which the only species is *L. megastoma*, the megrim, which has not only a large mouth but a large head and large eyes, and a general appearance of truculency which is not prepossessing. The scales are "ctenoid,"



Fig. 6.—
CTENOID SCALE.

that is, have a comb-like arrangement of teeth on the hinder edge, much the same as that in the illustration (Fig. 6), which, however, was not grown on a "merfy sole," as the megrim is occasionally called on account of its activity when on a cruise. The other genera have short tails. One, *Zeugopterus*, has ctenoid scales; the root of the tail is not free of the other fins, and the dorsal and ventrals are very long. There are two species, *Z. unimaculatus* and *Z. punctatus*, both known as topknots, the first being the one spotted, the other the brown. A third, known as the Norwegian topknot, seems to be a variety hardly worth mentioning, and, indeed, the topknots are of little importance compared with the next genus, *Rhombus*, which contains the turbot and the brill. The turbot, *R. maximus*, has no scales; their place is taken by tubercles. The brill, *R. lævis*, has no tubercles, but small scales, which in shape are "cycloid," that is to say, have no comb-like serrations at the rear edge, and are concentrically striated, in much the same way as those in the illustration (Fig. 7).

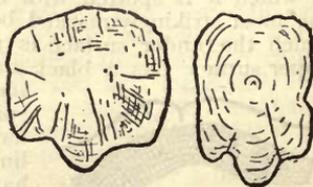


Fig. 7.—CYCLOID SCALES.

In the "eyes right" group there are also four British genera, divisible into two in which the jaws are alike on both sides, and two in which they are larger on the blind side. Those in which the jaws are similar on both sides are *Hippoglossoides*, represented by *H. limandoides*, the long, rough dab or lemon sole—north of the Forth—distinguished by the straight lateral line and rough scales, and, above all, by its size (which never exceeds a foot and a quarter) from *Hippoglossus*, in which the lateral line is curved, the scales smooth, and the size enormous, for its only British representative is *H. vulgaris*, the halibut, narrowest and largest of the flat-fish, which is commonly five feet long, and has been known to exceed twenty.

The other two are *Pleuronectes* and *Solea*, the latter distinguished by having no teeth on the upper side, instead of a few feebly developed, by the snout projecting beyond the jaws, instead of the mouth being at the end of the snout, and by having a sort of beard of short projections from the skin on the under side of the head. Of *Pleuronectes* the species on our list are the flounder, *P. fesus*, with tubercles along the bases of the fins; the dab, *P. limanda*, with a curved lateral line; the witch, *P. cynoglossus*, with no spots, the smear dab (another of the lemon soles), *P. microcephalus*, with dark spots, and the plaice, *P. platessa*, with orange spots, and having tubercles on the head. Some people are said not to know a turbot from a plaice; they have only to remember that one has the eyes to the left, the other has the eyes to the right. Some are said not to know a sole from a lemon sole: the only way out of that difficulty is to know what a sole is like, the lemon sole being what may be called various, and generally but a somewhat distant relative. Of the soles there are only four species—(1) the solenette, *Solea lutea*, which is not more than five inches long, never used for food, and has black rays, like stripes, on its fins; (2) the thickback, *S. variegata*, which is chestnut brown on the upper side, with five broad, dark bands; (3) the sand sole (perhaps the original lemon sole), *S. tascaris*, which has the lower nostril larger than the other, and is orange in colour, with dots and specks; and (4) the common sole, *S. vulgaris*, in which the nostrils are alike, and the colour blotchy brown, with a black spot at the outer end of the pectoral fin. To sum up our "eyes right" division, we stand thus:

Jaws alike on both sides—

Lateral line straight—*Hippoglossoides*,

Lateral line curved—*Hippoglossus*.

Jaws not alike on both sides—

Mouth at end of snout—*Pleuronectes*.

Snout curving beyond mouth—*Solea*.

With the soles we end our list of horizontals, and are face to face with the many more verticals, to one of which our specimen belongs. These we can sort out at once according to their tails.

There are half-a-dozen genera in the British list which are without a caudal fin; to dispose of these is to clear the way. Their shape is enough to guide us. In two the body tapers from a large head; these being *Chimara*, in which the tail becomes a long filament, and

Zoarces, in which the dorsal has a low, penultimate section, as if half an inch had been bitten out of it close to the end. The chimæra (*C. monstrosa*) has also a sort of nick near the end of the dorsal, but differs from the viviparous blenny (*Z. viviparus*) in having a similar nick in the anal beneath. One species is not likely to be mistaken for the other, as though the blenny is remarkable enough for bringing forth dozens of living young at a time, it is much more of a fish to look at than the chimæra, which is unlike anything else that swims, except it be another chimæra.

Among other features it is noticeable for its pectorals, which are very large, and may be compared to a beard, and in this respect it contrasts well with our next genus, *Nerophis*, in which the pectorals are absent, and the body rounded, smooth, and worm-like, as might be expected of the pipe-fishes. In these the body is sheathed in bony rings. By the number of these rings we can identify the three species, *N. æquoreus*, the ocean pipe-fish, having from 28 to 31 and 56 to 61; *N. ophidion*, the straight-nosed pipe-fish, having 28 or 29 and 65; and *N. lumbriciformis*, the worm pipe-fish, having 18 or 19 and 49.

Two genera are long, thin, and ribbon-shaped in build. These are *Trichiurus*, in which there are neither anals nor ventrals, and the tail thins off to so long a point that the name of hair-tail has been given to the only species, *P. lepturus*; and *Regalecus*, in which the anal is absent, the ventrals are represented by a pair of long-loomed paddles, and the dorsal is furnished in front with a curved crest that can be compared to that of the cockatoo. Of this genus there is but one species, *R. banksii*, the ribbon-fish, or, from the paddles, Banks's oarfish. This gives us five genera, all of the grotesque school; the sixth is *Hippocampus*, the sea-horse (*H. antiquorum*), in which the head is joined on to the body by a neck, and the whole form is ridged and shaped in so quaint a way that everyone knows it, though most people fancy the sea-horse is about a dozen times larger than he really is.

Our next division, that in which the vertical fins are continuous, include a few more out-of-the-way forms. Here come the two sun-fishes, *Orthogoriscus*, with their bulky bodies cut off short behind, as if they had lost their tail-end and grown a fringe on the stump. There is no doubt about these two—one, the sun-fish, *O. mola*, with a rough skin and the hinder end rounded; the other, the oblong sun-fish, *O. truncatus*, with a smooth skin and the hinder end straight—each with the narrow dorsal and anal standing out like the back-fin of a porpoise; known at a glance, and easily seen, seldom less than two feet, and sometimes over eight feet long. Next to them we will place the Cornish sucker, *Lepadogaster gouanii*, four inches in length, and not always that, in which the median fins are much less disputably continuous, and the body is depressed in front and compressed behind, and has a sucking disk between the ventrals. Following this we may as well get rid of *Coryphanoides rupestris*, which has only been found once or twice in British waters. In this rare visitor the body tapers so sharply from a large head to a pointed tail, that the fish looks like a ten-inch tadpole. Yet one more curiosity in this group, the red band-fish, *Cepola rubescens*, long and thin, like half-a-yard of orange ribbon edged with a fringe and ending in a point.

This leaves us with the eels and the eel-like. In the eel-like the skin does not extend over the gill-covers; in the eels it does. Of those in which the gill-covers are not hidden there are only *Ophidium*, in which the ventrals are represented by a pair of filaments,

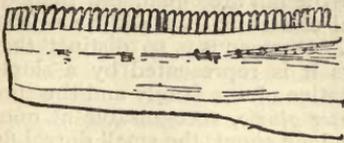


Fig. 8.—CARDIFORM TEETH.
(*Conger*.)

and *Fierasfer*, in which the ventrals are gone without any external traces. Of *Ophidium* only one British example is recorded, and of *Fierasfer* only two, so that they are not likely to trouble the fisherman. Of eels there are three species, each of a different genus. *Muraena* has no pectorals; *Conger* and *Anguilla* are alike in having pectorals, but in *Conger* the upper jaw is the longer, and in *Anguilla* it is shorter. The *Muraena* is a rarity; it is a rich purplish brown and yellow in colour. The other two eels are common enough; the conger, much the larger and fiercer—look at the “cardiform” teeth in his jaw, placed so closely together as to form a cutting edge (Fig. 8)—has always been assigned to one species, *C. vulgaris*, but the male and female eel were long assigned to two species or more, and have only of recent years been put in their right place.

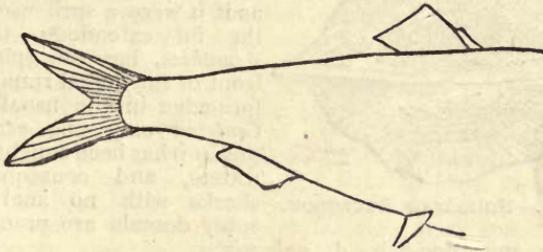


Fig. 9.—HOMOCERCAL TAIL.

The fishes that are left have well-defined tails, but it is apparent at once that these tails are of two different types, the majority having the lobes equal, but a by no means insignificant majority having one lobe much larger than the other. In the first group the tail is “homocercal,” in the second it is “heterocercal.” In Fig. 9 we

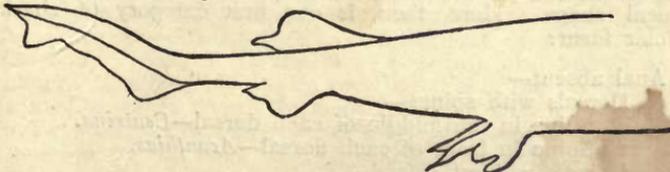


Fig. 10.—HETEROCERCAL TAIL.

have a homocercal tail, and in Fig. 1 will be seen how this form is produced by the last of the caudal vertebræ articulating with the fan-shaped hypurals, which, with the neural and hæmal extensions,

carry the rays of the caudal fin, so that the homocercal tail is only superficially symmetrical after all. Compare this with the other type sketched in Fig. 10, in which the backbone is continued to the outermost point.

In our specimen fish the lobes of the tail are equal, and there is nothing approaching a heterocercal character; we will, therefore, sort out our heterocercals forthwith. One genus is so distinct that it claims first place. In our waters it is represented by a single species, which is the sole representative of the family and the sub-order. This is the sturgeon, *Acipenser sturio*, recognisable at once by the five rows of bony plates, the long snout, the small dorsal fin placed near the tail, and last, not least, when it comes to table, the notochordal backbone. Externally the plates distinguish it at a glance; of one of them, which hang side by side like a long row of shields, we give a sketch (Fig. 11).

With the sturgeon out of the way, we have left on our hands the fifteen British sharks, which will not prove troublesome. Four of them have no anal fin, and of these four two have spines in their dorsals and two have not. Of the two with spiny dorsals, one,

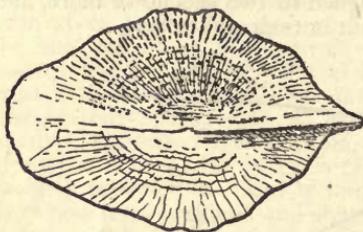


Fig. 11.—SHIELD OF STURGEON.

Centrina, has the spine starting from the middle of the base of the fin and curving forwards across it, as if it were a sprit used to keep the fin extended; the other, *Acanthias*, has the spine in the front of the dorsal running up the fore-edge in the usual way. Of *Centrina* only one example (*C. salviani*) has been caught in British waters, and consequently our sharks with no anal fin and spiny dorsals are practically the

common spur dog-fish, *A. vulgaris*.

In the next two genera the dorsals are without spines, but the skin is spiny. In one, *Lamargus*, the first dorsal is some distance in front of the ventrals; in the other, *Echinorhinus*, it is far back and over them. The former is represented by *L. microcephala*, the Greenland shark, a bulky species with a prominent snout and a sort of upper lip; and of the latter the only representative is *E. spinosus*, the spinous shark, in which the snout is of the normal conical shape. Here, then, is our first category of sharks in tabular form:

Anal absent—

Dorsals with spines—

Spine in the middle of each dorsal—*Centrina*.

Spine in front of each dorsal—*Acanthias*.

Dorsals without spines—

First dorsal in middle of back—*Lamargus*.

Both dorsals near tail—*Echinorhinus*.

The sharks of our waters that have an anal fin are eleven in number, and with a single exception they all have two dorsal

fins. The brown shark (*Notidanus griseus*) has but one, and is also recognisable by having six gill-slits, whereas all the other sharks have five. That reduces our eleven to ten, which we can arrange in two batches according to the position of their first dorsals. In the first batch we will place those in which the first dorsal comes over the space between the ventrals and the anal, that is, in the hinder third of the back; in the other batch, we will have those in which it comes over the interval between the pectorals and ventrals, or almost in the middle of the dorsal curve. Those with the dorsals well aft are two in number—*Pristiurus*, in which the anal is long enough to nearly reach the caudal; and *Scyllium*, in which it is not noticeably large, and never gets nearer the caudal than its own length. Of *Pristiurus* there is a solitary species, *P. melanostomus*, the black-mouthed dog-fish, recognisable at a glance by the three rows of squarish black blotches on its sides that suggest an ocelot; and of *Scyllium*, in which the markings are a multitude of spots and specks, there are but two species—*S. canicula*, the rough-hound, and *S. catulus*, the smooth-hound, in the first of which the anal ends below the interval between the dorsals, while in the second it reaches to beneath the middle of the second dorsal and no further.

Of the sharks in which the dorsals come so far forward for the first to begin over the interval between the paired fins, one, *Zygæna*, stands out boldly, not only from the sharks but from all other fish, by its hammer-shaped head, which extends right and left at right angles to the neck, and has the eyes in the middle of the square ends. These eyes have a lid or nictitating membrane, and this membrane will come in useful in sorting out the six remaining genera, in three only of which it is present. These are *Carcharias*, *Mustelus*, and *Galeus*, and they all have long, conical heads. The blue shark, *Carcharias glaucus*, has a pit at the base of the tail, and is without the spiracles that mark the opening of the respiratory passage leading into the pharynx. *Mustelus* and *Galeus* have no pit at the base of the caudal fin, and in the former the second dorsal is almost as large as the first, whereas in the other it is very small. Of each there is but one species, *M. vulgaris* being the smooth-hound, and *G. vulgaris* the tope which can be distinguished from it by the squarish gap in the caudal's lower lobe.

Of the three genera in which the eye has no nictitating membrane, one is as readily recognisable as the hammer-head by reason of its enormously-developed tail, the upper lobe of which is as long as the body. This is the thrasher (*Alopias*), also known as the fox-shark. The long tail has no keel, like that of the two remaining genera—*Lamna*, in which the teeth are large and lanceolate, the British representative being the porbeagle, *L. cornubica*; and *Selache*, represented by the huge basking shark, *S. maxima*, in which the teeth are small and conical, as might be expected from the innocent nature of its food. With the vegetarian *Selache* we conclude our second category of sharks, which we tabulate in this way:—

Anal present—

One dorsal—*Notidanus*.

Two dorsals—

First dorsal above interval between ventrals and anal—

Anal long—*Pristiurus*.Anal moderate—*Scyllium*.

First dorsal above interval between pectorals and ventrals—

Eye with nictitating membrane.

Head hammer-shaped—*Zygæna*.

Head conical;

Pit at base of caudal—*Carcharias*.

No pit at base of caudal;

Second dorsal almost as large as first—

Mustelus.Second dorsal small—*Galeus*.

Eye without nictitating membrane—

Tail not keeled—

Upper lobe very long—*Alopecias*.

Tail keeled—

Teeth large and lanceolate—*Lamna*.Teeth small and conical—*Selache*.

At last we have reached the fishes with homocercal tails, and by eliminating the two flying fishes (*Exocetus*), in which the pectoral fins are developed into organs of flight, and the lower lobe of the tail seems to be lengthened for steering purposes, we are left with the large group in which both lobes of the tail are similar in outline. The dorsal fins will guide us through the crowd, but before going straight ahead we can simplify matters to a great extent by clearing the road of some of the eccentricities.

To begin with, there is one fish in the British list which seems to have had its tail broken off short and stuck on again in a hurry at the wrong angle. This is the deal-fish, *Trachypterus arcticus*, with two dorsals, a short and a very long one, and no anal. In the others the tail is in a line with the backbone.

Two of the genera have short, stout bodies, one of them, *Tetrodon* (the globe-fish), having the gullet dilatible into a sphere dotted with star-like spines; the other, *Balistes*, having the scales developed into a coat of armour. Of *Balistes* there are two species, the trigger-fish (*B. maculatus*), which has spots on the sides and no plates behind the gills, and the file-fish (*B. capriscus*), which has no spots on the sides and two plates behind the gills.

Four genera are of little breadth, but much depth. Of these the opah (*Lampris*) is iridescent, and marked with rounded, silvery patches; the dory (*Zeus*) is grey, with a large round black blotch ringed with yellow, and has ragged filaments attached to the dorsal spines; the trumpet-fish (*Centriscus*) has a lengthy tubular snout, not unlike the chanter of the bag-pipes; and that very queer fish, *Argyropelecus*, known by only one specimen, is square in the fore body, becoming suddenly narrow as if the hinder half of a slender fish had been telescoped into it.

Four more genera we can group together, as having the body elongated and slender. Two of them are pipe-fishes, armoured with

bony plates and ridged, the caudal ridge in one (*Siphonostoma*) being continuous with the lateral ridge, that in the other (*Syngnathus*) being continuous with the dorsal. The two others are distinguishable by the development of the jaws into a long beak, one of them (*Scombre sox*) the skipper, having finlets, and the other (*Belone*), the gar-fish or mackerel-guard, being without them.

Two may be described as eel-like, one of them being the butter-fish (*Centronotus*), which has the dorsal marked all along its base with round black spots, edged with white, the other differing from it in having no spots and no ventral fins. This is *Ammodytes*, represented by the three sand-eels, one of which, the smooth sand-eel (*A. cicerellus*) has only 15 rays in its caudal fin, the others having 19, one of them (*A. tobianus*) having the fins curved in outline, and one of them (*A. lanceolatus*) having fins of the same height all along.

One genus (*Centrolophus*) has a long, flat body with a long dorsal, higher behind than in front in *C. britannicus*, and highest in the middle in *C. pompilus*, which also has long pectorals, while the other species, of which but a single specimen is known, has them short. Another genus (*Lepidopus*) has the body long and thin, and tapering to a small forked tail, and takes its name from the remarkable way in which the ventrals have departed and left behind a single scale as the only trace of their existence. Finally, there is *Xiphias*, known by everyone for the long, thin projecting upper jaw, which has caused it to be called the sword-fish.

In seven genera there may be a doubt as to whether there are two dorsals or one, owing to the first dorsal being in some way replaced or obscured. In *Echeneis*, for instance, it is replaced by a sucker; in *Cyclopterus*, the ungainly lump-fish, it becomes hidden in a fleshy ridge, and in five genera it is represented by isolated spines.

In the angler (*Lophius*) these spines are furnished with filaments. A repulsive, but withal interesting, fish is this, not only for his hideousness, and the way in which he dangles the bait over his big half-moon of a mouth, but for the reptilian character of the paired fins with which he walks about the bottom of the sea; and as to his teeth, justice can only be done to them by a sketch (Fig. 12), which we may as well supplement with another (Fig. 13), showing how the teeth are hinged in the middle, so as to fall down as the capture enters and rise to prevent escape.

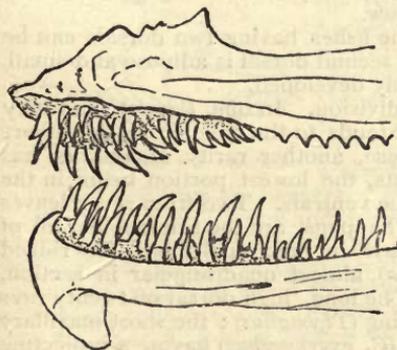


Fig 12.—TEETH OF ANGLER.

In the four other genera the spines are short, and have no filaments. One, *Lichia* (the derbio), has the long lobes of the deeply-forked tail tipped with black, and of the spines, which are five or six in number, the first points forwards. Another, *Naucrates* (the pilot-fish), is banded vertically with broad, dark stripes that

extend on to the fins; another, *Pammelas* (the black-pilot or rudder-fish), has six or seven spines representing the first dorsal, and the anal fin has two spines. The last, *Gasterosteus*, comprises our



Fig. 13.—
HINGED
TOOTH OF
ANGLER.

familiar friends the sticklebacks, in which the scales along the sides are replaced by scutes. In the smooth-tailed stickleback these plates extend only to the tip of the pectorals; in the half-armed stickleback they extend half-way to the base of the caudal; in the rough-tailed stickleback the plates are keeled at the base of the caudal. The other sticklebacks—the three-spined, four-spined, nine-spined, and fifteen-spined—are readily recognisable by the number of their spines.

The way is now clear for the long voyage home.

Our representative fish is not one of this unimportant seven, nor was it one of the foregoing seventeen, being, as we have said, an ordinary fish of ordinary shape, with nothing out of the way about it.

It has not three dorsals, that is the distinctive feature of the genus *Gadus*, including the cod-fish (*G. morrhua*), which, like the whiting, the haddock, the whiting-pout, and the power, has the upper jaw the longer, and, like all of them except the whiting (*G. merlangus*), has a barbule. It can be distinguished from the other three by having a white lateral line, the haddock (*G. aeglefinus*) having a black lateral line, the two that remain having a brown lateral line, the whiting-pout (*G. luscus*) being coppery and broadly banded, and the power (*G. minutus*) silvery and without bands. Three species of *Gadus* have the lower jaw the longer; one of them (*G. virens*), the coal-fish, has a barbule, those without a barbule being *G. poutassou* (Couch's whiting), on which the lateral line is straight, and *G. pollachius* (the pollack), on which it is curved; the two fishes differing much in colour, the pollack being greenish and grey, the other silver and yellow.

Nor has it two dorsals. The fishes having two dorsals can be sorted into those in which the second dorsal is adipose and small, and those in which it is noticeably developed.

Seven genera form the first division. In one, *Paralepis*, a rarity in British waters, the anal fin extends to the caudal; in the others it is not nearly so long. Of these, another rarity, *Maurolicus*, has the anal of three different heights, the lowest portion being in the middle and the highest near the ventrals. Two from seven leaves us with five, and the five, as it happens, are the salmonoids, all of whom have less than twenty rays in their anal fins. The ridged body of the argentine (*Argentina*), almost quadrangular in section, distinguishes it at a glance. The long, high dorsal of twenty rays or more characterises the grayling (*Thymallus*); the short maxillary marks off *Coregonus*, the hautin (*C. oxyrhynchus*) having a projecting snout, the gwyniad (*C. clupeioides*) a truncated snout, the vendace (*C. vandesius*) a long lower jaw, and the pollan (*C. pollan*) equal jaws and no truncation of the muzzle. Of the two genera with a long maxillary, the smelt (*Osmerus*) is recognised by its dorsal rays numbering 11, and *Salmo* by their ranging from 12 to 15. Of *Salmo* there are some twenty species or varieties, and as their many trifling differences cannot be dealt with briefly, we will hold the

matter over until we go into detail in another chapter. One thing is perhaps worth mentioning here, and that is, that the salmon (*Salmo salar*), like the rest of the genus, has less than 14 rays in its anal fin, while the salmon of the Pacific, the fish that is canned, belongs to another genus, *Oncorhynchus*, distinguished by having 15 or 16 rays, and is really the quinnat (*O. quinnat*), known as salmon for trade purposes.

We may as well have this adipose dorsal assemblage in tabular form:—

Two dorsals, second dorsal adipose—

Anal extending to caudal—*Paralepis*.

Anal not extending to caudal—

Anal with over 20 rays—

Anal in three portions of different heights—*Maurolucus*.

Anal with under 20 rays—

Body ridged—*Argentina*.

Body not ridged—

Dorsal rays over 18—*Thymallus*.

Dorsal rays under 18—

Maxillary short—*Coregonus*.

Maxillary long—

Dorsal rays 11—*Osmerus*.

Dorsal rays 12 to 15—*Salmo*.

In sorting out the fishes with two ordinary dorsals, we will avail ourselves of the barbules and pectoral filaments that are so conspicuous in a few. To the question as to what is a barbule, the best



Fig. 14.—HEAD OF BARBEL.

reply is a reference to the sketch of the barbel's head (Fig. 14); for the barbel was named after the appendages he wears, and on his account it is more convenient to call them barbules, in the old style, to save confusion between the "little beard" and its wearer. Of barbules, or barbels, then, it will be noticed that he has four, two from the snout and two from the corners of his mouth.

By the barbules, many and white, the octagonal body and the absence of pectoral filaments, we distinguish the pogge (*Agonus*). By the three pectoral filaments and the ridged body we know the gurnards (*Trigla*), of which there are half a dozen species, *T. gurnardus* being the grey one. Of the five which are all red, more or less, the piper, *T. lyra*, is known by the flat triangular plates over the muzzle, which make it look as if it were divided, and the lanthorn gurnard, *T. obscura*, is distinguished by the broad silvery stripe which separates the red back from the white abdomen; the streaked gurnard, *T. lineata*, has lateral ridges that slope forward from the back; the red gurnard, *T. cuculus*, has a spiny ridge along the base of the dorsals, and red fins; and the sapphirine gurnard, *T. hirundo*, has spines along the dorsals and large blue pectorals.

By the two pectoral filaments, the ridged body, and the bifid snout, we identify the armed gurnard (*Peristethus*), and by the two stiff barbules under the chin, and the two dorsals wide apart, we recognise the red mullet (*Mullus*). With one barbule we have four genera (1), *Phycis*, distinguished by the ventral being replaced by the bifid filament, from which the fish is known as the forkbeard; (2), *Molva*, the ling or "long-fish," in which the teeth are large in the lower jaw, and the first dorsal is short; (3), *Lota*, the burbot, in which the first dorsal is also short, but there are no large teeth in the lower jaw; and (4), *Raniceps*, the lesser forkbeard, in which the first dorsal consists of only three rays.

In our next category we have those without barbules. Of these, five genera are distinguishable off-hand by having finlets. In *Scomber* and *Auxis* the dorsals are wide apart; in *Pelamys*, *Thynnus*, and *Orcynus* they are close together. The finlets fill the gap between the tail and the second dorsal, and that between the tail and the anal; in the common mackerel (*Scomber vernalis*), they are readily seen. There are three mackerels—the ordinary species, which has a banded back and a spotless abdomen; the speckled mackerel (*S. punctatus*), which has a thinly-streaked or speckled back and a spotless abdomen; and the Spanish mackerel (*S. colias*), which has a banded back and a spotted abdomen. *Auxis* differs from *Scomber* in having a distinct keel on the tail instead of two slight ridges; it is represented only by *A. rochei*, the plain bonito. The three genera in which the dorsals are close together have keeled tails. *Pelamys* (the belted bonito) is recognisable by its long first dorsal, which has more than twenty rays; the others have shorter dorsals, one, *Thynnus* (the bonito), having seven finlets, the other, *Orcynus*, having eight or nine. To this last belong the tunnies, of which there are two on the British list—the short-finned tunny, *O. thynnus*, in which the pectorals do not reach the finlets, and the long-finned tunny, *O. germon*, in which they do.

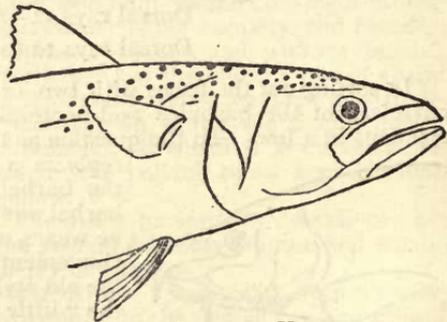


Fig. 15.—THORACIC VENTRALS

This finlet group may as well be set forth in a table like the rest—

Dorsals wide apart—

Tail with 2 slight ridges—*Scomber*.

Tail distinctly keeled—*Auxis*.

Dorsals close together; tail keeled—

First dorsal with over 20 rays—*Pelamys*.

First dorsal with under 20 rays—

Finlets 7—*Thynnus*.

Finlets 8 or 9—*Orcynus*.

Having neither barbules nor finlets to help us any more, we betake ourselves to the position of the ventral fins, which affords almost as easy a means of identification. These fins are found in three positions—they may be “jugular,” that is, in the throat, or “thoracic,” that is, in the chest (Fig. 15), or “abdominal,” that is in the middle of the abdomen or thereabouts (Fig. 16).

In only three genera of the double dorsal group are the ventrals jugular, and in one of them they are placed wide apart. This is *Callionymus*, the genus of the skulpin, in which the first spine is so unusually long in the males as to be distinctive, like the length of the last ray in the females. The two in which the ventrals are at the normal distance apart are *Trachinus* (the weevers), in which the first dorsal has only five or six rays, and *Merluccius*, the hake, in which it has ten. The hake can be recognised by his black mouth and formidable teeth, which are characteristic enough to deserve a sketch (Fig. 17); the greater weever, *T. draco*, has two spines above the eye, the viper weever, *T. vipera*, has no spines above the eye.

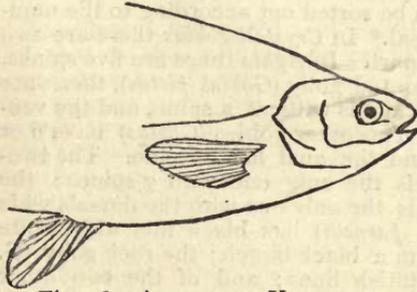


Fig. 16.—ABDOMINAL VENTRALS.

As there are three genera of this group with jugular ventrals, so there are three with abdominal ventrals. In this case, however, there is but one genus (*Capros*) in which the dorsals are close

up, it has but one species in our waters, *C. aper*, the boar-fish, flat and deep in body, red in colour, and rejoicing in a protractile snout from which it gets its name. The two genera in which there is a conspicuous interval between the dorsal fins are *Atherina*, in which the first dorsal has 7, 8, or 9 spines, and *Mugil* (the grey mullets), in which it has but only 4. Of *Atherina* there are two species, one of which appeared once, and has never been seen again; of *Mugil* there are two species, the grey mullet, *M. capito*, in which the anal begins nearly halfway between the dorsals, and the lesser grey mullet, *M. chelo*, in which it begins almost in a line with the second dorsal.

As far as we have gone with the double dorsals, we stand:

Ventrals jugular—

Ventrals wide apart—*Callionymus*.

Ventrals close together—

First dorsal with 5 or 6 rays—*Trachinus*.

First dorsal with 10 rays—*Merluccius*.

Ventrals abdominal—

Dorsals wide apart—

First dorsal with 4 spines—*Mugil*.

First dorsal with 7 or more spines—*Atherina*.

Dorsals close together—

Body red; deep and compressed; mouth protractile—

Capros.

This leaves us with the double dorsal fishes having thoracic ventrals. Two we can deal with on their lateral line, that row of perforated scales running along the sides of so many species, the holes in which communicate with a muciferous duct leading to the head, a good example of which was given in the outline of the dentex on a preceding page. In one genus of this group, *Caranx* (the horse mackerel or scad), the lateral line is armed with

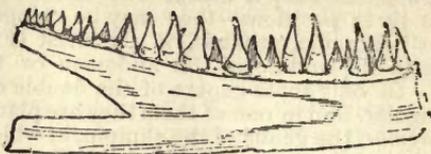


Fig. 17.—TEETH OF HAKE.

bony plates, a further distinctive mark being the two spines in front of the ventrals. In another genus, *Sciæna* (the shadow-fish), the lateral line is continued through the tail to the outer edge of the caudal fin.

The genera that remain can be sorted out according to the number of spines in the first dorsal. In *Crystallogobius* there are two spines which are placed wide apart. In *Aphia* there are five spines. In another of the gobies, the painted goby (*Gobius pictus*), there are 6 spines in the first dorsal, the anal is without a spine, and the ventrals have a spine and 5 rays. The other gobies (*Gobius*) have 6 or 7 spines in the first dorsal, and the anal has a spine. The two-spotted goby (*G. ruthensparri*) is the only one with 7 spines; the one-spotted goby (*G. minutus*) is the only one with the dorsals wide apart; the speckled goby (*G. parnelli*) has black fins with white lines, the first dorsal ending in a black blotch; the rock goby (*G. niger*) has brown fins with whitish lines; and of the two other gobies, *G. quadrimaculatus* has four spots in a line on the hinder half of the body, and *G. paganellus* has the dorsals banded with orange.

In *Cottus* the first dorsal has from 6 to 10 spines, the anal is spineless, and the ventrals have a spine and less than 5 rays. There are four species, one, *C. quadricornus*, having four short horns on the top of its head, the others having no horns. The miller's thumb (*C. gobio*) has a spine and 4 rays in its ventrals; the long-spined cottus (*C. bubalis*) has a spine and 3 rays; and the father lasher (*C. scorpius*) has no spine and only 2 rays.

This leaves us with the two highest representatives of the perch family, *Labrax* and *Perca*. In *Labrax*, of which there is only one British representative, the bass (*L. lupus*), there are 8 or 9 spines in the first dorsal, and the anal has 3 spines; in *Perca*, the sole representative being the perch (*P. fluviatilis*), the first dorsal has 14 or 15 spines, and the anal has only 2. Summarising as before, we have:—

Ventrals thoracic—

Lateral line armed with bony plates—

Two spines in front of ventrals—*Caranx*.

Lateral line continued through caudal fin—*Sciæna*.

First dorsal of 2 spines, wide apart—*Crystallogobius*.

First dorsal of 5 spines—*Aphia*.

First dorsal of 6 spines—

Anal spineless; ventrals with a spine and 5 rays—*Gobius (pictus)*.

First dorsal of 6 to 10 spines—

Anal spineless; ventrals with or without a spine and with less than 5 rays—*Cottus*.

First dorsal of 6 or 7 spines—

Anal with 1 spine—*Gobius*.

First dorsal of 8 or 9 spines—

Anal with 3 spines—*Labrax*.

First dorsal of 14 or 15 spines—

Anal with 2 spines—*Perca*.

In only one British fish with one dorsal fin are there no ventrals, and that is the wolf-fish or cat-fish (*Anarrhichas lupus*), whose powerful teeth and general ugliness have become proverbial (Fig. 18). In only two genera are the ventrals rudimentary, and in each case they surround a sucker. One of them is *Lepadogaster*, which we sorted out before so far as *L. gouanii* was concerned, owing to the vertical fins being continuous; in the two remaining species, the suckers (*L. decandollii* and *L. bimaculatus*) the vertical fins are not continuous, the last species being distinguished from the others by having a black ocellated spot under the tip of the pectoral. In all the species there are less than 20 rays in the dorsal. In *Liparis* the dorsal rays exceed 20 in number; the sea-snail, *L. vulgaris*, about six inches long, is streaked on the body, Montagu's sucker, *L. montagui*, which is about half the length, is spotted on the body.

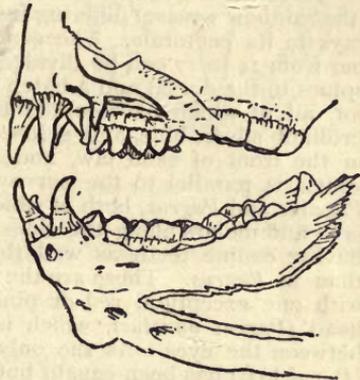


Fig. 18.—TEETH OF CAT-FISH.

This clears us of the cripples, and leaves us only with such fishes as have the dorsal and ventrals properly developed. In four genera the ventrals are jugular, these comprising the rocklings, the blennies, and the torsk. The rocklings (*Motella*) have the fore part of the dorsal in the shape of a fringe with a long ray to begin with. The three common species are known by their barbules—the five-bearded, four-bearded, and three-bearded—and the rare species, *M. macrophthalmia*, by its unspotted body, distinguishing it from the three-bearded rockling, which, like it, has three barbules, but, unlike it, has a large number of spots and blotches on its upper parts.

The blennies have the dorsal low in the middle and small ventrals. One, the butterfly blenny (*Blennius ocellaris*), differs from the others in having an ocellated spot on the first dorsal. Another, the shanny (*B. pholis*), has no tentacle over the eye; another (*B.*

galerita) has a black band at the base of the pectorals; and the last (*B. gattorugine*) has no such band. In Yarrell's blenny (*Carelophus ascanii*) the dorsal is long and straight, and there are filaments on the first three rays; in the torsk (*Brosmius brosme*) the dorsal is also long and straight, and the ventrals are curiously thick and pointed. It belongs to the cod family, and is a couple of feet long or so. Practically, the four genera with jugular ventrals are so easy of recognition that we need not summarise their distinctions, but pass on to those with thoracic ventrals, which are much more numerous.

In this large and important assemblage the anal fin is of great assistance. One genus (*Luvarus*) has a spine and 14 rays in its anal, and can otherwise be recognised by its quaint shape and red stripe. Three genera have two spines in their anal fin, one, *Acerina* (the ruff), having 5 or 6 rays behind it, while in *Schedophilus* and *Brama* the anal has over 25 rays, *Schedophilus* having 3 dorsal spines, short and isolated, and *Brama* having 3 or 4 short and not isolated.

