

On Two New Species of *Chimæra*.

By

Shigeho Tanaka, *Rigakushi*.

With two plates and one woodcut.

There are eight species of *Chimæra* known to be extant,
viz :—

- C. monstrosa* LINNÆUS. GÜNTHER, Catalogue of fishes, Vol. VIII., 1870, pp. 349–350.
- C. affinis* CAPELLO. GÜNTHER, Catalogue of fishes, Vol. VIII., 1870, pp. 350–351.
- C. colliei* LAY and BENNET. GÜNTHER, Catalogue of fishes, Vol. VIII., 1870, p. 350.
- C. ogilbyi* WAITE. Mem. Australian Mus., IV., Pt. I., 1899, p. 48, Pl. VI.
- C. neglecta* OGILBY. WERNER, Zool. Jahrbücher, Bd. 21, 1905, p. 276.
- C. phantasma* JORDAN & SNYDER. Proc. Nat. Mus., Vol. XXIII., 1903, pp. 338–339.
- C. mitsukurii* DEAN. Journal College Science, Vol. XIX., Art. 3, 1904, pp. 6–9, Pl. I., figs. 1–2.
- C. purpurascens* GILBERT MS. JORDAN & SNYDER, Smithsonian Miscellaneous Collections, Vol. 45, 1904, p. 235.

Last winter, from the last part of January to the middle of February, there were brought into Mr. OWSTON's office in Yokohama twenty-three specimens of *Chimæra*, all taken in the Sagami Sea, off the village of Inatori, Idzu. He generously turned them over to me for examination. There also came about the same time to the Zoölogical Institute of the Science College two specimens from the Tokyo market, said to have come from the same locality off Idzu. A careful examination of all these specimens has convinced me that they do not belong to any of the hitherto known eight species and that they must be referred to two new species, for which the specific names *jordani* and *owstoni* are proposed.

It is necessary for me to add here that I am under very deep obligations to Prof. Dr. MITSUKURI for superintending my study and for his careful corrections of the manuscripts in the preparation of this article. I wish also to thank Mr. OWSTON for his generosity in placing his specimens at my disposal for examination.

CHIMÆRA JORDANI N. SP. Pl. I., fig. 1.

The points of the species which strike us at a glance are (1) that the lateral canal of the sensory canal system runs straight on the side of the body almost without any sinuation, (2) that a deep notch lies between the anal fin and the lower lobe of the caudal, and (3) that the head and body are of a uniformly brown color.

The following is a detailed description of the species.

Head measured from tip of snout to first gill-opening contained $4\frac{5}{8}$ times, and greatest height of body in front of the posterior

end of the insertion of first dorsal $5\frac{1}{2}$ times, in the total length of body (excluding the parts from the end of the second dorsal to the end of caudal filament); snout about 2, eye $3\frac{1}{2}$; interorbital $4\frac{1}{2}$ –5 in head; height of head in front of the insertion of pectoral a little lower than the greatest height of body; the height in front of eye $1\frac{1}{2}$ – $1\frac{3}{4}$ in the height of body; spine of the first dorsal curved backwards, a little longer than the length of head and higher than the first ray of the first dorsal, triangular in cross section, smooth with a median keel anteriorly, grooved posteriorly, the distal third of its length with recurved spinules; this spinous roughness is weaker than in *phantasma* and stronger than in *mitsukurii*; first dorsal subcontinuous with second dorsal by a fold of rayless skin; height of the anteriormost ray of first dorsal exclusive of its fleshy base $1\frac{1}{2}$ in head; free margin of the first dorsal almost straight; external margin of the second dorsal even and slightly concave, its posterior margin rounded; height of the fin, measured perpendicular to the upper margin of body at a point two-sevenths of its length from the anterior end, $4\frac{1}{2}$ in head. Upper lobe of caudal slightly higher than the lower; height of the former measured perpendicular to the upper margin of body 7 in head; second dorsal and upper lobe of caudal continuous with a deep notch. Anal very low, falcate, continuous with the lower lobe of caudal, but separated by a deep notch opposite the dorsal notch and similar to but deeper than that of *phantasma*. Both caudal lobes nearly as high as in *mitsukurii*; as in that species as well as in *phantasma* the lower lobe extends more posteriorly than the upper lobe. Distance from the dorsal notch to the end of caudal filament 2 in body exclusive of head and the parts behind dorsal notch; in this proportion the species agrees with *phantasma*, but not with *mitsukurii* in which the distance from the dorsal

notch to the end of caudal filament is equal to the length of body.

