

Notes on Chimæra.

TWO JAPANESE SPECIES, *C. PHANTASMA* JORDAN AND SNYDER,
AND *C. MITSUKURII* N. S., AND THEIR EGG CASES.

By

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With 1 Plate.

Chimaeroid fishes enjoy the distinction of representing one of the largest (*i.e.*, major) groups of chordates of which least is known ; and they are forms, moreover, of especial interest, since they are often regarded as standing more nearly in the direct line of the higher vertebrates than even the oldest sharks. At the present day they are widely scattered, rarely common in any one locality, and they have proven unusually inaccessible to naturalists. Their embryology has not been described, and even their remarkable egg cases are known only in a few species.

From Japanese waters the only true Chimaera hitherto known is the one described, probably from the bay of Nagasaki, by Temminck and Schlegel, who figure it in their important *FAUNA JAPONICA* (1847). This species they here regard as identical with the common Chimaera of North Atlantic and Mediterranean waters,

C. monstrosa, a determination which has since been generally followed by both European and Japanese authors. Recently, however, Jordan and Snyder, studying the matter with greater care, have concluded that the Japanese species is distinct, and have given it the name of *C. phantasma*, describing it in the *Proceedings of the United States National Museum* for 1900, Vol. XXIII, pp. 338-339.

The latter authors distinguish it as follows:—*C. phantasma* “differs from *C. monstrosa*. . . . having much longer pectoral fins and larger eyes.” “Pectoral fin pointed; $1\frac{2}{3}$ as long as the dorsal spine; when depressed its tip reaches middle of ventral.” “Second dorsal fin a little higher than diameter of pupil; the posterior edge rounded; separated from caudal by a deep notch. Anal fin low, pointed posteriorly; separated from anal by a deep notch below the end of the dorsal. The lower caudal membrane extends posteriorly much farther than the upper.”

Further than in the above notices the Chimaeras of Japan have received little attention.* And I was therefore led to collect notes upon them during my stay at the Misaki zoological station, where the conditions were naturally favorable for my work, and where the Imperial University granted me the most generous privileges. To the University, and to the director of the station, Professor Mitsukuri, I am, accordingly, under deep obligation. I wish, also, in this connection, to express my sincere thanks to Prof. S. Watase, of the Imperial University of Tokyo, for his kindness in editing the present paper and in correcting the proof.

The present notes refer to the characters of *C. phantasma*, and include a description of a new species—*C. mitsukurii*, together with reference to the egg cases of both forms.

* *Chimaera ogilbyi*, an Australian species recently described by E. R. Waite (1899), is clearly distinct from Japanese forms. (*Mem. Australian Mus.* IV, pl. I, p. 48, pl. VI.)

CHIMÆRA PHANTASMA. *J. and S. (Pl. I, Fig. 3).*

This species is general in its distribution throughout the moderately deep water of the eastern coast of Japan, from the Hōkkaido to Kyūshū. In the neighbourhood of Misaki, Sagami, where I have had an opportunity of examining living specimens, I find that it is taken in water of from 50 to 300 fathoms. Its distribution, however, like that of the Californian species, *C. colliei*, is peculiarly local. The fishermen will sometimes fish for days without obtaining specimens, and on the other hand on practically the same ground, they will sometimes obtain them to the number of twenty or more in a day. There are certain well-known portions of the reef "Outside Okinosé" where many specimens can usually be obtained. This species corresponds in point of size with *C. monstrosa* Linn. Female specimens measure 100 cm., or even more, in length; males are somewhat smaller, rarely exceeding 85 cm.

Habits.

The fish are usually sluggish in their movements when kept in shallow water. They swim about slowly, but oftener remain in the same position, merely balancing, moving their pectorals up and down, in slow rhythm. In confinement—*e.g.*, in shallow water, in large floating fish baskets—they rarely live longer than the second day. At their accustomed depth, on the other hand, judging from their behavior when freshly caught, I am convinced that these fish are normally very active, far stronger and more alert than I had been led to believe: for one is inclined to assume from their highly specialized dentition and poorly developed caudal fin that their movements are sluggish, similar to those of lophobranchs or teradonts.

External Characters.