Those in which the anal has 3 spines are 12 in number, *Coris* (the rainbow wrasse) differing from the rest in having only 12 or 13 rays in its pectorals. The genera in which the pectoral rays number from 14 to 17 can be divided into a batch having 12 or fewer spines in the dorsal and a batch having more than 12. In the first lot, all of which have forked tails, *Dentex* is conspicuous by its brilliant silver, blue, and gold coloration, and its four large teeth in the front of each jaw, and *Cantharus* by its black lateral line, which is parallel to the curve of the back. The other two are *Pagellus* and *Pagrus*, both of which have cutting teeth in front of the jaws and molars along the sides, *Pagrus* differing from *Pagellus* in having canine teeth as well, the molars in *Pagellus* being smaller than in *Pagrus*. These are the sea-breams, all much alike, and all, with one exception, red or pinkish, the exception being the gilt-head (*Pagrus auratus*), which is silvery, and has a golden crescent between the eyes. As the only other *Pagrus*, Couch's sea-bream (*P. vulgaris*) has been caught but once in British waters, it may be said that *Pagrus* is only represented by a silvery fish, and *Pagellus* by red ones. There are five of these—the pandora (*P. erythrinus*), is red with purple and silvery reflections, and has colourless ventrals; *P. acarne* is red with golden reflections; *P. owenii* is carmine above and white below, with the fins paler than the body; *P. bogaraveo* (the Spanish bream) is pinkish above and white below, with a dark axillary spot; and the common sea-bream (*P. centro-dontus*), is scarlet above and paler below, with a black spot at the beginning of the lateral line.

In the next group, that in which the dorsal spines are more than a dozen, one genus (*Box*) has a forked tail. Of the others a few have spines on the gill-covers, and their lips are thin, while the remainder, consisting only of the wrasses, have no spines on the gill-covers, and their lips are thick. Of the three with spiny gill-covers, one, *Polyprion* (the stone-bass) has less than 13 rays in its dorsal; in the others there are more than 13, *Serranus* being distinguished by its 10 dorsal spines (in *S. cabrilla*) or 11 (in *S. gigas*), and *Sebastes* (the bergylt) by its 15 dorsal spines, and, at once, by its orange-red body and fins.

The wrasses—we have already disposed of the rainbow wrasse—are not an easy group to sort. Some have 3 spines in the anal, some have more. Of the three-spined, three, *Ctenolabrus* has a characteristic notch where the spines join the rays in the dorsal, which is not present in either *Crenilabrus* or *Labrus*, and *Labrus* has more than 40 scales in the lateral line, while *Crenilabrus* has less than 40. Of *Crenilabrus* there are two species, the conner (*C. melops*), which is purplish above and paler below, and the goldsinny (*C. cornubicus*), which is greenish above and yellow below. Of *Labrus* there are four species—the green wrasse (*L. lineatus*), which is green, streaked with yellow; the striped wrasse (*L. mixtus*), which is orange, striped with blue; the comber (*L. donovani*), which has a few white spots below the lateral line, and one incomplete white stripe; and the ballan wrasse (*L. maculatus*), which is plentifully spotted with white both above and below the lateral line. In *Labrus* the teeth are in a single row, and characteristic, as shown in the sketch of those of the ballan wrasse (Fig. 19).

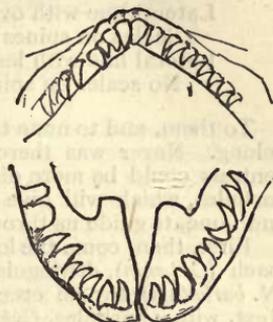


Fig. 19.—

TEETH OF BALLAN WRASSE.

Two genera only have more than 3 spines in the anal, these are also wrasses; they are *Acantholabrus*, with scales on the spines and rays, and *Centrolabrus*, without such scales, the latter also differing from the former in having less than 40 scales in the lateral line. This completes the thoracic group having 3 or more spines, as follows:

Anal with three spines—

Pectorals with 12 or 13 rays—*Coris*.

Pectorals with 14 to 17 rays.

Dorsal spines—12 or less—

Tail forked—

• Front teeth conspicuous—*Dentex*.

No molar teeth—

Lateral line black and parallel to back—*Cantharus*.

No canine teeth—*Pagellus*.

Molar teeth and canine teeth—*Pagrus*.

Dorsal spines—more than 12—

Tail forked—*Box*.

Tail not forked—

Gill covers spiny; lips thin—

Dorsal rays under 13—*Polyprion*.

Dorsal rays over 13—

Dorsal spines 15—*Sebastes*.

Dorsal spines 10 or 11—*Serranus*.

Gill covers smooth or serrated, but without spines ;
lips thick—

Notch between dorsal spines and rays—
Ctenolabrus.

No notch between dorsal spines and rays—

Lateral line with less than 40 scales—*Creni-*
labrus.

Lateral line with more than 40 scales—*Labrus*.

Anal with more than three spines—

Lateral line with over 40 scales—

Scales on spines and rays—*Acantholabrus*.

Lateral line with less than 40 scales—

No scales on spines and rays—*Centrolabrus*.

To them, and to none that preceded them, does our specimen fish belong. Never was there a fish with a single dorsal in which the ventrals could be more distinctly abdominal. Back, then, to our barbules, which will give us four main divisions, that run 6, 4, 2, and none, to guide us through this crowd of everyday acquaintances.

First, then, come the loaches, with six barbules, *Cobitis*, the spiny loach (*C. tania*), distinguished from *Nemachilus*, the common loach (*N. barbatula*), by the erectile, double-pointed spine below the eye. Next, with 4 barbules, *Cyprinus*, the carp (*C. carpio*), and *Barbus*, the barbel (*B. vulgaris*), the latter named from the conspicuous barbels we have thought better to spell in the older way to save confusion between the fish and its appendages. The carp has a long dorsal with 22 rays, the barbel has a short one with half the number; the scales are larger, there are never more than 40 in the lateral line, while there may be 70 in that of the barbel; and the carp is deeper in build and more coppery in colour.

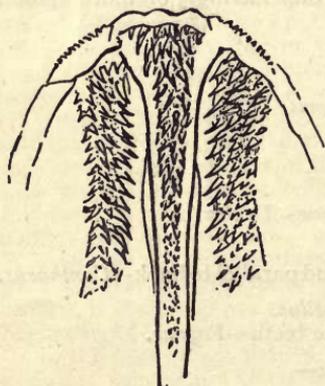


Fig. 20.—
UPPER JAW OF PIKE.

Next are the genera with two barbules, another party of two, each represented by a single well-known species—*Gobio*, the gudgeon (*G. fluviatilis*), and *Tinca*, the tench (*T. vulgaris*), *Gobio* having 8 rays in both aul and ventrals, *Tinca* having 9 rays in the anal and 10 in the ventrals; the gudgeon slender and graceful, clean and silvery, the tench deep and hump-backed, and slimy and dull, generally blackish, and occasionally yellow—two very different fishes, never likely to be mistaken for one another. That clears away

six genera in these groups of two, leaving us with seven we can group in a similar way when we have disposed of the most unmistakable of our fresh-water fishes, the pike.

Like the rest of this division the pike (*Esox lucius*) has no barbules, like two of them its abdomen is rounded all along, and has no

sharp edge, but, unlike all of them, its dorsal fin is placed above the anal, much nearer the tail than the head. The character of the pike is betrayed by the teeth, which are so characteristic that we must find room for a sketch (Figs. 20 and 21). Look at the array on the vomer, and note how the palatines on each side of it are armed, and

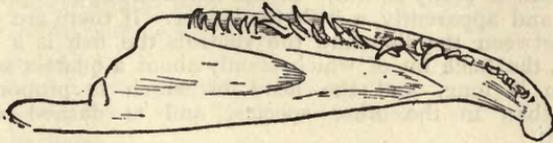


Fig. 21.—DENTARY OF PIKE.

how those on the premaxillary are kept small, so as not to obstruct the entrance into the capacious mouth; look at the miscellaneous assortment, large and small, on the dentary, that is, the tooth-bearing portion of the lower jaw; and, in addition to all these, there are teeth on the tongue and hyoid bones. Compare this formidable dental armament with the modest array of the carp (Fig. 22), which has teeth only on the lower pharyngeal bones.

Now for the other genera, two and two. In the first two the abdomen is rounded throughout, but the dorsal is in the middle of the back; these are *Carassius*, with 5 to 7 rays in the anal, and *Leuciscus*, with 8 to 11. Of *Carassius* there are two species, the goldfish (*C. auratus*), which is reddish-golden and silvery, frequently marked more or less with black, and varying so much in its fin structure, that it can only be distinguished from *C. vulgaris* (the crucian carp) by the number of scales in its lateral line, the goldfish having under 30, the other having more than 30, but the colour is guide enough, the crucian carp being greenish above, with yellow sides and pinkish abdomen, which the goldfish never has.

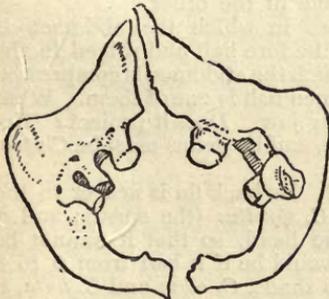


Fig. 22.—LOWER PHARYNGEAL
TEETH OF CARP

A genus of much more importance to the angler is *Leuciscus*, with its 8 to 11 anal rays. It includes the roach, the chub, the dace, the rudd, and the minnow. In four of these the lateral line runs from head to tail; in the minnow it does not, in fact, in technical phrase, it is "incomplete," although made up of from 80 to 90 scales. As a rule the minnow is distinguishable by its small size, it being generally some three inches or thereabouts in length, but as a few

giant specimens are on record, running up to seven inches, it is as well to keep an eye on the incomplete lateral line. The four others have the line complete, and though easily recognisable when side by side are not so easy of description. The safest way is to count the rows of scales between the lateral line and the ventrals. If there are

5 rows the fish is a dace (*L. vulgaris*), always silvery, with a dorsal about half as high again as its base is long. If there are 4 rows it is either a roach (*L. rutilus*) or a rudd (*L. erythrophthalmus*), and the rudd at once proclaims itself by its red eye, deeper build, and more coppery hue, and by the dorsal fin being rather nearer the tail. The rudd, too, has a habit of sticking out its under lip, so that it seems longer than it really is, while in the roach the upper lip is always, actually and apparently, a little the longer. If there are 3 rows of scales between the line and the ventrals the fish is a chub (*L. cephalus*), the back fin of which is only about a quarter as high as the base is long, and the head of which is proportionately stouter than in the other species, and is dashed with red and gold.

Two genera we have in which the edge of the abdomen is of unexpected shape, being rounded in front of the ventrals and sharply ridged behind them. These are *Abramis* (the breams), in which the dorsal has a distinct spine, and *Alburnus* (the bleak), which is without any trace of a spine. No one is likely to mistake the slender bleak (*Alburnus lucidus*) for the deeply-built breams. The bleak might have been grouped with the flying-fish, owing to the lower lobe of its tail being frequently longer than the upper, but the difference is not always invariably apparent, and is always so slight that it seemed better to brigade him here with his family relations. There are two breams, the bream (*Abramis brama*) and the white bream (*A. blicca*) from which it can be distinguished by the truer curve of its back, by the fins being brownish and red, instead of bluish and red, by the lateral line having from 50 to 63 scales, instead of from 43 to 52, by the scales between the line and the ventral fin being $6\frac{1}{2}$ or more, instead of 5 or 6, and by its having one row of pharyngeal teeth instead of two. The bream is often known as the carp bream, and the white bream as the silver bream, in reference to the olive colour of the one, and the lighter, whiter, and rosier hue of the other.

We have now dealt with all those in which the abdomen is rounded throughout, and rounded in the fore half and ridged in the hinder half; but are there none in which the abdomen is compressed all along? Certainly—and our specimen fish is one of them. What can it be? Let us look at its upper jaw. Does it project? No. Then it is not the anchovy (*Engraulis*), and its genus must be *Clupea*, the only one left.

But which of the five species is it? Its back fin is nearer to the head than to the tail, so it cannot be *C. sprattus* (the sprat); and it is not nearer to the tail than to the head, so that it cannot be *C. pilchardus* (the pilchard), which it would be if it had from 6 to 8 rays in its ventrals, or one of the two shads, *C. alosa* and *C. finta*, if it had 9 or 10 rays in them. Its dorsal fin, then, is no nearer to the head than to the tail, and there is only one species in which that is so. The pilchard has the tip of the back fin at the centre of gravity, which is not quite in the middle of the back, but when the dorsal is exactly half-way between the snout and the base of the tail we recognise the herring. Thus, by the trail of the herring, we have come home, and the fish we have identified by eliminating what it is not, is no other than the common bloater.

Yet another key—the last of the bunch—

Ventrals abdominal—

Barbules 6—

Erectile spine under eye—*Cobitis*

No spine under eye—*Nemachilus*

Barbules 4—

Dorsal with 22 rays—*Cyprinus*.

Dorsal with 11 rays—*Barbus*.

Barbules 2—

Anal 8 rays; ventrals 8 rays—*Gobio*.

Anal 9 rays; ventrals 10 rays—*Tinca*.

No barbules—

Abdomen rounded all along—

Dorsal placed far back—*Esox*.

Dorsal placed midway—

Anal with 5 to 7 rays—*Carassius*.

Anal with 8 to 11 rays—*Leuciscus*.

Abdomen rounded in front of ventrals and compressed behind them—

Dorsal with spine—*Abramis*.

Dorsal without spine—*Alburnus*.

Abdomen compressed all along—

Upper jaw projecting—*Engraulis*.

Upper jaw not projecting—*Clupea*.

Externals have served our purpose of identification, but, when we come to classification and zoological order, recourse to internals is inevitable. A few notes on structure we cannot do without, but we need not in this little book, written for the special purpose of merely ascertaining the name of the fish, have more notes than are necessary for understanding the descriptions that follow. The anatomy of the fishes is not a simple subject; some species have a thousand separate bones, and some sharks have quite as many vertebræ as there are days in the year, though the vertebræ of the bony fishes range from only 14 (in *Balistes*) to as many as 200.

The vertebra of a fish—that is, one of the sections of which the backbone is built up—is, as is well known, hollow at both ends, or, to be correct, it is so in all British fishes. For descriptive purposes, the vertebræ are divided into those that are abdominal and those that are caudal, the former being in the front of the body and carrying the ribs by means of the transverse processes one on each side. From the top of all rise two “neurapophyses,” which carry a neural spine, the arch formed by these at their bases being the neural arch, through which runs the spinal cord. From the bottom of the caudal vertebræ issue “hæmapophyses,” of much the same shape, which, at their bases, form the hæmal arch and at their tips carry a hæmal spine. Some—exceptionally all—of the neural spines are the supports of the “interneurals,” with which the spines and rays of the dorsal fin articulate, and the hæmal spines carry the “interhæmals,” which are connected with the spines and rays of

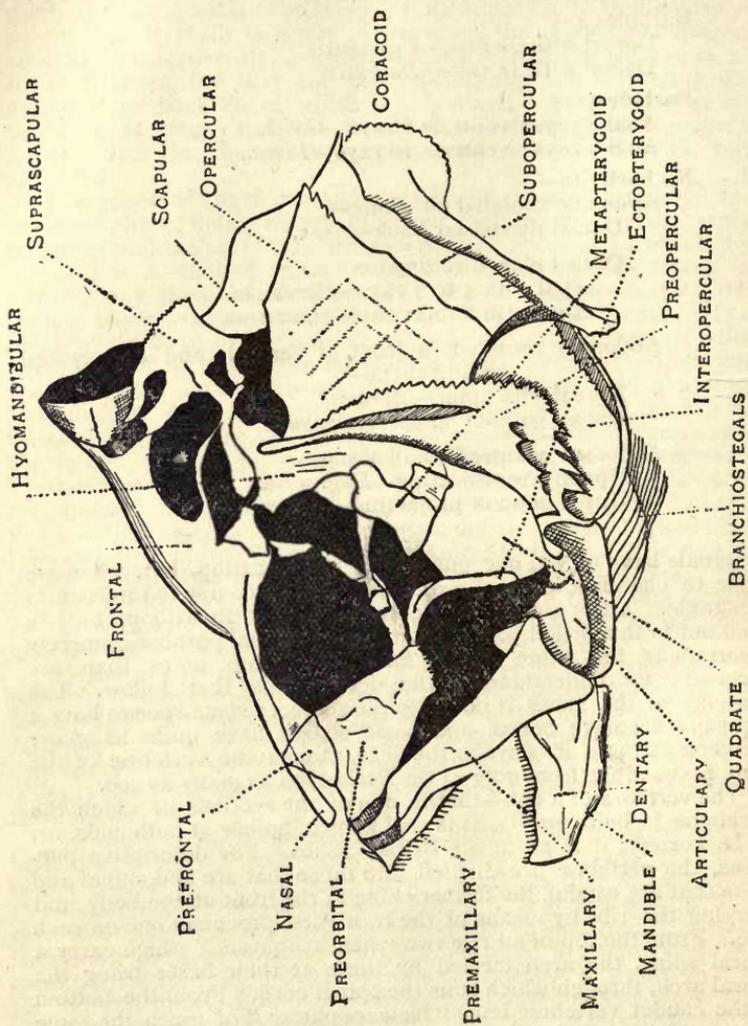


FIG 23.—SKULL OF PERCH.

the anal fin. The ventral fins, otherwise the pelvics, are supported by the pubic bone, and the pectorals are connected with the scapular arch, consisting of the supra-scapular, the scapular, and the coracoid, which join on the head.

The head we have intentionally left to the last, and we will be content with an outline of that of the perch, mentioning only a few

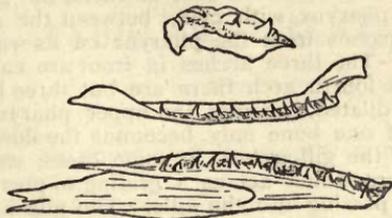


Fig. 24.—PREMAXILLARY, MAXILLARY, AND DENTARY OF SALMON.

of the parts, and advising those who would know more to make acquaintance with some of the beautiful mounted specimens in most museums, where the many parts do not blend into the mass as they do in diagrams.

In the region of the mouth (Fig. 23) we have the premaxillary and maxillary, and, in the lower jaw, the mandible, along which, carrying the teeth, is the dentary. A fish's teeth may be all over its mouth, not only on its jawbones, but on the bones of its palate and its pharynx, and even on its tongue-bones and tongue, which tongue is not free in its movements, but moves only as part of the hyoid apparatus. The curious way in which the teeth may cluster on the bones is well shown in the salmon, which has teeth on the

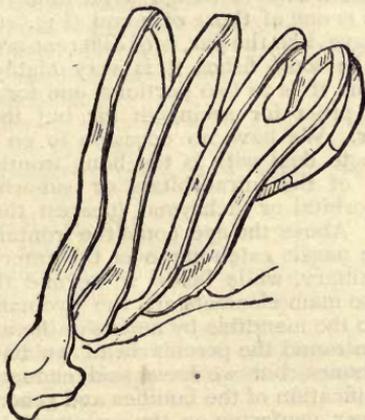


Fig. 25.—GILL ARCHES.

dentary, the premaxillary, the maxillary, the palatines, and also the vomer, which is the bone placed in the middle of the mouth (Fig. 24).

In the gill region we have the "covers," consisting of the opercular with the sub-opercular below it, and the pre-opercular with the inter-opercular below it. Under the inter-opercular are the branchiostegals, the rays which protect the gills, and if we were to remove the gill-covers we should see the gill-arches, of which we have a separate outline (Fig. 25). Of these arches there are five, with, as a rule, gills on four of them, the gills being in a cavity below the pharynx, with clefts between the arches through which the water passes from the pharynx on its way out through the gill openings. The three arches in front are each made up of four bones; in the fourth arch there are but three bones, and the uppermost, when dilated, becomes the upper pharyngeal, the fifth arch, composed of one bone only, becoming the lower pharyngeal. The inner side of the gill-arches, in some cases, carry projections known as gill-rakers, which act as a grating to prevent substances in the water from passing into the gills. The gills are usually held up by two rows of cartilaginous rods along the rounded edge of the arches, but in some fishes there is one row instead of two. The pseudo-branchiæ, or false gills, are along the inner side of the gill-covers. They do not assist in respiration except in the fish's early life, and in the adult they receive only arterial blood.

The gill-arches are bounded by the hyoid arch, which is connected with the temporal bones by the stylo-hyoids, its largest member being the ceratohyal, to the inner end of which are attached the branchiostegals, which carry the branchiostegal membrane in much the same way as an umbrella is spread by its ribs.

At the base of the cranial cavity, and in the bony fishes more or less within it, is the ear, a highly-developed organ, consisting essentially of a sac often divided into chambers, each containing an otolith with indentations and grooves to which the acoustic nerve is connected. These otoliths are the bones that people are so frequently at a loss to assign a position to. That in the diagram is one of those of a cod (Fig. 26).



Fig. 26.—
OTOLITH
OF
CODFISH.

The eye, like the ear, is of different grades of development. In some fishes it is very highly organised; in one genus it is in two portions, one for seeing in water and the other for seeing in air, but this fish is not a Britisher. We have no occasion to go into detail; all we have to deal with is the bony frontier. Below, this consists of the infraorbitals or suborbitals, of which the præorbital or lachrymal (nearest the mouth) is the largest. Above the eye come the frontal and prefrontal, with the nasals extending over the anterior half towards the maxillary, while below it, beyond the infraorbitals, an outer ring, whose main elements are the hyomandibular and the quadrate, join on to the mandible by means of the articulary.

In this hasty run round the perch's head we have by no means mentioned all the bones, but we have said enough to enable us to deal with the identification of the families and genera on the British list. Before, however, venturing on the systematic, we must have a few examples of the way in which our keys are worked, and for this purpose we will give the tabular scheme complete.

CHAPTER IV.
TABULAR SCHEME.

- Body horizontal—
Both eyes on upper surface; mouth on under surface; no gill-cover.
Gill-openings lateral—*Rhina*, 237.
Gill-openings inferior—
Tail without longitudinal fold—
No dorsal—*Trygon*, 252.
Dorsal on tail—
Dorsal between ventrals—*Cephaloptera*, 251.
Dorsal beyond ventrals—*Myliobatis*, 250.
Tail with longitudinal fold—
Caudal well developed, wings almost semi-circular—
Torpedo, 248, 249.
Caudal rudimentary or absent, wings angular—
Raia, 238-247.
Both eyes on upper side; mouth extending to upper and under sides; gill-covers present—
Eyes to the left—
Two spines behind left ventral—*Arnoglossus*, 156.
No spines behind left ventral—
Caudal as long as from snout to pectorals—
Lepidorhombus, 155.
Caudal short—
Scales ctenoid and rather large — *Zeugopterus*, 153, 154.
Scales cycloid, and small or absent—*Rhombus*, 151, 152.
Eyes to the right—
• Jaws alike on both sides—
Lateral line straight—*Hippoglossoides*, 150.
Lateral line curved—*Hippoglossus*, 149.
Jaws not alike on both sides—
Mouth at end of snout—*Pleuronectes*, 157-161.
Snout curving beyond mouth—*Solea*, 162-165.
Body vertical—
Caudal fin absent—
Body tapering—
Tail filamentary—*Chimara*, 221.
Dorsal with a low penultimate section—*Zoarcis*, 82.

- Body rounded and smooth; pectorals absent—*Nerophis*, 116-118.
- Body riband-shaped—
 Anal absent; dorsal with crest—*Regalecus*, 103.
 Anal and ventrals absent—*Trichiurus*, 22.
 Body ridged—*Hippocampus*, 119.
- Vertical fins continuous—
 Body truncated; dorsal and anal placed far back—
Orthogoriscus, 123, 124.
 Body depressed in front, compressed behind; a sucker between the ventrals—*Lepadogaster (gouanii)*, 99.
 Body tapering from a large head—*Coryphænoides*, 148.
 Body riband-shaped—*Cepola*, 74.
 Body long—
 Skin not extending over gill-covers—
 Ventrals a pair of filaments—*Ophidium*, 143.
 Ventrals absent—*Fierasfer*, 144.
 Skin extending over gill-covers—
 Without pectorals—*Muræna*, 168.
 With pectorals.
 Upper jaw the longer—*Conger*, 167.
 Lower jaw the longer—*Anguilla*, 166.
- Tail heterocercal—
 Body with bony plates in five rows—*Acipenser*, 220.
 Body without bony plates—
 Anal absent—
 Dorsals with spines—
 Spine in the middle of each dorsal—*Centrina*, 235.
 Spine in front of each dorsal—*Acanthias*, 233.
 Dorsals without spines; skin spiny—
 First dorsal in the middle of the back—*Lamargus*, 234.
 Both dorsals near the tail—*Echinorhinus*, 236.
- Anal present—
 One dorsal—*Notidanus*, 229.
 Two dorsals—
 First dorsal above space between ventrals and anal—
 Anal long, extending almost to caudal—*Pristiurus*, 232.
 Anal moderate, its length or more from caudal—
Scyllium, 230, 231.
 First dorsal above space between pectorals and ventrals—
 Eye with nictitating membrane—
 Head hammer-shaped—*Zygæna*, 224.
 Head conical—
 Pit at base of caudal; no spiracles—*Carcharias*, 222.
 No pit at base of caudal—
 Second dorsal almost as large as first—
Mustelus, 225.
 Second dorsal small—*Galeus*, 223.

- Eye without nictitating membrane—
 - Tail not keeled—
 - Upper lobe very long—*Alopecias*, 227.
 - Tail keeled—
 - Teeth large and lancolate—*Lamna*, 226.
 - Teeth small and conical—*Selache*, 228.
 - Tail homocercal—
 - Lower lobe of tail the larger—
 - Pectorals long and used for flight—*Exocetus*, 89, 90.
 - Lobes of tail equal—
 - Tail at an angle to backbone—*Trachypterus*, 102.
 - Tail in a line with backbone—
 - Body short and stout—
 - Scales forming a carapace—*Balistes*, 120, 121.
 - Gullet dilatable into a sphere—*Tetrodon*, 122.
 - Body deep and compressed—
 - Iridescent, with round silvery spots—*Lampris*, 33.
 - Grey, with black blotch edged with yellow, and spines with filaments—*Zeus*, 29.
 - Snout long and tubular—*Centriscus*, 98.
 - Fore half squarish, hinder half narrow; ocellated spots along lower edge—*Argyropelecus*, 187.
 - Body long and slender—
 - Ridged, with bony plates—
 - Caudal ridge continuous with lateral—*Siphonostoma*, 114.
 - Caudal ridge continuous with dorsal—*Syngnathus*, 115.
 - Both jaws prolonged into a beak—
 - With finlets—*Scombresox*, 88.
 - Without finlets—*Belone*, 87.
 - Body eel-like—
 - With ventrals; dorsal spotted—*Centronotus*, 81.
 - Without ventrals—*Ammodytes*, 145-147.
- Body long and compressed—
 - Dorsal long, and highest in middle or near tail—*Centrolophus*, 30, 31.
- Body long, thin, and tapering—
 - Tail forked, each ventral represented by a single scale—*Lepidopus*, 23.
 - Upper jaw produced into a long sword—*Xiphias*, 21.
- First dorsal replaced by a sucker—*Echeneis*, 44.
- First dorsal hidden in a fleshy ridge—
 - Body bulky, with ridges and tubercles—*Cyclopterus*, 60.
- First dorsal replaced by isolated spines—
 - Spines with filaments—
 - Head large; mouth very large—*Lophius*, 47.
 - Spines without filaments—
 - Tail deeply forked and tipped with black—*Lichia*, 27.

- Scales along sides—
 - Broad vertical bands extending on to fins—*Naucrates*, 25.
 - No bands—*Pammelas*, 26.
- Scales along sides replaced by scutes—*Gasterosteus*, 91-97.
- Three dorsals—*Gadus*, 125-132.
- Two dorsals, second dorsal adipose—
 - Anal extending to caudal—*Paralepis*, 186.
 - Anal not extending to caudal—
 - Anal with more than 20 rays—
 - Anal in three portions of different heights—*Mauroliticus*, 188.
 - Anal with less than 20 rays—
 - Body ridged—*Argentina*, 219.
 - Body not ridged—
 - Dorsal rays over 18—*Thymallus*, 218.
 - Dorsals rays under 18—
 - Maxillary short—*Coregonus*, 214-217.
 - Maxillary long—
 - Dorsal rays, 11—*Osmerus*, 213.
 - Dorsal rays, 12 to 15—*Salmo*, 195-212.
- Two dorsals; second dorsal not adipose—
 - Barbules many and white—
 - Body octagonal; no pectoral filaments—*Agonus*, 58.
 - Three pectoral filaments—
 - Body ridged—*Trigla*, 52-57.
 - Two pectoral filaments—
 - Body ridged; snout bifid—*Peristethus*, 59.
 - Two stiff barbules under chin—
 - Dorsals wide apart—*Mullus*, 8, 9.
 - One barbule—
 - Ventral a bifid filament—*Phycis*, 134.
 - First dorsal short—
 - Teeth large in lower jaw—*Molva*, 135.
 - No large teeth in lower jaw—*Lota*, 136.
 - First dorsal of only 3 rays—*Raniceps*, 41.
 - No barbules—
 - Finlets between second dorsal and caudal—
 - Dorsals wide apart—
 - Tail with two slight ridges—*Scomber*, 36-38.
 - Tail distinctly keeled—*Auxis*, 43.
 - Dorsals close together; tail keeled—
 - First dorsal with over 20 rays—*Pelamys*, 42.
 - First dorsal with under 20 rays—
 - Finlets 7—*Thynnus*, 41.
 - Finlets 8 or 9—*Orcynus*, 39, 40.
- Ventrals jugular—
 - Wide apart—*Callionymus*, 72, 73.
 - Close together—
 - First dorsal with 5 or 6 rays—*Trachinus*, 45, 46.
 - First dorsal with 10 rays—*Merluccius*, 133.

- Ventrals abdominal—
 Dorsals wide apart—
 First dorsal with 4 spines—*Mugil*, 85, 86.
 First dorsal with from 7 to 9 spines—*Atherina*, 83, 84.
 Dorsals close together—
 Body red, deep, and compressed; mouth protractile—
Capros, 28.
- Ventrals thoracic—
 Lateral line armed with bony plates—
 Two spines in front of ventrals—*Caranx*, 24.
 Lateral line continued through caudal fin—*Sciaena*, 20.
 First dorsal of 2 spines, wide apart—*Crystallogobius*, 71
 First dorsal of 5 spines—*Aphia*, 70.
 First dorsal of 6 spines—
 Anal spineless; ventrals with a spine and 5 rays—
Gobius (pictus), 68.
 First dorsal of 6 to 10 spines—
 Anal spineless; ventral with or without a spine, and
 with less than 5 rays—*Cottus*, 48-51.
 First dorsal of 6 or 7 spines
 Anal with one spine—*Gobius*, 63-67, and 69.
 First dorsal of 8 or 9 spines—
 Anal with 3 spines—*Labrax*, 2.
 First dorsal of 14 or 15 spines—
 Anal with 2 spines—*Perca*, 1.
- One dorsal—
 Ventrals absent—*Anarrhichas*, 75.
 Ventrals rudimentary and surrounding a sucker—
 Dorsal with under 20 rays—*Lepadogaster*, 99-101.
 Dorsal with over 20 rays—*Liparis*, 61, 62.
- Ventrals jugular—
 Fore-part of dorsal a fringe with a long first ray—
Motella, 137-140.
 Dorsal lowest in middle; ventrals small—*Blennius*, 76-79.
 Dorsal long and straight—
 Filaments on first 3 rays—*Carelophus*, 80.
 Ventrals thick and pointed—*Brosmius*, 142.
- Ventrals thoracic—
 Anal with one spine and 14 rays—
 Body grey with red stripe—*Luvarus*, 35.
 Anal with 2 spines—
 Anal rays 5 or 6—*Acerina*, 3.
 Anal rays, 27 to 29.
 Dorsal spines 3, short and isolated—*Schedophilus*, 34.
 Dorsal spines 3 or 4, short and not isolated—*Brama*, 32.
 Anal with 3 spines—
 Pectorals with 12 or 13 rays—*Coris*, 113.
 Pectorals with 14 to 17 rays—
 Dorsal spines 12 or less.
 Tail forked.
 Front teeth conspicuous—*Dentex*, 7.

- No molar teeth—
 Lateral line black and parallel to back—
Cantharus, 10.
 No canine teeth—*Pagellus*, 14-18.
 Molar teeth and canine teeth—*Pagrus*, 12, 13.
 Dorsal spines more than 12—
 Tail forked—*Box*, 11.
 Tail not forked—
 Gill-covers spiny; lips thin—
 Dorsal rays under 13—*Polyprion*, 6.
 Dorsal rays over 13—
 Dorsal spines 15; body and fins orange red—
Sebastes, 19.
 Dorsal spines 10 or 11—*Serranus*, 4, 5.
 Gill-covers smooth or serrated, but without spines;
 lips thick—
 Notch between dorsal spines and rays—*Ctenola-*
brus, 110.
 No notch between dorsal spines and rays—
 Lateral line with less than 40 scale,—*Crenila-*
brus, 108, 109.
 Lateral line with more than 40 scales—*Labrus*,
 104-107.
 Anal with more than 3 spines—
 Lateral line with over 40 scales—
 Scales on spines and rays—*Acantholabrus*, 111.
 Lateral line with less than 40 scales—
 No scales on spines and rays—*Centrolabrus*, 112.
 Ventrals abdominal—
 Barbules 6—
 Erectile spine under eye—*Cobitis*, 183.
 No spine under eye—*Nemachilus*, 184.
 Barbules 4—
 Dorsal with 22 rays—*Cyprinus*, 169.
 Dorsal with 11 rays—*Barbus*, 172.
 Barbules 2—
 Anal 8 rays; ventrals 8 rays—*Gobio*, 173.
 Anal 9 rays; ventrals 10 rays—*Tinca*, 179.
 No barbules—
 Abdomen rounded throughout—
 Dorsal placed far back—*Esox*, 185.
 Dorsal placed midway—
 Anal 5 to 7 rays—*Carassius*, 170, 171.
 Anal 8 to 11 rays—*Leuciscus*—174-178.
 Abdomen rounded in front of ventrals and compressed
 behind them—
 Dorsal with spine—*Abramis*, 180, 181.
 Dorsal without spine—*Alburnus*, 182.
 Abdomen compressed throughout—
 Upper jaw projecting—*Engraulis*, 189.
 Upper jaw not projecting—*Clupea*, 190-194.

CHAPTER V.

IDENTIFICATION.

WITH the aid of our tabular scheme we ought to be able to find the genus of any British fish without difficulty. Let us try a few examples.

Here is a flat-fish; the mouth is not on the under surface, and there is a gill-cover. That takes us at once past the first group. Are its eyes to the left or to the right? To the left. Has it two spines behind the left ventral? No. Is its tail short or long? Short. Are its scales large or small? There are no scales. The genus is *Rhombus*, and of the two species it can only be *R. maximus*, the turbot.

Here is a fish in which the vertical fins are continuous. That takes us on to another group. Is its body truncated? No. Depressed in front, compressed behind, with a sucker between the ventrals? No. Tapering from a large head? No. Riband-shaped? No. The body is long and rounded. Does the skin extend over the gill-covers? Yes. Has it pectoral fins? Yes. It is one of the eels; but which? Which jaw is the longer, the upper or the lower? The upper. The genus is *Conger*, and there is only one species.

Let us try one with a heterocercal tail. Has it bony plates along it? No; the body is without plates. Has it an anal fin? Yes. One dorsal or two? Two. Is the first dorsal above the interval between the ventrals and anal? No; it is over that between the pectorals and ventrals. Is its head hammer-shaped? No; it is conical. Has it a pit at the base of the caudal fin? No. Is its second dorsal fairly large, or is it much smaller than the first? Much smaller. The genus is *Galeus*, and there is but one species, the tope.

Let us take one with a homocercal tail. Is its tail at an angle to the backbone? No; it is not *Trachypterus*. Is its body short and stout and armoured? No. Is it deep and compressed? No; it is neither the opah, the dory, nor the trumpet-fish. Is it long and slender? Yes. Is it ridged with bony plates? No. Are both jaws prolonged into a beak? Yes; it is either *Scombresox* or *Belone*. Has it any finlets? No; and consequently it is *Belone*, the one species of which is the mackerel-guard, or gar-fish.

Yet another. How many dorsals are there? One complete, and a series of spines representing one in front of it. Have the spines any filaments? No. Are there scales all along its side or plates? Plates. The genus is *Gasterosteus*, one of the sticklebacks, for further particulars of which we refer to the chapter in which the genera are sorted into their respective species, though from the

fact of its having eight spines we know it can only be that known as the nine-spined stickleback, which may have 8, 9, 10, or 11 spines.

Yet another. How many dorsals are there? Three. Three? It can only be *Gadus*; but what species? Refer to the ninth chapter. Is the upper jaw longer than the lower? No. Has it a barbule? No. We have reduced the possibles to two. Is the lateral line curved. Yes, and it has a greenish back and golden and silvery sides, and is altogether a good-looking member of the cod family. It is a pollack.

Here is another with three dorsals, which is copper-coloured and broadly banded, and has blackish fins and a brown lateral line. Is its upper jaw longer than the lower? Yes; and it has a barbule. It is a whiting-pout.