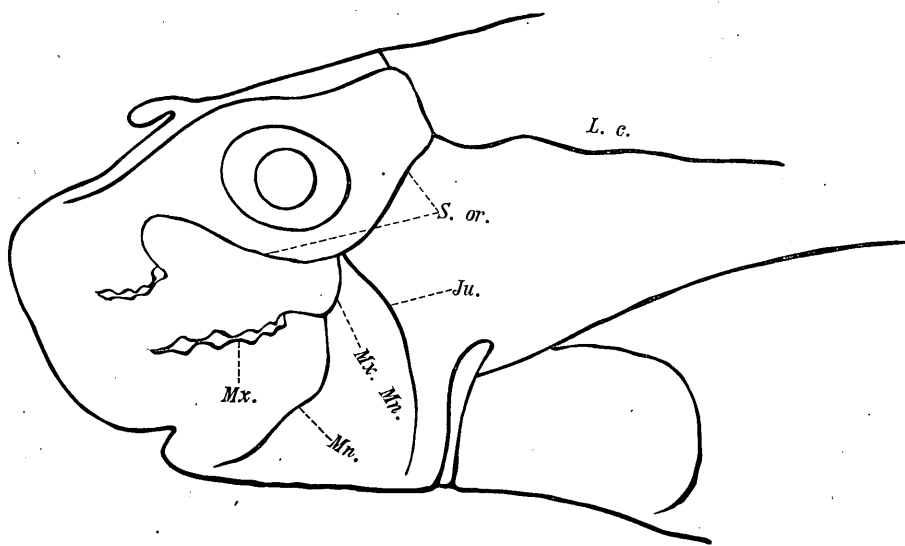
Pectoral pointed and slightly falcate, with a deep notch at its lower insertion in the fleshy base; its tip reaches far behind the insertion of ventral when depressed. Insertion of the ventral midway between tip of head and notch of second dorsal, its tip subtruncate, its inner margin rounded. Distance between origin of second dorsal and insertion of pectoral a little shorter than the distance between the latter and the insertion of ventral.

There exists no difference in external features between the male and the female except in the sexual characters. Cephalic organ in the male directed forwards and downwards, situated on the snout in front of the anterior margin of the eye; its length 2 in eye; on its lower side about sixty or more recurved spinous denticles, very much like those of *phantasma* or *mitsukurii*. Clasper tripartite; its tip covered with fine shagreen as usual; its length from the insertion $1\frac{2}{3}$ in head; its division at a point two-thirds of its length, as in *purpurascens* and *owstoni* (Pl. I., fig. 3), but unlike *phantasma* in which the point of division is at one-third of the length (Pl. I., fig. 4), while in *mitsukurii* the clasper is rather short, bipartite, and the point of division situated halfway of its length. In a young specimen, which measures 42.5 centimetres in total length exclusive of the parts behind the dorsal notch and in which the cephalic organ is still embedded in the skin, the claspers measure 1.6 centimetres in total length and 1 centimetre in the length from the insertion to the point of division; they are already tripartite. In a young *phantasma* 35 centimetres long and with the cephalic organ still embedded in the skin, the claspers are still bipartite. In all the Japanese species I have found the anterior ventral

clasping organ armed with five spinous denticles on the inner side.

Teeth confluent; five or six rods in each anterior lamina of the upper jaw; the margin of the lamina sinuate and slightly convex; lateral rods behind the anterior lamina low, oblique, their tips directed towards the median part. Mandibular laminæ included within the upper laminæ; rods in the laminæ rather indistinct, margin of lamina with two concavities and more or less indistinctly sinuate. Peritoneum lining the body cavity unpigmented; wall of digestive canal of a dusky color.

