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THE LIVING CHIMÆRA AND ITS EGG.

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Few naturalists have ever had the advantage of seeing alive that somewhat rare and profoundly interesting fish, the oceanic Chimæra or Rabbit Fish. Its grotesque outline and staring eyes so impressed Frank Buckland that he pronounced it "worthy the imagination of the most barbarous Chinaman that ever designed a figure-head for a piratical war-junk." In 1891 two or three specimens were obtained off Achill Head, Co. Mayo, at a depth of 127 fathoms, but as I had just left the vessel, the "Fingal," on which I was acting as naturalist to the Fisheries Survey, I missed seeing these remarkable examples alive. In 1895, during my cruise along the Pacific Coast, I had the privilege on many occasion of examining living specimens, the species occurring there (viz *Chimæra collaei*, Bennett) being netted fairly numerously in the inshore waters. In British and Norse seas the Chimæra is taken at considerable depths, say 70 to 200 fathoms; but in British Columbia this fish is frequently found in the drag seines used for taking salmon this kind of net being necessarily hauled in very shallow bay and estuaries.

The length of the fish varies from 12 inches to 30 or 36 inches and the head is disproportionately large, bluntly tapering in front, flattened on the top, and below sloping back to the mouth, which is quite underneath the head, some distance from the tip of the snout as in the sharks. The long body narrows

very much and ends in a long whip-like tail, bearing a fin-lobe above and below, near the tip. A long fin passes down the back, nearly the whole length, and in front of it, immediately behind the head, there rises a high first dorsal fin, triangular in shape, and provided with a powerful anterior spine, curiously serrated upon its front edge. The wing-like pectoral fins are a most striking feature as they possess a fleshy peduncle or arm portion, and the pointed fins protrude most prominently on each side of the head. When lying flat against the body they extend over one-fifth of its length. A similar but much smaller pair, the ventral fins, protrude some distance behind the pectoral fins. Both pairs are like very flexible grey wings, resembling Indian rubber in texture, semi-transparent, and supported by horny fin-rays. I was enabled to examine specimens of both sexes, a fortunate circumstance as they differ considerably in their external characters. On the forehead of the male, between the eyes, there exists a finger-like protruberance partly bent upon itself, with a flattened tip, fimbriated, and studded underneath with sharp denticles. This spine-covered surface fits into a soft mucous depression in front. Oil and mucus occur in the cavity which is no doubt glandular in nature. One writer has suggested that it is phosphorescent, and that the Chimæra carries a lamp upon its forehead ; while Buckland fancifully compared it to a crown, whence he says, the Norwegians have called the Chimæra the " king fish " and also the " King of the Herrings."

The hind part of each ventral fin forms a separate bifurcate appendage, covered with a soft glandular membrane complexly folded and perforated by a longitudinal channel.

The male shark and skate have similar curious structures but in the Chimæra they are even more complex and curious, and impossible to be clearly described without the aid of figures.

The eyes are large and brilliant, unprovided with lids, and show a glowing green opalescent in the living fish. The iris is of a pale steel-blue colour. Buckland presaged that " the eye in life must have a monstrous and fierce appearance " and

certainly these organs stand in great contrast with the dull unintelligent eyes of the shark or the sturgeon.

On account of its peculiar projecting teeth, four protruding from the upper jaw and two from the lower jaw, the fish bears in British Columbia the name of Rat-fish or Rabbit fish, and the terms are appropriate as the mouth recalls most strikingly that of a rodent. They are white or semi-transparent, and unlike the teeth of sharks and rays are never replaced if lost. No doubt mollusks and crustaceans from a large part of its food.