Let us have one with an adipose dorsal. Does the anal extend to the caudal? No, the anal does not reach the tail. Has the anal more than twenty rays? No. Is the body ridged? No. How many dorsal rays are there? A fair number; it is a long dorsal. Are there more than eighteen? Certainly. Then it is *Thymallus*, the grayling.

Next, we take one with two dorsals fully developed. Are there any barbules? No. Are there any finlets? No. What is the position of the ventrals? Jugular. Wide apart? No; close together. How many rays are there in the first dorsal? Ten. Then it is the hake (*Merluccius*), which, by the way, has hinged teeth like the angler.

Let us have a representative of the single dorsals. Has it any ventrals? Yes, and they are thoracic. What is the anal like? Has it a spine and fourteen rays? No; it has two spines. Two spines? How many rays? Five. Enough; it can only be the ruff (*Acerina*), which its rough scales prove it to be.

Here is another, with a single dorsal and abdominal ventrals. It has no barbules. Its abdomen is not sharply compressed, but gently rounded. Its dorsal is not placed over the anal, but midway along the back; and the anal is rather long, and seems to have ten rays, though, perhaps, there are eleven. The genus can only be *Leuciscus*. But what is the species? The lateral line is distinct all along the body, and there are five rows of scales between it and the ventrals, which, with the silvery side and bluish back, show the fish to be a dace (*L. vulgaris*).

Finally, we will have another, and run it through the mill. Its body is not horizontal; its tail fin is rather large; the tail is not heterocercal; the lobes of the tail are equal; and the tail is in a line with backbone. There is nothing eccentric about its shape; there is nothing to show that it ever had two dorsals; it has one dorsal, and the ventrals are neither jugular nor thoracic, but abdominal. It has no barbules; the abdomen is not rounded at either end, but compressed all along; and the upper jaw does not project. The genus is *Clupea*. The dorsal is nearer to the head than to the tail; the ventrals are below the middle of the dorsal, and have six rays and—to end all this—it can only be the pilchard, which we might have recognised at sight by its large scales.

CHAPTER VI.

SUB-CLASSES AND ORDERS.

OF the more recent schemes of classification we have adopted that which divides the fishes, living and extinct, into four sub-classes :—

1. Lung-fishes and Mud-fishes.
2. Bony fishes and Ganoids.
3. Chimæroids.
4. Sharks and Rays.

The lung-fishes and mud-fishes (DIPNOI) have a heart with three chambers, and have lungs as well as gills, and their nostrils lead into the hinder part of the mouth cavity like those of animals of higher organisation. Up to the present they have only been found in Australia, Africa, and South America; and as they are unknown in British waters they are beyond our scope.

With them out of the way we can describe the fishes we have to deal with as cold-blooded vertebrates adapted for life in the water, breathing by gills, having a heart with two chambers, a mouth with distinct jaws, and limbs either absent or modified into fins. They form the fifth class of the animal kingdom, those that precede it being the mammals, the birds, the reptiles, and the amphibians. The class can be divided into the four sub-classes already mentioned, the three with which we are left being :

1. TELEOSTOMI or Bony-fishes and Ganoids.
2. HOLOCEPHALI or Chimæroids.
3. ELASMOBRANCHII or Sharks and Rays.

Dealing with these in our customary way, the first sub-class can be divided into orders thus :

TELEOSTOMI :

Paired fins fan-like—ACTINOPTERYGII.

Paired fins lobate—CROSSOPTERYGII.

As the latter are not represented in the British fauna, and have only two surviving species (the bichir and the reed-fish) we

confine ourselves to the first order, which is divisible into sub-orders as follows:

ACTINOPTERYGII :

Gills lobed—**LOPHOBRANCHII.**

Gills laminate.

Air bladder with duct.

Skeleton notochordal ; body with dermal ossifications—**CHONDROSTEI.**

Skeleton osseous ; body without dermal ossifications—**PHYSOSTOMI.**

Air bladder without duct.

Skeleton incompletely ossified ; skin smooth, roughly scaled or ossified—**PLECTOGNATHI.**

Some of the fin rays unarticulated—**ACANTHOPTERYGII.**

None of the fin rays unarticulated ; ventrals, when present, jugular or thoracic—**ANACANTHINI.**

The second sub-class, **HOLOCEPHALI**, now represented by only three genera belonging to one family, is characterised by a single external gill-opening with a rudimentary cartilaginous gill-cover and four branchial clefts within the gill cavity, and by the jaws being attached to the skull.

The sub-class that includes the sharks and rays is of considerably more importance. The body is more or less cylindrical or depressed, the skeleton cartilaginous, the gills are attached to the skin by their outer edges with from five to seven gill-openings, there being no gill-cover, and the jaws being distinct from the skull. The two orders are recognisable as follows :—

ELASMOBRANCHII :

Gill openings lateral—**SELACHOIDEI.**

Gill openings inferior—**BATOIDEI.**

The first being the sharks, the second the skates and rays.

Of course there are other distinctions in each case, but our object being identification and not classification, we have mentioned only those that are most noticeable.

CHAPTER VII.

ORDERS, SUB-ORDERS, AND FAMILIES.

THE families represented in British waters are herein arranged alphabetically under each order or, in the case of the Actinopterygii, sub-order, which are also alphabetical as being more readily referred to. With each family is given a list, also alphabetical, of its British genera, the numbers indicating where the species are figured on the coloured plates.

Acanthopterygii. (TELEOSTOMI.) Plates i. to xiv. Nos. 1 to 113

ATHERINIDÆ.—Body more or less elongate. Two dorsals more or less remote from each other, spines of the first feeble and fewer than rays of the second, anal similar to second dorsal; ventrals abdominal, of one spine and five rays. Lateral line indistinct. Scales cycloid and of moderate size. Eyes lateral; mouth moderately wide and not deeply cleft; teeth minute; gill opening wide; four gills; pseudo-branchiæ present; branchiostegals five or six. *Atherina*, 83, 84.

BLENNIDÆ.—Body long and more or less cylindrical. One, two, or three dorsals occupying most of the back, spines varying in number from all to none; anal long; ventrals generally jugular and sometimes rudimentary or absent. Scales small and occasionally absent. Gill openings varying; pseudobranchiæ present. *Anarrhichas*, 75; *Blenius*, 76 to 79; *Carelophus*, 80; *Centronotus*, 81; *Zoarces*, 82.

CALLIONYMIDÆ.—Body, fore part depressed, hinder part cylindrical. Two dorsals, first with three or four flexible spines; ventrals widely separated, with five rays. Lateral line single or double. Eye moderate and generally directed upwards. Mouth narrow, upper jaw protractile. Small teeth on jaws, none on vomer. Angle of præoperculum armed with a spine. Gill opening very narrow; a slit behind the fourth gill; pseudobranchiæ present; branchiostegals five or six. *Callionymus*, 72, 73.

CARANGIDÆ.—Body more or less compressed, oblong or sub-cylindrical. One or two dorsals, spinous dorsal short, when present, and sometimes modified into tentacles or a suction disk, soft dorsal always long when spinous is absent; soft dorsal and anal similar, hinder portion of both occasionally consisting of finlets; ventrals thoracic, sometimes rudimentary or absent. Lateral line with or without shield-like plates. Scales small or absent. Eye lateral. Mouth small; teeth conical, when present. Gill opening wide. *Capros*, 28; *Caranx*, 24; *Lichia*, 27; *Naucrates*, 25; *Pammelas*, 26.

- CENTRISCIDÆ.**—Body compressed, long, oblong, or elevated. Two dorsals the first short with one strong spine, the second soft and moderate in size like the anal; ventrals abdominal and rudimentary. No lateral line. Scales absent or small and rough, body covered with bony patches. Mouth small and at end of a long tube or trumpet. No teeth. Gills four; pseudobranchiæ present; branchiostegals three or four. *Centriscus*, 98.
- CEPOLIDÆ.**—Body long and compressed. Dorsal long, more or less continuous with caudal and anal, caudal rounded; ventrals thoracic and consisting of one spine and five rays. Eye large and lateral. Teeth of moderate size, angle of præoperculum without bony stay. Gill opening wide; pseudobranchiæ present; branchiostegals six. *Cepola*, 74.
- CORYPHÆNIDÆ.**—Body compressed. One long dorsal, without spinous division, extending almost to caudal; anal without spines; ventrals generally thoracic and receivable in groove. Eye lateral. Mouth cleft wide. Teeth small and conical or absent. Præoperculum without bony stay. Gill opening wide. *Brama*, 32; *Lampris*, 33; *Luvarus*, 35; *Schedophilus*, 34.
- COTTIDÆ.**—Body oblong or sub-cylindrical. Two dorsals, the spinous less developed than the soft one, or than the anal; ventrals thoracic with five or fewer soft rays, sometimes rudimentary. Eye lateral or directed upwards and outwards. Mouth lateral. Teeth villiform, no canines. Some of the head bones armed. Infraorbitals articulate with præoperculum. *Cottus*, 48 to 51; *Trigla*, 52 to 57.
- CYCLOPTERIDÆ.**—Body thick or oblong. Dorsal spinous, or partly spinous soft part of dorsal equal to anal; ventrals thoracic or jugular, composed of one spine and four or five soft rays, which are rudimentary and support a round disk, which is encircled by a cutaneous fringe. Skin bare or tubercular. Teeth small. Gill opening narrow. Anal papilla prominent. *Cyclopterus*, 60; *Liparis*, 61, 62.
- CYTTIDÆ.**—Body elevated, compressed. Dorsal in two portions. Ventrals thoracic. Skin with small scales, or shields, or bare. Eye lateral. Teeth conical and small. No stay to præoperculum. Gill opening large. Anal papilla not prominent. *Zeus*, 29.
- DACTYLOPTERIDÆ.**—Body elongate, sub-cylindrical and more or less angular. One or two dorsals; ventrals thoracic, with five or fewer rays. Scales replaced by plates. Præoperculum articulated with infraorbitals. *Agonus*, 58; *Peristethus*, 59.
- GASTEROSTEIDÆ.**—Body elongate, compressed. First dorsal absent or represented by isolated spines; second dorsal soft; ventrals abdominal, consisting of a spine and a small ray. Scales absent but replaced by scutes along the side. Mouth cleft, small and oblique; teeth villiform; opercular bones unarmed, infraorbitals covering cheek. Branchiostegals three. *Gasterosteus*, 91 to 97.
- GOBIESOCIDÆ.**—Body irregular and ungraceful. Dorsal soft and short and near tail; anal similar to dorsal; ventrals jugular with sucker between them. No scales. *Lepadogaster*, 99 to 101.

Gobiidæ.—Body long. One dorsal, frequently divided into two, with flexible spines in front portion, which has fewer rays than the other; anal similar to soft part of dorsal; ventrals occasionally united into disk. Scales present or absent. Teeth generally small, sometimes canines present. Infraorbitals not articulated with præoperculum. Gill opening narrow. Pseudobranchiæ sometimes rudimentary. *Aphia*, 70; *Crystallogobius*, 71; *Gobius*, 63 to 69.

Labridæ.—Body long or oblong. One dorsal, spinous portion with rays as many as or more than the soft portion; anal similar to soft dorsal; ventrals thoracic, with one spine and five rays. Lateral line continuous or interrupted. Scales cycloid. Teeth on jaws; none on palate. Gills, three-and-a-half. Pseudobranchiæ present. Branchiostegals, five or six. *Acantholabrus*, 111; *Centrolabrus*, 112; *Coris*, 113; *Crenilabrus*, 108, 109; *Ctenolabrus*, 110; *Labrus*, 104 to 107.

Lophiidæ.—Body pyriform, head large. First dorsal absent or represented by a few spines placed forwards and developed into tentacles; ventrals jugular, with four or five soft rays occasionally absent. Carpal bones prolonged into arms terminated by the pectorals. Scales absent. Teeth villiform or rasp-like. Infraorbitals not articulated with præoperculum. Gills from two-and-a-half to three-and-a-half; gill opening a small hole. Pseudobranchiæ generally absent. *Lophius*, 47.

Mugilidæ.—Body oblong and compressed, fore part occasionally depressed. Two dorsals, anterior of four stiff spines, posterior shorter than anal; ventrals abdominal. Scales generally cycloid. Head scaly. Eye lateral. Mouth narrow or moderate; teeth fine or absent. Gills four; gill opening wide. Pseudobranchiæ present. Branchiostegals four to six. *Mugil*, 85, 86.

Mullidæ.—Body long and compressed. Two dorsals wide apart, with weak spines: second dorsal similar to anal; ventrals with one spine and five rays. Lateral line continuous. Scales ctenoid and large. Head convex; eye lateral; mouth in front of snout; teeth weak and various: two stiff barbules below the chin. Pseudobranchiæ present. Branchiostegals four. *Mullus*, 8, 9.

Percidæ.—Body more or less compressed, oblong, and not elongate. Dorsals one or two, occupying most of the back, spinous dorsal well developed, generally with stiff spines; anal similar to soft dorsal; ventrals thoracic, with one spine and five soft rays. Lateral line continuous when present. Scales ctenoid or cycloid, rarely extending over vertical fins. Eye lateral; mouth more or less protractile; no barbules; teeth villiform, with or without canines. Præoperculum entire or serrated and not articulated to infraorbitals. Pseudobranchiæ present. Branchiostegals six to eight. *Acerina*, 3; *Dentex*, 7; *Labrax*, 2; *Perca*, 1; *Polyprion*, 6; *Serranus*, 4, 5.

Sciænidæ.—Body somewhat long and compressed. Two dorsals, second larger than first and longer than anal; anal with one or two spines; pectorals branched; ventrals thoracic, consisting of a spine and five soft rays. Lateral line often continued on to caudal fin. Scales ctenoid or cycloid, covering both head and snout. Eye lateral. Mouth in front of snout. Teeth in villiform bands, palate toothless. Branchiostegals seven. *Sciæna*, 20.

SCOMBRESOCIDÆ.—Body long and rounded. Dorsal rayed and opposite anal. Scales keeled along free portion of tail. Lower pharyngeals united into one bone. Pseudobranchiæ glandular and hidden. *Belone*, 87; *Exocoetus*, 89, 90; *Scombrosox*, 88.

SCOMBRIDÆ.—Body slightly compressed. Two dorsals, first with fewer spines than second has rays, finlets behind dorsal and anal occasionally absent; ventrals thoracic, with one spine and five rays. Side of tail sometimes keeled. Scales small or absent. Eye lateral. Infraorbitals not articulated to præoperculum. Gill opening wide. *Auxis*, 43; *Echeneis*, 44; *Orcynus*, 39, 40; *Pelamys*, 42; *Scomber*, 36 to 38; *Thynnus*, 41;

SCORPÆNIDÆ.—Body oblong, compressed, or sub-cylindrical. Dorsal with spinous part as large or larger than the soft part; soft part similar to anal; ventrals thoracic, generally with a spine and five rays, but sometimes rudimentary. Some of the head bones armed; armature of angle of præoperculum supported by the stay to the infraorbital ring. Teeth in villiform bands. Pseudobranchiæ present. Branchiostegals, five to seven. *Sebastes*, 19.

SPARIDÆ.—Body oblong, compressed. One dorsal, spinous and soft portions equally developed; anal with three spines; ventrals thoracic, of one spine and five rays. Lateral line not extending to caudal. Scales cycloid or minutely ctenoid. Eye lateral. Mouth lateral, in front of snout; cutting teeth in front of jaws, or a lateral series of molars, or both. Pseudobranchiæ well developed. Branchiostegals, five to seven. *Box*, 11; *Cantharus*, 10; *Pagellus*, 14 to 18; *Pagrus*, 12, 13.

STROMATEIDÆ.—Body oblong and compressed. One dorsal, long and without distinct spinous division, or with rudimentary spines in front; ventrals thoracic. Scales very small. Eye lateral. Teeth very small in jaws, palate toothless, œsophagus with barbed teeth. Præoperculum not articulated with infraorbitals. Gill opening wide. *Centrolophus*, 30, 31.

TRACHINIDÆ.—Body long, hinder part compressed; head often large. One or two dorsals, spinous portion shorter and less developed than the other; anal similar to soft dorsal; pectorals with or without appendages; ventrals thoracic, with one spine and five rays. Scales present or absent. Teeth small and conical. Præoperculum not articulated with infraorbitals. *Tria hinus*, 45, 46.

TRACHYPTERIDÆ.—Body riband-shaped; bones porous, thin, and light. Dorsal as long as back, rays unbranched and not articulated, front portion detached; anal absent; caudal at an angle to the longitudinal axis or rudimentary; ventrals jugular and filamentary. Scales absent. Eye lateral. Mouth cleft small. Teeth small and smooth. Gills four; gill opening wide. Pseudobranchiæ present. *Regalecus*, 103; *Trachypterus*, 102.

TRICHIURIDÆ.—Body long, compressed or riband-shaped. Dorsal and anal long and many rayed, and nearly similar in size, and occasionally ending in finlets; caudal forked or absent; ventrals thoracic, sometimes rudimentary. Scales absent or rudimentary. Eye lateral. Mouth cleft deep. Teeth in jaws or on palate, a few of them strong and conical. Gill opening wide. *Lepidopus*, 23; *Trichiurus*, 22.

XIPHIIDÆ.—Body long and compressed. One or two dorsals, with no spinous portion; ventrals thoracic and rudimentary or absent. Scales forming rudimentary shields or absent. Eye lateral. Mouth deeply cleft; upper jaw produced into a long sword formed of the coalesced premaxillaries, vomer, and ethmoid; teeth absent or rudimentary. Pseudobranchiæ present. Branchiostegals, seven. *Xiphias*, 21.

Anacanthini (TELEOSTOMI) PLATES xvi. to xxi. Nos. 125 to 165

GADIDÆ.—Body elongate. Dorsals, one, two, or three, occupying almost the entire length of the back; rays of posterior dorsal well developed; one or two anals; caudal usually free; ventrals jugular, consisting of several rays or filamentary. Scales cycloid, moderate or small. Gill opening wide. Gill membranes not as a rule attached to isthmus. Pseudobranchiæ glandular and rudimentary or absent. *Brosmius*, 142; *Gadus*, 125 to 132; *Lota*, 136; *Merluccius*, 133; *Molva*, 135; *Motella*, 137 to 440; *Phycis*, 134; *Raniceps*, 141.

MACRURIDÆ.—Body with large head and tapering tail. Dorsals two, anterior short, posterior long, weak, and continued to end of tail; anal similar to second dorsal; caudal absent; ventrals of several rays, thoracic or jugular. Scales spiny, keeled or striated. *Coryphanoides*, 148.

OPHIDIIDÆ.—Body long. Dorsal united to anal, and occupying nearly the entire length of the back; pectorals often absent; ventrals rudimentary and generally jugular, but sometimes absent. Scales present or absent. Canine teeth sometimes present. Gill opening wide; gill membranes not attached to isthmus. *Ammodytes*, 145 to 147; *Fierasfer*, 144; *Ophidium*, 143.

PLEURONECTIDÆ.—Body flat and unsymmetrical. Dorsal and anal united and long. Lateral line on upper side, single, double, or triple, and curved or straight. Scales present or absent. Both eyes on upper side, sometimes rudimentary. Gills, four. Pseudobranchiæ well developed. Colour dark on upper side, white or lightly spotted on lower. *Arnoglossus*, 156; *Hippoglossoides*, 150; *Hippoglossus*, 149; *Lepidorhombus*, 155; *Pleuronectes*, 157 to 161; *Rhombus*, 151, 152; *Solea*, 162 to 165; *Zugopterus*, 153, 154.

Batoidei (ELASMOBRANCHII.) PLATES xxxi. to xxxiii. Nos. 238 to 252.

MYLIOBATIDÆ.—Body flat, angular and broad. Dorsal small and situated on tail; pectorals skirting the sides of the body, but absent from the sides of the head, except at the snout, where they form cephalic appendages; caudal absent. Tail slender. Teeth, flat molars. *Cephaloptera*, 251; *Myliobatis*, 250.

RAIIDÆ.—Body flat, rhombic, generally spiny. Dorsals, one or two, on tail; pectorals skirting sides of body and extending to snout; caudal rudimentary or absent. Tail with longitudinal fold on each side, and without serrated caudal spine. *Raia*, 238 to 247.

TORPEDINIDÆ.—Body flat, broad, and smooth, and gradually passing into tail. Dorsal rayed, sometimes absent; pectorals not extending beyond base of muzzle; caudal well developed. Tail with longitudinal fold on each side. An electric organ between the pectorals and the head. *Torpedo*, 248, 249.

TRYGONIDÆ.—Body broad. Dorsal, caudal, and anal absent or rudimentary; pectorals skirting body and head and confluent at snout. Tail long and slender without longitudinal fold. Vertical fins, often replaced by strong serrated spine. *Trygon*, 252

Chondrostei. (TELEOSTOMI.) PLATE xxvii. No. 220

ACIPENSERIDÆ.—Body long and sub-cylindrical, with five rows of bony shields. Dorsal near caudal; anal nearer caudal than dorsal. Four barbules on lower side of snout. Teeth minute or absent. Gill membranes confluent at throat and attached to isthmus. Gills, four; two accessory gills. Branchiostegals absent. *Acipenser*, 220.

Holocephali. PLATE xxvii. No. 221.

CHIMÆRIDÆ.—Body stout, with filamentous tail. Dorsals, two, occupying greater part of back, anterior dorsal with long, strong spine; caudal absent, but tail with fins on upper and lower edges similar to a dorsal and anal; anal very low. Snout prominent and without appendage. Single gill opening covered by fold of skin enclosing rudimentary gill cover; gill clefts, four, within the cavity. *Chimæra*, 221

Lophobranchii. (TELEOSTOMI.) PLATE xv. Nos. 114 to 119.

SYNGNATHIDÆ.—Body ridged or rounded. One dorsal, which is not spinous; anal absent or present; caudal absent or present; pectorals absent or present; ventrals absent. Snout prolonged. Mouth terminal, small, and toothless. Gills not laminated, but of small rounded tufts; gill opening small, round, and at upper posterior angle of cover, which is a simple plate. *Hippocampus*, 119; *Nerophis*, 116 to 118; *Siphonostoma*, 114; *Syngnathus*, 115.

Physostomi. (TELEOSTOMI.) PLATES xxii. to xxvii. Nos. 166 to 219.

CLUPEIDÆ.—Body slender, abdomen often compressed into a serrated edge. Dorsal not long, with weak rays, few or moderate in number; no adipose fin; anal sometimes many-rayed. Lateral line present or absent. Scales on body, but not as a rule on head. No barbules. Gill openings very wide. Pseudobranchiæ well developed when present. *Clupea*, 190 to 194; *Engraulis*, 189.

CYPRINIDÆ.—Body oblong or long; abdomen usually rounded. Single dorsal, no adipose fin. Scales present or absent, no bony plates; head without scales. Mouth toothless, but from one to three rows of teeth on lower pharyngeal bones. Margin of upper jaw formed by premaxillaries. Pseudobranchiæ generally present. Branchiostegals, three. *Abramis*, 180, 181; *Alburnus*, 182; *Barbus*, 172; *Carassius*, 170, 171; *Cobitis*, 183; *Cyprinus*, 169; *Gobio*, 173; *Leuciscus*, 174 to 178; *Nemachilus*, 184; *Tinca*, 179.

ESOCIDÆ.—Body oblong. Single dorsal near tail, no adipose fin. Scales on body but not on head. Margin of upper jaw formed by maxillaries laterally, and premaxillaries mesially. Barbules absent. Gill opening very wide. Pseudobranchiæ glandular and concealed. *Esox*, 185.

MURENIDÆ.—Body long, cylindrical, or riband-shaped. Dorsal long and confluent with anal, or separated by tip of tail; pectorals present or absent; ventrals absent. Scales rudimentary or absent. Sides of upper jaw formed by premaxillaries more or less coalescent with vomer and ethmoid. *Anguilla*, 166; *Conger*, 167; *Murana*, 168.

SALMONIDÆ.—Body compressed, moderate or elongate; abdomen rounded. Two dorsals, the anterior rayed, the posterior adipose. Scales on body but not on head. Margin of upper jaw formed laterally of maxillaries and mesially of premaxillaries. Barbules absent. Pseudobranchiæ present. *Argentina*, 219; *Coregonus*, 214 to 217; *Osmerus*, 213; *Salmo*, 195 to 212; *Thymallus*, 218.

SCOPELIDÆ.—Body elongate. Two dorsals, the posterior adipose. Scales present or absent. Margin of upper jaw formed by premaxillaries. Barbules absent. Gill opening very wide. Pseudobranchiæ well developed. Branchiostegals generally numerous. *Paralepis*, 186.

STERNOPTYCHIDÆ.—Body compressed, elevated, or elongate, with phosphorescent bodies along the lower parts. Adipose fin generally rudimentary. Scales thin and deciduous or absent. Margin of upper jaw formed of toothed maxillary and premaxillary. Barbules absent. Gill opening very wide. Pseudobranchiæ absent or present. *Arygopelcus*, 187; *Mauroliscus*, 188.

Plectognathi. (TELEOSTOMI.) PLATE XV. Nos. 120 to 124.

BALISTIDÆ.—Body compressed or angular. Dorsal modified or absent; ventrals modified or absent. Skin with scutes or rough, or the scales forming a carapace. Mouth narrow, snout produced, teeth small and few. Gill opening narrow. *Balistes*, 120, 121.

DIODONTIDÆ.—Body short. Dorsal, caudal, and anal without spines; ventrals absent; pectorals present. Scales modified with spines or laminae. Bones of jaw modified into a cutting beak, with a covering resembling ivory. Teeth consisting of plates in thin parallel layers. *Orthogoriscus*, 123, 124; *Tetrodon*, 122.

Selachoidei. (ELASMOBRANCHII.) PLATES xxviii, to xxxi. Nos. 222 to 237.

- CARCHARIIDÆ.**—Body cylindrical. Two dorsals, first without spine and placed above space between pectorals and ventrals; anal present. Eye with nictitating membrane. Mouth crescent shaped, inferior; snout slender and conical, or hammer-shaped. Teeth hollow when fully grown. *Carcharias*, 222; *Galeus*, 223; *Mustelus*, 225; *Zygæna*, 224.
- LAMNIDÆ.**—Body cylindrical. Two dorsals, first without spine and placed above space between pectorals and ventrals; anal present. Eye without nictitating membrane. Mouth crescent-shaped and inferior. Teeth solid when fully grown. *Alopias*, 227; *Lamna*, 226; *Selache*, 228.
- NOTIDANIDÆ.**—Body cylindrical. One dorsal only, spineless, placed above space between ventrals and anal. No nictitating membrane. Mouth crescent-shaped and inferior. Gill openings six or seven. *Notidanus*, 229.
- SCYLLIIDÆ.**—Body cylindrical. Two dorsals, first without spine and placed above or behind ventrals; anal before, below, or behind second dorsal. No nictitating membrane. Spiracles distinct. Mouth semi-circular or angular, inferior. Teeth small, and several rows in use at once. *Pristiurus*, 232; *Scyllium*, 230, 231.
- SPINACIDÆ.**—Body cylindrical. Two dorsals; anal absent; pectorals not notched at base, and not prolonged forwards. No nictitating membrane. Mouth inferior, slightly arched, with long, deep oblique groove on each side. Spiracles present. Gill openings narrow. *Acanthias*, 233; *Centrina*, 235; *Echinorhinus*, 236; *Læmargus*, 234.
- SQUATINIDÆ.**—Body depressed and flat. Two dorsals; anal absent; pectorals large with base prolonged forward. Spiracles behind the eyes. Mouth anterior. Teeth conical and pointed. Gill openings wide and lateral. *Rhina*, 237.

CHAPTER VIII.

FAMILIES AND GENERA.

THE particulars given herein are only such as are necessary for distinguishing the genera from each other with regard to their representatives in the British list. The arrangement is alphabetical. The orders are given as facilitating reference to the preceding chapter. In the next chapter will be found the species of each genus and their main characteristics.

Acipenseridæ. (CHONDROSTEI.) Plate xxvii.

Acipenser, 220.

Atherinidæ. (ACANTHOPTERYGII.) Plate x.

Atherina, 83, 84.

Balistidæ. (PLECTOGNATHI.) Plate xv.

Balistes, 120, 121.

Blenniidæ. (ACANTHOPTERYGII.) Plate x.

Ventrals absent.

Anarrhichas, jaw teeth strong and conical, 75.

Centronotus, jaw teeth small, 81.

Ventrals small.

Zoarces, caudal absent, 82.

Cavelophus, caudal present, dorsal level throughout, 80.

Blennius, caudal present, dorsal not level throughout, 76-79.

Callionymidæ. (ACANTHOPTERYGII.) Plate ix.

Callionymus, 72, 73.

Carangidæ. (ACANTHOPTERYGII.) Plate iv.

Capros, first dorsal 9 rays, pectorals 13, 28.

Caranx, first dorsal 8 rays, pectorals 19 to 21, lateral line armed with keeled or spiny scales, 24.

Pammelas, first dorsal 6 or 7 rays, pectorals 23, caudal emarginate, 26.

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CHAPTER IX.

GENERA AND SPECIES.

THIS Chapter is devoted to distinguishing between the species, though here and there a few characters of the genus are given to assist in identification. For the distinctions between the genera, etc., reference must be made to the preceding chapters.

Abramis, Plate xxiii. *CYPRINIDÆ*.

180. *brama*, BREAM. Fins brownish and red; $6\frac{1}{2}$ or $7\frac{1}{2}$ scales between lateral line and ventral fin; pharyngeal teeth in one row.
181. *blicca*, WHITE BREAM. Fins bluish and red; 5 or 6 scales between lateral line and ventral fin; pharyngeal teeth in two rows.

The Bream has a single dorsal fin, with 2 or 3 spines, and 11 or 12 rays, the anal fin has 3 spines and 24 to 28 rays, the caudal has 19 rays, the pectorals have 15 to 17 rays and the ventrals 10. The dorsal begins midway between the eye and the base of the caudal where the body curves sharply downwards. The anal is the broadest fin. The lateral line has from 50 to 63 scales, and curves downwards from the nape. The scales are higher than they are broad. The body is flat, the curves awkward, and the abdomen is keeled between the ventrals and the anal fin. The head is short, and the mouth does not extend as far back as the front edge of the eye. The colour is olive or yellowish green, lighter on the sides, the fins being of a reddish brown. The Bream is gregarious, so that where there is one there are generally more. As a rule it is confined to lakes and large ponds, or gently flowing waters, and it feeds on plants, insects, and worms. One has been caught that was 26 inches long, but perhaps 16 inches may be taken as the average.

The White Bream has a single dorsal, with 2 or 3 spines and 8 or 9 rays, the anal fin has 2 or 3 spines and from 19 to 24 rays, the caudal has 19 rays, the pectorals have 15 rays, and the ventrals 10. The dorsal begins midway between the ventrals and the anal fin, and the ventrals are nearer to the pectorals than to the anal. The anal is the broadest fin. The lateral line has from 43 to 52 scales, and curves gently downwards from the nape. The scales are higher than they are broad. The body is flat, the curves not so abrupt as those of the Bream, the depression at the neck being not so marked,

and the hump where the dorsal begins being lower. The mouth does not reach the front edge of the eye, and its lips are thick. The colour is silvery, with a rosy blush, and the fins are bluish with a red tinge on some of the edges. Unlike the Bream, this species is not gregarious, though its haunts and food are similar. It is much smaller in size, and may be a foot in length, but is generally smaller.

Acanthias. Plate xxx. *SPINACIDÆ.*

233. *vulgaris*, SPUR DOGFISH. A spine in front of each dorsal fin ; anal fin absent.

This is the common Dog-fish, often called the Picked Dog ; the picked being a corruption of piked, the name being derived from the conspicuous spines which stand up in front of each dorsal like pike-heads, and are triangular in section with a groove behind. That of the first dorsal stands just above the inner edge of the pectorals, and that of the second dorsal, which is longer than the other, is a trifle nearer the tail than the after edge of the ventrals. The ventrals are small and the pectorals are larger than the dorsals. In colour this, the most frequent of the British sharks, is greyish or brownish above, with a few white spots, and whitish below. In winter it feeds near the ground in deep water, but at other times it comes closer in, and preys on surface-swimming fishes. The spines are used by bending the back so as to dig them in and then drawing them asunder as the body straightens, tearing a gash outwards from each point of incision. In length the Spur-dog reaches about four feet.

Acantholabrus. Plate xiv. *LABRIDÆ.*

111. *falloni*, SCALE-RAYED WRASSE. Upper lip thicker than lower

The Scale-rayed Wrasse has a single dorsal fin with 20 or 21 spines and 9 or 10 rays, which are longer than the spines ; the anal has from 4 to 6 spines and 5 to 8 rays ; the caudal has 14 or 15 rays ; the pectorals have 14 or 15, and the ventrals have 1 spine and 5 rays. The dorsal begins above the base of the pectorals and gradually increases in height to the first ray with which the higher after portion begins, the anal spines also increase in height to the first ray. The lateral line runs parallel to the curve of the back, and contains from 40 to 45 scales ; there are 5 or 6 rows of scales on the cheek and 7 on the gill-covers. The mouth is large and extends to the front edge of the eye, the lower jaw being the longer. The teeth in the jaws are conical, the outer row being the larger. In colour this wrasse may be yellow, orange, brown, violet, or blue, with rosy sides and whitish under parts, but it always has a black blotch on the membrane between the 3 last dorsal spines. There are scales on its dorsal, caudal, and anal fins, hence its fisherman's name. It is a deep-water species, measuring 20 inches or more when fully grown.

Acerina. Plate i. *PERCIDÆ*.

3. *vulgaris*, RUFF. Dorsal continuous; scales rough to the touch; lateral line prominent.

The Ruff—occasionally spelt with a useless “e”—is the same fish as the Pope. It has the two dorsal fins of the Perch running into each other and forming one, though each is well marked. The dorsal thus consists of 14 spines and from 11 to 13 rays; the anal consists of 2 spines and 5 or 6 rays, the caudal of 18 rays, the pectorals have 13 or 14 rays, and the ventrals the usual single spine and 5 rays. In the dorsal the third and fourth spines are the longest, and all the spines project further above the membrane than those of the Perch. The tip of the pectoral is just half-way between the snout and the fork of the tail. Of the two anal spines the first is the longer. In the very distinct lateral line there are 40 scales, and in them the tubes are double. The body is flat and easily curved, except between the snout and the dorsal, where it runs almost straight, so that the eye—which is brown with a blue pupil—appears to be almost at the top of the head. The mouth extends to the front edge of the eye, the upper jaw being the longer. There are no teeth, except in the jaws, where they are in rows. There are 6 or 7 spines on the gill-cover, and 1 spiny scale at the shoulder, and another at the angle of the pectoral fin. In colour the Ruff is olive brown or greyish, with cloudy spots, and is paler on the sides and whitish below. The fins are spotted and the ventrals are frequently of an orange tint. The Ruff is a bottom-feeding fresh-water fish, living in shoals, generally in deepish water in cool shady places. It feeds on the fry of other fish, on insects, and on worms, and is usually 3 or 4 inches in length, though it may be 7 inches or more.

Acipenser. Plate xxvii. *ACIPENSERIDÆ*

20. *sturio*, STURGEON. Shields along the back, the sides, and the abdomen; 4 barbules in a row.

The Sturgeon has the dorsal fin close to the tail; in it there are from 35 to 40 rays, the anal having from 23 to 25 rays, the caudal 100 to 125 rays; the pectorals have a spine and 28 to 38 rays, and the ventrals have 23 or 24 rays. The pectorals are placed very low and close to the gills, and the anal is close to the tail, its base beginning under where that of the dorsal ends. The ventrals are in the tail end of the body, a little further in front of the dorsal than the dorsal is of the anal. The characteristic bucklers, or plates, number from 11 to 13 along the back, 23 to 26 along the side, those along the abdomen being less conspicuous and varying greatly in number. The mouth extends to beneath the small eyes, the snout is protracted and often half as long as the head. In colour the Sturgeon is olive, greenish, or yellowish, as the case may be. It is a solitary fish that appears in our rivers in spring, and takes to the sea in winter, and is, as a rule, caught when 5 feet long, though it attains 9 feet, and has been recorded as long as 12 feet.

Agonus. Plate viii. *DACTYLOPTERIDÆ.*

58. *cataphractus*, POGGE. Body octagonal; barbules under throat, white.

The Pogge, or Armed Bullhead, bears a distant resemblance to the sea-horse. It has two dorsal fins, the first with 5 spines and the second with 5 or 6 rays; in the anal fin there are 6 rays, in the caudal 12; the pectorals have 16 rays, and the ventrals a spine and 2 rays. The dorsals are almost semi-circular, and the pectoral is very broad, and extends beyond the middle of the first dorsal. The body is divided by ridges of bony plates into 8 sides, and between the two side ridges runs the lateral line of 32 scales, which are without spines. The mouth nearly extends to the front edge of the eye, and there are many barbules. There are no teeth except in the jaws. In colour the Pogge is pinkish or yellowish grey, with broad vertical bands and many spots. The pectorals are distinctly banded, the other fins not so much so. This is a bottom-feeding species, haunting the mouths of rivers and similar places. It rarely exceeds 6 inches in length.

Alburnus. Plate xxiii. *CYPRINIDÆ.*

182. *lucidus*, BLEAK. Tail with lower lobe longer than upper; anal fin broad and cut square.

