

Kyoto University  
Seto Marine Biological Laboratory  
Seto, Japan

海洋生物

KYOTO UNIVERSITY

PUBLICATIONS

OF

THE SETO MARINE BIOLOGICAL LABORATORY

No. 1

CONTRIBUTIONS TO THE JAPANESE ASCIDIAN FAUNA.

I. ASCIDIANS COLLECTED BY PROF. MIYADI AND MR. MASUI  
DURING THE BOTTOM SURVEY 1939-40.

BY

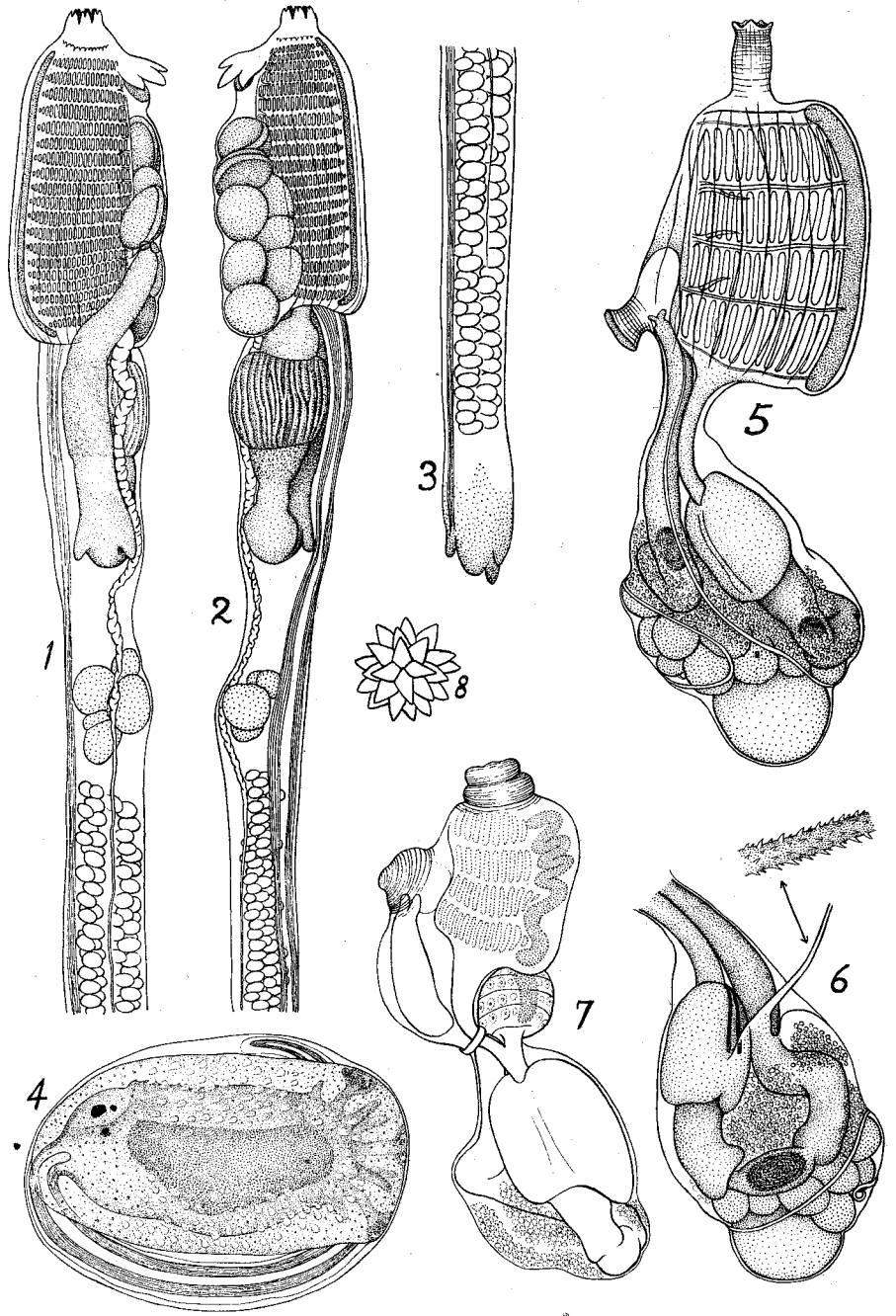
TAKASI TOKIOKA

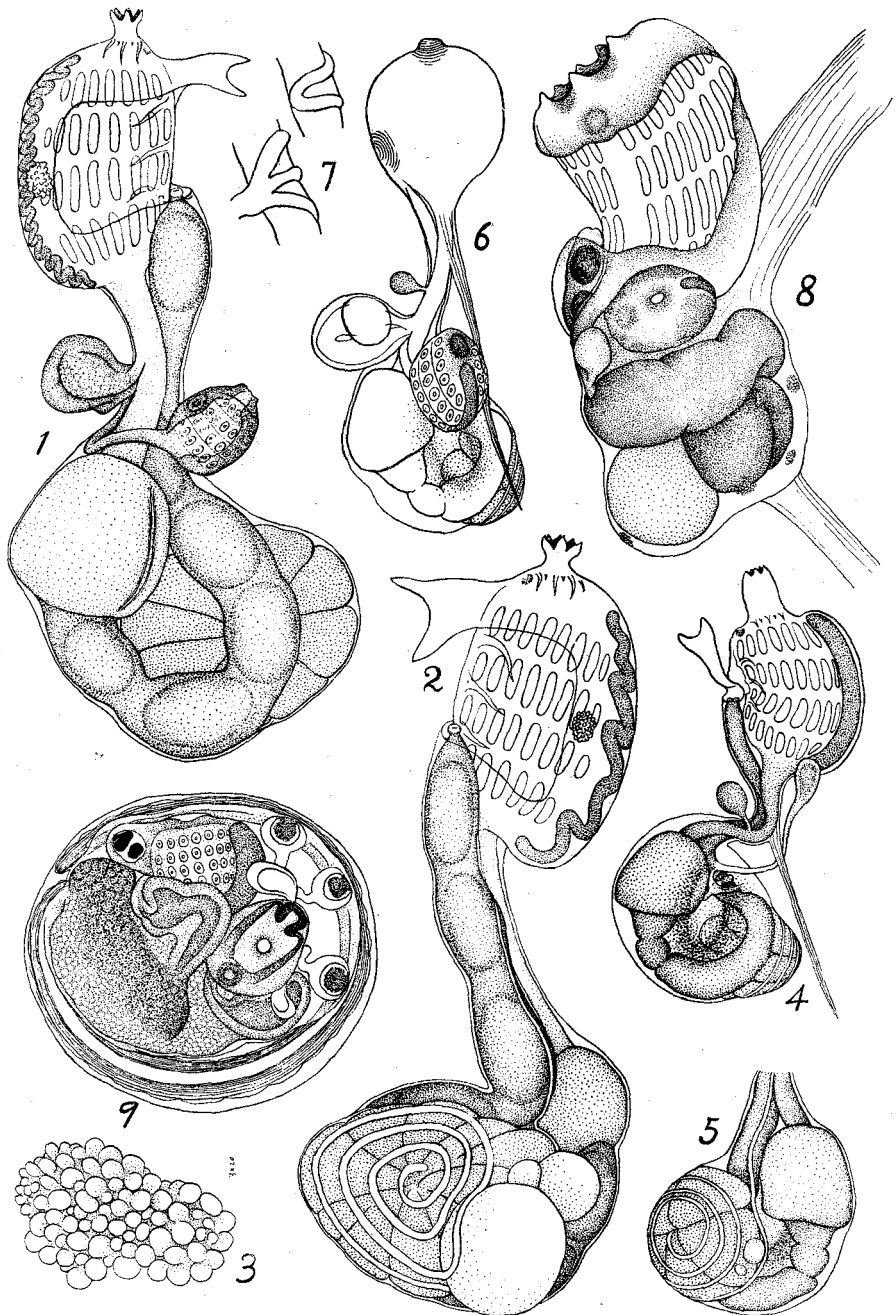