This species presents a more compact and smoother appearance

than any chimaeroid which I have examined. (*C. collicii*, *monstrosa*, *affinis*, *mitsukurii*) in fresh condition ; and the general curvature of the head and body is roundly continuous to a degree which suggests a swift-swimming teleost. Living specimens are of exceptionally brilliant color and iridescence, altogether the most beautiful chimaeroids I have seen. The general color is silvery, and there is a series of jet black bands which pass down the side of the body from head to tail, fading away in the latter region. The bands are more numerous anteriorly where they frequently break into a series of mottlings, the lowermost following the lateral line. Between the anterior dorsal fin spine and the lateral line as many as four of these bands can be counted. The dark coloration continues along the roof of the head, and extends as far as the snout tip. The opercular fold shows also a degree of mottling as indicated in the accompanying figure. (Pl. I, Fig. 3.) The dorsal fin throughout its length is black at its base, but becomes unpigmented from this line outward as far as near the margin. Here there appears a continuous black band, narrow but distinct. The paired fins are pigmented notably on the anterior and posterior margins : their pigmentation ceases at the lobate bases of the pectoral fin (ventral side), but is continued irregularly on the ventral fins. I note also irregular pigmentation in the region of the ventro-median line posterior to the ventral fins and anterior to the rudiment of the anal.

The disposition of the mucous canal system of the head shows no noteworthy differences from other chimaeroids. The dental plates are stout and present well marked tritoral areas. In the "pre-maxillary" plates about eight tritoral lines are present, of which the median pair are most conspicuous. Each palatine plate is margined (laterad) by about a dozen grinding points and possesses two large tritors in the median region. The conspicuous tritor in the anterior

part of the plate is interpreted as the medianmost of the marginal series. In each maxillary plate about 26 tritons are present, far less distinct, however, than in the other plates. Of these tritons all but one are marginal, and in this row the most conspicuous are the third and fourth, counting from the symphyseal region and also the twentieth or thereabouts. The most conspicuous tritor of all is the one which occurs on the inner surface of the plate.

An examination of the viscera of this species has shown but unimportant differences from other chimaeroids, *C. colliei* particularly

Characters of the Egg Case.

Two specimens of the egg case of this form are preserved in the Imperial University of Tokyo and two in Columbia University. The fifth specimen, referred to by Günther (*Ann. & Mag. Nat. Hist.* 4 (6.) 1889, p. 415), is probably preserved in the British Museum. Its general size and character are well shown in the accompanying illustration, Pl. I, Fig. 3. In point of size (length about 27 cm.) it is notably larger than those of other members of this genus. It approaches most closely to that of *C. monstrosa*, as figured, for example, by Grieg (1898, *Bergen's Museums Aarbog.* No. 3. p. 15.) I notice, however, that the web like margin in the egg case of the Japanese species is much the narrower, and is lacking in conspicuous striation. On the other hand, the texture of the shell shows conspicuous longitudinal striae. In its form, too, the elongated narrow end of the egg case is proportionally narrower and shorter. The character of the opening end of the case is closely similar in both species, but the perforations occurring near the extreme tip of the narrow end of the egg case are finer and more numerous in the Japanese species. The color of the case when freshly deposited is a deep shade of Indian yellow. I have observed that two eggs are

deposited at a time, and that they are, for several hours at least, attached to the fish before they are deposited. During this time they hang freely into the water, attached only by the terminal of the narrow end.

Comparing this egg case in greater detail with those of *Chimaera colliei* and *C. monstrosa* (as shown in Grieg's figures), I find that the interlapping lamellae at the opening are about 46 in number, as opposed to 75 in *C. colliei*. The extent of these interlapping lamellae measure $\frac{1}{16}$ the length of the entire case, as opposed to $\frac{1}{5}$ in *C. colliei* and $\frac{1}{9}$ in *C. monstrosa*. At the narrow end of the egg case the marginal perforations extend over somewhat more than $\frac{1}{3}$ of the length of the egg case, as opposed to somewhat under $\frac{1}{3}$ in *C. colliei* and $\frac{1}{6}$ in *C. monstrosa*. Here 140 perforations are present as opposed to about 80 in *C. colliei* and about 70 in *C. monstrosa*. The narrow portion of the egg case (the marginal flaps not considered) measures about $\frac{1}{6}$ the width of the widest region: the corresponding width in *C. colliei* is about $\frac{1}{4}$ and *C. monstrosa* $\frac{1}{5}$. The marginal lappets are $\frac{1}{2}$ the width of those in *C. colliei* and $\frac{2}{3}$ those in *C. monstrosa*. The anterior end of the egg case, it may finally be noted, shows more distinctly than in other forms a lobe like dilation, and the marginal flaps in this region are distinctly directed towards the keeled face of the egg case. The keel in this species is proportionally lower than in the others.