The Bleak has a single dorsal fin with 2 or 3 spines and 7 or 8 rays; the anal fin has 2 or 3 spines and from 16 to 20 rays, and the caudal has 19 rays; in the pectorals there are 16 or 17 rays, and in the ventrals there are 9 or 10. The dorsal is midway between the eye and the base of the caudal; the anal is the broadest fin and is curiously square at the corners; the pectorals are pointed. The lateral line curves downwards from the nape and rises to meet the caudal below the middle. It has from 47 to 57 scales, and there are $3\frac{1}{2}$ rows of scales between it and the base of the ventral fin. The mouth does not reach to the fore edge of the eye, and the lower jaw is hooked and projecting. In colour the Bleak is greenish above and silvery below, with a blue stripe along the side. It attains a length of 8 inches, but is generally caught smaller, and is not a favourite with anglers owing to its frequently taking the bait intended for other fish. It swims near the surface in rivers and running waters, always in shoals, which are generally more numerous where drains enter the stream, and it is particularly apt at springing out of the water after flying insects, and making more fuss than its size would lead one to suspect.

Alopias. Plate xxix. *LAMNIDÆ.*

227. *vulpes*, THRASHER. Upper lobe of tail as long as body.

The Thrasher, otherwise the Fox-shark, is unmistakable, owing to its peculiar tail. It has a stout, sturdy body, with a very large pectoral fin, a forked first dorsal about the same size as the pectorals, and very small second dorsal and anal. The mouth is in the shape of a crescent, the teeth are small, flat, and triangular, with smooth edges. The body is darker above than below, but the colour varies very much, though it is generally some shade of grey. This energetic shark is by no means rare in British waters, and has been caught over 15 feet long.

Ammodytes. Plate xix. *OPHIDIIDÆ.*

145. *lanceolatus*, SAND EEL. Caudal with 15 rays, pectorals with 12 or 13 rays; scales many; fins of same height throughout; lower jaw with soft prolongation; dorsal begins behind tip of pectoral.
146. *tobianus*, LESSER SAND EEL. Caudal with 15 rays; pectorals with 12 rays; scales many; fins curved in outline; dorsal begins above or before tip of pectorals.
147. *cicerellus*, SMOOTH SAND EEL. Caudal with 19 rays; pectorals with 14 rays; scales few or absent; fins waved in outline; dorsal begins over tip of pectorals.

The Sand Eel has from 53 to 61 rays in its dorsal fin, 28 to 33 in the anal fin, and 15 in the caudal; the pectorals have 12 or 13 rays, and there are no ventral fins. The anal starts from under the middle of the dorsal or thereabouts, and both fins have their outer edges parallel to the very slight curve of the body, and are separated from the caudal by a short interspace. The scales are small, and there are two lateral lines, one with from 190 to 203 scales, the other being incomplete. The head is nearly flat on the top, the mouth does not extend to the front edge of the eye, and the lower jaw is the longer and has a long fleshy tip. Teeth are absent, but are represented by two processes on the vomer. The Sand Eel is greenish above and silvery below, with a bright stripe as a line of demarcation. It is about a foot long, but has been caught measuring over 15 inches. It is gregarious, and buries itself in the sand between the tide-marks.

The Lesser Sand Eel has from 53 to 59 rays in its dorsal fin, 26 to 30 in its anal fin, and 15 in its caudal; the pectorals have 12 rays, and there are no ventrals. The dorsal begins above the last third of the pectorals, and gradually increases in height until it reaches the middle, when it curves slightly downwards towards the tail. There are two lateral lines, one incomplete and the other with from 125 to 145 scales. The lower jaw is the longer, and the mouth extends backwards behind the nostrils. There are a few small teeth on the vomer and on the base of the tongue. The colour is olive green above and silvery below, with a bright stripe between. This species also frequents the shore in shoals, and burrows in the sand between the tide-marks. It measures about 6 inches in length.

The Smooth Sand Eel has from 53 to 59 rays in its dorsal fin, 28 to 30 in its anal fin, and 19 in its caudal; there are 14 rays in its pectorals, and the ventrals are absent. The dorsal begins above the tip of the ventral and curves downwards, upwards, downwards, and upwards again, and the anal curves inwards so as to be lowest in the middle. The mouth extends to the eye, the lower jaw slightly projecting. There are no teeth and few or no scales, and consequently no lateral line. The brownish green of the back and the white of the under parts are divided by a silvery stripe that reaches from the eye to the tail. The only specimen caught in British waters—and that was off the Shetlands—was 6 inches long.

Anarrhichas. Plate x. *BLENNIIDÆ.*

75. *lupus*, CAT-FISH. Long curved teeth in the front of each jaw.

The Cat-fish, Sea-cat, or Wolf-fish, is the unprepossessing individual who, with his head cut off, is frequently sold as "rock-salmon," a name really belonging to the coal-fish. There is a long dorsal fin with 72 to 74 rays, a long anal with 45 to 48 rays, a rather small rounded caudal with 15 to 18 rays, broad ear-shaped pectorals with 19 rays, and there are no ventrals. The dorsal begins at the nape and almost reaches the base of the tail, the outer margin being a gentle curve that dies away as it reaches the end, while that of the anal terminates abruptly exactly underneath it. The scales are rudimentary, and there is a row of pores on the head, which has a more ferocious appearance than that of any other British fish. The mouth is large, and extends beyond the eye. In the upper jaw there are 4 large curved canines and 6 or 8 smaller conical teeth; in the lower jaw there are 2 or 3 diverging canines, which are conical and curved with 2 smaller ones behind, and behind them are two rows of rounded molars converging into one. In the roof of the mouth there are 3 double rows of teeth, those in the centre being flat and those at the sides being pointed. In colour the Cat-fish is bluish grey, darkest along the back, with broad vertical bands stretching down the sides. It is strong, swift, and fierce, and feeds on crustaceans and molluscs, using the powerful teeth for crushing the shells. As a rule it is found near the bottom along rocky coasts, its food being more abundant there. When a year old it is from 7 to 8 inches long, and when full grown it attains from 3 to 6 feet or more.

Anguilla. Plate xxii. *MURÆNIDÆ*

166. *vulgaris*, EEL. Vertical fins continuous.

The Eel has a pair of pectorals with from 17 to 18 rays; the dorsal, caudal, and anal join, forming one long fin extending from about a quarter the length of the body from the snout to nearly the middle of the body underneath. In this fin there are from 480 to 500 rays. The tail is prehensile. The mouth extends to the middle of the eye or slightly beyond, there being no great difference in the length of the jaws. The scales are small and buried in the skin. In colour the Eel is dark olive above and whitish or yellowish below. In length it may exceed a yard, but is generally shorter. In habits it is nocturnal, and its haunts are rivers and pools near them in which the water is clear and the bottom muddy, but it migrates to the sea to spawn. In the male the lips are broad, in the female they are narrow; before the sexes were made out these were assumed to be two different species. The migration seawards takes place in the autumn and the spawn is deposited not far from the shore where the influence of the river water is still perceptible. Early in January young eels or "elvers," as they are called, are big enough to be noticeable on the ebb of the tide; in April or thereabouts they ascend the rivers, and when mature, perhaps in the second or third year,

they begin their journey to the sea, whence very few return. Eels will travel overland wherever it is fairly moist, and have even been reported by a gardener for eating his peas. They are quick of hearing, and in captivity will come to be fed when called.

Aphia. Plate ix. *GOBIIDÆ*.

70. *pellucida*. TRANSPARENT GOBY. Teeth conspicuous and in a single row.

The Transparent Goby, the whitebait of the Adriatic, has two dorsal fins, the first having 5 spines, the second having 1 spine and from 11 to 13 rays, the anal has 1 spine and 13 or 14 rays, the caudal has 17 rays, the pectorals have 16 rays and the ventrals have the usual spine and 5 rays. In the male the first dorsal is higher than in the females, and in both the anal is very similar to the second dorsal in shape and size. The caudal is rounded, and the sides are nearly parallel. In the lateral line there are 26 scales. The scales are large and cycloid. The mouth extends to the middle of the eye, the under jaw being the longer; and in the male the jaws become larger and more oblique during the breeding season, when the teeth also increase in size. The Transparent Goby is generally transparent with a faint line of yellow, and a few orange dots, and is not much more than $1\frac{1}{2}$ inches long. It is a surface-swimmer and gregarious, and in the Mediterranean appears in large numbers, but is not very noticeable in our waters, though some have been taken all round the coast.

Argentina. Plate xxvii. *SALMONIDÆ*.

219. *sphyrana*, ARGENTINE. Body ridged.

The dorsal fin has 1 or 2 spines and 8 or 9 rays; the anal has 2 or 3 spines and 9 or 10 rays, and the caudal has 19 rays; the pectorals have 13 or 14 rays, and the ventrals 10 or 11. The ventrals start below the last ray of the dorsal and midway between the snout and the base of the caudal. Both dorsal and anal are higher in front than behind. There are from 50 to 53 scales in the lateral line, though exceptionally there are a few less. The scales are of good size, thin, and not so wide as they are high; on those of the back and abdomen are stellate or spiny ossicles. The body is four-sided in shape, the back and sides and abdomen being divided off by 4 well-marked ridges. The mouth extends to the front edge of the silvery eye, the upper jaw being the longer. In colour the Argentine is yellowish above, silvery blue on the sides, and yellow below. It is a deep-water fish, rather uncommon, and about 9 inches long.

Argyropelecus, Plate xxiv. *STERNOPTYCHIDÆ*.

187. *hemigymnus*. Head and trunk large and flat, and dotted along lower edge with a row of ocellated spots.

The dorsal fin has 6 spines and 7 or 8 rays, the anal has 11 or 12 rays, the caudal 19; the pectorals have 10 rays and the ventrals 6. The fore part of this curious fish is flat and almost square, the

hinder half being narrow and joined on abruptly as if it did not belong to it. In colour it is silvery yellow, and along the lower edge are straight lines of eye-like spots, one under the gills, one where the hinder part joins on, and one on the tail itself. It appears in the list owing to a single specimen having been dredged up between the Shetlands and the Faeroes.

Arnoglossus. Plate xx. *PLEURONECTIDÆ.*

155. *laterna*, SCALD FISH. Mouth small, scales spiny on upper side.

There are from 87 to 101 rays in the dorsal fin, from 64 to 68 in the anal, and 15 in the caudal; in the pectorals there are 10 or 11, and there are 6 in the ventrals. The first rays of the dorsal fin are occasionally separate, and are longer in the male than in the female. The eyes are on the left side, but the teeth and jaws are equal on both sides. The lateral line has 48 scales, and forms a half-circle over the pectoral; the scales generally are rather large and deciduous, and the skin is thin and tears off as easily as if it had been scalded, whence the fish's popular name. The small mouth is at the end of the snout, the lower jaw is the longer, and the teeth are small and in one row. In colour the Scaldfish, or Scaldback, as it is often called, is light brown above and white below. It is found in rather deep water where the bottom is sandy, but is of no importance, and not used for food.

Atherina. Plate x. *ATHERINIDÆ.*

83. *presbyter*, AATHERINE. Dorsals farther apart than the base of the second dorsal is long.

84. *boyeri*, BOYER'S AATHERINE. Dorsals as far apart as the base of the first dorsal is long.

Of the two dorsals of the Atherine, the first has from 7 to 9 spines, and the second a spine and from 11 to 13 rays, the anal has a spine and from 14 to 18 rays, and the caudal has 17 rays; in the pectorals there are from 13 to 15 rays, and the ventrals have a spine and 5 rays. In the first dorsal the second and third spines are the longest. The lateral line has from 57 to 62 scales. The fish is translucent, with a silvery band from the eye to the base of the tail; on the back it is brownish, and there is a purple tinge on the sides. It is from 7 to 8 inches long, and appears in small shoals in harbours and inlets, returning to deeper water in the winter. It seldom comes near the surface.

Boyer's Atherine appeared at Polperro on Trafalgar Day, 1846. "They were all near the surface," says Couch, "not more than three or four within a foot or two of each other, but the whole scattered loosely over the water to the number of several thousands. Their heads were in one direction, as if passing inward, and they were constantly raising dimples on the surface, like scattered drops of rain, by apparently examining or seizing some floating object; but however earnestly engaged their vigilance was never remitted, and it became scarcely possible to approach them, as in an instant they were off in another direction at the sight of a moving object."

This mighty gathering of fishes not exceeding three inches long remained about Polperro for a week and then disappeared, not even a straggler having been since. The few that were caught have 7 or 8 spines in the first dorsal, a spine and 11 or 12 rays in the second dorsal, a spine and 12, 13, or 14 rays in the anal, and 17 rays in the caudal; in the pectorals there are 14 or 15 rays, and in the ventrals are a spine and 5 rays. The lateral line has from 50 to 57 scales. The mouth is cleft very obliquely, and extends to the front edge of the eye, the eye being much larger than that of the common Atherine.

Auxis. Plate vi. *SCOMBRIDÆ*.

43. *rochei*. PLAIN BONITO. Dorsals remote; first dorsal triangular.

The first dorsal is triangular and has 10 or 11 rays, the second dorsal is as far removed from it as the base of the triangle is long, and has 11 or 12 rays, and behind it are 8 or 9 finlets; the anal has 11 or 12 rays followed by 7 finlets; the caudal has 24 rays; in the pectorals are 21 or 22 rays, and the ventrals have the usual spine and fin rays. The ventrals are beneath the pectorals, and the anal starts below the first finlet. The lateral line becomes crooked above the anal fin. There are 3 keels at the base of the caudal, and prolongations to the corslet. The mouth extends to the middle of the eye; the teeth in the jaws are small, and there are none on the palatines and tongue. In colour this bonito is bluish, with silvery underparts. In size it measures about 18 inches. It is rare in British waters.

Balistes. Plate xv. *BALISTIDÆ*.

120. *maculatus*, TRIGGER FISH. Side spotted; no plates behind gills

121. *capricus*, FILE FISH. Side not spotted; two plates behind gills.

The Trigger-fish has 3 spines in its first dorsal, 26 or 27 rays in its second dorsal, 24 or 25 rays in its anal, and 12 in its caudal; in its pectorals there are 15 rays, and the ventrals are represented by a movable bony knob. The dorsal spines are black and at equal intervals, and the front one is longer and stronger than the others. The scales are rough and granulated, and form a carapace. The colour is blackish, and the length is about 16 inches. The species is very rare in our home seas, in fact it is doubtful if it has been caught more than once.

The File Fish is not quite so rare. In its first dorsal there are 3 spines, and in the second 27 or 28 rays; in its anal there are from 24 to 26 rays, and in its caudal 12 rays; there are 15 rays in its pectorals, and the ventrals are represented by a bony process as in the other species. The first spine is the longest, and the second is not so far from it as from the third. The scales form a carapace. The colour is yellowish, darker on the upper portion; the size is about 16 inches. The generic name is derived from the way in which the spines spring up when raising the fin. Like the preceding species it is a native of the tropical seas, where it feeds on corals and hard-shelled mollusca.

Barbus. Plate xxii. *CYPRINIDÆ*.

172. *vulgaris*, BARBEL. Two pairs of barbules.

The dorsal fin has 3 or 4 spines and 12 or 13 rays, the anal has 2 or 3 spines and 5 rays, and the caudal has 20 rays; in the pectorals there are 18 rays, and in the ventrals 9 or 10. The dorsal begins over the ventrals in the middle of the back, and the tip of the pectorals is half-way between their base and the base of the ventrals. The anal is mid-way between the pectorals and the caudal; the pectorals are low on the body and the anal is narrow. There are 7 scales between the base of the ventrals and the lateral line. The lateral line has from 52 to 70 scales. The back is curved, and the abdomen nearly straight; the snout is long and the lips are thick and leathery. The colour is olivaceous, the scales being pale yellow edged with greenish black, the tint becoming lighter on the sides and underparts. The dorsal fin has a dark edge; the other fins are reddish. The Barbel lives at the bottom of gently flowing rivers, generally in the middle third between the source and the sea, and searches for its food routing about among the stones. It feeds on vegetable matter, and on worms and insects, and other aquatic animals. It reaches 24 inches in length, perhaps more. It is very quick of hearing, and often makes a noise when caught, and growls under the water. It bites with a double knock, and tries to break the line by striking it with its tail.

Belone. Plate xi. *SCOMBRESOCIDÆ*.

87. *vulgaris*, GARFISH. No finlets; tail forked, lower lobe slightly the longer.

The dorsal fin is opposite the anal, and placed in the tail third of the body; it has from 17 to 20 rays, the anal having from 21 to 23, and the caudal 15 or 16; in the pectorals there are 13, and in the ventrals 6. The jaws are lengthened into a beak, the lower jaw being the longer. It is soft at its outer end, the upper jaw being sharp and pointed, so that it can be driven into the prey. In colour the Garfish is bluish green on the back and silvery below. It is generally gregarious, and swims near the surface, often on the very top of the water, and occasionally springing over the waves. The lower jaw is always long, but in the young the upper jaw is very short and increases in length as the fish becomes mature until there is not very much difference between them. There is a Garfish on record that was a yard long, but about half that length is the usual size when found, as it often is, among the mackerel shoals.

Blennius. Plate x. *BLENNIIDÆ*.

Eye spot on first dorsal—

79. *ocellaris*, BUTTERFLY BLENNY. First spine long; a tentacle above the eye.

No eye spot on first dorsal—

8. *pholis*, SHANNY. No tentacle above the eye.

77. *galerita*, MONTAGU'S BLENNY. A tentacle above the eye; a black band at the base of the pectorals.
76. *gattorugine*, TOMPOT. A tentacle above the eye; no black band at the base of the pectorals.

The Butterfly Blenny, like the others, has really one dorsal, but the break in the middle is so marked that it may conveniently be considered as two fins, the first having from 11 to 12 spines, the second 14 to 16 rays. In the anal there are from 16 to 18 rays, in the caudal 11; the pectorals have 12 rays and the ventrals only 2. In addition to the tentacle over the eyes there is one on the fore nostril. The mouth extends to the middle of the eye; in the upper jaw there are from 36 to 40 teeth, and in the lower jaw from 34 to 36, there being a curved canine at the back of each jaw. The colour is grey with bands, blotches, and reticulations, and between the fifth and ninth dorsal spines there is a large round black spot with a narrow white edging. This Blenny, which attains a length of 7 inches, lives among seaweeds, feeding upon them and upon crustaceans, molluscs, and small fishes. Of late years it has become rare.

The Shanny has the first part of the dorsal with 11 to 13 spines, the second, which is similar in appearance, but longer, having from 18 to 20 rays. In the anal, which is just under this, there are also 18 to 20 rays; the caudal has 13 rays, the pectorals have 13, and the ventrals 2. There is no tentacle over the eyes, but on the fore nostril there is a short one divided into 4 or 5 filaments. The mouth is large and extends to below the eye, the upper jaw having from 14 to 20 teeth and the lower from 12 to 16, there being a curved tooth at the angle. In colour the Shanny is generally greenish yellow, banded, blotched, and spotted with black, the fins are yellowish, with black spots, and the anal has a white edging over a black stripe. It is a solitary fish, living in rock pools, driving away its would-be competitors from its hunting grounds, creeping about in and out of the water, jumping up with the aid of its tail, and taking a look round as it stands on its broad pectorals. It feeds on seaweed and on insects, molluscs, and other small animals, and is about 6 inches long.

Montagu's Blenny has from 12 to 13 dorsal spines, and 15 to 17 rays, the second half of the dorsal being higher than the first, and almost semi-circular; in the anal there are from 17 to 18 rays, and there are 11 in the caudal, 12 in the pectorals, and 2 in the ventrals. The anal is longer than the second dorsal, but ends at the same distance from the tail. Across the head is an erectile crest, orange in colour, which is united to the dorsal by a row of tentacles. The mouth extends to the back of the eye, and in the upper jaw are from 55 to 65 teeth, there being only 35 to 45 in the lower jaw, which also has a curved canine. This is a small fish, 3 inches long, brownish grey in colour, with vertical bands, bluish white spots, and a line of white blotches from the pectorals to the caudal. It lives in rocky pools and shelters under stony ledges.

The Tompot has from 12 to 14 spines and 19 to 20 rays in its dorsal, which is united by a membrane to the caudal; the anal has

21 or 22 rays, and is about the same size as the second half of the dorsal, but unlike it is not joined to the caudal. The caudal has 12 or 13 rays, the pectorals have 14, and the ventrals, unlike those of the other British Blennies, have a spine and 2 or 3 rays. The mouth extends to the front edge of the eye, and there are about 40 teeth in the upper jaw, the lower having about 35. It is the largest of our Blennies, being some 9 inches long, and has received its name from being frequently caught in lobster pots, to which it is attracted by the bait. It feeds on molluscs and small crustacea, and lives among rocks in deep water, and not in tidal pools. In colour it is brownish grey, banded, blotched, and spotted. Like some of the other Blennies, it uses its pectorals and ventrals like hands and feet for crawling and feeling.

Box. Plate ii. *SPARIDÆ*.

ii. *vulgaris*, BOGUE. Body narrow and not compressed.

The Bogue has a long dorsal fin with 14 weak spines in the first sweep of the curve, and 14 or 15 rays in the second; in the anal are 3 spines and 15 rays, in the caudal are 17 rays, in the pectorals are 21 rays, and in the ventrals are a spine and 5 rays. The scales are cycloid, there are 3 or 4 rows of them on the cheeks, and there are 75 in the lateral line. In colour this Mediterranean and Atlantic species, occasionally straying into British waters, is yellowish green on the back and silvery on the abdomen, with yellow streaks parallel to the lateral line. It is generally 8 or 9 inches long, but reaches 16, and feeds mainly on seaweeds.

Brama. Plate v. *CORYPHÆNIDÆ*.

32. *vaii*, RAY'S BREAM. First few dorsal rays much higher than the spines, and rapidly decreasing in height.

Ray's Bream has 3 or 4 short spines, and 29 to 34 rays, the fin rising at once to the tip of the longest ray and then curving suddenly downwards to continue parallel to the back. In the anal, which is somewhat similar in curve to the dorsal, are 2 spines and 27 to 28 rays, in the deeply-forked caudal are 19 rays, the long-pointed pectorals have 19 to 23 rays, and the ventrals a spine and 5 rays. The mouth, which is very oblique, extends to the outer edge of the eye, the lower jaw projecting to meet the curve of the head. The front nostril is round, the hinder one is a slit. The body is flat and little more than double as long as it is deep. In colour it is blackish above, whitish below, with black edges to the vertical fins. It is a deep-water fish, rare in our seas, but ranging from the Faeroes to the Cape of Good Hope. Our specimens have been generally washed ashore after a storm; the first was found left by the tide in the Tees in September, 1681, and, being described by Ray, was named after him.

Brosmius. Plate xviii. *GADIDÆ*

142. *brosme*, TORSK. Body round; only one dorsal.

The Torsk is a member of the cod family with but one dorsal, and that extends from above the middle of the pectorals nearly to the caudal. It has from 85 to 100 rays; the anal, which is rather more than half as long, having from 62 to 76, the caudal having 35, the pectorals from 21 to 23, and the ventrals 5. The ventrals are thick and pointed, and the skin generally is tough and thick. The colour is a yellowish grey, which becomes lighter on the edges of the fins. The Torsk is a deep-water fish, frequenting rocky ground in northern latitudes, and has never been taken south of Yorkshire. It is generally about 18 inches long, but grows to double that length, or rather more.

Callionymus. Plate ix. *CALLIONYMIDÆ*.

72. *lyra*, DUSKY SKULPIN. Dorsal striped.
73. *maculatus*, SORDID DRAGONET. Dorsal spotted.

The Skulpin has two dorsals, the first with 4 spines, the second with 9 rays. In the anal there are 9 rays, in the caudal 9, in the pectorals 20, and in the ventrals a spine and 5 rays. In the male the first spine is very long, in the female it is no longer than the rays, but in both the last ray is the longest. The body is long and narrow, the head flat, the snout long, and the upper jaw protractile. On the præopercle there is a three-pointed spine. It is a solitary fish, from 7 to 12 inches long, hiding in the sand in bays and estuaries. The male is orange in colour, marked with blue, with the stripes purple on the first dorsal and pale blue on the second; the female is brown, with 3 bands across the back, the second dorsal being bluish with a yellow stripe.

The Dragonet has 4 spines in the first dorsal and 9 or 10 rays in the second, in the anal are 8 or 9 rays, in the caudal 9 or 10, in the pectorals 16, and in the ventrals the usual spine and 5. Both dorsals are high, the first spine being very long, and they are grey in colour, with 3 or 4 rows of round, pearl-edged black spots running across them. This fish, which is 4 inches long, appears in the list on the strength of a solitary specimen from the Shetlands.

Cantharus. Plate ii. *SPARIDÆ*.

10. *lineatus*, BLACK SEA-BREAM. Lateral line black and parallel to back throughout.

The Black Bream has 11 spines and 12 rays in its dorsal fin, 3 spines and 10 rays in its anal fin, 17 rays in its caudal fin, 14 rays in its pectorals, and the normal spine and 5 in the ventrals. In the dorsal the rays are closer together than the spines, and start at a slightly higher level; the fourth or fifth spine is the longest. The body is compressed and rather deep, the mouth extends to the front edge of the eye; the only teeth are on the jaws, and they are cardiiform, the outer row being the largest. The general colour is grey, with yellow streaks below the lateral line, and a dark dorsal with

two or three rows of spots occasionally continuous; the long-pointed pectorals, the caudal, which has a light edging, and the spotted anal are mainly pale yellow. This species feeds on seaweeds, and comes inshore in small shoals, generally where the ground is rocky or there is a breakwater or pier on which seaweed grows. When fully grown it is about 16 inches long and 5 deep.

Capros. Plate iv. *CARANGIDÆ*.

28. *aper*, BOAR-FISH. Body flat and deep; colour red

The Boar-fish has two dorsals, the first with 9 spines, the second with from 23 to 25 rays, and the anal is in two distinct divisions, the first with 3 spines, and the second with 23 or 24 rays; the caudal has 12 rays, the pectorals have 13 rays, and the ventrals have a spine and 5 rays. In the first dorsal the first spine is rather short, the second being the longest, the others shortening one after the other, so that the fin is triangular; the second dorsal increases in height towards the tail; the ventral spine is strong and has a rough fore-edge; the anal is similar to the second dorsal. The mouth does not extend as far back as the eye, which is very large. The scales are small and spiny. The body rises in a hollow curve from the protractile snout to the beginning of the first dorsal, and then curves boldly outwards to the last ray of the second dorsal. The lateral line follows the outline of the body, and dies out between the dorsals. The hinder nostril is large and oval, the other is small and round. This unmistakable red fish is 7 inches long, and feeds on the molluscs and crustaceans it finds on the bottom in moderately deep water. It appears on the coast of England in May, and returns to the Atlantic in October, and is said to grunt like a pig, but gets its name from the pig-like snout.

Caranx. Plate iv. *CARANGIDÆ*.

24. *trachurus*, HORSE MACKEREL.

The Horse Mackerel, perhaps quite as well known as the Scad, has two dorsal fins coming close together, the first with 8 spines, the second with 1 spine and 11 or 12 rays. There are two anals, also close up, the first with 2 spines, the second with 1 spine and from 26 to 29 rays; in the caudal there are 17 rays, in the pectorals from 19 to 21, in the ventrals the usual spine and 5 rays. The second dorsal is not so high as the first, and, like the anal, extends almost to the tail. The lateral line has 73 large bony plates, which are keeled towards the tail end where the line becomes straight. Elsewhere the scales are very small. The mouth extends to the first third of the eye, the lower jaw being the longer. There are teeth not only on the jaws, but on the vomer and palatines, and in a band along the middle of the tongue, and they are all small. The dark blue back is marked off by the lateral line from the silvery sides. In food and habits this fish resembles the mackerel. It is of very wide distribution, and found solitary or in shoals, which are sometimes of immense extent. In the spring it feeds on the bottom, but in summer it is a surface swimmer. Large specimens measure 20 inches in length.

Carassius. Plate xxii. *CYPRINIDÆ*.

170. *vulgaris*, CRUCIAN CARP. Back greenish, sides yellow, abdomen reddish white; lateral line over 30; caudal rays 19 or more.
171. *auratus*, GOLD-FISH. Gold or silver; lateral line under 30; caudal rays 19 or less.

It would seem to be more reasonable to treat these as two varieties of the same species, to which may be added a third, *C. gibelio*, the Prussian Carp, which differs only in being narrower in build and having a longer lower jaw and the tail more deeply forked.

In the Crucian Carp and the Prussian Carp the dorsal has 1 to 4 spines, and 14 to 21 rays, the anal has 3 spines and 5 or 6 rays, the caudal has from 19 to 21 rays; the pectorals have from 13 to 18 rays, and the ventrals 9 or 10. The pectorals are twice as long as they are broad; the dorsal begins behind them and over the ventrals, and ends over the end of the anal. In the lateral line there are from 28 to 35 scales. The upper jaw is the longer; the snout is blunt and the mouth small, and not reaching to the eye. In habits this fish resembles the Carp, but it thrives in water that would kill any other, and is generally small, rarely exceeding 7 inches in length.

The Gold-fish is singularly varied in its fin arrangements, but the typical form has 3 or 4 spines and 16 to 18 rays in the dorsal, 3 spines and 5 or 6 rays in the anal, 18 or 19 in the caudal, the pectorals having from 16 to 17 rays, and the ventrals 9. The pectorals should be three times as long as they are broad; the dorsal begins over their tip, which should just reach the base of the ventrals. In the lateral line there are from 26 to 30 scales. As a rule both jaws are alike, and the mouth is small. Gold-fish are generally kept in tanks or glass bowls, and lead an artificial sort of life, feeding on worms, insects of all sorts and in all stages, generally as pupæ, and occasionally shredded meat and even grain. In any water—except rain-water—be it from the tap, the pump, the stream, or the steam-engine, provided it is kept by frequent change or continual movement from becoming stagnant, they linger for years, but only really thrive in tanks or pools in which there are shady depths in which they can shelter. In such places they will reach 11 inches in length. In colour the Gold-fish is gold or silver, or red or white with gold, silver, or red markings, the colour seeming to vary with the temperature, the warmer the water the more golden being the fish, the handsomest and healthiest examples being found in the pools in which waste steam is condensed, where the average temperature is 80 degrees.

Carcharias. Plate xxviii. *CARCHARIIDÆ*.

222. *glaucus*, BLUE SHARK. Pectorals long and pointed; caudal large, upper lobe notched.

The Blue Shark has two dorsal fins, the first in the middle of the back, the second above the anal close to the tail; the ventrals are

placed midway between the dorsals, and the pectorals are almost long enough to reach the beginning of the dorsal with their pointed tips. There is no fold at the angle of the mouth, the mouth is deep and wide, and the teeth are in four or five rows. The body is long and slender, dark greenish blue above, shading off into white below. It reaches 25 feet in length, but the British specimens, mostly caught in drift nets off Cornwall, average about 7 feet.

Carelophus. Plate x. *BLENNIIDÆ.*

80. *ascanii*, YARRELL'S BLENNY. Vertical fins even.

Yarrell's Blenny has a long dorsal running from the nape to the tail, and having from 50 to 52 rays; the anal, which begins a little behind the tip of the pectoral, has from 36 to 40 rays; the caudal has 17; the pectorals have 14 and the ventrals have a spine and 3 rays. On the first three rays of the dorsal are filaments, occasionally long. The mouth extends to the front edge of the eye; over the eyes is a large tentacle, and at the nostrils are two small tentacles. The colour is reddish brown, with dark bands and mottlings. The length is about $7\frac{1}{2}$ inches. This fish, which is found in crab-pots and lives in deeper water than the other Blennies, is not of frequent occurrence.

Gentrina. Plate xxxi. *SPINACIDÆ.*

235. *salviani*, The spine in each dorsal curving forwards from the middle of the base of the fin.

Only one example of this shark has been caught in British waters. There is only one spine in each dorsal, and it curves forward, as stated, across the fin and projects beyond the front edge. There is no anal fin. The length of the captured specimen is about 2ft., but the full size is between 4 and 5 feet. It is a Mediterranean species.

Centruscus. Plate xii. *CENTRISCIDÆ.*

98. *scolopax*, TRUMPET FISH. Snout long and tubular.

There are two dorsal fins, the first with from 5 to 7 spines, the second with 11 or 12 rays; in the anal there are 18 to 20 rays; in the caudal 16; in the pectorals there are 16 or 17, and in the ventrals 5. The first dorsal spine is short, but the second is long and thick, striated and serrated. The body is deep and thin, red above and silvery below, and about 5 inches in length. Only a few have been taken in British waters.

Centrolabrus. Plate xiv. *LABRIDÆ.*

112. *exoletus*, ROCK COOK. Five spines in the anal fin.

The dorsal has from 18 to 20 spines and 6 rays; the anal has 5 spines and 7 or 8 rays; the caudal has 15 rays; in the pectorals are 14 rays, and in the ventrals a spine and 5 rays. The dorsal begins over the base of the pectorals, and its spines are all of the

same height, the rays, which are also all of the same height, standing rather higher. In the lateral line are from 32 to 35 scales. The mouth is small and reaches only halfway to the eye. The lips are fleshy and the jaws equal. The Rock Cook, otherwise the Small-mouthed Wrasse, is the most graceful of the wrasses, and is brown above, yellowish on the sides, with yellow stripes along the rows of scales, blue stripes on the head below the eye, and dark bands along the fins. It is 5 inches long, and lives in deep water where the ground is rocky and weeds are plentiful.

Centrolophus. Plates iv. and v. *STROMATEIDÆ.*

30. *britannicus*, CORNISH CENTROLOPHUS. Pectorals short.

31. *pompilus*, BLACK-FISH. Pectorals long.

The Cornish Centrolophus has a long dorsal fin higher behind than in front, with 46 rays; the anal, which is somewhat similar in shape, has 30 rays and the caudal 17; the short pectorals have 17 rays, and the ventrals a spine and 5 rays. The dorsal and anal are sheathed with scales; the scales are small, and the lateral line begins with a short curve over the pectorals, and then continues straight along the middle of the long body. There is only one on record, and that was washed ashore at Looe. It is brownish pink above and paler below, and is 19 inches long.

The Black-fish is fuller in the body. Its dorsal, which is highest in the middle, has from 38 to 41 rays; its anal has from 23 to 25, and its caudal 17; in the pectorals are 21 rays, and in its ventrals a spine and 5 rays. The pectorals are long, and the lateral line becomes straight beyond their tips. The eye is large, and the mouth extends to its front edge. This is a Mediterranean fish, occasionally straggling into British waters, following vessels in the same way as the pilot-fish. It attains a yard in length, but none of that length has been caught off our coasts. In colour it is blackish, with irregular markings.

Centronotus. Plate x. *BLENNIIDÆ.*

81. *gunnellus*, BUTTER-FISH. Dorsal even, long and spotted.

The Butter-fish is of much the same shape as an eel. The dorsal is long and low, with from 75 to 82 rays; the anal starts from the middle of the abdomen, has 2 spines and from 39 to 45 rays, and, like the dorsal, is connected by a membrane with the caudal, which has 15 rays; the pectorals have 11 or 12 rays, and the ventrals have a spine and 1 or 2 rays, and are very small and placed immediately below the base of the pectorals. The mouth reaches to the fore-edge of the eye, and has a single row of teeth in its jaws. The body varies in colour, but is generally yellow; there is a dark stripe from the eye to the mouth, and along the base of the dorsal is a row of round black spots with a white edging. It is a very slimy fish—hence its popular name—found between the tide marks under the seaweed, and is occasionally left dry by the tide. In length it is about 11 inches.

Cephaloptera. Plate xxxiii. *MYLIOBATIDÆ.*

251. *giornæ*, Ox RAY. Head with horn-like projections.

In general outline this curious fish is not unlike a butterfly. The disk is nearly twice as broad as it is long. The upper and lower halves are doubly curved, and join in a point like a bird's beak. The top of the head, between the horns, is perfectly straight, and the tail is long with a spine at the base and a small triangular dorsal just in front of it. The skin is smooth, the colour greenish-blue above, white below. A straggler from the Mediterranean was once caught off the coast of Ireland, which was 45 inches long, but full-grown specimens are much larger.

Cepola. Plate ix. *CEPOLIDÆ.*

74. *rubescens*, RED BAND-FISH. Body long; tail pointed.

The vertical fins are practically continuous; the dorsal has from 67 to 74 rays, the anal 60 to 70, and the caudal 12; the pectorals have from 12 to 15 rays, and the ventrals a spine and 5 rays. The dorsal and anal are of much the same height throughout; the caudal, instead of having two lobes, ends in a long, central point. The scales are small and oval, and become larger towards the tail. The mouth is oblique, and extends to the middle of the eye; the eye is large. In colour this long, thin fish is orange, with tints of yellow and rose. It measures about 22 inches in length, and swims like a snake at moderate depths over rocky ground, where it feeds mainly on crustaceans.

Chimæra. Plate xxvii *CHIMÆRIDÆ.*

221. *monstrosa*, CHIMÆRA. Tail finless and filamentary.