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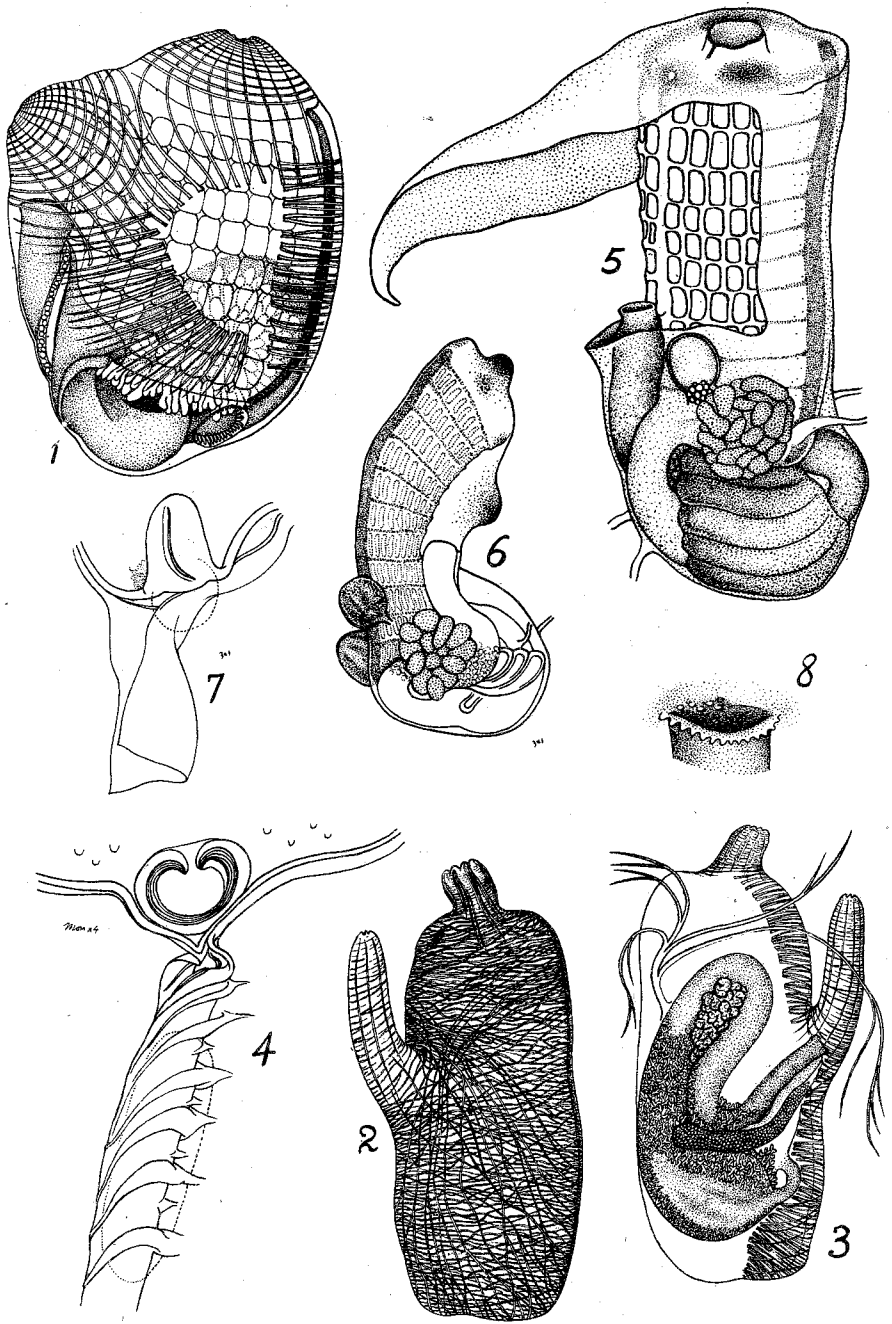
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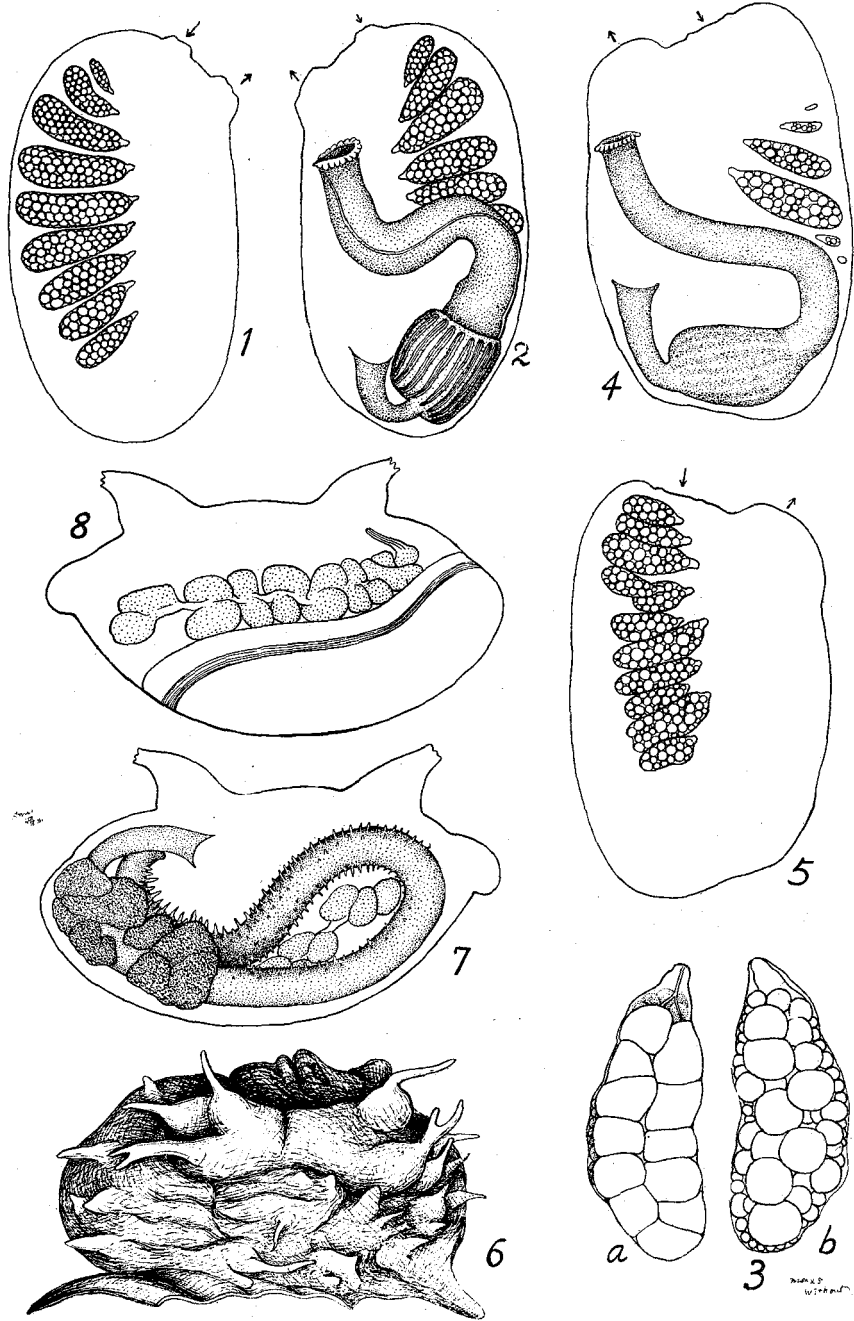