CHIMÆRA MITSUKURII, N. S. (Pl. I, Fig. 1).

Among the rarities in the zoological museum of the Imperial University of Tokyo, are the egg-cases * of three different chimaeroids. All were collected in the neighborhood of Misaki. One of them, with wide flap like margins, resembling the egg-casse of *Callorhynchus*, has

* I wish to acknowledge with especial thanks the kindness of Professor Mitsukuri in placing them at my disposal for description.

since been associated by the writer with "*Harriotta*" *pacifica*: the second, of great length, was found to belong to *C. phantasma*; but the third egg-case remained unaccounted for. It showed clearly, however, that new species of Chimaera was to be looked for on the Japanese coast; and it was further obvious that the species was notably smaller than the common one. For the egg-case (Pl. I. Fig. 2) was distinctly smaller, its measurements being 22 by 2.7 cm., as opposed to 27 by 3.5 cm. (*C. phantasma*). That the difference in these egg-cases is not one merely of size is at once seen in the smoother texture of the smaller egg-case, and by the different modelling of the apex of the larger end.

Accordingly I tried to collect the unknown species during my stay in Misaki; but my efforts met with no success, the fisher people not appearing to know of a smaller species of "gin samé," which they probably confused with immature specimens of *C. phantasma*. Just before the close of my stay, however, my search was rewarded: among a number of small specimens of Chimaera brought me was an adult of a new species, which, as the possibility is not great of getting a second small species of Chimaera in the same locality, readily answered as the parent form of the undetermined egg.

The specimen proved to be an adult male (Pl. I, Fig. 1) measuring 60 cm. in length, smaller, therefore, than the full-grown male of *Chimaera phantasma* by about 25 cm. Its color was dark sepia below, blackish above, with here and there clouded lighter areas. A conspicuous feature is the greater relative size and strength of the dorsal spine: it projects beyond the tip of the succeeding fin rays, and shows serration, not only on its lateral borders, but on its anterior rim. The opisthure is of extraordinary length equalling $\frac{1}{3}$ the length of the entire animal. In spite of this, the caudal fin itself is of relatively large size, as is also the continuous dorsal fin. The

unpaired fins are almost black in color, the tone softening somewhat near the body-wall. I note also that there is a distinct bluish tint on the anterior rim of the ventrals (which, by the way, are much larger than in *phantasma*) and along the somewhat adipose anal.

The mixipterygium is bifid, as in Gill's "*Hydrolagus*," although in other regards, *e. g.* long opisthure, the specimen is a typical *Chimaera*. The tip of the mixipterygium is covered with the usual fine shagreen, which in the present instance passes up around the crotch of the "clasper." The anterior ventral clasping organ is armed with five denticles. In visceral matters: there is an intestinal valve of $3\frac{1}{2}$ turns: the lining membrane of the body cavity is unpigmented, while the wall of the gut is dark colored. The body wall is remarkably thin. Regarding dentition. "Premaxillary" plate is of large size, with fewer tritors, about eight, than in *C. phantasma*. "Maxillary" with three well marked tritors on its inner face, of these the most lateral the narrowest. "Mandibular" with a single tritor projecting sharply from its inner surface, much narrower than in the common species.

As nearly as I could ascertain, the present species was taken in deeper water off Misaki, more concretely, in water of about 300 fathoms. It belongs evidently to a somewhat deeper zone than the commoner species, which is taken oftenest in water of from 100 to 200 fathoms. That the new species is a deep water form is evident from the greater size of the eye,—which measures no less than $\frac{1}{3}$ the distance from snout tip to the base of the dorsal spine,—from its dusky color, as well perhaps as from its greatly extended opisthure. I may note that it can be distinguished at a glance from the commoner species by the lack of the conspicuous longitudinal bands along its trunk region, by the large size of the ventral fins, and by a less distinct anal. The new species has been named in honor of Professor

Mitsukuri, the director of the Marine station at Misaki, as a slight testimony of my appreciation of his important and many-sided services to zoology. The type specimen is preserved in the Museum of the Imperial University of Tokyo. *



* A second example, an immature female, coming from the same locality, was afterwards found among the specimens of Chimaera in the University museum. As a juvenile specimen and discolored in alcohol, it had long been confused with the common species. This specimen was generously presented to Columbia University by the zoological department of the Imperial University

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PLATE I.