This is the King-of-the-herrings, so called from the spiny knob on the head, or the Rabbit-fish (from the rodent-like teeth), and is unmistakable though not easily described. The girth is greatest at the gills, the body tapering gradually. There are three dorsals, the first high and triangular, with a strong, serrated spine in front, the second long and low, extending to the last quarter of the body, where it is separated by a mere notch from the third of equal height, which soon dies out along the whip-like tail. The pectorals are very large and almost reach the ventrals, which, in the male, have claspers. There are two anals, about equal in length, and divided from each other by a similar notch as that which separates the second and third dorsals, and is immediately above it. The so-called "crown" on the head is like a hook with a rounded end. The Chimæra is about 48 inches long, and in colour is blue above and white below, with metallic reflections.

Clupea. Plate xxiv. *CLUPEIDÆ.*

190. *harengus*, HERRING. Dorsal halfway between snout and base of tail; ventrals behind commencement of dorsal.

192. *spratrus*, SPRAT. Dorsal nearer tail than head; ventrals before commencement of dorsal.

191. *pilchardus*, PILCHARD. Dorsal nearer head than tail; ventrals below middle of dorsal, and with from 6 to 8 rays.
193. *alosa*, ALLIS SHAD. Dorsal nearer head than tail; ventrals below third ray of dorsal and with 9 or 10 rays; gill-rakers from 60 to 80.
194. *fonta*, TWAIT SHAD. Dorsal nearer head than tail; ventrals below third ray of dorsal and with 9 rays; gill-rakers from 20 to 28.

The Herring has from 17 to 19 rays in the dorsal fin, 16 to 19 in its anal, 18 or 19 in its caudal, 17 in its pectorals, and 9 in its ventrals. In its lateral line there are from 53 to 60 scales; the scales are moderate in size. The mouth extends to the centre of the eye, which has an adipose lid on each side; the lower jaw is longer than the upper, and is tipped with black. There are no radiating lines on the gill-covers. The abdomen is keeled, but the spines on it are short and weak. In colour the Herring is greenish-blue above, becoming silvery and iridescent on the sides and below. In length it ranges from about 8 inches to 15. It feeds on smaller fish, and minute crustacea and other marine invertebrates, and swims at any depth, always in shoals, but is captured as a surface swimmer. It squeaks like a mouse when caught. Its migrations do not take it out of the northern seas, though it is found in the Pacific as well as in the Atlantic. When caught young at the mouth of the Thames it is known as whitebait.

The Sprat has from 16 to 18 rays in its dorsal fin, 17 to 20 in its anal, 19 in its caudal, 16 or 17 in its pectorals, and 7 in its ventrals. In its lateral line there are 47 scales, which are rather larger than those of the herring, and are smooth and deciduous. The mouth extends to the first third of the eye, which has adipose lids. The lower jaw is the longer, and has no black tip. There are no radiating lines on the gill-covers. The abdomen is keeled, and the spines on it are strong and sharp. In colour the Sprat is slaty-blue above, becoming silvery and slightly iridescent on the sides and below. In length it ranges from 4 to 6½ inches. Its food is apparently similar to that of the herring, but it is known only as a surface swimmer. It migrates as far south as the Mediterranean. When caught young at the mouth of the Thames it is known as whitebait, as the herring is; in fact, whitebait consists almost entirely of the young of these two fishes.

The Pilchard has the dorsal fin at the centre of gravity, so that the body hangs horizontally when held up by the first rays of the fin. The dorsal has 17 or 18 rays, the anal 17 or 18, the caudal 19, the pectorals 16 or 17, and the ventrals 6 or 8. In its lateral line are 29 or 30 scales; the scales are the largest among the British representatives of the family. The mouth extends to the first third of the eye, the lower jaw being the longer. Like the foregoing species, there are eyelids, but—unlike them—there are radiating lines on the gill-covers. The abdomen is rounded and the spines weak. In colour the Pilchard is olive green above, and silvery below; in length it ranges from 8 inches to 14. It has been seen feeding on the bottom, but is caught as a surface swimmer in enormous shoals that crowd together during the day, but spread

out at night, and are frightened off at the slightest noise. The Pilchard ranges into the Mediterranean, and is the same fish as the Sardine, the Sardine being merely the Pilchard caught off the coast of France before it is large enough to have a roe.

The Allis Shad has from 19 to 21 rays in its dorsal fin, 20 to 24 in its anal, and 20 in its caudal, and it has 15 or 16 in its pectorals and 9 or 10 in its ventrals. The ventrals are almost level with the beginning of the dorsal, and the lower lobe of the caudal is rather longer than the upper. In its lateral line there are from 70 to 80 scales. The abdomen is sharply keeled, and has strong spines. The body is much deeper in proportion than those of the foregoing species. The mouth extends to the hinder edge of the eye, and the upper jaw is notched in the middle, the lower jaw being the longer. There are radiating lines on the gill covers and below the eye, the eye having vertical eyelids like the rest of the family. In colour the Allis Shad is greenish blue, with silvery sides; in length it ranges, when fully grown, from 2 feet to 4 feet. It is solitary at sea, and gregarious when it enters the rivers to spawn; and it is as quick of hearing and fond of music as the Twait Shad.

The Twait Shad has from 18 to 20 rays in its dorsal fin, 20 to 25 in its anal, 19 in its caudal, 15 or 16 in its pectorals, and 9 in its ventrals. The ventrals are under the seventh ray of the dorsal, and the caudal is deeply forked, the lobes being equal. In its lateral line there are from 60 to 75 scales. The spines on the abdomen are strong and sharp. The body is about a third as deep as it is long. The mouth reaches the hinder edge of the eye, and the upper jaw has a notch in the middle, the lower jaw being the longer. The gill covers have radiating lines, and the gill-rakers are thick, sharp, and under 29 in number. In colour the Twait Shad is blue above, silvery below, with a row of dark blotches in a line from the head to behind the dorsal, which are only found in the Allis Shad when young. In length it rarely exceeds 16 inches. It ascends the rivers to spawn in May, a month later than the Allis Shad, and returns in July. It is quick of hearing, frightened at thunder, and so fond of music that the Germans attach little bells to their shad nets, which ring under water, and not only attract the fish, but keep them lost in admiration as the nets are drawn in!

Cobitis. Plate xxiii. *CYPRINIDÆ.*

183. *tania*, SPINY LOACH. A double-pointed spine below the hind nostril.

The Spiny Loach, otherwise the Groundling, has from 8 to 10 rays in its dorsal, the first two or three of which are spiny; in its anal are 7 or 8 rays, two or three of which may perhaps be called spines; in its caudal are 16 rays, in its pectorals 8 or 9, in its ventrals 6 or 7. The dorsal, which is high in proportion to its width, is over the ventrals, midway between the eye and the base of the caudal, and the anal is midway between the ventral and the caudal, which is wide at its base, the body tapering gently with but a very slight curve. The mouth extends to the hind nostril, and on the upper jaw and snout are 6 barbules. This Loach is not common; it is pale

brown in colour, with dark markings on the back, and white below, the fins being banded. It is 3 inches long, lives where the bottom is muddy, and makes a guttural noise when touched.

Conger. Plate xxii. *MURÆNIDÆ*.

167. *vulgaris*, CONGER. Head large; eyes large; upper jaw longer than lower; teeth conspicuous.

The Conger has the vertical fins continuous, the rays of the united dorsal, caudal, and anal numbering between 500 and 550; in the pectorals there are from 16 to 19 rays; there are no ventrals. The dorsal starts from the tip of the pectoral, the anal from the middle of the body. The tail is prehensile. The mouth reaches the hinder edge of the eye. In colour the Conger is dark grey above and lighter or even quite white below, and it has white spots along its lateral line. It attains a length of 7 or 8 feet, and shelters among rocks in deep water, feeding most actively at night, generally on flat fish. Like young eels it can swim backwards as well as forwards, and tail first escapes from the lobster pots it robs of their bait.

Coregonus. Plate xxvii. *SALMONIDÆ*.

214. *oxyrhynchus*, HAUTIN. Snout projecting.
 215. *clupeoides*, GWYNIAD. Snout truncated.
 216. *vandesius*, VENDACE. Lower jaw the longer.
 217. *pollan*, POLLAN. Jaws equal; snout not truncated.

The Hautin has two dorsal fins, in the first it has 14 or 15 rays, the second is adipose; in its anal it has 14 or 15 rays, and there are 20 in its caudal; in its pectorals it has 15 or 16, and in its ventrals 12 or 13. The first dorsal is nearer to the snout than to the base of the tail, and the second dorsal is slightly behind the beginning of the anal. In the lateral line there are from 75 to 80 scales. The mouth extends to the first third of the eye, and the upper jaw, which ends in a conical black snout, is the longer. It is a sea fish entering fresh water, and rather rare. In colour it is grey above and silvery below, and in length measures from 7 to 14 inches.

The Gwyniad has two dorsals, the second of which is adipose, the first having from 13 to 15 rays; the anal has from 13 to 16 rays, the caudal 19; in the pectorals there are 17 rays, and in the ventrals 11 or 12. The ventrals are below the middle of the first dorsal. In the lateral line there are from 73 to 90 scales. The mouth extends to the first third of the eye, and the snout is cut off short and square. It is the silvery fish with darkish fins, which is frequently called the freshwater herring, and is hardly ever found in running water. It is confined to some of the lakes in North Wales, the North West of England, and Loch Lomond, and attains a length of 16 inches.

The Vendace has two dorsals, the second being adipose, the first having 11 rays; in the anal there are 13 or 14 rays, in the caudal 23; the pectorals have 15 or 16, and the ventrals 11. The first dorsal begins half-way between the snout and the second dorsal; the ventrals are under the middle of the dorsal. In the

lateral line there are from 66 to 70 scales. The mouth extends to the middle of the eye, the lower jaw being conspicuously longer than the upper. It also is a lake fish, keeping to the bottom in the heat of the day when the weather is warm. It is found in Derwentwater and Bassenthwaite in the English lake district, but is better known as a native of the Castle Loch and Mill Loch at Lochmaben, in Dumfries. In colour it is silvery, with a greenish blue back and dark fins, and in length is about 9 inches.

The Pollan has 13 or 14 rays in its first dorsal, the second dorsal being adipose; in its anal are from 12 to 14 rays, in its caudal 23; its pectorals have 15 or 16, and its ventrals 11 or 12. The second dorsal is over the middle of the anal, and the first is midway between the hinder edge of the anal and the snout; the ventrals are below the hinder half of the first dorsal. There are from 80 to 88 scales in the lateral line, and 9 between it and the base of the ventrals. The mouth extends to the first third of the eye, and the jaws are equal, the outline of the head being easy and graceful. In colour the Pollan is silvery, with a bluish back and dark fins, and it is about 13 inches long. It is an Irish lake fish, best known as living in Lough Neagh and Lough Erne.

Coris. Plate xiv. *LABRIDÆ*.

113. *julis*, RAINBOW WRASSE.

This species has a long dorsal with 9 spines and 12 or 13 rays; the anal has 3 spines and 11 or 12 rays; the caudal has 13 or 14; the pectorals have 12 or 13; and the ventrals have a spine and 5 rays. The dorsal begins over a spot on the hinder angle of the gill cover, and in the male the 3 first spines are long, the others being shorter than the rays; while in the female the spines are all the same height, which is very little less than that of the rays. In the lateral line, which follows the curve of the back, there are from 75 to 80 scales. The mouth extends to the hinder nostril, the snout being longer in the males than in the females, and in both there are four long teeth in front of each jaw, and a canine at the angle. The colours vary, but are generally purplish above and silvery below, with always a more or less indented whitish stripe along the side. The male has a spot between the longer spines. In the female the side stripe is not indented. In length this handsome wrasse is about 7 inches. It lives among rocks, in fairly deep water, and feeds on molluscs and crustaceans.

Coryphænoïdes. Plate xix. *MACRURIDÆ*.

148. *rufestris*, Body tapering from the large head to the pointed tail.

This is a silvery deep-water fish, about 10 inches long, of which only one or two specimens have been dredged up between the Faeroes and Shetlands.

Cottus. Plate vii. *COTTIDÆ*.

51. *quadricornus*, FOUR-HORNED COTTUS. Four short horns on top of head.

48. *gobio*, MILLER'S THUMB. No horns; spines on gill-covers less than 7; ventrals with a spine and 4 rays.
49. *scorpius*, FATHER LASHER. No horns; no spiny ridge on occiput; spines on gill-covers over 7 in number, stout and short; ventrals with 2 rays and no spine.
50. *bubalis*, LONG-SPINED COTTUS. No horns; a spiny ridge on occiput; spines on gill-covers over 7 in number, slender and long; ventrals with a spine and 3 rays.

The Four-horned Cottus has two dorsals, the first lower than the second. In the first are 9 spines, in the second 14 rays; the anal having 13 to 15 rays, the caudal 13, the pectorals 17, and the ventrals a spine and 3 rays. The anal is placed under the second dorsal; the caudal is rounded, and the pectorals are broad and reach to the end of the first dorsal. There are no scales. The mouth extends to the middle of the eye. The so-called horns are really rough tubercles. In colour this species is greyish brown above, with more or less red and yellow, and whitish below; in length it averages about a foot. As might be expected from its large fins, it is a rapid swimmer, and it lives among seaweed in ambush for its prey.

The Miller's Thumb has from 6 to 8 spines in its first dorsal, and from 16 to 18 rays in its second; in its anal are from 12 to 14 rays, in its caudal 11; in its pectorals are 14, and in its ventrals are a spine and 4 rays. The first dorsal is not half the height of the second; the second extends further back than the anal, but begins above it, the pectorals just reaching to a line joining the fore ends of their bases. The head is broad and flat, the mouth wide but shallow and reaching to the middle of the eye. There are usually only 4 spines, but occasionally there are 6. In colour this bullhead is dusky yellow above and whitish underneath. It is 3 inches long, and shelters among the gravel in clear running water, being especially partial to mill-streams. It is not a vegetarian, but feeds on anything animal in a small way.

The Father Lasher, otherwise the Short-spined Cottus, has 9 or 10 spines in its first dorsal, and from 13 to 17 rays in the second; in the anal there are 9 to 14, in the caudal there are 11; in the pectorals 16 or 17, in the ventrals only 2. The dorsals are equal in height, the anal is shorter than the second dorsal, the pectorals overlapping the front of the second dorsal, but not reaching that of the anal; and the tail is cut square. There are spines, often 20 in number, distributed mostly over the gill covers and scapulars. The head is wide and flat, and the mouth reaches to the eye. This northern sea-fish is common on our coasts. It is usually 4 or 5 inches long, but has been known to attain 15 inches. In colour it is mottled grey above and yellowish below, the males having white spots on the under parts. When caught, the Father Lasher thrills his throat as if producing some sound that might be audible under water.

The Long-spined Cottus has the dorsals of the same height and length, and the anal of similar length, but not quite so high. In the first dorsal there are 8 spines, in the second 11 or 12 rays, in the anal there are 9 rays, in the caudal 10, in the pectorals 16, in the ventrals a spine and 3 rays. The fins are all comparatively large;

the pectorals extend to the front edges of the anal and second dorsal; the caudal is square. The lateral line has bony plates. The head is broad and flat; the mouth extends to the middle of the eye. This fish, which is about a foot long, is reddish or brownish, with white spots on the side. It is a coast-fish like the last, but haunts the rocks and stony ground in rather deeper water, and is fairly common.

Crenilabrus. Plate xiv. *LABRIDÆ*.

108. *melops*, CONNER. Purplish above; lighter below.

109. *cornubicus*, GOLDSINNY. Greenish above; yellow below.

The Conner has the usual wrasse-like dorsal, with from 14 to 17 spines and 8 or 9 more closely-set rays; in the anal there are 3 spines and 9 or 10 rays, in the caudal 14 rays, in the pectorals 14 rays, and in the ventrals a spine and 5 rays. The dorsal spines become longer as they approach the rays, and the rays are higher than any of them. In the lateral line are from 32 to 35 scales; it follows the curve of the back, and, like it, runs straight in the tail portion, the tail having almost parallel sides and the caudal being nearly square. The mouth does not reach the eye; the hinder edge of the gill-cover is toothed. In colour this wrasse is purplish or reddish, with or without bands and spots. It is 9 inches long, and swims in shoals among the rocks in shallower water than any of the other wrasses except the Goldsinny.

The Goldsinny differs from the Conner only in colour, it being greenish brown above and yellow below, with 6 faint bands on the body, and no spots on the fins, though there is a spot at the base of the caudal fin. It can be conveniently considered as one of the varieties of the Conner, the typical coloration of which is purple, with 8 or 9 distinct bands on the body, round, ocellated spots on the second dorsal and caudal, round, blackish spots on the anal, and stripes across the cheeks and gill-covers. When there is no black mark behind the eye, and the reddish back is spotted with green, and the abdomen with silver, and the fins have red bands, we have *C. rone*. When there is a black spot behind the eye, another at the vent, and another at the tail, and the cheeks are banded with colour, the variety is *C. pennantii*; when the body and fins are marbled with brown, and there is no spot behind the eye, it is *C. norvegicus*; and when the fins are striped with red and green, and there is a spot at both eye and tail, it is *C. couchii*.

Crystallogobius. Plate ix. *GOBIIDÆ*.

71. *nilssonii*, NILSSON'S GOBY. Scaleless and transparent.

This rare little fish is an inch and a half long. It has 2 spines in its first dorsal, 19 or 20 rays in the second dorsal, 21 rays in the anal, 14 or 15 in the caudal, 30 or 31 in its pectorals, and a spine and 5 rays in its ventrals. Its dorsal spines are wide apart, and its tail fin curves inwards on each of the three outer edges. It has been dredged from rather deep water in the northern part of the North Sea.

Ctenolabrus. Plate xiv. *LABRIDÆ.*

110. *rupestris*, JAGO'S GOLDSINNY. A notch between the spines and rays of dorsal, owing to the last spine being much shorter than the last but one.

There are from 16 to 18 spines in the dorsal, and from 8 to 10 rays; in the anal there are 3 spines and 8 rays, in the caudal there are 15 rays, in the pectorals 14, in the ventrals a spine and 5 rays. The dorsal is almost straight along the outer edge, gradually rising from the back until the last spine; the rays are higher. In the anal the spines lengthen from the first to the third. The lateral line has from 38 to 40 scales, and follows the curve of the back. The mouth is small, and does not quite extend to the eye; the snout is pointed. In general colour this wrasse is pinkish or golden, with a few blotches, and it is occasionally banded or striped. It is a deep-water species, not entering estuaries or harbours, and is 5 inches long.

Cyclopterus. Plate viii. *CYCLOPTERIDÆ.*

60. *lumpus*, LUMP-FISH. Sucker formed by union of the ventrals.

This ugly fish with an ugly name has really two dorsal fins, the first being hidden beneath the skin when the fish is fully grown. The hidden dorsal has from 4 to 6 rays, the second dorsal having 10 or 11. The anal has 9 or 10 rays, the caudal 10 or 11, the pectorals have 20 or 21, and the ventrals have a spine and 5 rays, the two ventrals uniting. There are tubercles on the body, the largest of which are arranged in three rows on each side and one along the back, extending over the first dorsal fin. The male is blue above and red below, the female is blackish blue, the young are green or green and yellow. When fully grown the Lump-fish is 2 feet long. By means of the sucker it sticks to the rocks and to floating objects. The young use it for sticking themselves on to the male as he carries them off with him out of danger into deeper waters. It is not an uncommon fish, and is known all round the coasts of the North Atlantic.

Cyprinus. Plate xxii. *CYPRINIDÆ.*

169. *carpio*, CARP. Four barbules.

The Carp has from 21 to 25 dorsal rays, the first two or three being bony and higher than the others; the anal has 7 or 8 rays, with the first 2 or 3 bony. There are 20 rays in the caudal, 15 or 16 in the pectorals, 8 in the ventrals. The ventrals are placed midway along the abdomen, and the dorsal begins a little in front of them; the anal begins halfway between the front edge of the ventrals and the base of the caudal; the pectorals just reach the front edge of the dorsal. In the lateral line there are from 35 to 40 scales; the scales are large. The mouth is small, and reaches about half-way to the eye; it is toothless, the only teeth being on the lower pharyngeal bones; the lips are leathery. In colour the Carp is golden brown, paler below. It occasionally

reaches 30 inches in length. It thrives in ponds and sluggish waters where the bottom is soft or muddy, spending the winter in the mud, and rising to the surface in summer among the weeds, when it can be heard grunting like a pig. It is very quick of hearing and discriminating in attacking its food, but it can be tamed so as to feed from the hand, and will come for its dinner when the bell rings.

Dentex. Plate i. *PERCIDÆ*.

7. *vulgaris*, DENTEX. Four large teeth in front of each jaw.

The dorsal fin has 10 or 11 weak spines and 11 or 12 rays; the anal has 3 spines and 8 rays; the caudal has 17 rays; in the pectorals are 15 rays, and in the ventrals a spine and 5 rays. The fourth and fifth spines are the highest in the dorsal, which curves downwards from them and rises again when the rays are reached. The pectorals are long and pointed, and extend to the middle of the dorsal. There are from 60 to 65 scales in the lateral line. The mouth does not quite reach to the eye, which is golden, with a blue pupil. The fish is brilliantly clothed in silver, and blue, and gold, and light red, and averages 40 inches in length, though it has been recorded up to 56 inches. It does not swim in shoals, and it is not often caught.

Echeneis. Plate vii. *SCOMBRIDÆ*.

44. *remora*, REMORA. First dorsal modified into an adhesive disk.

This sucking-fish is recognisable at a glance by its being darker below than above, and by the first dorsal having developed into the disk of which its 17 or 18 rays are the laminæ. The second dorsal has from 22 to 24 rays, the anal from 22 to 25, the caudal 19; in the pectorals there are from 20 to 24, and in the ventrals a spine and 5 rays. By its disk it attaches itself to fishes and other objects, and gets a lift on its lonely way. It is between 4 and 5 inches long, and greyish brown in colour.

Echinorhinus. Plate xxxi. *SPINACIDÆ*.

236. *spinus*, SPINOUS SHARK. Two small dorsals near tail; no anal.

The ventrals begin at three-quarters of the distance from the snout to the heel of the tail; the first dorsal starts in a line with their beginning, and the second in a line with their after end. Ventrals and pectorals are of about the same size. The skin is studded with spiny scales. In colour this shark is brownish grey, with a white lateral line, and in length it ranges up to 9 feet.

Engraulis. Plate xxiv. *CLUPEIDÆ*.

189. *encrasicholus*, ANCHOVY. Upper jaw the larger and longer.

The Anchovy has from 15 to 18 rays in its dorsal fin, 16 to 18 in its anal, 21 in its caudal, 16 or 17 in its pectorals, and 7 in its

ventrals. The dorsal rises behind the ventrals and in the middle of the back, and the anal is halfway between the ventrals and the caudal. There are from 48 to 50 scales in the lateral line. The scales are large and deciduous. The mouth is very deep and reaches beyond the eye. The body is slender, and thicker along the back than below. The greenish blue of the back is marked off from the silvery lower parts by a steely stripe. The Anchovy is from 5 to 8 inches long, and swims in shoals, which, coming up the Channel at night, can be detected by their phosphorescence.

Esox. Plate xxiv. *ESOCIDÆ.*

185. *lucius*, PIKE. Dorsal and anal fins opposite and near caudal body long; head long; mouth large.

There are from 20 to 23 rays in the dorsal fin, of which the first 6 or 8 are stronger than the others. In the anal there are from 17 to 19 rays, of which the first 6 or 8 are also stronger than the rest; in the caudal there are 19 rays; in the pectorals 13 or 14, and in the ventrals 9 or 10. The pectorals, ventrals, anal, and caudal are almost at equal distances from one another. The dorsal begins just in front of the anal, and ends at exactly the same short distance from the caudal, where the body suddenly narrows. In the lateral line there are from 125 to 130 scales. The scales are small, bifid at the base, and extend on to the head. The back is almost straight from the eye to the dorsal; the abdomen is very slightly curved; the head is long and flattened above; the mouth reaches to the eye, the lower jaw being the longer. There are no teeth on the maxillary; those on the mandible are large at the sides and smaller in front; there are small teeth on the vomer and tongue, and larger ones on the palatines. In colour the Pike is greenish or greyish, with yellowish marblings and other markings; in size it exceeds 3 feet, and is said to have attained 7 feet in Kirkcudbrightshire. It is generally found in slow-running weedy rivers and ponds, close to the surface in warm weather, and swimming deeper at other times. It is quick of sight and hearing, ferocious, audacious, and persistent, and mostly carnivorous, but will eat anything, even model yachts.

Exocoëtus. Plate xi. *SCOMBRESOCIDÆ.*

89. *volitans*, GREATER FLYING-FISH. Anal with 9 rays.

90. *evolans*, FLYING-FISH. Anal with from 13 to 15 rays.

The Greater Flying-Fish has from 11 to 13 dorsal rays; in its anal are 9 rays, in its caudal 19, in its pectorals 15 to 17, and in its ventrals 6. The pectorals are placed high up, not far from the gills, and extend to the base of the tail; the ventrals overlap the anal. The lower jaw is the longer, the snout is pointed, and the head wide and flat between the eyes. In the lateral line there are 63 scales. In colour it is bluish on the back, silvery below; the pectoral fins are grey, with whitish edges. It exceeds 20 inches in length. It swims in shoals, but in British waters is only known as a straggler. When in the water the pectorals are held close to the body, but when it springs above the surface it extends them to increase the length of its leap, but it never flaps them, so that it glides rather than flies.

The Lesser Flying-Fish has from 12 to 14 dorsal rays; in its anal there are from 13 to 15 rays, in its caudal 17 to 19, in its pectorals 14 to 16, and in its ventrals 6. The pectorals extend to the base of the caudal; the ventrals do not overlap the anal. Like the foregoing species the lower lobe of the caudal is longer than the upper. There are from 40 to 42 scales in the lateral line. In colour it is bluish on the back, lighter on the sides, and silvery below; its pectorals are grey or black, edged with whitish. In length it measures about 9 inches. In habits it resembles the Greater Flying-Fish, but it is much rarer on the British coast.

Fierasfer. Plate xviii. OPHIDIIDÆ.

144. *dentatus*, DRUMMOND'S ECHIODON. Colour red, with dotted sides; vertical fins continuous.

This rare fish has 180 rays in its dorsal, 180 in its anal, 12 in its caudal, and 16 in its pectorals, and has no ventral fins. The dorsal and anal each begin about halfway along the pectorals, and are continuous with the caudal, the middle rays of which are the longest. The body tapers to a point from the gills, and is about 11 inches long. The colour is pale red, with many dots and a few brownish markings.

Gadus. Plate xvi. GADIDÆ

Upper jaw the longer—

129. *merlangus*, WHITING. Without barbule.
 125. *morrhua*, COD. With barbule; lateral line white.
 126. *aglefinus*, HADDOCK. With barbule; lateral line black.
 127. *luscus*, WHITING POUT. With barbule; lateral line brown; body copper coloured, with broad bands, fins bluish black.
 128. *minutus*. POWER. With barbule; lateral line brown; body yellow and silvery, without bands.

Lower jaw the longer—

131. *virens*, COALFISH. With barbule.
 130. *poutassou*, COUCH'S WHITING. Without barbule; lateral line straight; body silvery with yellow stripe, back brownish.
 132. *pollachius*, POLLACK. Without barbule; lateral line curved; body grey, back greenish.

The Whiting has from 13 to 16 rays in the first dorsal, 18 to 23 in the second dorsal, and 19 to 21 in the third; in its first anal are from 30 to 35 rays, and in its second anal from 20 to 24; in its caudal are 28 rays, in its pectorals 19, in its ventrals 6. The 3 dorsals do not join; the first anal is under the first two dorsals, the second anal being under the third dorsal; the ventrals are some distance in front of the pectorals. The lateral line becomes straight under the middle of the second dorsal. The eye is large; the mouth extends to the middle of the eye, and the snout is conical. In colour the Whiting is greyish yellow, with

yellow stripes along the silvery sides. In length it reaches 16 inches or more. It appears near the coast in shoals in spring and summer, but in winter retires to deeper water. It feeds mainly on small fishes and crustaceans, and hence is most often found in the vicinity of rocks and sandy bays, where its food is plentiful.

The Cod has three dorsal fins, with 13 to 15 rays in the first, 16 to 19 in the second, 17 to 21 in the third; and it has 2 anals, the first with from 17 to 19 rays, the second from 16 to 18. In the caudal there are 28 rays, in the pectorals from 16 to 19, in the ventrals 6. The dorsals are close together; the ventrals are before the base of the pectorals, and the pectorals reach to the beginning of the second dorsal. The white lateral line follows the curve of the back until about halfway between the first anal and second dorsal, where it begins its straight run to the tail. In colour the Cod varies, but is mostly brownish or olive grey, with or without spots; the lower parts being white, and the fins grey. In length it exceeds 5 feet. It feeds near the ground in enormous numbers, and indulges in very miscellaneous eating, including birds, hares, turnips, and tallow candles, though its main diet is evidently crustaceans, molluscs, and small fishes.

The Haddock has 14 to 16 rays in its first dorsal, 20 to 24 in its second, and 19 to 21 in its third; in its first anal it has 24 or 25, and in its second anal from 20 to 22; in its caudal it has 25, in its pectorals 19 or 20, and in its ventrals 6. The first dorsal is pointed, and its base is the same length as the pectorals, above which it is placed; the second anal is similar to the third dorsal, and immediately below it. The lateral line, which is black, straightens under the third dorsal. In colour the Haddock is greyish bronze above, lighter on the sides, and whitish beneath, and generally, but not always, there is a black blotch on the side beneath the first dorsal. In length it has been known to exceed a yard, but the average of well-grown fish is about 2 feet. It is a ground-feeder, rarely found in the same localities as the cod, but quite as gregarious and voracious, and living on crustaceans, molluscs, echinoderms, worms, and young herrings and other fishes.

The Whiting Pout has 12 rays in its first dorsal, from 20 to 23 in the second, and 19 or 20 in the third; in the first there are from 27 to 32 rays, in the second from 17 to 20; there are 25 rays in the caudal, 17 in the pectorals and 6 in the ventrals. The first dorsal is close to the second, which is joined at the base to the third. The first dorsal is rather narrow, long and pointed, and the second begins with a short ray; the first ray of the ventrals is about twice as long as the second. In proportion to its length this fish is the deepest of the British representatives of the genus. In colour it is coppery, with broad vertical bands; the fins are bluish black, and there is a black blotch on the base of the pectorals. In length it reaches 16 inches. It frequents rocky ground and seaweeds, and congregates near pier piles and other timbers, sheltering during the day and feeding from the evening to the early morning. In cold and stormy weather it generally moves into deeper water, to return when the weather is warmer or more settled.

The Power has from 12 to 15 rays in its first dorsal, 19 to 25 in the second, 17 to 22 in the third; in the first anal it has from 25 to 29, in the second from 17 to 24; in the caudal there are 26, in the pectorals from 13 to 16, in the ventrals 6. The dorsals are joined at their base; the barbule, the ventrals, and the first anal are at equal distances from each other. The snout is rather large and obtuse. In colour it is brownish yellow, without bands. In length it is about 8 inches. It feeds on crustaceans, and lives among rocky ledges in somewhat deep water.

The Coalfish has 12 to 14 rays in the first dorsal, 19 to 22 in the second, 20 to 22 in the third; in the first anal there are from 24 to 27, in the second 20 to 23; in the caudal there are 36, in the pectorals 19, in the ventrals 6. The dorsals are not joined. In colour it is greenish black above, silvery below, with an almost straight white lateral line. In length it reaches 42 inches or more. It is gregarious and voracious, and frequents deep, rocky coasts, but is well known as a surface feeder under more names than any other British fish.

Couch's Whiting has 12 or 13 rays in its first dorsal, from 12 to 14 in the second, from 22 to 24 in the third; in its first anal are from 34 to 38, in the second from 20 to 25; in the caudal there are from 25 to 29, in the pectorals 20, in the ventrals 6. The first and second dorsals are narrow and pointed, with a much less interval between them than that between the second and third; the first anal is long, low, and level. The lateral line is nearly straight, and the body is long in proportion to its depth, and flat in its curves. In colour it is brownish above, with a yellow stripe above the lateral line, and one or more lower down the silvery sides. It is 15 inches long, and is a deep-water species, common in the Mediterranean.

The Pollack has from 11 to 13 rays in the first dorsal, 16 to 20 in the second, 15 to 19 in the third; in its first anal there are from 24 to 31, in the second 16 to 21; in the caudal there are 31, in the pectorals 19, in the ventrals 6. The first ray of each dorsal is rather short; the second dorsal has an indentation in the middle. The lower jaw projects considerably. The lateral line straightens at the beginning of the second dorsal. In colour the Pollack is dark green on the back, and golden and silvery on the sides. In length it ranges as a rule from 18 inches to 30, but it has been known to reach 36. It is found in moderately deep water, where the rocks are covered with seaweed, and seems to feed on molluscs, worms, and crustaceans when young, and on fishes when large enough to swallow them. It is best known as a surface feeder, and is rarely found far away from the shore. It is unknown on the western coast of the Atlantic, and does not range much further south than the Mediterranean.

Galeus. Plate xxviii. *CARCHARIIDÆ.*

223. *vulgaris*, TOPE. Back grey and unspotted; snout conical and long.

The Tope has the dorsals far apart and the ventrals midway between them; the lower lobe of the caudal fin is notched and

much wider than the upper. The teeth are large and sharp, and have the inner edge serrated. The colour is grey above without spots, and whitish below. The largest British specimen measured 7 feet.

Casterosteus. Plate xii. *GASTEROSTEIDÆ.*

Spines more than three—

- 97. *spinachia*, FIFTEEN-SPINED STICKLEBACK. Spines 15 or more; snout produced, body long.
- 96. *pungitius*, NINE-SPINED STICKLEBACK. Spines 8 to 11
- 95. *spinulosus*, FOUR-SPINED STICKLEBACK. Spines 4.

Spines three—

- 94. *gymnurus*, SMOOTH-TAILED STICKLEBACK. Plates extending to tip of pectoral.
- 93. *semiarmatus*, HALF-ARMED STICKLEBACK. Plates extending half-way to base of caudal.
- 92. *trachurus*, ROUGH-TAILED STICKLEBACK. Plates keeled at base of caudal.
- 91. *aculeatus*, THREE-SPINED STICKLEBACK. Spines very short.

The Fifteen-spined Stickleback is a sea fish, and in other ways differs greatly from the others. The fore part of its dorsal fin is represented by 15 or 17 isolated spines, the hinder part consisting of 6 or 7 rays; in the anal there are also 6 or 7 rays; in the caudal there are 12 or 14; in the pectorals 9 or 10; and the ventrals have only one spine and one ray. The second dorsal is over the anal, and begins in the middle of the back, the hinder portion of the fish being long and slender. Along the body is a row of ridged plates, with shorter ridges above and below it, all three ending at the base of the tail. The snout is long, and the eye is placed halfway between its tip and the first spine. In colour this species is olive, with silvery underparts, and it has a silver stripe along the snout; but under excitement the colour is changeable. In length it measures 7 inches. It is found in rocky pools and among seaweed-covered rocks, where it makes a nest under one of the overhanging fronds, lacing together and affixing to it a sort of open ball of the softest and silkiest weeds around. This nest is watched over by the male until the young are about a month old.

The Nine-spined, otherwise the Ten-spined, Stickleback is a fresh-water species. The isolated spines representing the fore-half of the first dorsal number from 8 to 11, the rays number 9 or 10, and have a short spine to begin with. In the anal there is a short spine and 8 or 10 rays; in the caudal there are 12 rays; in the pectorals 10; and the ventrals are represented by a spine and a ray, or are absent altogether. In colour this species is olive green or brown above, the sides silvery spotted and dotted with black, and the fins transparent. In the breeding season the underparts become blue or red. The length is from 2 to 3 inches. The nest built by this species is like a muff in shape, and consists of soft-leaved water plants, the finest being confervoid filaments.

The other Sticklebacks are little better than varieties of one species, and can only be briefly dealt with as such. As far as the fins go they can be tabulated :

- No. 91. Dorsal, 3 spines and 11 rays ; anal, a spine and 8 or 9 rays ; caudal 12 rays ; pectorals 10 to 12 ; ventrals, a spine and a ray.
- No. 92. Dorsal, 3 spines and 11 rays ; anal, a spine and 8 rays ; caudal 12 rays ; pectorals 10 ; ventrals, a spine and a ray.
- No. 93. Dorsal, 3 spines and 11 rays ; anal, a spine and 9 rays ; caudal 12 rays ; pectorals 10 ; ventrals, a spine and a ray.
- No. 94. Dorsal, 3 spines and 11 rays ; anal, a spine and 8 rays ; caudal 12 rays ; pectorals 10 ; ventrals, a spine and a ray.
- No. 95. Dorsal, 4 spines and 10 rays ; anal, a spine and 8 rays ; caudal 12 rays ; pectorals 10 rays ; ventrals, a spine and a ray.

The body is short and compressed, and not over $3\frac{1}{2}$ inches long ; in colour it is grey with greenish or golden reflections, and spots and stripes. During the breeding season the underparts are red. As a rule these are inland fishes, but they descend the rivers in shoals to the sea, so that they are fresh-water, estuarine, and marine. When in sea-water they are darker and bluer in colour than when in fresh. In fresh-water the male builds his nest of straws, and lines and laces it with confervæ, in sea-water he uses algæ, as does his fifteen-spined relative.