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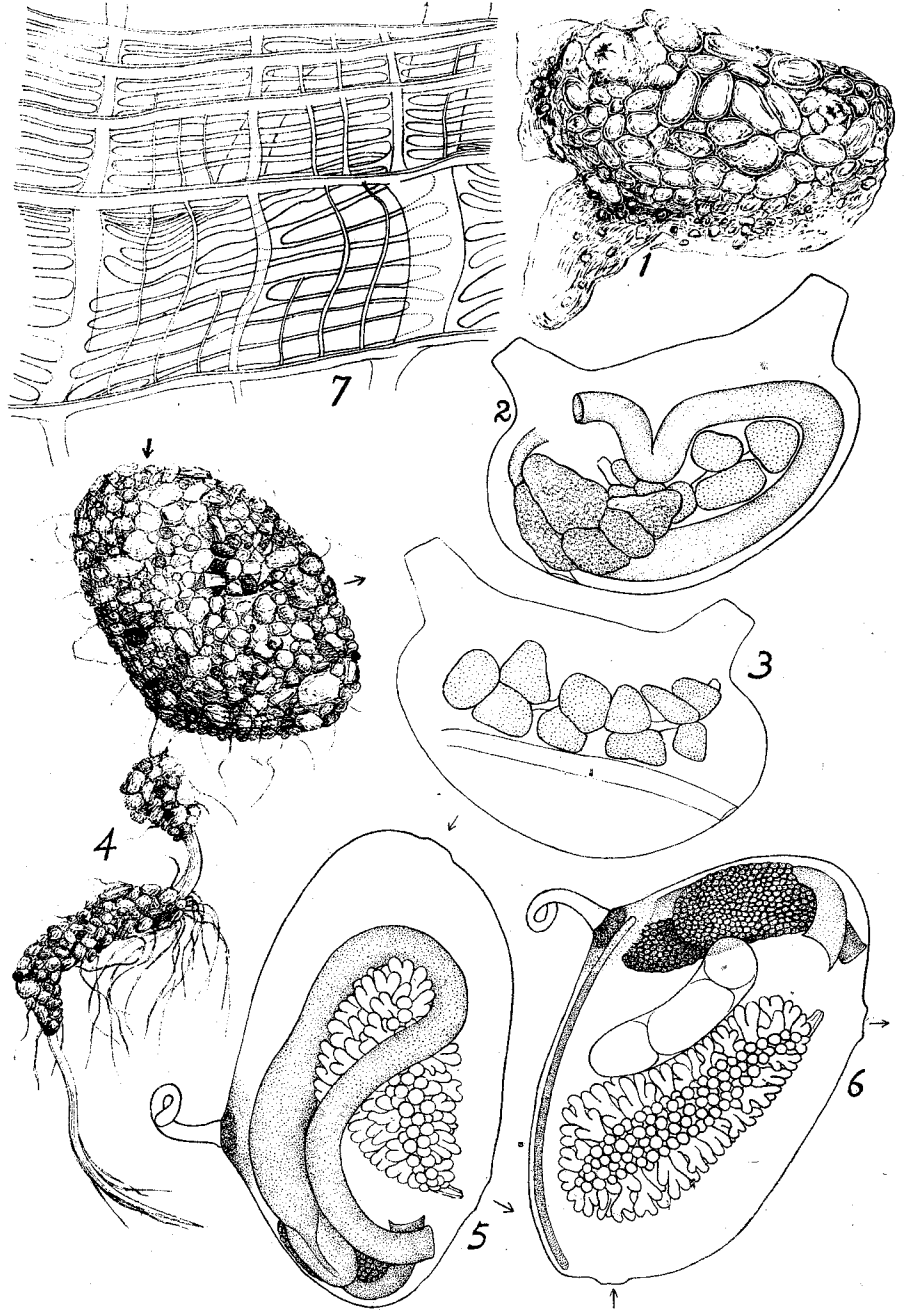
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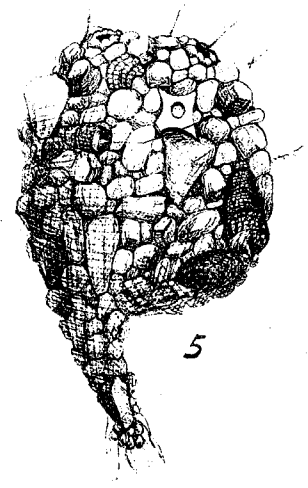
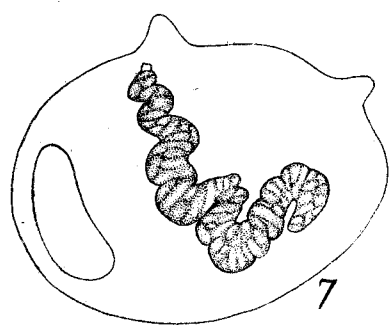