Lateral canal of the sensory canal system straight almost



Lateral view of the head of a *Chimæra*, explaining nomenclature of the sensory canal system adopted. (After Mr. COLLINGE's nomenclature.) *Ju.*, Jugular branch; *L. C.*, Lateral canal; *Mx. Mn.*, Maxillo-mandibular branch; *Mx.*, Maxillary division of the maxillo-mandibular; *Mn.*, Mandibular division of the maxillo-mandibular; *S. or.*, Suborbital branch.

without any sinuation. It shows an interesting feature in the sub-orbital part. From the suborbital branch of the canal system

below the posterior margin of the eye, there branch off a maxillo-mandibular and a jugular branch sometimes at the same point (Pl. II., fig. 15), at other times the latter from the former (Pl. II., fig. 12), and at still other times the two separately from the suborbital (Pl. II., figs. 13 and 14). This variation may go so far that in one and the same individual the two branches, the jugular and the maxillo-mandibular, may arise at the same point on one side, while on the other side, the origin of the jugular may be shifted a greater or less distance along either the suborbital or the maxillo-mandibular branch as mentioned above. In *phantasma* and *mitsukurii* such variations seem never to occur. The origin of the jugular seems to be constant for each of the species. In *phantasma* it arises always from the suborbital (Pl. II., fig. 6), while in *mitsukurii* it is given off invariably from the maxillo-mandibular (Pl. II., fig. 16). So far as I was able to examine specimens of *jordani*, I came to the conclusion that in this species the points of origin of the maxillo-mandibular and of the jugular, whether the latter arises from the former or directly from the suborbital, are considerably nearer each other than in *phantasma* or in *mitsukurii* (cf. Pl. II., figs. 6, 12, 13, 14, and 16). Individual differences with respect to this part of the sensory canal system I have observed in *purpurascens* also (Pl. II., figs. I and 5).

Color in formalin uniformly dark brown; as Mr. OWSTON tells me, a female when brought in by a fish-monger was beautifully iridescent; one indistinct pale line above the lateral canal and three indistinct pale lines below it run parallel to one another in the posterior part of the body; posterior margin of the pectoral and ventral fins blackish; free margins of all other three fins with a more or less broad blackish band; color of second

dorsal fading out abruptly towards its base; numerous transverse series of dark dots above the lateral canal on the side of body as shown in the figure of the next species.

This species and the next are intermediate in many respects between *phantasma* and *mitsukurii*. According to our collector, KUMA, *phantasma* is taken with long line at a depth of two hundred and fifty to three hundred hiro¹⁾ in the fishing grounds near Misaki, Province of Sagami, and *mitsukurii* at a depth of three hundred to four hundred and fifty hiro in the same grounds. The ground off Inatori where *jordani* and *owstoni* have been taken is some five hundred or more hiro deep. From the ground of capture as well as from their dusky coloration and large eyes, the two species seem to be residents of deeper regions than either *phantasma* or *mitsukurii*. The male specimen here figured and a female are deposited as types in the museum of the Zoölogical Institute, Tokyo Imperial University.

To sum up, the species is characterized by the following points:—uniformly dark coloration; large eye; first dorsal spine showing rather distinct roughness, the same spine projecting out beyond the end of the anteriormost ray of first dorsal; large pointed pectoral; distinct anal; caudal filament as long as that of *phantasma*; height of caudal much greater than in *phantasma*; almost straight lateral canal.

The species is named after Dr. DAVID STARR JORDAN, of the Leland Stanford Junior University, in recognition of his extensive work on fishes of Japan.

The measurements of the species are as follows:

1) One hiro is a little less than five feet.