Gobio. Plate xxii. CYPRINIDÆ.

173. *fluviatilis*. GUDGEON. Two small barbules ; abdomen nearly straight ; bands of spots on dorsal and caudal.

The Gudgeon has 9 or 10 rays in its dorsal fin, 8 in its anal, 19 in its caudal, 15 or 16 in its pectorals, and 8 or 9 in its ventrals. The dorsal rises in the middle of the back, over the tip of the pectorals and in front of the ventrals, the ventral being half way between the pectorals and the anal. In the lateral line, which is straight, there are from 36 to 44 scales ; the scales are large and angular. The back is rather sharply curved, and is highest slightly in front of the dorsal ; the abdomen is nearly straight from the jaw to the anal fin, along the base of which it curves upwards, and continues almost straight again to the caudal. The mouth is small, and the upper jaw the longer, with a barbule at each corner like the end of a moustache. In colour the Gudgeon is olive above and silvery below, with lines of spots on the vertical fins. In length it reaches 8 inches or more. In habits it is gregarious, and prefers running water with a sandy or gravelly bed whereon it can feed on the molluscs, and worms, and plants, but it is not particular as to the purity of the water.

Gobius. Plate ix. GOBIIDÆ.

Seven spines—

63. *ruthensparri*, TWO-SPOTTED GOBY. A spot under pectorals, and a spot at base of caudal.

Six spines—

69. *quadrifasciatus*, FOUR-SPOTTED GOBY. Dorsals close, first dorsal long; four spots in a line in hinder half of body.
66. *minutus*, ONE-SPOTTED GOBY. Dorsals wide apart; black ocellated spot on first dorsal.
67. *parnelli*, SPECKLED GOBY. Dorsals close; first ending in a black blotch; fins black with white lines.
68. *pictus*, PAINTED GOBY. Dorsals close and banded with spots.
64. *paganellus*, PAGANELLUS. Dorsals close, with an orange band; body nearly black.
65. *niger*, ROCK GOBY. Dorsals close; fins brown with whitish lines; body mottled greyish brown.

The Two-spotted Goby has 7 spines in the first dorsal, and a spine and 10 or 11 rays in the second, in the anal there are a spine and 10 or 11 rays, in the caudal there are 15 rays, in the pectorals 19, in the ventrals a spine and 5 rays. The dorsals are some distance apart, and the caudal is square. In the lateral line there are from 34 to 40 scales. The mouth is oblique, the lower jaw being the longer. There are teeth in both jaws, the longest being in front. The colour is reddish brown, with undulating bands, and a dark band from the eye to the corner of the mouth. The spots are distinct. In length this goby is $2\frac{1}{2}$ inches. It swims among seaweeds, near the surface, over rocky ground.

The Four-spotted Goby has 6 spines in its first dorsal, a spine and 9 or 10 rays in its second dorsal, also a spine and 9 or 10 rays in its anal; there are 13 rays in its caudal, 17 in its pectorals, and a spine and 5 rays in its ventrals. The dorsals are close together. The first dorsal is triangular, the second spine being much the longest; the caudal is spatulate. There are from 37 to 40 scales in the lateral line. The body is narrow, the back and abdomen being almost parallel to each other. In colour it is a yellowish grey, with a dark mark descending from the eye. Besides the four dark spots on the body, there are spots on the dorsals, and the caudal and anal have dark edges. In length it is 2 inches. Its only occurrence out of the Mediterranean is in deep water off the Shetlands.

The One-spotted Goby has 6 spines in its first dorsal, and a spine and 10 or 11 rays in its second dorsal; in its anal it has a spine and from 10 to 12 rays; in its caudal it has 11; in its pectorals 27; in its ventrals 6. In the dorsals the spines are but a trifle higher than the rays, and neither are higher than the body is deep. In the lateral line there are from 60 to 70 scales. The mouth extends nearly to the eye. In the female the eye is more forward in the head than in the male. The colour is yellowish brown, with spots and vertical bands, and is darker in the male than in the female. The dorsals are faintly spotted with brown, but the black ocellated spot is conspicuous. This goby is from 3 to 4 inches long, and is generally caught in sandy bays, where it lives on small crustacea.

The Speckled Goby has 6 spines in its first dorsal, and a spine and 9 or 10 rays in its second dorsal; in its anal it has a spine and 9 or 10 rays; in its caudal 13 rays; in its pectorals 19; and in its ventrals a spine and 5 rays. The tail is cut square, and does not widen towards the tip, its edges being in line with those of the body. There are 40 scales in the lateral line. The scales are smaller in the fore-part of the fish than in the hinder half. The head is broader than it is high. In colour this goby is bluish grey, with blackish bands. The fins are black with whitish streaks. In length it is about $2\frac{1}{2}$ inches. It is found on shallow shores in which the tide ranges over a wide distance of sand and mud.

In the Painted Goby the first dorsal has 6 spines and the second 10 rays; the anal has 9 rays; the caudal 13; the pectorals 20; and the ventral a spine and 5 rays. The pectorals are broad and reach to the second dorsal, which is very little higher than the anal. The caudal is long and rounded and rather narrow. There are from 35 to 40 scales in the lateral line. In colour the Painted Goby is light brown with bands, and two short black streaks from the lower edge of the eye. The caudal has a dark inner margin, and the dorsals are iridescent, with spots and a dark edging. In length it is about 2 inches.

The Paganellus has 6 spines in the first dorsal; a spine and from 14 to 16 rays in the second dorsal; a spine and from 14 to 15 rays in its anal; 13 rays in its caudal; 20 in its pectorals; and a spine and 5 rays in its ventrals. The dorsals are close together, and the caudal is rounded. There are from 54 to 58 scales in its lateral line. The teeth in the upper jaw are conspicuously large and curved; the lips are thick and bear papillæ. The colour is blackish above, lighter below, and the dorsals are banded with orange. In length this species attains 4 inches, and is generally caught in seaweed among rocks.

The Rock Goby is not as black as its specific name would imply. It has 6 spines in its first dorsal; a spine and 12 or 13 rays in its second dorsal; a spine and from 10 to 12 rays in its anal; 13 rays in its caudal; 18 in its pectorals; and a spine and 5 rays in its ventrals. In its lateral line are from 39 to 41 scales. The tail curves inwards from its base, so as to resemble the section of a cone. The jaws are equal in length. In colour it is a dull brown, with indistinct bands and mottlings; the dorsals and caudal have lines of spots. This is the largest of the British gobies, and reaches 6 inches in length. Its home is among rocks, and it feeds on the small fishes and crustaceans that lurk in the clumps of seaweed. It is an active, voracious sea fish that will live in fresh water, at least, for a time.

Hippocampus. Plate xv. *SYNGNATHIDÆ*.

119. *antiquorum*, SEAHORSE. Head crested, and somewhat like that of a horse; tail tapering, finless, and prehensile.

The Seahorse has either 3 or 4 fins, the dorsal which has from 18 to 20 rays, the anal which has 5 rays, and is present only in the female, and the pectorals which have from 15 to 17 rays. The body

is armed with a series of osseous rings, of which there are about a dozen between the head and the vent, and about three dozen from that point to the tip of the tail. The head and body are covered with tubercles, and the head is flattened and rises into a crest above the long gill covers. The colour is brown of a greenish hue with whitish dots, and frequently the tail is whitish. In size the Seahorse measures about 6 inches along the curve. It is a quaint, intelligent fish, which swims upright. The female transfers the ova to the male, who hatches them in its breeding pouch, and looks after them during their infancy. Seahorses call each other with a sort of cough.

Hippoglossoides. Plate xix. *PLEURONECTIDÆ*

150. *limandoides*, LONG ROUGH DAB. Scales ctenoid and spiny on the hinder edge; mouth large.

The Long Rough Dab has from 76 to 87 rays in its dorsal fin, 60 to 69 in its anal, 14 to 16 in its caudal, 10 in its pectorals, and 6 in its ventrals. The dorsal rises for two-thirds of its length, and then takes a straight slope towards the caudal, and the anal rises for half its length, and slopes at a similar angle. The lateral line has from 85 to 95 scales, and is nearly straight. The eyes are on the right side, the mouth extends to the middle of the eye, the jaws being alike on both sides. The colour is brownish grey on the upper side, generally without spots, and it is white on the under side. This flat-fish is about 15 inches long, and lives in the northern seas in rather deep water, feeding on crustaceans and molluscs.

Hippoglossus. Plate xix. *PLEURONECTIDÆ*.

149. *vulgaris*, HALIBUT. Scales cycloid and not spiny; lateral line curved.

This is the longest, narrowest, and thickest of our flat fish. Its dorsal rays number from 99 to 107; in its anal it has from 73 to 82, in its caudal from 15 to 18; its pectorals have from 14 to 18, and its ventrals 6. The dorsal and anal are low at their beginning, and reach their highest point at about half-way. The lateral line curves boldly above the pectorals, whereas in the last species it has little more than a shiver. The scales are smooth. The eyes are on the right side, the jaws alike on both sides; there is a double row of teeth in the upper jaw; the mouth reaches the back of the eye. In colour the upper side is marbled olive, the under is white. The ordinary size is from 3 to 7 feet, but it has reached 20 feet. The Halibut is not often found in the Channel, and it is confined to deep water, the larger specimens being taken on rocky ground.

Labrax. Plate i. *PERCIDÆ*.

2. *lupus*, BASS. Spines in dorsals, anal, and ventrals; gill cover serrated; colours slaty blue and silver.

The Bass is like a slender Perch. Its first dorsal consists of 8 or 9 prickly spines; in its second dorsal are a spine and 12 or 13 rays, in its anal are 3 spines and 10 or 11 rays, in its caudal are 17 rays,

in its pectorals 16, and in its ventrals a spine and 5 rays. The first dorsal is almost semicircular, being highest in the middle; the second dorsal is not so high; in the anal the third spine is the longest; in the ventrals the spine is strong. The lateral line has 72 scales, and curves gently downwards from the first dorsal. The mouth reaches to the eye; there are 2 distinct spines on the operculum, and well marked serrations on the hinder edge of the præoperculum. In colour the Bass is a deep bluish grey above, and silvery below, with a dark spot on the gill cover under the spines; the vertical fins are grey, the others yellowish; the eye is silvery. In length it reaches 18 inches. It is a summer fish, returning from the deep sea to the coast from May to November, occasionally ascending some distance up the rivers, but usually found among rocks or near wooden piers, feeding close to the surface on small fishes, crustacea, and seaweeds.

Labrus. Plates xiii. and xiv., *LABRIDÆ*.

104. *maculatus*, BALLAN WRASSE. Body plentifully spotted with white above and below the lateral line.
105. *donovani*, COMBER WRASSE. Body with a few white spots below the lateral line, and with an incomplete white stripe.
106. *lineatus*, GREEN WRASSE. Green with yellow streaks.
107. *mixtus*, STRIPED WRASSE. Orange with blue stripes and no vertical bars.

The Ballan Wrasse has a long dorsal, in which there are 20 or 21 spines, and from 9 to 11 rays; in the anal are three spines, and from 8 to 10 rays, in the caudal are 14 rays, in the pectorals 14 or 15, and in the ventrals a spine and 5 rays. The dorsal rays are half as long again as the spines, which are all of much the same height. The dorsal begins just behind the base of the pectorals. In the lateral line there are from 41 to 47 scales. Mouth extends to the fore nostril; lips very thick; teeth in a single row on the jaws, and prominent. Præoperculum serrated when young. In colour this species varies, but it nearly always has spots, and never has a white side stripe or is green with yellow streaks. It attains over 16 inches in length. It lives in moderately deep water, on rocky ground where seaweeds are plentiful.

The Comber Wrasse and the Green Wrasse are really varieties of the Ballan, and resemble it in every way except in colour, as noted above.

In the Striped Wrasse there are from 16 to 18 spines in the dorsal, and from 11 to 14 rays; in the anal there are 3 spines and from 10 to 12 rays, in the caudal from 13 to 15 rays, in the pectorals 17 rays, in the ventrals a spine and 5 rays. The dorsal begins just over the base of the pectorals, and is level throughout, the spines and rays being of the same height. In the lateral line there are from 50 to 60 scales. The lips are very thick and the teeth prominent. Orange, lighter below, is generally its colour, the male having blue stripes radiating from the eye, two of which extend to the caudal, one above the lateral line and the other below it, the

female having 2 dark blotches at the base of the dorsal rays, and a third one at the root of the tail. This species is 13 inches long, and is found not in sandy bays, but on rocky coasts, where the molluscs and crustaceans that form its food are abundant. It is frequently caught in crab-pots, which it enters to feed on the bait.

Læmargus. Plate xxx. *SPINACIDÆ*.

234. *borealis*, GREENLAND SHARK. Body stout; dorsals without spines; anal fin absent.

In the Greenland Shark the fins are all small in proportion to the girth of the body. The first dorsal is in the middle of the back, and also half-way between the pectorals and ventrals. The second dorsal begins above the hinder edge of the ventrals. The lower lobe of the caudal fin is much larger than the upper. The snout is prolonged, and the curve from its tip to the mouth is that of a clipper bow. The mouth extends to the eye, which is small and without a lid. The gill-slits are small. This is an Arctic species, known only as a straggler in British waters. It reaches 25 feet in length, and is grey above, lighter below.

Lamna. Plate xxviii. *LAMNIDÆ*.

226. *cornubica*, PORBEAGLE. Body stout; side of tail keeled; anal fin present.

This is the second of the three stout-bodied sharks in our list, the third being the Basking Shark. It is distinguishable by the large size of its first dorsal, caudal, and pectoral fins. The second dorsal and anal are small and opposite. The first dorsal is half-way between the snout and the second dorsal, and the ventrals are halfway between the two dorsals. The upper lobe of the caudal is large, and notched near the tip. Along the side of the tail there is a conspicuous keel. It is fairly common, and attains a length of 9 feet, the colour being greyish above and whitish below.

Lampris. Plate v. *CORYPHÆNIDÆ*.

33. *luna*, ОРАН. Iridescent, with oval silver spots; fins pointed.

This is the most brilliantly coloured of British fishes. There are from 53 to 55 rays in the dorsal fin; 38 to 41 in the anal; 22 in the caudal; 24 in the pectorals, and from 14 to 16 in the ventrals. The dorsal is very long in front, and in about a quarter of its length suddenly shortens and becomes very low and level with the back until near the end. The anal is low and straight; the caudal is deeply forked; the pectorals are pointed, and extend beyond the middle of the dorsal. The lateral line is a semicircle for half its length, and then becomes perfectly straight. The shape is a deep oval, the body being flat. In colour it is best described as iridescent, the reds, greens, blues, and purples mingling and changing according to the point of view, the conspicuous feature being a number of large, well-defined oval spots of silver. The fins are mainly red. In size the Opah attains 6 feet. Notwithstanding its bright colours it seems to be a northerly fish, and is only found in deep waters. Though not common, it has been frequently taken in the North Sea.

Lepadogaster. Plate xiii. *GOBIESOCIDÆ*.

99. *gouanii*, CORNISH SUCKER. Vertical fins continuous.
 100. *decandollii*, SUCKER. Vertical fins not continuous; no black spot under tip of pectoral.
 101. *bimaculatus*, DOUBLY-SPOTTED SUCKER. Vertical fins not continuous; black eye-spot under tip of pectoral.

The Cornish Sucker has from 16 to 20 rays in its dorsal fin; 9 to 11 in its anal; 19 in its caudal; 20 to 25 in its pectorals; and a spine and 4 rays in its ventrals. The dorsal begins beyond the middle of the back, and, like the anal, which begins nearer the tail, is continuous with the caudal. The pectorals are connected by a membrane with the ventrals. The spine of the ventrals is imbedded in skin; between them is the sucking disk, with a deep groove in the middle. The skin is loose and tough, the snout spatulate, the upper jaw the longer. The mouth extends to the middle of the eye, and the eyes, like those of the other suckers and those of the blennies, can be moved independently of each other. In colour this species is red as a rule, though sometimes brown or green, and there are two dark spots on the nape which have a light edging. In length it rarely exceeds 4 inches, and it is generally found under stones between the tide marks.

The Sucker has from 14 to 16 rays in its dorsal; 8 to 11 in its anal; 18 in its caudal; 25 in its pectorals; and a spine and 4 rays in its ventrals. The dorsal begins in the hinder half of the back, and, like the anal, is distinctly separate from the caudal, although in each case a membrane extends from the hinder edge. The pectorals are connected with the ventrals. The snout is spatulate and the upper jaw the longer, the mouth extending to almost the middle of the eye. The body tapers very slightly; the head is the widest part, and is flat at the top. The sucker is of the same character as that of the last species. In colour this species is red with light spots. In length it is 2½ inches, and it is generally found clinging to stones between the tide marks.

The Doubly-spotted Sucker has only from 5 to 7 rays in its dorsal fin; in its anal are from 4 to 6; in its caudal 12; in its pectorals 17; and in its ventrals 5. The dorsal and anal are small, and though in the hinder part of the body, are some distance from the tail. The pectorals are not joined to the ventrals, as in the other two species, though the sucking disk is of the same character. The colour is orange, with reddish bands. The characteristic ocellus is just covered by the tip of the pectorals. In length this species is 2 inches or more. It is found near low-water mark in rather deeper water than the other two. Like them, it has no scales on its body.

Lepidopus. Plate iii. *TRICHIURIDÆ*.

23. *caudatus*, SCABBARD FISH. Body long, thin, and tapering; tail small and forked.

In the dorsal there are from 100 to 105 rays, in the anal 18 to 25 rays, in the caudal 16 to 18, in the pectorals 12. The ventrals are represented by the pair of scales from which the fish takes its name

(*lepidopus*—scale foot). The dorsal begins on the nape and extends almost to the tail. The lateral line is long, straight, and well marked. There are about 20 teeth in each jaw, with 2 or 3 barbed canines; the lower jaw is the longer, and the mouth extends to the eye. This rare fish is silvery in colour, with yellowish grey fins; it attains a length of 6 feet.

Lepidorhombus. Plate xx. *PLEURONECTIDÆ.*

155. *megastoma*, MEGRIM. Eyes left; eyes large; mouth large; jaws alike.

In the dorsal fin there are from 85 to 91 rays, in the anal 61 to 75, in the caudal 15, in the pectorals 13, in the ventrals 6. The dorsal is highest in its hinder half. The lateral line makes a semi-circular curve over the pectorals; it has from 104 to 110 scales. The scales are rough, and easily detached. The body is oval and thin; the jaws have two rows of small teeth; the mouth extends to the back of the eyes; and the eyes are yellow, and unusually large for those of a flat fish. In colour this fish is brownish yellow, spotted with dark brown, many of the spots being arranged in rings. In length it is about 18 inches. It lives in comparatively deep water. It is said to come ashore in the Orkneys with its tail in the air scudding before the wind, whence its name of Sail Fluke. It is also known as the Whiff and as the Merry Sole.

Leuciscus. Plate xxiii. *CYPRINIDÆ.*

Lateral line incomplete—

178. *phoxinus*, MINNOW. Incomplete lateral line with from 80 to 90 scales.

Lateral line complete—

174. *rutilus*, ROACH. Bluish or greenish, lighter on sides and below; base of dorsal $\frac{3}{4}$ of height; 4 rows of scales between lateral line and ventrals.

175. *cephalus*, CHUB. Bluish or greenish, lighter on sides and below; base of dorsal $\frac{2}{3}$ of height; 3 rows of scales between lateral line and ventrals; cheeks with red and gold reflections.

176. *vulgaris*, DACE. Bluish above, silvery on sides and below; base of dorsal $\frac{2}{3}$ of height; 5 rows of scales between lateral line and ventrals.

177. *erythrophthalmus*, RUDD. Silvery glossed with red; eye red; 4 rows of scales between lateral line and ventrals.

The ubiquitous Minnow has 9 or 10 rays in its dorsal fin, 10 or 11 in its anal, 19 in its caudal, 15 in its pectorals, and 9 or 10 in its ventrals. The dorsal begins behind the ventrals, and ends in a line with the commencement of the anal; the pectorals, ventrals, and caudal are at equal intervals. The upper jaw is the longer; the mouth reaches to the first third of the eye. In colour this fish is silvery, occasionally dotted or striped with black. In size it is generally

about 3 inches, but it has been recorded as long as 7. Its favourite haunt is in running shallow water, where it assembles in shoals near the surface or among the weeds. It feeds on plants and worms and water animals, including the dead bodies of its own species.

The Roach has from 11 to 13 rays in its dorsal fin, from 12 to 13 in its anal, 19 in its caudal, from 16 to 18 in its pectorals, and 9 or 10 in its ventrals. The first two or three rays in the dorsal and anal are bony. The dorsal is over the ventrals; the ventrals are midway between the pectorals and anal. The lateral line has from 42 to 45 scales; it curves slightly downwards to the tip of the pectorals, and then runs straight. The jaws are equal in length; the mouth reaches to the hinder nostril. The silvery underparts become reddish in the breeding season; the lower fins are tinged with red, and the dorsal and caudal have blackish edges. In length it attains 15 inches. It is found in shoals in clear, deep, still, or slowly running water, where there is gravel or sand, keeping close to the bottom in running water, and not so deep in still. It feeds on water plants, worms, crustaceans, and other water animals. It gathers in large numbers at certain spots for breeding purposes, and its eggs can be identified by their being greenish and becoming red when boiled. Though a typical fresh-water fish, the Roach is occasionally caught in estuaries.

The Chub is rather more slender in build, and has a larger head. It has 11 rays in its dorsal, from 10 to 12 in its anal, 19 in its caudal, 16 or 17 in its pectorals, and 9 or 10 in its ventrals. The first 3 rays of the dorsal and anal are bony. The dorsal begins behind the ventrals; the pectorals, ventrals, anal, and caudal are at equal intervals. The pectorals are very close to the gill cover; the curve of the back is low. The lateral line has from 43 to 48 scales, and is slightly concave throughout, reaching its lowest point over the tips of the ventrals. The jaws are equal, the snout blunt, and the mouth reaches the front edge of the eye. It is much the same colour as the Roach, but rather lighter below, the ventrals and anal are reddish, and the edges of the dorsal and caudal are dark in colour. There is a decided blush of red on its cheeks as a rule. It attains a length of 21 inches. It frequents deep holes in clear water flowing over gravel, sand, or marl, and comes to the surface in warm weather. It feeds on plants, worms, and insects. It is very quick of sight and hearing, and will sink to the bottom at a passing shadow or the slightest sound.

The Dace is the slenderest and most graceful fish of the five. It has 9 or 10 rays in its dorsal; 10 or 11 in its anal; 19 or 20 in its caudal; 15 or 16 in its pectorals; and 9 or 10 in its ventrals. The first 2 or 3 rays in the dorsal and anal are bony. The dorsal is nearly over the ventrals; the ventrals are nearer to the anal than to the pectorals, and the anal is midway between the ventrals and the caudal, which is deeply forked. In the lateral line there are from 48 to 52 scales; it is concave, with the lowest point under the hinder end of the dorsal. At the base of the ventrals there is an angular scale. The upper jaw is the longer; the mouth does not quite reach the eye. The curve of the back is easy and rather slight;

the abdomen is nearly straight ; the head is almost as long as the body is deep. In colour the Dace is silvery, with a bluish back and greenish fins, the ventrals and anal being tinged with red. In length it attains 12 inches. It is a gregarious fish, living in clear running water, feeding on plants, worms, and insects, and often swimming near the surface and leaping out of the water. At breeding time it gathers in large numbers in weedy shallows. It is a fast swimmer, quick of sight and hearing, and will dart for some distance out of danger when alarmed.

The Rudd has 11 or 12 rays in the dorsal, from 13 to 15 in the anal, from 19 to 21 in the caudal, 16 or 17 in the pectorals, and 9 or 10 in the ventrals. The first 2 or 3 rays in the dorsal and anal are bony. The dorsal is placed on the highest point of the back ; the pectorals, ventrals, anal, and caudal are at equal intervals. There are from 40 to 44 scales in the lateral line, which curves downwards, the lowest point being over the tip of the ventrals. The body is elevated and flat ; the head is small, and has rather a hollow curve over the eye ; the mouth extends to the hinder nostril. The colour varies, but as a rule it is silvery, with the dorsal, caudal, and pectorals tipped with black, and the anal and ventrals yellow. The eye is always red, hence the fish is widely known as the Red-eye. In length it does not exceed 9 inches. It is mainly confined to gently-flowing rivers, particularly to their broads or expansions, frequenting deep water and pools. It feeds on plants, worms, molluscs, and insects, and will rise to flies when swimming near the surface.

Lichia. Plate iv. *CARANGIDÆ*.

27. *glauca*, DERBIO. First dorsal consisting simply of 5 or 6 spines, the first of which points forwards.

The Derbio has two dorsals, the front one being a row of 5 or 6 short isolated spines, the first of which points forwards parallel to the lateral line. The second dorsal has a spine and from 24 to 27 rays. There are also two anals, the first of which consists of 2 isolated spines, the second anal having a spine and from 23 to 25 rays. In the caudal there are 17 rays, in the pectorals 17, and in the ventrals a spine and 5 rays. The caudal is deeply forked. The scales are small and cycloid. In colour this fish is sea-green with yellowish sides, the fins being yellowish and stained with black. In length it reaches 15 inches. It is very rare in British waters ; independently of its spines it can easily be recognised by its black-tipped tail, the lobes of which are quite three times as long as their extreme width.

Liparis. Plate viii. *CYCLOPTERIDÆ*.

61. *vulgaris*, SEA SNAIL. Body streaked.
62. *montagui*, MONTAGU'S SUCKER. Body spotted.

The Sea Snail has from 34 to 36 rays in its dorsal, 27 or 28 in its anal, 12 to 14 in its caudal, 28 in its pectorals, and a spine and 5 rays in its ventrals. The pectorals are deeply notched, and extend

under the throat; the ventrals surround the disk. The head is broad and round; the mouth extends to the front edge of the eye; the upper jaw is the longer. In colour this species is brown or pale grey, with many narrow stripes; in length it is about 6 inches.

Montagu's Sucker has from 26 to 30 rays in its dorsal fin, 24 in its anal, 14 in its caudal, 30 in its pectorals, and 6 in its ventrals. The pectorals are notched, and extend under the throat as in the foregoing species, but there are only 5 long rays on the lower side instead of 6. In colour it is brownish, covered with dark spots, and its length is 3 inches. Like the Sea Snail, it is found just below low-water mark along the coast and in estuaries, and seems to use its sucker to hold on by as the tide runs out.

Lophius Plate vii. *LOPHIIDÆ*

47. *piscatorius*, ANGLER. Anterior dorsal spines modified into tentacles.

The dorsal fin of the Angler is in four divisions, the first consisting of 2 long isolated spines, the second of a long spine at some distance from them, the third of 3 spines united by a membrane at their base, and the fourth of an ordinary sort of fin containing 11 rays; in the anal are from 9 to 11 rays, in the caudal 8, in the pectorals 13, in the ventrals a spine and 5 rays. The pectorals are large and not unlike feet; by their means the Angler can not only walk but cling to anything so as to be carried from place to place, and with them it digs a hole in sand, in which it hides, dangling the filaments attached to its anterior spines over its mouth as a bait. Its mouth is a quarter as wide as the fish is long, and there are two rows of teeth in the jaws, the inner row being the larger and being movable backwards. The eye is well developed, as is also the organ of hearing. In colour the Angler is dirty brown, with dark reticulations; in length it measures from 4 to 7 feet; and it feeds on fishes and crustaceans.

Lota. Plate xviii. *GADIDÆ*.

136. *vulgaris*, BURBOT. Two dorsals, one anal, and a long barbule.

The Burbot is a fresh-water member of the Cod family. It has 2 dorsals, the first short with 12 to 14 rays, the second long with from 67 to 76 rays; the anal has from 65 to 71 rays, the caudal 30, the pectorals 19 to 21, and the ventrals 7. The vertical fins are nearly continuous; the caudal is rounded, the lower half beginning nearer the head than the lower half. The lateral line is almost straight; the scales are small. The head is broad, the mouth wide, the jaws equal, the mouth extending to the middle of the eye. In colour the Burbot is brownish, mottled or banded with darker brown; in length it reaches 30 inches. It is found in clear streams and lakes, mainly in the Trent and rivers of the north-east coast, and is nocturnal in habit, hiding under stones or in the mud or in holes in the banks.

Luvarus. Plate v. *CORYPHÆNIDÆ*.

35. *imperialis*, Grey with a scarlet stripe; tail forked and keeled.

This Mediterranean fish is of rare occurrence round these islands. In full-grown specimens the dorsal has a spine and from 11 to 13 rays, the anal a spine and 14 rays, the caudal 16, the pectorals 14 to 18, and the ventrals a spine and 4. The rays of the dorsal and anal are wide apart; both fins are in the hinder half of the body, which is pyriform in shape, with a curious head, small mouth, and large eyes. In colour it is grey above, silvery below, with a red stripe along the side, and red fins. In length it attains 5 feet.

Maurolucus. Plate xxiv. *STERNOPTYCHIDÆ*.

188. *pennantii*, PEARLSIDES. Anal fin in three portions, of different heights.

The dorsal fin has 10 rays; the anal has 10 longish rays, then 12 short rays, then from 4 to 13 rays rather higher than the middle group. The caudal has 19 rays, the pectorals 16, the ventrals 7. Sometimes there is an adipose dorsal. In the lateral line are 28 scales; the scales are cycloid, and are higher than they are wide. The head is unusually square, and the body tapers gradually backwards from the cheeks. The back is blackish, the sides silvery; there are many luminous spots, and under the spots are black marks. The average length seems to be 3 inches. This is a deep-sea form, and the few British examples have been found after storms.

Merluccius. Plate xvii. *GADIDÆ*.

133. *vulgaris*, HAKE. No barbule; anal highest behind; eye round; teeth many and large.

The first dorsal has 10 rays, the second from 36 to 40, the anal 36 to 38, the caudal 22, the pectorals 14, the ventrals 7. The first dorsal is short and triangular, the second is long, lowest in the middle and highest at the end; the anal, which is the same length as the second dorsal, is also highest near the tail; the caudal is square, the pectorals and ventrals are pointed. The lateral line is straight, and is black with a white edging. The mouth is large, and its inner surface and that of the gill cavities are black. The teeth are long and sharp, and in two rows, the inner being the larger. In colour the Hake is greyish brown above and white below; in shape it is long and slender; in length it reaches 48 inches. It is a voracious fish of wide distribution, active generally at night, and following the shoals of mackerel, herring, and so forth round the coasts.

Molva. Plate xvii. *GADIDÆ*.

135. *vulgaris*, LING. Long barbule; anal level throughout; eye oval.

The Ling—that is, the “long” fish—has two dorsal fins, the first with 13 to 16 rays, the second with from 63 to 70; in the anal there are from 57 to 66 rays, in the caudal from 35 to 38, in the pectorals 19,

in the ventrals 6. The dorsals are of the same height; the first is rounded, the second long and rather higher behind; both it and the anal almost join the caudal, which is spatulate. The fins are narrow and flexible. The lateral line curves downwards to the second dorsal and then becomes straight. The upper jaw is the longer. The teeth are not so conspicuous as in the Hake. In colour the Ling is greenish grey, with white underparts, the vertical fins becoming dark towards their edges, which are bordered with white. In length it reaches 7 feet, but the usual size is about 3 feet. It is a night-feeding fish, keeping to the bottom, and rarely found where the ground is not rocky.

Motella. Plate xviii. *GADIDÆ.*

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| 137. <i>mustela</i> , | FIVE-BEARDED ROCKLING. Barbules 5. |
| 138. <i>cimbria</i> , | FOUR-BEARDED ROCKLING. Barbules 4. |
| 139. <i>trivirrata</i> , | THREE-BEARDED ROCKLING. Barbules 3; body spotted. |
| 140. <i>macrophthalma</i> , | Barbules 3; body unspotted. |

In the Five-bearded Rockling the first dorsal has a spine and 20 low rays, the second dorsal has from 47 to 55 rays, the anal from 40 to 47, the caudal 20 or 21, the pectorals 15, and the ventrals 7 or 8. The first dorsal is a sort of fringe, headed by a spine which is the same height as the rays of the second dorsal; the dorsals are continuous. The second dorsal is curved, and ends close to the caudal; the anal ends in a similar manner, but is not so high; the caudal is rounded. The mouth extends to the middle or back of the eye. In colour this species is brownish with brown fins. It is 18 inches long, and feeds on molluscs and crustaceans in rocky and sandy localities.

The Four-bearded Rockling has also a spine and 20 rays in its fringe-like dorsal, the second dorsal having 50 rays; the anal has 44 rays, the caudal 31, the pectorals 15, and the ventrals 6. There is one barbule on the upper lip instead of two, one on each side of the snout and one on the chin. The anal begins further back than in the foregoing species. In colour it is chestnut on the back, lighter below. In length it reaches 14 inches, and, like the others, it is found in rocky, sandy places abounding in molluscs and small crustaceans.

The Three-bearded Rockling has a spine and 20 rays in its first dorsal, and from 55 to 57 rays in the other; in the anal are from 48 to 50 rays, in the caudal 21, in the pectorals 16 to 18, in the ventrals 6 or 7. There are two barbules on the upper lip, and one on the chin. The upper jaw is the longer; the mouth extends behind the eye. The colour above is black or brown, with round spots and blotches, and white below. This Rockling is 20 inches long, and is a ground feeder, living among seaweeds on rocky shores.

The fourth species of Rockling is small and but little known. It has a spine and 20 rays in its first dorsal, 55 rays in its second dor-

sal, 55 in its anal, 32 in its caudal, 15 in its pectorals, and 6 in its ventrals. It has a barbule on each side of the snout, and one on the lower jaw. In colour it is brownish, becoming paler on the sides; and in length it reaches at least $4\frac{1}{2}$ inches.

Mugil. Plate xi. *MUGILIDÆ*.

85. *capito*, GREY MULLET. Anal begins almost half-way between the dorsals.

86. *chelo*, LESSER GREY MULLET. Anal begins almost in a line with second dorsal.

In the Grey Mullet there are 4 spines in the first dorsal, in the second there are a spine and 8 or 9 rays; in the anal are 3 spines and 8 or 9 rays, in the caudal 17 rays, in the pectorals 17 rays, in the ventrals a spine and 5 rays. The caudal is large; the dorsals are wide apart. The upper lip is not thickened. In colour this fish is silvery, with stripes along the back and sides; the fins are grey. It attains a length of 3 feet, and is a surface feeder in shallow waters, moving up rivers in shoals with the tide, and apparently delighting in oily foods.

The Lesser Grey Mullet has 4 spines in the first dorsal, and a spine and 8 rays in the second; in the anal are 3 spines and 9 or 10 rays, in the caudal 15 rays, in the pectorals 17, in the ventrals a spine and 5 rays. The caudal is large and the scales are large. The upper lip is thickened, and has rows of papillæ. In colour this species is grey with bronze reflections, and dark lines along the scales. It generally measures a foot, but has been known as large as 3 feet in length. Like the other, it is very quick of hearing, and is gregarious and generally found in estuaries. It burrows in search of food, and seems to have some special fondness for the grass-wrack, *Zostera marina*.

Mullus. Plate ii. *MULLIDÆ*.

8. *barbatus*, RED MULLET. Body not striped.

9. *surmulletus*, STRIPED MULLET. Body striped.

The Red Mullet has 7 or 8 spines in the first dorsal, and a spine and 8 rays in the second; in the anal are 2 spines and 6 rays, in the caudal 15 rays, in the pectorals from 16 to 18 rays, in the ventrals a spine and 5 rays. The spines of the first dorsal are flat and weak at the ends, and the front spine is very short. The scales are large; there are from 38 to 40 in the lateral line, the tubes of which are much branched. The forehead, nape, cheeks, and gill covers are scaly. In colour, this rather rare fish is a plain red; in length it reaches 17 inches. It feeds at the bottom as well as at the surface, and for most of the year keeps out at sea, but in July comes into shallow, sandy ground among seaweed-covered rocks.

The Striped Mullet is little better than a variety. Its fins are similar in all respects, except that the dorsals are banded. The profile is more oblique. The body is pale pink, with yellowish

stripes along the sides above and below the lateral line. The caudal is often banded. This is the common Red Mullet which comes in with the mackerel in shoals in the summer, but spends most of the year out at sea. It reaches the same size as the other, but is generally smaller.

Muræna. Plate xxii. *MURÆNIDÆ*.

168. *helena*, MURRY. Purplish brown with yellow markings.

The vertical fins of this brightly-coloured Eel are continuous, and together have about 550 rays. The snout is pointed; the mouth ends in a black spot, and extends behind the eye, the upper jaw being the longer. The gill opening is in a black spot. In length this species reaches 52 inches. It is of very rare occurrence in British waters.

Mustelus. Plate xxviii. *CARCHARIIDÆ*.

225. *vulgaris*, SMOOTH HOUND. Dorsals far apart; anal under second dorsal.

The pectorals are under the last three gill slits; the first dorsal is behind the pectorals; the ventrals are halfway between the pectorals and the anal, and the anal is under, but begins rather behind, the second dorsal; caudal notched at tip. The colour is bluish, with or without spots, lighter below. The length is from 3 to 6 feet. It swims near the ground, and comes in-shore in the summer months, retiring to deep water in the winter. Though not sought after this shark is not wasted, as it is used up among the "snacks" in fried-fish shops.