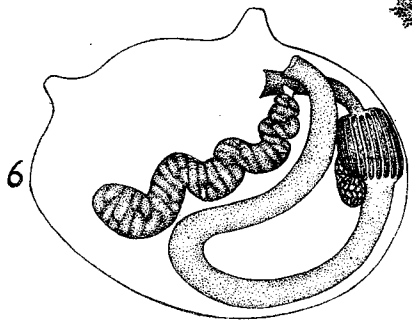
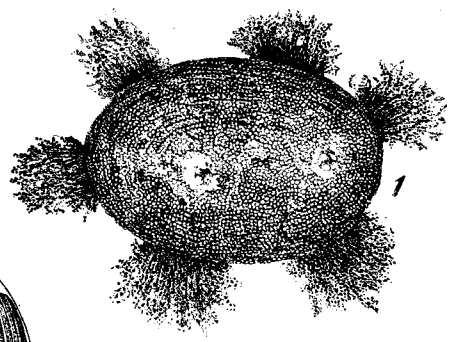
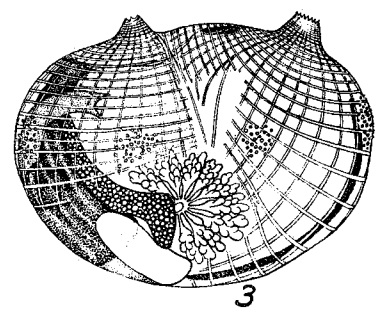
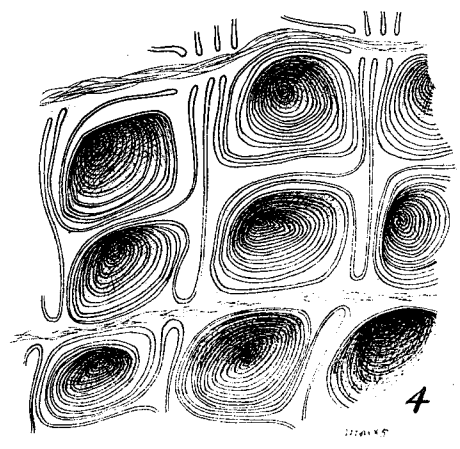
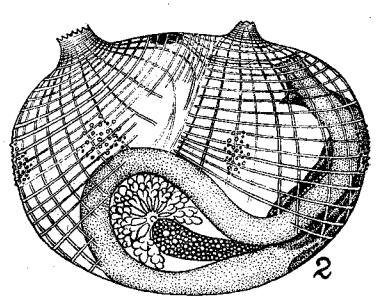