MEASUREMENTS

	MALE.			
Total length (exclusive of parts behind dorsal notch)	62.0	60.0	55.5	42.5
Length from dorsal notch to end of filament.....	28.0	23.5	23.5	25.0
Length of head (to first gill opening)	? 10.7	10.6	? 9.5	9.2
Height of head behind eye	8.9	9.0	8.8	6.5
Height of head in front of eye	8.15	7.5	7.15	5.5
Greatest height of body (in front of the posterior end of the insertion of first dorsal)	10.7	9.2	10.5	7.5
Long. diameter of eye.....	3.6	3.3	3.7	2.8
Diameter of pupil	1.65	1.7	1.6	1.2
Long. diameter of iris	3.1	3.0	2.9	2.2
Length of snout	4.1	5.7	4.4	4.4
Interorbital width	3.1	2.7	2.8	2.1
Length of dorsal spine	? 11.6	12.1	13.0	8.7
Height of anteriormost ray of first dorsal (exclusive of its fleshy base)	11.4	10.5	10.1	6.6
Height of highest part of second dorsal (measured perpendicular to upper margin of body)	2.3	2.3	2.2	2.0
Height of lowest part of second dorsal	1.5	1.85	1.55	1.7
Upper margin of pectoral (excl. of its fleshy base).	19.0	16.0	17.2	11.3
Breadth of pectoral at insertion of base	5.0	5.0	4.0	3.0
External margin of ventral (exclusive of its fleshy base)	9.0	8.1	7.6	5.8
Breadth of ventral at insertion of base	2.6	2.2	2.0	1.5
Height of upper lobe of caudal	1.25	1.1	1.2	1.1
Height of lower lobe of caudal	1.25	1.0	1.2	1.05
Length of cephalic organ.....	2.05	1.7	1.7	?
Length of clasper from its insertion	7.0	6.0	6.0	1.6
Length of clasper from insertion to the point of division	4.65	4.1	3.9	1.0
Distance between insertion of pectoral and that of ventral	20.0	18.0	18.5	12.0
Distance between insertion of the dorsal spine and that of pectoral.....	9.1	9.0	8.4	5.8
Distance between base of ventral and anal notch.	30.0	31.5	26.5	21.0

All the measurements are

OF THE SPECIES.

FEMALE.											
63.5	60.0	58.5	57.1	63.0	39.0	50.5	56.5	69.0	62.5	51.0	64.0
23.0	27.0	2.55	23.0	?26.0	22.5	23.5	28.5	?20.0	?	29.0	25.0
12.8	12.4	?11.9	12.0	12.6	8.1	10.4	11.8	?12.0	?12.9	11.1	?11.5
9.3	8.85	9.0	9.9	10.3	6.0	7.7	9.0	8.8	10.35	8.3	9.3
8.4	8.35	7.7	7.85	8.4	5.35	6.6	7.5	8.3	9.15	7.25	8.45
11.3	10.8	9.9	11.4	11.3	6.6	9.1	11.0	11.0	10.7	8.5	11.2
3.7	3.6	3.3	3.5	3.8	2.6	3.0	3.5	3.8	4.0	3.2	4.1
1.5	1.6	1.6	1.65	1.7	1.4	1.7	1.75	1.65	1.8	1.5	1.9
2.7	2.9	2.8	2.7	3.0	1.9	2.8	3.0	2.95	3.5	2.5	3.1
6.2	5.8	5.0	6.3	5.6	4.1	5.0	4.9	5.2	5.3	6.0	5.2
2.3	2.8	2.8	2.7	2.3	1.5	2.6	2.6	2.8	2.9	2.2	2.6
12.9	?10.8	12.5	12.7	?9.3	6.6	10.1	?9.8	12.2	12.0	9.4	12.6
9.9	10.5	10.5	10.9	10.0	5.5	7.7	9.6	10.0	9.4	7.1	10.5
2.7	2.5	2.0	2.6	2.7	1.8	2.5	2.8	2.6	2.2	2.3	2.3
2.2	1.95	?	1.8	1.75	1.3	1.8	1.9	2.0	1.7	2.0	1.8
16.6	16.2	15.7	16.1	17.2	10.3	13.1	15.8	16.6	16.5	13.5	16.9
5.1	4.3	4.3	4.8	5.0	2.3	4.0	4.0	4.1	4.8	3.2	4.8
8.9	8.9	8.0	8.6	9.2	5.4	6.7	8.3	8.6	8.5	6.2	9.5
2.8	2.6	2.3	2.3	2.6	1.4	1.8	2.2	2.5	2.5	1.9	2.6
1.45	1.65	1.65	1.65	1.8	0.97	1.45	1.55	1.7	?	?	1.3
1.3	1.5	1.45	1.45	1.55	1.0	2.7	1.25	1.5	?	?	1.3
—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—
21.0	20.0	19.0	18.5	18.8	10.5	15.6	18.5	20.5	20.0	16.0	21.5
8.9	9.1	8.8	8.6	9.5	5.5	7.3	8.6	8.0	9.2	7.5	9.3
31.0	30.0	29.0	26.0	30.0	19.5	25.0	28.5	32.0	29.0	25.0	30.0

in centimetres.

CHIMÆRA OWSTONI N. SP. Pl. I., figs. 2 and 3.