Myliobatis. Plate xxxiii. *MYLIOBATIDÆ*.

250. *aquila*, WHIP RAY. No horns; tail very long, with serrated spine near the root

The disk is diamond-shaped, nearly twice as broad as long, with undulating edges. On the tail is a small square dorsal, the serrated spine being just behind it. The tail is like a whip. The teeth are hexagonal and in 7 rows. The colour is white below, greenish above; the head and backbone being clearly shown. This fish, often known as the Eagle Ray, from its appearance when swimming, has been found as much as 50 inches in length. It is active in its habits, and swims much faster than would be supposed.

Naucrates. Plate iv. *CARANGIDÆ*

25. *ductor*, PILOT FISH. Body blue, with 5 or 6 broad dark vertical bands.

The Pilot Fish has from 3 to 6 spines representing the first dorsal, and a spine and from 26 to 28 rays in the second dorsal; the anal has 2 isolated spines in front, and then from 26 to 28 rays; the caudal has 17 rays, the pectorals from 19 to 21, and the ventrals a

spine and 5 rays. The second dorsal is highest in front. The lateral line curves to the first third of the anal, and then forms a raised keel towards the caudal. The fins are grey, the dorsal and anal being tipped with black. The length is about 9 inches. This fish is usually caught in roadsteads, to which it has accompanied some vessel; occasionally it is found in shoals, as at Falmouth, when 3 dozen were caught at a time.

Nemachilus. Plate xxiii. *CYPRINIDÆ*.

184. *barbatula*, LOACH. Barbules 6.

The Loach has 10 rays in the dorsal fin, 7 or 8 in the anal, 17 in the caudal, 10 to 12 in the pectorals, and 8 or 9 in the ventrals. The dorsal is over the ventrals, and midway between the eye and the caudal; the caudal is wide at the base and oblong in shape. The back is but slightly curved, and the abdomen is straight. The lateral line runs from the top of the eye along the upper half of the body. The snout overhangs the mouth, which extends to beneath the hind nostril; there is no spine at the nostril. The colour is greenish, with white underparts, and the length 5 inches. The Loach avoids muddy water, and frequents clear streams and pools with a gravelly bottom, where it lurks under the stones and among floating grass, looking out for worms and insects. It is very sensitive to changes of temperature, and is occasionally kept in glass bowls as a weather indicator.

Nerophis. Plate xv. *SYNGNATHIDÆ*.

116. *aguoreus*, OCEAN PIPE-FISH. Rings 28 to 31, and 56 to 61.

117. *ophidion*, STRAIGHT-NOSED PIPE-FISH. Rings 28 or 29, and 65.

118. *lumbriiformis*, WORM PIPE-FISH. Rings 18 or 19, and 49.

The Ocean Pipe-fish has from 37 to 44 rays in its dorsal. The anal, pectorals, and ventrals are always absent, the caudal usually so. The number of osseous rings mentioned above are given as before and behind the vent. The colour is olive, darkest along the back, with black-edged bluish bands, there being a purple stripe along the snout, and the dorsal rays being yellow. In length this Pipe-fish reaches 41 inches. It lives in deepish water. The tail is prehensile.

The Straight-nosed Pipe-fish has from 34 to 38 rays in its dorsal, which stands on 12 rings, 8 of which are beyond the vent. The snout turns upwards a little. The colour is greenish, spotted with white, there being a black band across the gill cover. In length this fish measures about 12 inches. It lives in moderately deep water, and between the tide-marks.

The Worm Pipe-fish has from 24 to 26 rays in its dorsal, which stands on 8 rings, of which 6 are beyond the vent. The snout is turned up. In colour the body is olive brown, with white lines and dots. In length it reaches 9 inches. This fish is found among the seaweeds in rocky pools, and is unknown below low-water mark.

Notidanus. Plate xxix. *NOTIDANIDÆ*.229. *griseus*, BROWN SHARK. Gill-slits 6.

There is one dorsal, which is smaller than the ventrals, and placed between them and the anal. The pectorals are close to the gill-slits. The tail is long, with the lower part of the caudal fin highest near the base, and tapering off towards the tip, where it is but little higher than the upper portion, which is of the same height throughout. The colour is grey; the length over 26 feet. This is a common Mediterranean species, rare in our seas.

Ophidium. Plate xix. *OPHIDIIDÆ*.143. *barbatum*, BEARDED OPHIDIUM. Vertical fins continuous; ventrals, a pair of filaments under throat.

There is apparently no caudal fin, the long and level dorsal and anal being continuous, and having from 230 to 260 rays. The pectorals have from 20 to 23 rays. The filaments representing the ventrals are bifid. The lateral line is in the upper half of the body. The colour is greyish brown, and the length 10 inches. A Mediterranean fish, of which only one specimen is recorded as British.

Orcynus. Plate vi. *SCOMBRIDÆ*39. *thynnus*, SHORT-FINNED TUNNY. Pectorals not reaching to finlets.40. *germo*, LONG-FINNED TUNNY. Pectorals reaching to finlets.

The Short-finned Tunny has 13 or 14 spines in its first dorsal, 1 or 2 spines and 13 rays in its second dorsal, and 8 or 9 finlets between the second dorsal and the caudal; the anal has 2 spines and 12 rays, with 7 or 8 finlets behind it; the caudal has from 32 to 35 rays, the pectorals have 31, and the ventrals have a spine and 5 rays. The dorsals are close together; the pectorals are in a groove. The first dorsal is triangular; the other fins are pointed; the lobes of the caudal are narrow and long, the fork being deep and broad. The scales in the fore part of the body form a corslet, with three prolongations. In colour this Tunny is dark blue on the back, grey netted with darker grey along the sides, and white below; the pectorals are edged with white. In length it reaches 9 feet or more. It is generally observed in shoals, but only a few stragglers have been caught round the British Islands.

The Long-finned Tunny has 14 spines in its first dorsal, 3 spines and 12 rays in the second, with 7 or 8 finlets behind; the anal has 3 spines and 12 rays, with 8 or 9 finlets behind it; the caudal has 35 rays, the pectorals 37, the ventrals a spine and 5 rays. The pectorals are in a groove, and are curved and pointed and a third as long as the fish; the ventrals are close together, with only one scale between them. The colour is deep blue above and silvery below, with narrow stripes occasionally present. The few British examples have been between 2 and 3 feet in length. This Tunny ranges from the Bay of Biscay to the Cape of Good Hope, and migrates in shoals.

Orthogoriscus. Plate xv. *DIODONTIDÆ.*

123. *mola*, SUN-FISH. Hinder end rounded; skin rough.
 124. *truncatus*, OBLONG SUN-FISH. Hinder end straight; skin smooth.

The Sun-fish has from 16 to 18 rays in the dorsal, 15 to 17 in the anal, 12 to 16 in the caudal, 11 to 13 in the pectorals, and is without ventrals. The dorsal and anal are narrow, high, and pointed; the pectorals are short and rounded. The skin is granulated, and at first is spiny. The eye has a lid in front with which the eye can be covered. In colour this fish is pearly brown, and luminous in the dark, and in length has been known to reach 8 feet. It swims in an undulating way, and sometimes leaps out of the water. It groans loudly when it dies, and when hooked sighs and grunts like a pig.

The Oblong Sun-fish has from 16 to 19 rays in its dorsal, 16 in its anal, 18 to 22 in its caudal, 12 or 13 in its pectorals, and the ventrals are missing. The dorsal and anal are joined to the caudal, which is little better than a fringe. The skin has hexagonal divisions. The colour above is purple or bluish grey. This is much rarer in British waters than the other species, and has not exceeded 25 inches in length.

Osmerus. Plate xxvii. *SALMONIDÆ.*

213. *eperlanus*. SMELT. Skin transparent, and having a silver stripe.

The first dorsal has 10 or 12 rays, the second is adipose; the anal has from 13 to 17 rays, the caudal 19, the pectorals have 11 or 12, and the ventrals 8 or 9. The first dorsal is midway between the eye and the base of the caudal; the adipose dorsal is over the middle of the anal; the ventrals are under the beginning of the first dorsal. In the lateral line there are from 60 to 65 scales; the scales are cycloid, and there are 6 rows between the lateral line and the base of the ventrals. The body is long, the sides rather flat, the back more curved than the abdomen, the mouth deeply cleft, the lower jaw the longer. The eyes are silvery. The Smelt has been caught 12 inches in length. It is gregarious and voracious, and generally found in estuaries and harbours feeding on small fish and shrimps, being particularly numerous in fishing ports frequented by shrimp smacks.

Agellus. Plates ii and iii. *SPARIDÆ.*

14. *centrodontus*, SEA BREAM. Scarlet, lighter below; a black spot where the lateral line begins.
 15. *bogaraveo*, SPANISH BREAM. Pinkish above, white below; a dark axillary spot.
 16. *owenii*, AXILLARY BREAM. Carmine above, white below; fins paler than body.
 17. *acarne*, Red, with golden reflections.
 18. *erythrinus*, PANDORA. Red, with purple and silvery reflections; ventrals colourless.

The Sea Bream has 12 spines and 12 rays in its dorsal, 3 spines and 12 rays in its anal, 19 rays in its caudal, 17 in its pectorals, and

a spine and 5 rays in its ventrals. The fourth and fifth dorsal spines are the longest; the pectorals are as long as the head. In the lateral line the scales number 75. The hinder nostril is oval and oblique, and larger than the other. This fish attains a length of 15 inches. It lives among rocks and seaweed, and feeds on seaweed, small fishes, and crustaceans; it is very sensitive to cold, and sometimes appears in shoals. The characteristic black spot is a mark of maturity.

The Spanish Bream has 12 spines and 12 rays in its dorsal, 3 spines and 11 or 12 rays in its anal, 17 in its caudal, 17 in its pectorals, and a spine and 5 rays in its ventrals. The fourth and fifth dorsal spines are the longest; the pectorals overlap the anal. There are 71 scales in the lateral line. There is a dark base to the pectorals, as well as the axillary spot, and the body is spotted with blue. In length this rather rare species measures about 12 inches. It has never been observed in shoals.

The Axillary Bream has 12 spines and 11 or 12 rays in the dorsal, 3 spines and 10 rays in the anal, 21 rays in the caudal, 17 in the pectorals, and a spine and 5 rays in the ventrals. The fourth and fifth dorsal spines are the highest; the last 2 dorsal rays are in a sheath. The third anal spine is the longest, and the last 2 rays are in a sheath. The pectorals are two-thirds as long as the head, and the ventrals three-quarters as long as the pectorals. There are from 68 to 70 rays in the lateral line. There is a rosy tint on the sides, and the fins are of a beautiful pale rose. The length is 14 inches. It is not a common species.

No. 17 is also a rare species in our waters. In its dorsal it has 12 spines and 11 or 12 rays, in its anal 3 spines and 10 rays, in its caudal 17 rays, in its pectorals 17, and in its ventrals a spine and 5 rays. The third spine in the dorsal and anal is the longest, and in both fins the last 2 rays are in a sheath. The pectorals reach to the anal spines. The lateral line has from 70 to 72 scales. The length is about 13 inches.

The Pandora has 12 spines and 10 rays in its dorsal, 3 spines and 8 or 9 rays in its anal, 17 rays in its caudal, 15 in its pectorals, and a spine and 5 rays in its ventrals. The third dorsal is the longest, the hindermost rays are not sheathed; the second and third anal spines are equal in length. The lateral line has from 56 to 60 scales. In length this fish reaches 16 inches. It is not found in shoals, and appears in our waters during the summer months, retiring to the deep sea for the winter.

Pagrus. Plate ii. *SPARIDÆ.*

12. *vulgaris*, COUCH'S SEA BREAM. Colour, red.

13. *auratus*, GILT-HEAD. Colour, silvery.

Couch's Sea Bream has 12 spines and 10 rays in its dorsal, 3 spines and 8 rays in its anal, 17 rays in its caudal, 15 in its pectorals, and a spine and 5 rays in its ventrals. In the lateral line are from 53 to 58 scales. The lower jaw is the larger, the teeth in the outer row are conical and conspicuous, and on each side of the mandible are 2 large canines. This fish varies in colour, but is

always red on the back and in front. There is only one British example, and that measures 20 inches, but the species is fairly common in the Atlantic and Mediterranean.

The Gilt-head has 11 spines and 13 rays in its dorsal, 3 spines and 11 or 12 rays in its anal, 17 rays in its caudal, 16 in its pectorals, and a spine and 5 rays in its ventrals. The lateral line has from 75 to 86 scales; the scales are marked with lines and have irregular edges. The upper jaw is the larger; the teeth are not prominent. There are faint stripes along the body, a dark spot at the base of the pectoral, and a golden crescent between the eyes; the head is greenish on the top. This is a rare fish, some 15 inches in length, found in rocky localities, where it feeds mainly on crustaceans.

Pammelas. Plate iv. *CARANGIDÆ.*

26. *perciformis*, RUDDER FISH. First dorsal of 6 or 7 isolated spines.

The first dorsal is represented by 6 or 7 free spines, the second has a spine and 22 rays, the anal has 3 spines and from 26 to 29 rays, the caudal has 21 rays, the pectorals 23 rays, the ventrals a spine and 5 rays. The two first spines of the anal are nearly imbedded in the skin. In the lateral line there are 78 scales. The lower jaw is the longer, and the mouth reaches to the eye. The teeth are in a single row and wide apart. The colour is purplish on the back and grey on the sides, the head mottled; the length is 15 inches. This fish, which is quite as well known as the Black Pilot, is a North American species, of which only one example has appeared in our seas. That was found six miles off Penzance imprisoned in a packing case of which only one of the boards of the lid was missing, so that the fish had got in and could not get out, the result being that it drifted across the Atlantic into the British list.

Paralepis. Plate xxiv. *SCOPELIDÆ.*

186 *coregonoides*, Colour, silver and lilac, darker on abdomen.

This is a small straggler from the Atlantic and Mediterranean. The head and body are long and compressed, the eyes large, the cleft of the mouth very wide. The dorsal is short and placed well back, though there is a small adipose fin; the ventrals are below the dorsal, and the anal extends to the tail.

Pelamys. Plate vi. *SCOMBRIDÆ.*

42. *sarda*, BELTED BONITO. Two series of bands are broad and vertical, the other narrow and oblique.

There are two dorsals, the first with 22 spines, the second with 2 spines and 13 or 14 rays, succeeded by 8 or 9 finlets; the anal has 2 spines and 13 rays, behind which are 7 finlets; the caudal has 26 rays, the pectorals 25; the ventrals have a spine and 5 rays. There is a corslet extending beyond the pectorals. The lateral line is undulated. The colour is dark blue above, with broad vertical bands crossed by a series of narrow bands that slope from the back down-

wards and forwards. The second dorsal and anal are yellowish, the caudal and pectorals blackish. In length this fish reaches 36 inches, but the few British specimens have been smaller. It is a surface-feeder, migrating in shoals, and leaping into the air after its prey.

Perca. Plate i. *PERCIDÆ.*

1. *fluviatilis*, PERCH. Body with vertical bands; large spinous dorsal.

The Perch has two dorsal fins, the first with 14 or 15 strong spines, the second with one or two very short spines and 13 or 14 rays; in the anal are 2 spines and 8 or 9 rays, in the caudal 18 rays, in the pectorals 14, in the ventrals a spine and 5 rays. In the lateral line there are from 55 to 60 scales. There are villiform teeth on the jaws, vomer, and palatines, and none on the tongue. The mouth extends to the middle of the eye; the gill cover has a strong, flat spine, and the edges of the opercles are serrated. The colour is olive green above, with dark vertical bands, and the underparts are yellowish, tinged with pink. The first dorsal is grey, with one or two black spots; the eyes are a rich yellow. The Perch is 5 inches long when two years old, and when old attains a length of 29 inches. Though occasionally found in brackish and even salt water, the Perch is a fresh-water fish, mainly found in ponds and rivers where the current is slow, keeping, as a rule, near the bank, and in deep holes, but in the breeding season betaking itself to shallow parts where the stream runs fairly fast. It feeds on insects, crustaceans, worms, and small fishes, and is best known when under a foot in length. It breeds in its third year, and in the breeding season becomes very bright in colour, with a good deal of red about the fins.

Peristethus. Plate viii. *DACTYLOPTERIDÆ.*

59. *cataphractum*, ARMED GURNARD. Snout bifid.

There are two dorsals; the first with 7 long spines, the second with a spine and 18 or 19 rays. In the anal there are from 18 to 21 rays, in the caudal 11, in the pectorals 12, with 2 free appendages, and in the ventrals a spine and 5 rays. The spines of the first dorsal extend some distance above the membrane. The lateral line has 29 or 30 scales; the scales are large and bony; there are three angular scales at the base of the caudal, and 3 bony plates between the throat and the anal fin. Along the body are 4 spiny ridges, and the body is octagonal in shape. The snout is long and spiny, and divides into two projections; there are spines on the gill covers, barbules along the mouth, and one under the chin. In colour this fish is scarlet above and yellow below, the dorsals and anal being crimson. The few that have been caught in British waters have not exceeded a foot in length, but it grows to double that size in the Mediterranean.

Phycis. Plate xvii. *GADIDÆ*.

134. *blennoides*, GREATER FORKBEARD. Ventrals represented by a long, forked filament.

The first dorsal has 9 or 10 rays, the second from 54 to 62, the anal has from 54 to 58, the caudal 22, the pectorals 15, and the ventrals only the filament just mentioned. The first dorsal is triangular, and nearly joins the long, level second, which does not quite join the caudal. The lateral line has 112 scales. The colour is brownish grey, paler on the sides, and whitish along the abdomen; the length does not exceed 2 feet. It is a ground feeder, living among rocks in deep water.

Pleuronectes. Plates xx. and xxi. *PLEURONECTIDÆ*.

157. *platessa*, PLAICE. With orange spots; tubercles on head.
 158. *microcephalus*, LEMON SOLE. With dark spots; head small; skin slimy.
 159. *cynoglossus*, WITCH. Unspotted; lateral line straight.
 160. *limanda*, DAB. Lateral line curved over pectorals; no tubercles along bases of fins or along lateral line.
 161. *flesus*, FLOUNDER. Tubercles along bases of fins and at beginning of lateral line.

The Plaice has from 66 to 77 rays in the dorsal, 50 to 57 in the anal, 17 or 18 in the caudal, 10 or 11 in the pectorals, and 6 in the ventrals. There is a short spine in front of the anal. The eyes are on the right side; the mouth is at the end of the snout; the teeth are larger on the blind side; the scales are small, cycloid, and imbedded. There are bony tubercles on the head behind the eyes. The curve in the lateral line is very slight. The lower jaw is the longer; the front teeth are broad and flat, and end in straight edges, those in the throat are rounded. The colour is brown, the orange spots being numerous and distinct. In shape this fish is oval, and in length it occasionally reaches 36 inches. It feeds mainly on molluscs, preferring those with two shells, but it also eats worms and crustaceans, though not many. It lives on sandy, muddy ground, in which it can hide.

The Lemon Sole is perhaps more definitely known as the Smear Dab, "Lemon Sole" being a market term applied to several fishes. It has from 85 to 93 rays in its dorsal, 70 to 76 in its anal, 15 in its caudal, 10 in its pectorals, and 5 or 6 in its ventrals. The anal has no spine in front. The eyes are on the right side, the mouth is at the end of the snout, the teeth are larger on the blind side, and are conical and blunt. The mouth and head are small. The lateral line is very slightly curved over the pectorals, and has 130 scales. The shape is a long regular oval; the colour a yellowish brown, marbled with round and oval blotches. In length this fish reaches 17 inches. Its names are many; it is not only the Smear Dab, but the Merry Sole, the Lemon Dab, the Smooth Dab, and the Sand Fleuk, and from Yarmouth, Lowestoft and Grimsby is the chief species invoiced as Lemon Sole.

The Witch has from 102 to 115 rays in the dorsal, 86 to 100 in the anal, 18 in the caudal, 10 to 12 in the pectorals, and 5 or 6 in the ventrals. The eyes are on the right side; the mouth is at the end of the snout; the teeth are larger on the blind side. The eye is large; the body is long, oval, and thin. The bones of the head are pitted on the blind side. In the lateral line there are 115 scales; it does not curve over the pectorals, and it gives off a dorsal branch. The scales are cycloid on the blind side, and ctenoid on the upper side. In colour this fish is plain pale brown above and smoky white below. It reaches 17 inches in length.

The Dab has from 65 to 78 rays in the dorsal, 50 to 62 in the anal, 14 in the caudal, 10 or 11 in the pectorals, 6 in the ventrals. There is a spine in front of the anal. The eyes are on the right side; the mouth is at the end of the snout; the teeth are lanceolate, and larger on the blind side. The lateral line has 86 to 96 scales; it makes a rounded curve above the pectorals. The scales are spiny, and the skin is consequently rough; the ridge behind the eyes is smooth. The colour is brown, with or without dark spots. The extreme length is 15 inches. This fish lives in sandy localities in rather shallow water; it feeds principally on crustaceans.

The Flounder has from 60 to 62 rays in the dorsal, 39 to 45 in the anal, 14 in the caudal, 10 in the pectorals, and 6 in the ventrals. The dorsal and anal are highest in the hinder half, where they rise to an angle, instead of being gently curved like those of the foregoing species. There are 85 scales in the lateral line. The eyes are not always on the right side; the mouth is at the end of the snout; the teeth are conical, and larger on the blind side. There is a row of spiny tubercles along the bases of the dorsal and ventral, and a group of similar tubercles along the beginning of the lateral line. In colour the Flounder is dark brown above and white below; in length it reaches 9 inches. It lives in sandy or muddy places near the coast, in estuaries and harbours, and up rivers, even in fresh water. It feeds on shrimps and other crustaceans, on molluscs, fishes, almost anything animal. For a flat fish it is singularly active and enterprising, and it can climb and cling by means of its ventral fins.

Polyprion. Plate i. *PERCIDÆ.*

6. *cernium*, STONE BASS. Head ridged on top.

In the dorsal are 11 spines and 11 or 12 rays, in the anal 3 spines and 8 or 9 rays, in the caudal 17 rays, in the pectorals 16 or 17, in the ventrals a spine and 5 rays. The dorsal spines form a regular curve; they are lower than the rays, which give a spatulate shape to the hind portion of the fin, similar to that of the anal. The ridges above the eyes form a sort of crest; there is a prominent bony ridge on the gill cover; the lower jaw projects. The scales are small; there are 120 in the lateral line. The colour is greyish yellow, marbled or blotched; the fins are darker. The length reaches 6 feet. The Stone Bass is gregarious, and frequents deep water where the bottom is rocky; it also gathers round wreckage and any timber on which there are barnacles.

Pristiurus. Plate xxx. *SCYLLIIDÆ.*

232. *melanostomus*, BLACK-MOUTHED DOG-FISH. Three rows of oblong blotches, which are black, with a narrow light margin.

The first dorsal is close up behind the ventrals, the second dorsal close behind the anal; the first dorsal is the larger; the pectorals are the largest fins; the anal is placed between the dorsals, and the ventrals are midway between it and the pectorals; the caudal is long, with a row or two of spines arranged like a saw along its upper edge. In colour this shark is greyish brown, blotched with black; the blotches in the fore part being in rows and edged with whitish. The few British examples have been a little over 2 feet long.

Raja. Plates xxxi., xxxii., xxxiii. *RAIIDÆ.*

Snout long—

238. *batis*, SKATE. Under surface brownish.
 241. *oxyrhynchus*, LONG-NOSED SKATE. Under surface grey.
 239. *macrorhynchus*, FLAPPER SKATE. Under surface white, with black spots.
 240. *alba*, WHITE SKATE. Under surface white; no row of spines round eye; 3 rows of spines on tail, one row central.
 242. *fullonica*, SHAGREEN RAY. Under surface white; a row of spines round eye; no central row of spines on tail.

Snout short—

244. *maculata*, SPOTTED RAY. Under surface brown, with black spots.
 246. *radiata*, STARRY RAY. Under surface brown, without spots.
 247. *circularis*, CUCKOO RAY. Under surface white, generally with a dark edging; upper surface with a black and yellow patch on each side of median line.
 245. *microcellata*, PAINTED RAY. Under surface white; spines confined to median line.
 243. *clavata*, THORNBAC. Under surface white; spines not confined to median line.

The Skate has 2 dorsal fins on the tail which are fairly large and nearly equal in size. The skin is smooth; but there is a row of spines down the middle of the tail, with generally a row on each side. The males have a patch of spines on each wing, where the females frequently have a certain roughness of the skin. The snout is longer in the females than in the males and the eye is smaller. The edge of the disk is undulated in front and rounded behind. The tail is not so long as the body. The colour is brownish or greyish above, brownish below; the length seems to be at least 7 feet. The Skate, like all the rays, is confined to soft sandy or muddy bottoms, at comparatively moderate depths. None of the family has been

found at a greater depth than 500 fathoms. In the wholesale fish trade the skate is grouped with the other rays and sundries as "Roker."

The Long-nosed Skate has the first dorsal larger than the other, with no spine between them. The disk is concave in front and almost straight behind; the snout is very long and pointed. The tail has a row of spines along each side, and no middle row. In colour this species is greyish above, with spots and streaks, and below it is greyish. It reaches 3 feet in length.

The Flapper Skate has the dorsals nearly equal in size, with a spine between them. The tail is half as long as the body. The disk is concave in front, convex behind. The mouth is arched. There are usually 2 spines in front of the eye; and there are 3 rows of spines on the tail, the side rows being incomplete. In colour this species is brown above and white below, the under surface being dotted with black. The length is 26 inches.

The White Skate has the first dorsal larger than the second, and there is a spine between them. There are 3 rows of spines on the tail, and 3 large spines in the middle of the body. There are spines on the under surface of the snout, and in the males there is a patch of spines on each wing. The disk is waved in front, convex behind, and broadest in the hinder half. The colour above is greyish or brownish, below it is pure white. The length reaches 7 feet.

The Shagreen Ray has 2 dorsals on the tail, and a well-developed caudal, all three fins being at equal distances and close together. There is no middle row of spines on the tail, but 2 or 3 lateral rows. There are spines on the snout, round the upper edge of the eye, and in the middle of the back. The disk is waved in front, slightly convex behind, and widest in the front half. The mouth is large; there are 64 rows of teeth in the upper jaw, and 56 in the lower. In colour this species is yellowish brown above and white below. In length it reaches 37 inches.

The Spotted Ray has the two dorsals of equal size, with a spine between them. There is a spine on each shoulder, a row down the back, 2 in front of each eye, 2 near its hinder edge, a few on the snout, and the line down the back is continued along the tail, with a row on each side of it. The male has a patch of hooked spines on each wing. In colour, both above and below, this ray is brown with black spots; in length it reaches 45 inches.

The Starry Ray has two dorsals of equal size and a small caudal, all close together. The disk is heart-shaped, widest in the lower half, the sides forming a continuous curve. It is dotted all over with large, curved, thorny spines on radiating bases, the largest being at equal distances along the tail. In colour it is sandy brown without spots; in length it reaches 20 inches.

The Cuckoo Ray has the two dorsals of equal size, and without an interspace. The caudal is very small. The disk is heart-shaped, widest in the lower half, the sides forming a continuous curve. There are many small spines. On the back is a diamond-shaped

patch of spines from which runs a double row to the tail, along which the two rows continue as four. In colour the under surface is white, generally with a dark margin; the upper surface is brownish yellow, and on each wing is a roundish black blotch with yellow spots and short streaks. In length this species attains 3 feet.

The Painted Ray has 2 dorsals, equal in size, lobed in shape, and rather wide apart. The disk is undulated in front, rounded at the angle, and convex behind. There is only one row of spines down the tail, and this begins in the lower half of the back. The teeth are flattened in the females and pointed in the males. In colour this species is grey above, striped and blotched with white and brown; below it is white. In length it is about 33 inches.

The Thornback has the 2 dorsals with one or two spines between them, and a small caudal contiguous to the second dorsal. There are spines along the back and tail, and the surface generally is spiny and tubercular above, and occasionally so below. The disk is waved in front, concave behind, the greatest breadth being half way. The mouth is curved. The colour is mottled brown with, in some cases, a white blotch on the wings; the under surface is white. In length this species runs to 36 inches; it is found in shallower water than the others, and feeds voraciously on anything that swims.

Raniceps. Plate xviii. *GADIDÆ*.

141. *raminus*, LESSER FORKBEARD. Head flat and fleshy; barbule small; first dorsal rudimentary.

The first dorsal is inconspicuous, and has but 3 rays, the second has from 65 to 67 rays, and extends in a gentle curve almost to the tail; the anal has from 57 to 60 rays, the caudal 35, the pectorals 20 to 23, and the ventrals 6. The head is broad; the mouth large, extending behind the eye; the body bulky in front, tapering to the round caudal. In colour it is purplish brown above, whitish below, the lips being white. The length is a foot or less.

Regalecus. Plate xiii. *TRACHYPTERIDÆ*.

103. *banksii*, RIBBON FISH. Front rays of dorsal forming a tall crest; ventrals represented by a long spine.

The fore end of the dorsal consists of some 10 to 15 rays, beginning over the eyes and highest in front, curving forwards and upwards, not unlike the crest of a cockatoo, the membrane extending no further up than the first third, and continuing at the same level all along the back, the number of rays ranging from 226 to 290; there is no anal fin, and there is no caudal; in the small pectorals are 11 rays; and each ventral is represented by a spine, which is about a third as long as the fish. The body is long and flat, and the back and abdomen are very slightly curved; it is covered with small deciduous scales and bony tubercles, and there are four ridges above the lateral line. In colour it is silvery, with spots and streaks;

and in length it attains 16 feet. It is a deep-sea species, of which there have been only a few British examples. From the paddle-like tips of its ventrals it is also known as Banks's Oar-fish; it swims with lateral undulations.

Rhina. Plate xxxi. *SQUATINIDÆ*.

237. *squatina*, MONK FISH. Body flat; tail thick; eyes wide apart.

This ugly fish has a broad flat body, with large paired fins. The dorsals are equal in size, and placed far back on the tail; there is no anal; the caudal is well developed; the body tapers gradually into the tail, which is much thicker than in the rays. The eyes are curiously wide apart, and the mouth is large, and has several rows of sharp conical teeth. The colour varies with the ground in which the fish hides itself. It reaches 8 feet in length, and preys on flat fish. In appearance it somewhat resembles a monk with a cowl over the head. Its other name of Angel-fish is derived from the wing-like shape of its fins.

Rhombus. Plates xix. and xx. *PLEURONECTIDÆ*.

151. *maximus*, TURBOT. With tubercles instead of scales.

152. *levis*, BRILL. With scales and without tubercles.

The Turbot has its eyes on the left side. Its dorsal has from 61 to 72 rays, its anal 45 to 56, its caudal 15 or 16, its pectorals have 11 or 12, and its ventrals 6. The dorsal begins between the eyes, and is highest where the body is broadest; the anal begins midway between the ventrals and pectorals. The lateral line curves over the pectoral, and then becomes straight. The body is shaped like a diamond, and has no scales, but blunt, bony tubercles. The mouth is large and placed at the end of the snout; the jaws and teeth are alike on both sides. The colour above is mottled and speckled brown, darker or lighter according to the ground on which the fish lives; below it is white. The average length is 17 inches; but specimens measuring 28 inches have been taken. It is broader in proportion than the Brill, and, like it, feeds on other fishes.

The Brill has from 63 to 85 rays in its dorsal, 50 to 63 in its anal, 15 to 17 in its caudal, 11 or 12 in its pectorals, and 6 in its ventrals. Its eyes and colour are on the left side. The dorsal begins in front of the upper eye, and the first rays are fringed. The dorsal and anal are highest in the hinder half; the anal and ventral are not attached to the caudal; the pectoral on the blind side is smaller than the other. There are 150 cycloid scales in the lateral line, which curves over the pectoral; there are no tubercles, hence the smoothness recorded in its specific name. The mouth is large, and placed at the end of the snout; the jaws and teeth are alike on both sides. In life the colour is speckly brown; when dead it is dark and without speckles. The Brill is generally about 20 inches long, but has been known to reach 26. It is longer than the Turbot in proportion to its width, and, like it, lives in rather shallow water.

Salmo. Plates xxv. and xxvi. SALMONIDÆ.

Teeth on body of vomer in a single series throughout—

195. *salar*, SALMON. Spots black, few and small. Lateral line 120 to 125.
 200. *levenensis*, LOCH LEVEN TROUT. Spots black, many and large on head. Lateral line 120 to 130.
 202. *orcadensis*, GREY TROUT. Spots black and red and small. Lateral line 115.

Teeth on body of vomer in one series dividing into two—

196. *trutta*, SEA TROUT. Sides silvery.
 198. *eriox*, BULL TROUT. Sides brownish.

Teeth on body of vomer in a double series throughout—

197. *albus*, BLUE POLL. Head short, body long, pectorals pointed.
 203. *ferox*, LAKE TROUT. Head long, snout long, caudal truncated.
 205. *nigripinnis*, HOG-BACKED TROUT. Fins dark, pectorals long and black.
 204. *stomachichus*, GILLAROO TROUT. Pectorals 13; dorsals 15; fins edged with white.
 199. *cambricus*, SEWEN. Pectorals 13 or 14; dorsals 12 to 14; dorsal longer than high.
 201. *fario*, TROUT. Pectorals 13 to 15; dorsals 13 to 15; dorsal higher than long.

Teeth at head of vomer only; teeth small; lower jaw feeble—

211. *colii* COLE'S CHAR. Pectorals not reaching dorsal.
 209. *killinensis*, KILLIN CHAR. Pectorals reaching or overlapping dorsal; colour, dark, with light spots.
 210. *grayi*, GRAY'S CHAR. Pectorals reaching or overlapping dorsal; colour, light, with orange spots.

Teeth at head of vomer only; teeth moderate; jaws equal in strength—

206. *alpinus*, ALPINE CHAR. Height of body a fifth or sixth of total length; height of dorsal three-eighths or half the length of the head.
 207. *perisii*, TORGOCH. Height of body a fifth or sixth of total length; height of dorsal two-thirds the length of the head.
 208. *willughbii*, WINDERMERE CHAR. Height of body a quarter of total length; dorsal as long as the head without the snout.

The Salmon, like all the genus, has an adipose dorsal fin, which we need not again mention. The dorsal has 13 or 14 rays, the anal 11, the caudal 19, the pectorals have 13 or 14 rays, and the ventrals 9. The dorsal is rather shorter than it is high; the ventrals are beneath the middle of the dorsal; the caudal is much forked in the young, and almost square in the adult. The abdomen is more curved than the back; the mouth extends to the middle of the eye,

or beyond it. The snout is longer in the male than in the female, and in the breeding season the lower jaw becomes hooked, so that the mouth cannot be completely closed. The colour is a steel blue, with crosses and round spots above the lateral line and on the upper half of the head, particularly in the female; the dorsal, caudal, and pectorals are blackish, the ventrals and anal are whitish. The male is spotted and streaked with orange during the breeding season; the young, known as parr, have broad, dark bands extending from the back down the sides. When first hatched, the Salmon is known as an alevin; in a few months the alevin becomes a parr, and the bands become conspicuous. In its second or third spring the parr marks disappear, and the head and body become silvery, preparatory to starting for the sea. In this silvery stage the salmon is known as a smolt. The smolt returns from the sea next year as a grilse, having grown surprisingly. From its next sea trip it returns as a salmon. A kelt is a salmon that has spawned; if a male, it is often called a kipper (from its hooked jaw); if a female, it is known either as a kelt or a slat. A grilse-kelt is a salmon that has spawned in the grilse stage. The salmon is "anadromous," that is, it lives both in salt and fresh water. It is as much a fish of the sea as it is a fish of the river. It ascends the rivers mainly, if not entirely, for the purpose of spawning, and in summer is found close in along the coast, gradually assembling at the mouths of the streams it intends entering when the time comes. It would seem to be the fact that, whenever possible, each salmon returns to the river from which it first reached the sea. To what part of the sea they retire on their outward migration is at present unknown. Salmon ova will not develop in sea water; but that the fish can be reared entirely in fresh water has been abundantly proved by experiment, and is, indeed, obvious from the existence of salmon in waters unconnected with the sea. Nearly all the salmon that comes to market is caught in nets in the lower reaches of the rivers, or even along the coast in the vicinity; the number caught by rod and line is but a small proportion of the total. In Frank Buckland's Fish Museum there is a cast of a Tay salmon which weighed 70 lbs., and is 53 inches long; it is apparently the largest about which there can be no mistake.

The other British representatives of the genus *Salmo* are the trouts and charrs, which differ so little in extreme examples that it would seem there is really only one species of each. In this list is included all between which any definite distinctions could be discovered, and we leave them to be ranked as species or varieties as opinion may dictate. It is a thorny question, and is merely mentioned as accounting for the unusual order in which it became easiest to sort them out.

The Loch Leven Trout has from 12 to 14 rays in the dorsal, from 10 to 12 in the anal, 19 in the caudal, 12 to 14 in the pectorals, and 9 in the ventrals. The fins vary in shape and size. In colour it is dark, and rather green or grey along the back, and there are small black ocellated spots on the head and gill covers, and black spots and crosses above the lateral line, except in the fore part, where they extend down to the pectorals. This fish used to be confined

to Loch Leven, but it has been largely bred in the fish farms and widely distributed in the streams, where it interbreeds with the common trout. In the original strain its flesh is very red, and it has been caught up to 18 lbs. in weight.