The gill arrangements are most remarkable, for instead of the five to eight exposed gill-openings in front of each breast fin, such as we find in sharks, the Chimæra has a large operculum or gill cover consisting of several broad plates marked by distinct lines of division, and most effectively shielding the four-paired gills within. The gill chamber opens by a narrow slit near the base of the peduncle or stalk of the pectoral fin, on each side of the head. No doubt the lines marking the separate opercular plates are the tracks of mucus canals. Similar large smooth plates encase the whole head. They resemble a coat of mail resplendent with a brilliant metallic appearance. The head is especially striking from its bright silvery lustre, over which, in life, all the colours of the spectrum spread, golden yellow, rosy pink, emerald green, pearly blue, indeed every prismatic tint. If Chimæra is one of the sea's most grotesque creatures, it is, in its rainbow glory, one of its most resplendent. The shrunken, faded brownish or yellow examples of Chimræa, exhibited in our museums, convey no idea of the real splendour of this strange marine vertebrate. The crude semblance as if made of wrinkled leather, is utterly unlike the smooth glittering, living fish. In allusion to its beautiful colours the Norsemen call it the gold or silver fish ; but its external appearance is not less remarkable, to the naturalist, than its anatomical structure.

In my dissection of a number of specimens in 1895 I noted some of its structural features. Thus the short and capacious intestine exhibited the spiral partition or valve, which we also find in sharks and ganoids.

The liver was smooth, solid and compact, not expanded and lobed, as in many fishes, and it was extremely rich in oil. In form and character it reminded me of the same organ in the electric ray *(Torpedo)* which I dissected in Ireland six years ago. The cheeks and face of the fish are traversed by a complex series of mucus canals with numerous rows of pores. These canals are connected with the well-marked lateral line, along the side of the body. The ovaries in the female fish were large leaf-like organs, not unlike those of the Skate, and in the semi-transparent tissue pale white eggs were scattered in great numbers, about the size of peas. The ova were not apparently near complete maturity, though the specimens were examined in July, which is usually regarded as the spawning time. I should opine that the specimens examined by me would not have spawned until the fall, say September or October. The eggs deposited are probably few in number as in the sharks.

In the male specimens I found white, compact ovate organs with complicated tortuous ducts, and other structures found always in the shark tribe. By the kindness of the curator of the Victoria Museum (Mr. Fannin) I became possessed of an egg case of Chimæra. It is an extremely rare object though H. M. Inspector of Irish Fisheries (Mr. Spotswood Green) lately secured many examples in deep water on the west coast of Ireland. Yarrell curiously enough states that the eggs are large and "covered with a horny shell flattened on the edges and velvety," but on what authority is not explained. The egg case is in fact like a dark horny pod, long and narrower at one end than at the other. It is $3\frac{1}{2}$ or 4 inches long, and down each side there extends a flattened projecting edge which may, in some cases, bear hairs. Each case contains one egg, and the young fish is compelled to assume a somewhat peculiar position, lying flat on its side with its head directed towards the larger end of the case. How it escapes no one knows. Probably an imperceptible slit exists through which the fish emerges, but the Chimæra's egg is usually held to be imbedded in the sand with

one end projecting. This, it is considered, accounts for its extreme rarity in the marine zoologist's hauls.

In the Fisheries Museum in Ottawa, a specimen of the egg of Chimæra is exhibited but the young fish had hatched out before it was obtained.

The scientific interest of a fish like Chimæra is very great. There are not more than three or four species now existing and they are widely scattered in the most diverse seas. No doubt it is an ancient type of fish and may be the last of a dying race. Its protocercal or equal-lobed tapering tail is more primitive than that of any other fish. In some points *e. g.* the spiral valve, the ventrally placed mouth, and the cartilaginous skeleton, it is allied to the sharks. Its naked skin is in contrast to both sharks and ganoids, while the operculum, almost enclosing the branchial apparatus, connects it with Ganoids and Teleosts. The teeth, ears and jaw cartilages are very peculiar. the palato-quadrate bar being unsegmented. Whether to class it with the sharks, or establish as Professor Huxley urged, a separate sub-class Holocephali, for these few fish, the Chimæras, scientific authorities are not yet agreed.

Linnæus called it Chimæra on account of its peculiar external aspect, but its anatomical and other features fully justify the name. It is at once a primitive, aberrant, and grotesque creature, with characteristics which are common to all the various sub-classes of the great class of fishes. It is in many respects one of the most generalised of existing fishes, and on that account it is of the highest scientific interest.

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