Of this species I have seen only two specimens, a male and a female, in which rather a robust body, minutely lateral canal undulating, distinct and falcate anal fin, very deep anal notch, and brown color with more or less indistinct pale spots or blotches are characteristic points. Description in detail is as follows:

Head measured from tip of snout to first gill-opening (snout being rather shortened after preservation) equal to greatest height of body in front of the posterior end of the insertion of first dorsal; both contained $4\frac{3}{4}$ in total length exclusive of the parts behind the dorsal notch; height of head in front of insertion of pectoral a little less than height of body; the height in front of eye $1\frac{3}{4}$ in height of body; snout 2, eye $3\frac{3}{4}$, inter-orbital $4\frac{1}{4}$ in head. Spine of first dorsal curved backwards, its length equal to that of head, longer than the anteriormost ray of first dorsal, its anterior surface smooth, keeled in the median line, its posterior surface for a little less than half its length with recurved spinules as strong as those of *phantasma*; anteriormost ray of first dorsal exclusive of its fleshy base $1\frac{1}{2}$ in head; free margin of the fin almost straight, subcontinuous to second dorsal by a fold of rayless skin; the distance between origin of second dorsal and insertion of pectoral a little less than the distance between the latter and insertion of ventral; free margin of second dorsal may be either gently convex or concave as shown in the figure; its posterior margin rounded, continuous to caudal lobe with a deep notch. Anal low, falcate, its notch opposite the dorsal notch and very deep; lower lobe of caudal higher than the upper, the former extending further

posteriorly than the latter; each lobe of caudal nearly as high as in *mitsukurii*; no tail filament as in *purpurascens*; pectoral pointed and slightly falcate, its tip reaching far behind insertion of ventral when depressed; ventral truncate at the free margin, its inner margin rounded, its insertion midway between tip of head and dorsal notch.

Lateral canal with fine sinuation which is not so apparent as in *phantasma*; from the insertion of ventral backwards for some distance, the sinuation grows somewhat more pronounced; maxillo-mandibular and jugular branches of the canal system arise at the same point from the suborbital branch. (Pl. II., figs. 8 and 10), or the latter directly from the suborbital at a point a short distance behind the maxillo-mandibular (Pl. II., fig. 2). Six rods in the anterior lamina of upper jaw; margin of the lamina sinuate and slightly convex; lateral rods behind the lamina low, oblique, their tips directed medianly. Each lamina of lower jaw with two concavities more or less sinuate in the margin. Peritoneum white; wall of the digestive canal whitish. The species has more a robust body than *jordani*.

There exists no difference in external features between the male and the female except in the sexual characters. Cephalic organ on the snout in front of eye, its inner surface armed with about seventy spinous denticles, its length $2\frac{1}{8}$ in eye length. Clasper tripartite, its length from insertion $1\frac{5}{8}$ in head, its division at a point about two thirds its length, its tip covered with fine shagreen skin; anterior ventral clasper with five spiny denticles on the median side.

Color in formalin dark brown, with lighter dot-like and elongate spots, often indistinctly vermiculate by the spots fusing together. This marking extends to head and to bases of pectoral

and ventral fins. On the side of body behind the ventral, three pale broad lines below the lateral canal and one above it. Dorsals, anal, caudal, and free margins of pectoral and ventral blackish; proximal parts of dorsals marked similarly as on the side of body; numerous transverse series of dark dots above the lateral canal on the side of body.

The male specimen here figured as the type is deposited in the museum of the Zoölogical Institute.

To sum up, the species has the following characters:—dusky coloration with lighter spots; great eye; rather robust body; spine of first dorsal with spinules as strong as those of *phantasma*, and projecting beyond the end of the anteriormost ray of first dorsal; large, pointed pectoral; no caudal filament; anal larger than that of *jordani*; lateral canal finely sinuate in the anterior part of body.

The species is named after Mr. OWSTON, the well-known naturalist of Yokohama.

MEASUREMENTS OF THE SPECIES.