The Grey Trout has 14 rays in the dorsal, 12 in the anal, 19 in the caudal, 13 in the pectorals, and 9 in the ventrals. It has a broad, strong maxillary, and large scales on the tail, and is peculiar to Loch Stenness in the Orkneys. It is hardly distinguishable from the Lake Trout, except in the number of its pyloric appendages.

The Sea Trout is one of the three or four species known as Salmon Trout. It has from 12 to 14 rays in its dorsal, 11 to 13 in its anal, 18 or 19 in its caudal, 13 or 14 in its pectorals, and 9 in its ventrals. The ventrals are generally under the last third of the dorsal. The lateral line has from 115 to 130 scales. The mouth extends beyond the eye, and the body is rather long and slender. In colour it is bluish grey, with a purple gloss on the sides, and it is dotted with black spots and crosses over the upper body. It ranges to 4 feet in length.

The Bull Trout, or the chief of so-called Bull Trout, for in this case, as in others, the name is not restricted to the same fish, has fin rays the same as those of the Sea Trout, and like it, varies so much that the only external difference seems to be in the colour of the sides, which are brownish instead of silvery.

The Blue Poll, otherwise the White Salmon, Whiting, or Herling is very long in the body. It also has a similar fin formula to the foregoing (D. 12-14; A. 11-13; C. 18-19; P. 13-14; V. 9). In colour it is mainly silvery, with a few black spots.

The Lake Trout has 14 rays in its dorsal, 10 or 11 in its anal, 19 in its caudal, 13 in its pectorals, and 9 in its ventrals. It feeds mainly on fish, hence it has large fins and large teeth. Its head is of moderate size, but the snout is long, and in the males is hooked in the breeding season. In colour it is generally rather dark; in length it reaches 31 inches.

The Hog-backed Trout has 14 rays in its dorsal, 12 in its anal, 19 in its caudal, 13 in its pectorals, and 9 in its ventrals. The head is small, the snout rather short, and the lower jaw has not been observed to bear a hook in the breeding season. It has not been found over 16 inches long, but that may not be its full size. It resembles No. 203 in almost every respect that has not been mentioned.

The Gillaroo Trout is found in the Irish loughs, and has the middle coat of its stomach thickened, owing to its feeding principally on molluscs. There are no other distinctions except those given above.

The Sewen has from 12 to 14 rays in its dorsal, 11 to 13 in its anal, 18 or 19 in its caudal, 13 or 14 in its pectorals, and 9 in its ventrals. It is rather long in the body. The lower jaw does not always become hooked in the breeding season, when the colour, which is bluish or greenish grey, becomes a sort of brownish orange in the males. There are always a few black crosses above the lateral line.

The Trout has from 12 to 15 rays in the dorsal, 10 to 12 in the anal, 19 in the caudal, 13 to 15 in the pectorals, and 9 in the ventrals. The fins vary in size and proportion according to the surroundings, though in all cases the dorsal seems to be higher than it is long. As a rule, the swifter the stream the larger the fins and the slenderer the body. The colour also varies, being darker in deeper water; in general it is brown, more or less silvery below and on the sides, and it is marked with dark spots all over the upper part, with red ones along the lateral line, and close above and below it, the spots being usually ringed with white. In length the Trout reaches 28 inches. It goes to sea every year when it can, and is brightest in colour when it returns. The typical Trout seems to be able to swim in any clear running stream, no matter how shallow it may be; but deep water is evidently sought by its allies, some of whom find it in lakes and some in estuaries and the sea.

The Chars are even more difficult of short description. They are all found in lakes formed directly by glacial action, or indirectly by the deposition of glacial moraines; and they all become red on the underparts during the breeding season. Of the six on our list, Cole's Char has 14 rays in the dorsal, 12 in the anal, 19 in the caudal, 13 in the pectorals, and 9 in the ventrals. In the lateral line are from 125 to 128 scales. The pectorals are short, and the ventrals and anal are edged in front with white.

The Killin Char has 14 rays in the dorsal, 13 in the anal, 19 in caudal, 13 in the pectorals, and 9 in the ventrals. The dorsal, pectorals, and ventrals are the largest among the chars. There are 135 scales in the lateral line. In colour this char is dark, with a few light spots on the sides. In length it is about 12 inches. It is named from Loch Killin, in Inverness-shire, to which it is peculiar.

Gray's Char has 13 or 14 rays in the dorsal, 12 in the anal, 21 in the caudal, 13 or 14 in the pectorals, and 9 in the ventrals. The dorsal begins nearer the snout than in the other varieties, and the scales are more conspicuous. There are from 125 to 140 scales in the lateral line.

The Alpine Char has from 12 to 14 rays in the dorsal, 11 to 13 in the anal, 19 to 21 in the caudal, 12 to 14 in the pectorals, and 9 or 10 in the ventrals. The dorsal begins midway between the snout and the caudal. There are from 125 to 145 scales in its lateral line. In colour it has a purplish tinge above. Like all the chars it is a deep-water species, rising to the surface only when the weather is warm.

The Torgoch has 12 or 13 rays in its dorsal, 11 or 12 in its anal, 21 in its caudal, 12 in its pectorals, and 9 in its ventrals. In the lateral line are from 125 to 135 scales. It is purplish in colour above, passing into yellow and red, and has many red spots on the back and sides.

The Windermere Char has 12 or 13 rays in the dorsal, 11 or 12 in the anal, 19 in the caudal, 13 or 14 in the pectorals, and 9 or 10 in the ventrals. There are 118 to 128 scales in the lateral line. The

base of the pectorals is not overlapped by the gill covers; the nostrils are close in front of the eye, the hinder being the larger, and there being no flap between them. In colour this char is green above, and the red underparts are minutely dotted with black.

Schedophilus. Plate v. *CORYPHÆNIDÆ.*

34. *medusophagus*, Head greenish yellow; body greenish, with dark olive stripes and spots more or less united.

There are 3 spines and from 45 to 50 rays in the dorsal, 2 spines and from 27 to 29 rays in the anal, 21 in the caudal, 18 in the pectorals, and a spine and 5 rays in the ventrals. The scales are cycloid and small; the gill openings are large. This is a Mediterranean species, of which only two have been caught in British waters.

Sciæna. Plate iii *SCIÆNIDÆ.*

20. *aquila*, SHADOW FISH. Lateral line continued through the caudal fin.

The first dorsal has 9 or 10 spines, the second one spine and from 26 to 29 rays; the anal has 2 spines and 7 rays, the caudal 15 rays, the pectorals have 17, the ventrals a spine and 5 rays. The first dorsal, of which the third and fourth spines are the longest, is united at its base to the second dorsal, the tip of the pectorals being just below the junction. In the lateral line are from 52 to 55 scales; it curves above the pectoral, and then runs straight along to the outer edge of the tail, which is either rounded or truncated. The scales are ctenoid and large, and in oblique rows. The mouth is horizontal, and extends beyond the middle of the eye; the stronger teeth are in the upper jaw; there are 9 on the vomer, palatines, or tongue. In colour this species is grey, darker on the back, with a grey blotch on the spiny gill-covers, the caudal being grey and the other fins red. It ranges up to 6 feet in length. It is called the Shadow Fish, from its passing like a shadow through the water; sometimes it is known as the Meagre, though it is anything but meagre, being, on the contrary, particularly robust, active, and audacious. From it originated the myth of the songs of the sirens, for under water it bellows, and buzzes, and purrs, and whistles. It can be heard 20 fathoms down, and its whereabouts thereby known, so that it has been netted in shoals; for it is gregarious, and rather sought after as food, though not in so much esteem now as in the days of ancient Rome.

Scomber. Plate vi. *SCOMBRIDÆ.*

36. *vernalis*, MACKEREL. Back with bands; abdomen without spots.
 37. *punctatus*, SPECKLED MACKEREL. Back with small spots or thin streaks; abdomen without spots.
 38. *colias*, SPANISH MACKEREL. Back with bands; abdomen with spots.

The Mackerel has from 11 to 14 spines in its first dorsal, a spine and 10 or 11 rays in the second dorsal, and behind it are 5 finlets. The anal has a spine and 11 rays; before it is an isolated spine, and

behind it are 5 finlets. In the caudal there are 19 rays, in the pectorals 17, in the ventrals a spine and 5 rays. The caudal is forked, and there are two faint keels along it on each side. The lateral line is nearly straight; the scales are small. The mouth extends to the middle of the eye; the eyes have broad, fleshy, upright lids. In colour the Mackerel is green, shot with blue, the sides being silvery and iridescent; there is a yellow patch behind the eye; the bands are waved and vertical, and there is a dark stripe below the lateral line. In length it ranges from 14 to 16 inches. It is gregarious and a surface feeder, and comes into our shallows from the deep sea in pursuit of the fry of the other gregarious fishes from which it mainly feeds.

The Speckled Mackerel has 12 spines in the first dorsal, and a spine and 10 rays in the second, behind which are 5 or 6 finlets. In the anal there are a spine and 11 rays, with a separate spine in front, and 5 or 6 finlets behind; in the caudal there are 19 rays, in the pectorals 17, in the ventrals a spine and 5 rays. In colour the only difference is that the back is spotted instead of being banded, the spots being numerous, round, and small. This fish is never found by itself, but arrives with the summer shoals of the common Mackerel, of which it seems to be a variety.

The Spanish Mackerel has 7 spines in its first dorsal, a spine and 12 rays in its second dorsal, and behind this are 5 or 6 finlets. In the anal there is a spine and 11 rays, with a detached spine in front, and 5 or 6 finlets behind; in the caudal there are 21 rays, in the pectorals 21, in the ventrals a spine and 5 rays. The lateral line is rather irregular; the scales near the pectorals form a sort of corslet. The eye is larger than in the other species. The colour is dark blue on the back, with wavy bars, and a row of dark spots from the pectorals to the caudal; the dark colour extends below the lateral line; the sides and abdomen are speckled and spotted. Finally, it differs from the other mackerel in having an air bladder, they having none. It comes in shoals, but is not very frequent. It reaches to about 16 inches in length.

Scombrosx. Plate xi. *SCOMBRESOCIDÆ.*

88. *saurus*, SKIPPER. Jaws lengthened into a beak; finlets in front of caudal.

The dorsal has from 10 to 12 rays, with 5 or 6 finlets behind it; the anal has from 12 to 13 rays, with 6 or 7 finlets behind it. The caudal has 14 rays, the pectorals 12 or 13, the ventrals 6. The dorsal is near the tail, the fin of which is deeply forked. A row of keeled scales runs from the gills to the tail. There are no teeth except the small ones in the jaws; the lower jaw is the longer. The back is blue, the sides silvery; the dorsal is blackish, the anal yellowish. This is a near ally of the Flying-fish. Migratory in shoals, it is found further from land than the Gar-fish, and further inland up rivers when it visits the coast. It is a surface swimmer, frequently leaping into the air as it follows the Pilchards on which it preys, and at times gliding along the top of the water by a mere touch of the tips of the pectorals and lower fins. It reaches 18 inches in length.

Scyllium. Plates xxix. and xxx. *SCYLLIIDÆ*.

230. *canicula*, ROUGH HOUND. Anal ends under space between dorsals.
 231. *catulus*, NURSE HOUND. Anal ends under middle of second dorsal.

The Rough Hound has the first dorsal in the middle of the back, nearly half way between the ventrals and anal. The ventrals are wide apart; in the male their inner edges are united nearly all along, but in the female for only two-thirds of their length. The nostrils are nearer to mouth than to end of snout; the nasal flap is single. The colour is greyish or yellowish red, with blotches and spots; the length reaches 42 inches. This shark feeds on fishes and molluscs, and keeps mainly to the bottom in sandy ground. When caught it turns its tail in a half coil round the object that holds it, and uses its rough skin as a rasp. Its egg-case is rather slender, with slender arms and filaments.

The Nurse Hound has the dorsal farther back; the ventrals are close together, and the nasal flap is double. The colour is a brownish or reddish grey, with large spots and blotches; the length reaches 5 feet. This is a deeper-water species than the other, and more frequent in rocky ground. Its egg-case is stouter, with broader, stronger arms and filaments.

Sebastes. Plate iii. *SCORPÆNIDÆ*

19. *norvegicus*, BERGYLT. Body and fins bright orange red.

The dorsal is in two distinctly curved portions, the first with 15 spines, the second with 15 rays. In the anal are three spines and 8 or 9 rays, in the caudal 13 rays, in the pectorals 20, in the ventrals one spine and 5 rays. The caudal is cut square. The gill covers are spiny; the lower jaw is the longer; the mouth extends to the middle of the eye, or beyond. This is a rare fish, reaching 4 feet in length, frequenting rocky ground in deep water, feeding on crustaceans and flat fishes. It is stated to be viviparous. Its colour makes it easy of identification.

Selache. Plate xxix. *LAMNIDÆ*.

221. *maxima*, BASKING SHARK. Snout porous and projecting like a beak.

This large shark is of large girth. The second dorsal is small, but larger than the anal, the first dorsal is halfway between the pectorals and ventrals. There is a pit at the base of the caudal, and the tail is keeled. The teeth are in 4 or 6 rows, small and conical, and have smooth edges. The gill-slits are long and of almost equal length. In colour it is dark brown or blue above, lighter below, the long snout, which begins behind the eye, and projects for some distance beyond the upper lip, being of a red tint on its upper half. The specimen at South Kensington is 29 feet 10 inches long. It is said to feed on seaweed and other soft stuff, including eggs; in fact it is mainly a vegetarian shark, and looks as though it did well on its diet.

Serranus. Plate i. *PERCIDÆ*.

4. *cabrilla*, COMBER. Orange, with several bluish stripes.
 5. *gigas*, DUSKY PERCH. Reddish brown, without stripes.

The Comber has 10 spines and 14 rays in its dorsal, 3 spines and 7 or 8 rays in its anal, 15 rays in its caudal, 15 in its pectorals, and a spine and 5 rays in its ventrals. The dorsal rays are higher than the spines, the first being about double as high as the tenth spine. In the lateral line there are from 80 to 90 scales. The hinder edge of the præoperculum is serrated; the male has 2 spines on the gill cover, the female only one. The mouth extends to the middle of the eye, the tongue is small and free, the teeth in both jaws are large in the outer row, and the lower jaw is the longer. In colour this sea perch is an orange yellow, striped longitudinally with more or less greyish-blue, the fins being yellowish, some of them having blue spots. In length it reaches about a foot. It feeds on fishes and other animals of the sea, is never found in shoals, and frequents rocky ground in deep water.

The Dusky Perch has 11 spines and 15 or 16 rays in its dorsal, 3 spines and 8 or 9 rays in its anal, 17 rays in its caudal, 16 or 17 rays in its pectorals, and a spine and 5 rays in its ventrals. The spinous part of the dorsal is fairly level, and the rayed portion is not much higher, and only slightly curved. In the lateral line there are from 120 to 130 scales. The præoperculum is serrated. The lower jaw is the longer. In colour this fish is reddish brown, with no stripes beyond two faint streaks on the gill-covers. It reaches a yard or more in length, and is very rare in British waters.

Siphonostoma. Plate xv. *SYNGNATHIDÆ*.

114. *typhle*, BROAD-NOSED PIPE-FISH. Body ridged, upper caudal ridge continuous with lateral ridge, dorsal ridge extending only to dorsal fin.

In the dorsal there are from 38 to 46 rays; the anal is absent; in the caudal there are 9 or 10 rays, in the pectorals 15, in the ventrals 4. The dorsal begins about half way; it stands on 10 or 12 rings, and is longer than the snout. The snout is compressed, and the mouth almost upright. The lateral line joins the upper caudal ridge. From the head to the vent there are from 17 to 19 plates, thence to the tail there are from 36 to 42. The male is broader in the abdomen than the female, owing to the pouch in which the ova are carried. In colour this Pipe-fish is dark brown, with light spots on the under parts. In length it is about 13 inches.

Solea. Plate xxi. *PLEURONECTIDÆ*.

162. *vulgaris*, SOLE. Nostrils alike. Pectorals on both sides, 7; caudal 16. Brown, with blotches in rows.
 163. *lascaris*, SAND SOLE. Nostrils not alike. Pectorals on both sides, 10; caudal 15. Orange, dotted and blotched.
 164. *variegata*, THICKBACK. Pectorals 4 or 5 on one side, 2 or 3 on the other; caudal 15. Chestnut brown, with 5 dark bands.

165. *lutea*, SOLENETTE. Pectorals 5 on one side, 3 on the other; caudal 19. Stone grey, with blotches; fins with occasional black rays.

This genus has the eyes on the right-hand side. The Sole has from 73 to 97 rays in the dorsal, 61 to 74 in the anal, 16 in the caudal, 7 in the pectorals, and 5 or 6 in the ventrals. The dorsal begins on the snout in front of the eyes; the pectoral on the upper side has a black spot at its outer end. The snout projects; the front edge of the head is curved; the jaws are larger on the lower side; the teeth are small, and only present on the blind side. There are 160 scales in the lateral line, which is straight. The colour is brown, with rows of black blotches along the bases of the fins and the middle of the dark side. The length may be as much as 18 inches, but few large soles are taken in these days. The Sole is a night-feeding fish, frequenting sandy or gravelly ground in comparatively shallow water, feeding mostly on molluscs, crustaceans, and worms.

The Sand Sole, otherwise the French Sole, and perhaps the original Lemon Sole, has from 70 to 89 rays in its dorsal, 67 to 71 in its anal, 15 in its caudal, 10 in its pectorals, and 5 in its ventrals. The dorsal begins at the end of the snout. The dorsal and anal are joined by a membrane to the caudal. The nostril on the lower side is enlarged and fringed on its outer edge. There are from 130 to 140 scales in the lateral line. The scales are larger than in the common sole. The colour is yellowish brown, with black spots and gold specks. The length does not exceed 14 inches. It frequents sandy ground in rather deeper water than No. 162, from which it differs in the points mentioned, and also in having smaller eyes, the upper eye nearer the snout, and the mouth further under.

The Thickback has from 65 to 74 rays in the dorsal, 55 to 58 in the anal, and 15 in the caudal; in the right pectoral there are 4 or 5 rays, in the left only 2 or 3, and in the ventrals there are 5. The dorsal and anal do not reach the base of the tail. The pectorals are very small, the left being almost rudimentary. The mouth is nearer the snout than in Nos. 162 and 163, and is straighter. The lateral line has from 85 to 90 scales, and is nearly straight. The colour is reddish, with brown bands across, which become black as they run on to the fins. In length this species does not exceed 9 inches.

The Solenette is never more than 5 inches long. It has from 65 to 73 rays in its dorsal, 50 to 63 in its anal, 19 in its caudal, 5 in its right pectoral, 3 in its left pectoral, and 5 in its ventrals. The dorsal and anal have a few scattered black rays. The scales are rather large; there are 72 in the lateral line. In colour it is generally pale greyish yellow, with rounded spots. It is not used as food.

Syngnathus. Plate xv. SYNGNATHIDÆ

115. *acus*, GREATER PIPE-FISH. Caudal ridge continuous with dorsal ridge.

The dorsal stands upon 10 or 11 rings about halfway along the back. It has from 40 to 44 rays; there is no anal fin; the caudal has from 3 to 10 rays, the pectorals have 13, and the ventrals 3.

There is a ridge along the top of the snout which is joined by another over the eye. The osseous plates number 19 or 20 to the vent, and from 44 to 46 beyond. In the males the dorsal is higher and the abdomen broader than in the females. There are lines of spots on the dorsal, and a black spot at the base of the first ray. The colour is brownish, with dark broad bands; the length reaches 16 inches. This pipe-fish is generally found in deep water, but has been taken in shallows among rocks and weeds. It can swim in almost any position, and occasionally skims over the water in duck-and-drake fashion.

Tetrodon. Plate xv. *DIODONTIDÆ*.

122. *lagocephalus*, GLOBE FISH. Gullet dilatable into a spherical shape.

The Globe Fish has from 12 to 14 rays in its dorsal, 12 to 14 in its anal, 12 in its caudal, 14 or 15 in its pectorals, and it has no ventrals. The dorsal and anal are placed more than halfway towards the tail. The eyes are well back, the nostrils distinct, the beak divided by a suture. In colour it is blue above, the underparts being silvery and armed with fixed spines, each having four roots. It reaches about 22 inches in length.

Thymallus. Plate xxvii. *SALMONIDÆ*

218. *vulgaris*, GRAYLING. Scales in regular rows; dorsal long and high.

The Grayling has from 20 to 24 rays in the first dorsal, the second dorsal is adipose, there are from 11 to 14 rays in the anal, 21 in the caudal, 15 or 16 in the pectorals, and 10 or 11 in the ventrals. The ventrals are under the middle of the dorsal, and small, the anal is under the adipose dorsal. The scales in the lateral line number from 75 to 85. The back is more curved than the abdomen; the shape is slender and graceful; the upper jaw is the longer. The head is bluish, the back golden, with parallel grey lines along the side; the fins are banded and spotted with purple. In length the Grayling reaches about 16 inches. It is generally gregarious and local in occurrence, confined to clear streams running over sand and gravel, with many pools and shallows. It swims deeper than the Trout, and feeds mainly on molluscs and crustaceans.

Thynnus. Plate vi. *SCOMBRIDÆ*.

41. *pelamys*, BONITO. Parallel stripes along the sides following the curve of the abdomen.

The first dorsal has from 13 to 15 spines, the second a spine and 12 or 13 rays, behind it are 8 finlets; the anal has 2 spines and 12 rays, behind it are 7 finlets; the caudal has 35 rays, the pectorals have 27 rays, the ventrals a spine and 5 rays. Both dorsals are high, and pointed in front, the first spine of the first dorsal being twice the length of the highest ray of the second dorsal; the pectoral is in a groove. The lateral line is curved throughout; there is a

corslet, and no other scales. The lower jaw projects, and on the jaws is a single row of teeth. In colour the Bonito is bluish above, silvery below, and is striped as above stated, the stripes being dark blue. The few British examples have been from 2 to nearly 3 feet long.

Tinca. Plate xxiii. *CYPRINIDÆ*.

179. *vulgaris*, TENCH. Scales small; skin thick and slimy.

The Tench has 12 or 13 rays in its dorsal, 9 or 10 in its anal, 17 in its caudal, 17 in its pectorals, and 9 or 10 in its ventrals. The pectorals, ventrals, anal, and caudal are at equal intervals; the dorsal is a little behind the ventrals, and half-way between the snout and the base of the caudal. The lateral line curves downwards from above the gill-cover, and has from 90 to 115 scales. The scales are small and embedded in the skin, which is covered with mucus. The fins are blackish, the body is generally blackish green or grey, but in one variety it is yellow, and in another it is spotted. The length, as a rule, reaches 18 inches, but one of 33 inches is on record. The Tench feeds on weeds, worms, and insects, and thrives where weeds are plentiful, preferably in still waters and sluggish rivers that are not particularly clean. As a rule it swims near the bottom, but in summer it rises to the surface and shelters among the weeds. In winter it buries itself in the mud like the Carp

Torpedo. Plate xxxiii. *TORPEDINIDÆ*.

248. *nobiliana*, TORPEDO. Greyish, with or without a few blotches.

249. *marmorata*, MARBLED TORPEDO. Mottled or spotted.

The Torpedo has the front edge of the disk straight, and the wings almost semi-circular. The two dorsals are close together, the first being as large again as the second; they are placed above the tip of the ventrals, and not on the tail; the caudal is almost as large as the ventrals put together. The skin is smooth, there being neither spines nor tubercles. The mouth is arched. The colour is generally plain purplish grey, but it varies, and occasionally is faintly blotched. The length reaches 4 feet. It is a coast fish, living in sandy and muddy localities. The electrical organ is between the head and the pectorals.

The Marbled Torpedo seems to be only a variety of smaller size and with rather larger ventrals. The few British examples have not exceeded 10 inches in length. It varies much in colour, but is invariably mottled or marbled and spotted.

Trachinus. Plate vii. *TRACHINIDÆ*.

45. *draco*, GREATER WEEVER. Two spines over the eye.

46. *vipera*, VIPER WEEVER. No spines over the eye.

The Greater Weever, otherwise the Spitalfields Weaver, from its being sold to the foreign Jews in Whitechapel, has 5 or 6 spines in its first dorsal, 19 to 31 rays in its second dorsal, 31 in its anal, 12 in its caudal, 16 in its pectorals, and a spine and 5 rays in its ven-

trals. The first dorsal is not unlike a quadrant in shape, the second is lower and parallel to the back for the greater part of its length; both dorsals are in a groove; the anal is longer than the second dorsal. The lateral line runs along the upper half of the body and has 78 scales; the scales are cycloid and in oblique lines. The mouth is oblique, and extends to behind the eye. In shape the body is long and slender. There are 2 small spines over the eye, 4 on the præoperculum, and a long one on the operculum, with loose skin extending nearly to its point. The colour is greyish or yellowish, the head being spotted or streaked. The length is as much as 17 inches. It is found on sandy ground, occasionally between the tide marks, and can give a painful wound with its long spine, which it seems always anxious to use.

The Viper Weever is even more active and venomous. It has 6 spines in its first dorsal, and from 21 to 24 rays in the second; in the anal it has 25 or 26 rays, in the caudal 12, in the pectorals 14, in the ventrals a spine and 5 rays. The fins are similar in shape to those of the larger species. The mouth extends beyond the eye, and there is a row of papillæ along the upper edge of the lower lip. There are no spines over the eye, but there are two below the angle of the præoperculum, and a long, straight spine on the operculum. The colour is brownish with grey streaks along the back and yellowish underparts; the first dorsal is black, with thin white lines. In length it does not exceed 6 inches. Like the other, it feeds on small fry and almost anything animal, and it is of the same habits and disposition.

Trachypterus. Plate xiii. *TRACHYPTERIDÆ.*

102. *arcticus*, DEAL-FISH. Caudal fin at a sharp angle as if dislocated.

The Deal-fish is known by its tail, which looks as though it had been broken off and stuck on again in the wrong position. In the long dorsal there are from 158 to 172 rays; there is no anal; the caudal has 7 or 8 rays; the pectorals have from 5 to 11, and the ventrals 6. The lateral line consists of spiny, oval plates, increasing in size towards the tail; it is nearly straight. The back and abdomen are almost parallel, curving towards each other just at the ends, and in shape the fish resembles the deal board from which it received its name. It is silvery in colour, has red fins, swims on the slant, is 7 feet or more in length, and is an Arctic species of rare occurrence in British waters.

Trichiurus. Plate iii. *TRICHIURIDÆ.*

22. *lepturus*, HAIRTAIL. No fins beyond a long dorsal and small pectorals.

The Hairtail has 135 or 136 rays in its dorsal fin, and 11 in its pectorals. It is a long, thin, ribbon-like fish, tapering to a point, the dorsal beginning over the gill-covers and extending to the very tip of the finless tail. The lateral line runs along the lower third of

the body; and there are no scales. In colour this rare fish is silvery, and in length it does not exceed 30 inches. It straggles here from the tropics, and made its appearance on the British list by being left by the tide on a sandy shore.

Trigla. Plates vii. and viii. *COTTIDÆ.*

- 52. *lineata*, STREAKED GURNARD. Lateral ridges that slope forwards from back to abdomen; lateral line with serrated spines. Colour red above, white below.
- 53. *cuculus*, RED GURNARD. Spiny ridge along base of dorsals; lateral line with spineless plates. Colour red; fins red.
- 54. *hirundo*, SAPPHIRINE GURNARD. Spines along base of dorsals; lateral line unarmed. Colour brownish red; pectorals large and blue.
- 55. *gurnardus*, GREY GURNARD. Colour grey with or without white markings.
- 56. *lyra*, PIPER. Two flat triangular plates over the snout, giving it the appearance of being divided.
- 57. *obscura*, LANTHORN GURNARD. Broad silvery stripe along the side marking off the red above from the white below.

The Streaked Gurnard has from 9 to 11 spines in the first dorsal, 16 or 17 rays in the second, 16 rays in the anal, 12 in the caudal, 10 or 11 in the pectorals, and a spine and 5 rays in the ventrals. At the base of the pectorals it has three filaments, like the other species of the genus. The lateral line has 66 toothed spines, being half the number of the row of scales above it. The scales along the bases of the dorsals are keeled. Down each side is a series of narrow, parallel ridges that slope slightly forwards. The sides are banded with red; the dorsals and caudal are reddish brown, spotted and blotched, and have red edges; the pectorals are red, green, and blue. The length reaches 14 inches. This fish lives near the ground, and feeds on fish and crustaceans. Like our other gurnards it erects its dorsals when touched, and grunts. "These sounds," says Cunningham, "are produced in the air-bladder. That organ is entirely closed, and its walls contain well-developed muscles, which, by their contraction, drive the air from one part of the bladder to another. The air-bladder consists of three portions, a larger central chamber and a smaller chamber on each side, communicating with the central chamber at the front end. At the hinder portion of the central chamber there is a partition running in a slanting direction across it, and in the middle of this partition there is a round opening. The air is pressed to and fro through this opening, and so the sound is produced."

The Red Gurnard has 8 or 9 spines in the first dorsal, 18 rays in the second, 16 or 17 rays in the anal, 13 in the caudal, 10 in the pectorals, and a spine and 5 rays in the ventrals. In the lateral line are from 73 to 76 plates, which are higher than they are wide, and have no spines. This fish is rose-coloured, the three filaments being red with a yellow tinge. In length it reaches 18 inches. In habits it resembles the Streaked Gurnard, and makes a similar noise in a similar way.

The Sapphirine Gurnard has 9 spines in the first dorsal, 16 or 17 rays in the second, 15 or 16 rays in the anal, 12 in the caudal, 10 in the pectorals, and a spine and 5 rays in the ventrals. The lateral line is without spines, but along the base of the dorsals is a row of about 25 spiny plates. In colour it is a brownish red, the pectorals having a good deal of blue in them, the dorsal being reddish, the caudal purplish, and the filaments red. It is 24 inches long, and lives near the bottom in water of moderate depth, sometimes rising to the surface. It grunts like the other gurnards.

The Grey Gurnard has 8 or 9 spines in the first dorsal, 19 rays in the second, 18 or 19 rays in the anal, 15 in the caudal, 10 in the pectorals, and a spine and 5 rays in the ventrals. In the lateral line are from 73 to 76 scales, armed with short spines. In colour it is slaty grey, generally with white spots or lines; below it is white. Its extreme length seems to be about 24 inches. It is found in shoals, keeping to the bottom as a rule, but frequently swimming close to the surface and grunting with satisfaction. It croons as it is taken from the water.

The Piper has 9 or 10 spines in its first dorsal, 16 or 17 rays in the second, 16 rays in the anal, 12 in the caudal, 10 in the pectorals, and a spine and 5 rays in the ventrals. The third dorsal spine is the longest, the curve of the fin being rounder than in the other species. The lateral line is without spines, but there are 25 or more spiny elevations along the base of the dorsals. The pre-orbital is extended into a broad, triangular plate, which is toothed in front and projects over the snout. The colour is bright red above, white beneath, the fins being red. It is rather larger than the other species, and is of the same habits. It grunts like the others; but, when taken from the water, instead of crooning, it hisses, and from this hiss or whistle it derives its name.

The Lanthorn Gurnard has 10 spines in its first dorsal, 17 or 18 rays in the second, 17 rays in the anal, 12 in the caudal, 10 in the pectorals, and a spine and 5 rays in the ventrals. The second spine of the dorsal is very long. The lateral line is marked by spineless, lined plates, but there are spiny plates along the base of the dorsals. There are spines on the head and gill-covers, as in all the species. The thin filaments are rather more slender than in the other gurnards. The colour is bright red above and whitish below, separated from each other by a wide silvery stripe. The pectorals are blue, the other fins red. In size it does not exceed 12 inches. It is the rarest of the British species.

Trygon. Plate xxxiii. *TRYGONIDÆ.*

252. *pastinaca*, STING RAY. Disk pyriform, front edge straight, angle rounded, hind edge convex.

There is a long serrated spine on the tail, but no fins. The body is raised along the line of the backbone. The skin is smooth, with occasionally a few tubercles along the back. The mouth is small and the teeth are small. The colour varies above, but is always white below; the length reaches 33 inches. The Sting Ray is found in shallow water where the bottom is soft and oozy.

It is known by its spine, which has the teeth directed downwards like a spear-head. It was one of these spines which ended the career of Ulysses.

Xiphias. Plate iii. *XIPHIIDÆ*.

21. *gladius*, SWORDFISH. Upper jaw long and shaped like a sword.

The Swordfish has but one dorsal when young, but in time a portion of it dies away, so that in old examples the fin is almost divided into two. The anal becomes separated in a similar manner. When complete there are 3 spines in the dorsal, and 43 rays, and 17 rays in the anal; in the caudal there are 21, in the pectorals 15; there are no ventrals. The pectoral is placed low, and is long and pointed. The scales are quite rudimentary, and there are no teeth. The colour is blue above, white below; the length 15 feet or less, generally 7 or 8. It is only a straggler in British waters.

Zeugopterus. Plate xx. *PLEURONECTIDÆ*.

153. *unimaculatus*, ONE-SPOTTED TOPKNOT. Ventrals not joined to anal.

154. *punctatus*, BROWNY. Ventrals joined to anal.

The One-Spotted Topknot has from 70 to 80 rays in its dorsal, 61 to 68 in its anal, 16 in its caudal, 10 to 12 in its pectorals, and 6 in its ventrals. The marginal fins are highest in the hinder half. The lateral line curves over the pectoral. The eyes are on the left-side; the mouth is large, and at the end of the snout; the teeth and jaws are equal on both sides. The first ray of the dorsal is long. The underside is rough. The colour is reddish brown, with a round spot on the upper side near the tail. The length does not appear to exceed 5 inches.

The Browny has from 87 to 101 rays in the dorsal, 69 to 80 in the anal, 14 to 16 in the caudal, 10 in the pectorals, and 6 in the ventrals. The dorsal and anal are highest in the hinder half, and are continuous with the caudal. The ventrals join the anal. The eyes are on the left, the mouth large and at the end of the snout, the teeth and jaws alike on both sides. The underside is rather smooth; on the upper side the scales are spiny. In colour it is dark brown with spots, and there is a pale streak extending from each eye. The length of this fish does not exceed 8 inches.

Zeus. Plate iv. *CYTTIDÆ*.

29. *faber*, DORY. Grey, with a large black spot edged with yellow.

There are 10 spines in the first portion of the dorsal, and 22 or 23 rays in the second; the anal is in two distinct portions, the first of which has 4 spines, the second 21 to 23 rays; in the caudal are 13 rays, in the pectorals 13, in the ventrals a spine and 6 rays. The dorsal spines have filaments at their tips, and spines at their bases; and at the bases of the dorsal rays are spiny plates, the bases of the anal spines and rays being protected in the same way. The spinous

portion of the anal is very broad, and the spines large. The lateral line curves to the middle of the anal, and then runs straight. The body is about two-thirds as high as it is long, and is much compressed. The mouth is large and protrusible so as to form a tube. The colour is a somewhat yellowish grey, frequently with wavy bands; the length is under 24 inches. The Dory feeds on fair-sized fishes, such as sprats and smelts. It swims with a list to starboard, not upright; and it grunts, squeaks, or groans when taken out of the water.

Zoarces. Plate x. *BLENNIIDÆ.*

82. *viviparus*, VIVIPAROUS BLENNY. Dorsal long, with a low section of 10 spines just before the end.

The dorsal extends all along the back. In the fore part there are from 76 to 80 rays, continuous with which are 10 spines followed by 20 to 25 rays. The rays are level and not very high, and the spiny section is half the height of the rest of the fin. In the anal there are 84 to 89 rays; the caudal is absent except in the young; the pectorals have 19 rays, and the ventrals 3. The mouth extends to the middle of the eye; the lips are thick. In colour this fish is olive, striped and banded with dark green; it attains 2 feet in length, and is of slender tapering form. It lives among rocks, and hides among seaweed; and it has been observed to bring forth at a birth 250 young, an inch and a half long, which immediately began to swim about and look after themselves.

Zygæna. Plate xxviii. *CARCHARIIDÆ.*

224. *malleus*, HAMMERHEAD. Head in the shape of a hammer, with the eyes at the lateral extremities.

This shark is recognisable at a glance, owing to its strangely-shaped head. The colour is slaty grey above, and white below. It is said to be very ferocious, but it has rather a small mouth. The teeth are oblique and notched. It is not uncommon in the Mediterranean, but better known in more southerly seas; in British waters it is rarely seen. The largest yet caught on the English Coast measured 13 feet 7 inches. Its specific name means a balance, and it is frequently called the Balance Shark. It is the last on our alphabetical list, so that with a balance we close our account.

CHAPTER X.
SPECIFIC NAMES.

THIS list contains, it is hoped, all the specific names appearing in the standard works on British fishes, in addition to a selection of those used by foreign authors, for the synonymy of the fishes is extensive and rather more miscellaneous than usual. The numbers refer to the coloured plates, in the list of which will be found the systematic and popular names adopted throughout this book.

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