PLATE I.

Japanese Chimaeroids and their eggs ($\times \frac{3}{7}$).

- Fig. 1 *Chimaera mitsukurii*, n. s.
2 " " " Egg case.
3 *Chimaera phantasma*, Jordan and Snyder.
4 " " " " Egg case.
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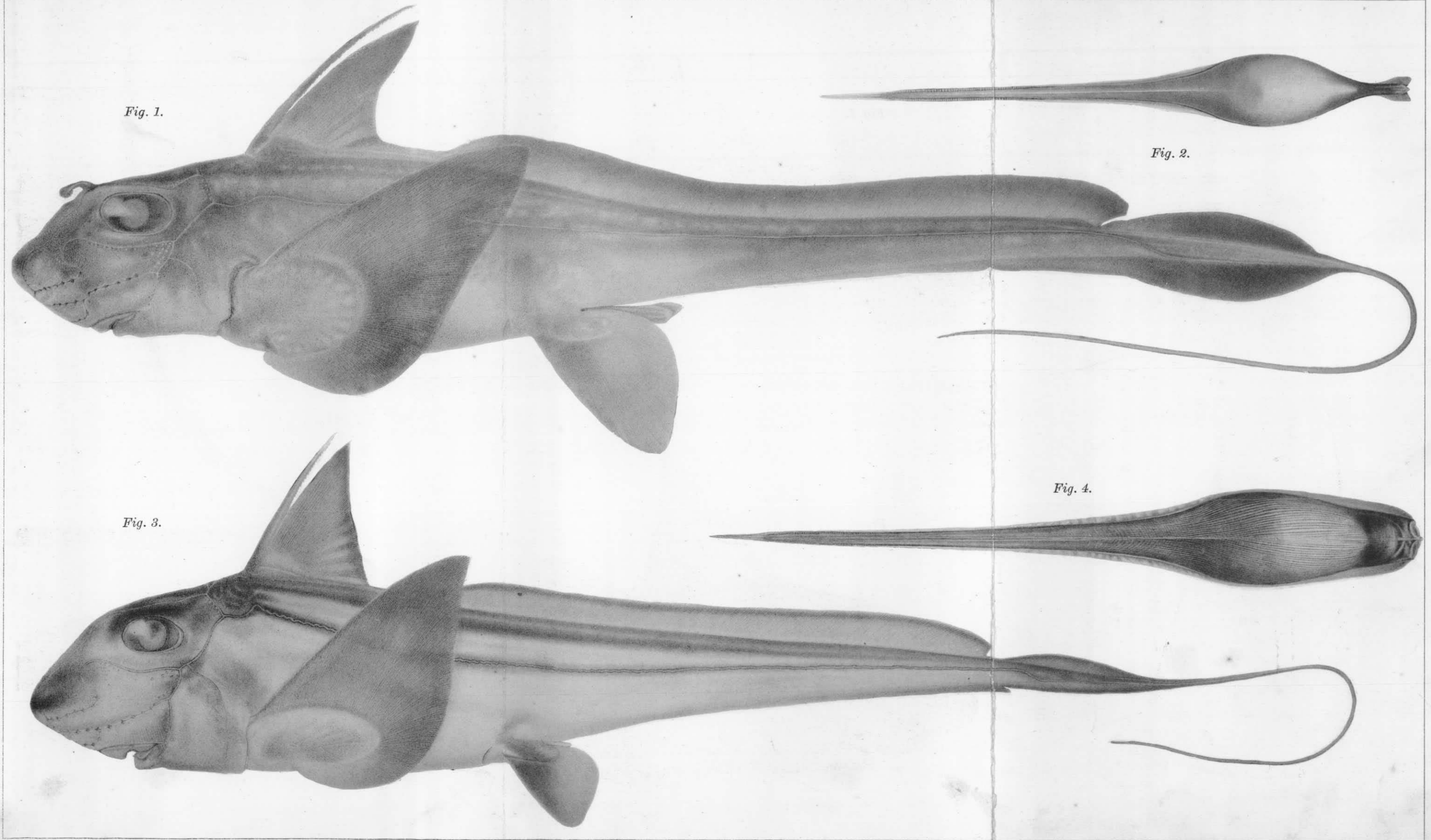


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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