	Male.	Female.
Total length (exclusive of parts behind dorsal notch)	71.0	69.0
Length from dorsal notch to end of caudal	? 22.5	14.5
Length of head (to first gill opening)	14.2	? 15.0
Height of head behind eye	12.6	13.1
Height of head in front of eye	11.1	11.9
Greatest height of body (in front of the posterior end of the insertion of first dorsal).....	14.7	14.5
Long. diam. of eye.....	4.25	3.9
Diameter of pupil	1.8	1.8
Long. diam. of iris.....	3.6	3.0

	Male.	Female.
Length of snout	7.0	7.2
Interorbital width	3.4	3.5
Length of dorsal spine	15.8	? 12.6
Height of anteriormost ray of first dorsal (exclusive of its fleshy base)	11.2	10.9
Height of highest part of second dorsal (measured perpendicular to upper margin of body)	2.8	3.4
Upper margin of pectoral (excl. of its fleshy base)	20.5	19.2
Breadth of pectoral at insertion of base	5.5	5.1
External margin of ventral (exclusive of its fleshy base).....	11.9	10.9
Breadth of ventral at insertion of base	2.9	2.8
Height of upper lobe of caudal	1.4	1.35
Height of lower lobe of caudal	1.8	1.75
Length of cephalic organ	2.0	—
Length of clasper from its insertion	8.5	—
Length of clasper from insertion to the point of division...	5.2	—
Distance between insertion of pectoral and that of ventral...	24.0	24.0
Distance between insertion of the dorsal spine and that of pectoral	11.6	10.3
Distance between base of ventral and anal notch	33.5	31.5

All the measurements are in centimetres.

*Synopsis of Species of Chimæra in the Waters
of Japan.*

I. Anal notch present. (With two dorsal fins. Claspers long, tripartite.)

a) Caudal filament present, moderate in length.

1) Distance between insertion of clasper and its point of division almost one half that between the latter and tip of clasper; spinous roughness of dorsal spine distinct; color silverly, with two longitudinal bands near

back, and one less distinct band along the lateral canal.....*phantasma*.

- 2) Distance between insertion of clasper and its point of division almost twice that between the latter and tip of clasper; spinous roughness of dorsal spine less distinct; anal notch deeper; color uniformly dark brown, with four indistinct bands in the posterior part of body.....*jordani*.

b) No caudal filament.

- 3) Distance between insertion of clasper and its point of division nearly twice that between the latter and tip of clasper; spinous roughness of dorsal spine as distinct as in *phantasma*; anal notch deeper than in *jordani*; color brown, distinctly marbled with small pale spots, with four indistinct lighter bands in the posterior part of body.....*owstoni*.

II. No anal notch. (Two dorsal fins.)

a) Claspers rather short, bipartite. Caudal filament very long.

- 4) Point of division of clasper in the middle of its length; spinous roughness of dorsal spine rather indistinct; color whitish with dusky parts here and there.....
.....*mitsukurii*.

b) Claspers long, tripartite. No caudal filament.

- 5) Distance between insertion of clasper and its point of division nearly twice that between the latter and tip of clasper; spinous roughness of dorsal spine very indistinct; color uniformly deep purple...*purpurascens*.



S. TANAKA.

ON TWO NEW SPECIES OF CHIMÆRA.

PLATE I.

Explanation of Plate I.

- Fig. 1. Lateral view of *Chimaera jordani* N. SP. About $\frac{2}{3}$ nat. size.
- Fig. 2. Lateral view of *Chimaera owstoni* N. SP. About $\frac{2}{3}$ nat. size.
- Fig. 3. Ventral view of the claspers of *Chimaera owstoni*. About $\frac{2}{3}$ nat. size.
- Fig. 4. Ventral view of the claspers of *Chimaera phantasma* JORDAN & SNYDER. About $\frac{2}{3}$ nat. size.

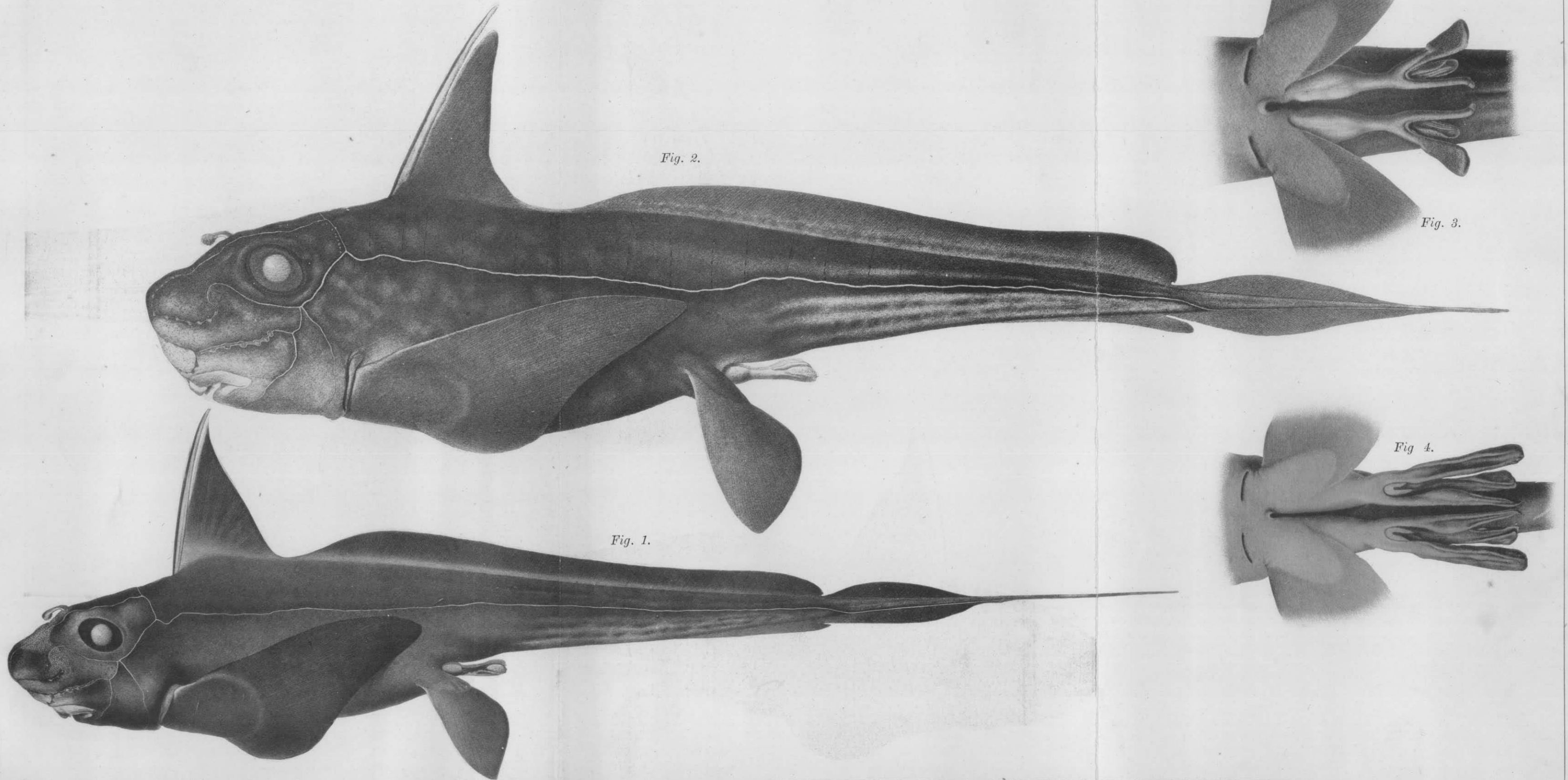


Fig. 2.

Fig. 3.

Fig. 1.

Fig. 4.

S. TANAKA.

ON TWO NEW SPECIES OF CHIMÆRA.

PLATE II.

Explanation of Plate II.

Course of the sensory canal system in the *Chimæra* of Japan. All the lines have been traced on paper placed on the specimens themselves.

Figs. 1-4. Several parts of the canal system taken successively from anterior parts of the left side of *Chimæra purpurascens*. Fig. 3. Lateral canal above insertion of ventral fin.

Fig. 5. Anterior part of the canal system on the left side of another specimen of *purpurascens*.

Figs. 6-7. Anterior parts of the canal system on the left side of *Chimæra phantasma*.

Figs. 8-9. Anterior parts of the canal system on the left side of *Chimæra oustoni*.

Figs. 10-11. Anterior parts of the canal system on the right side of the same individual as above.

Figs. 12-15. Anterior parts of the canal system in four individuals of *Chimæra jordani*.

Fig. 16. Anterior parts of the canal system on the left side of *Chimæra mitsukurii*.