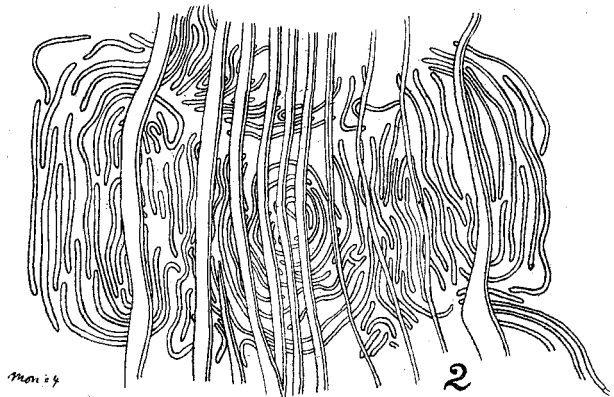
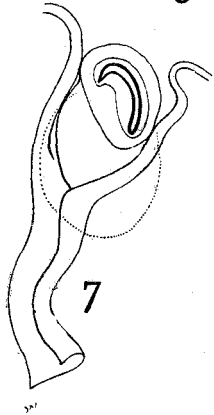
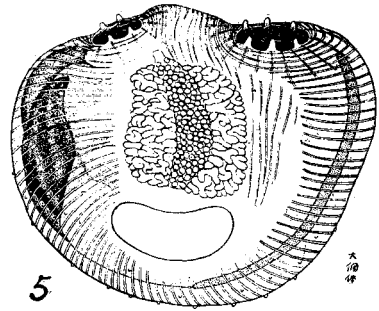
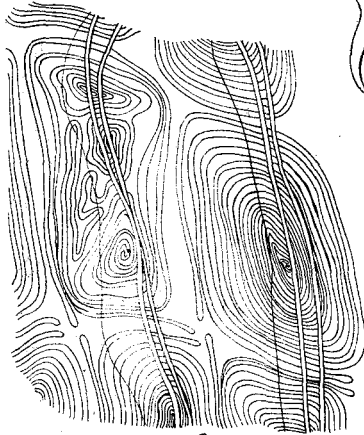
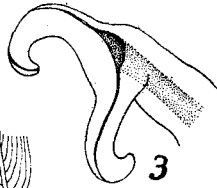
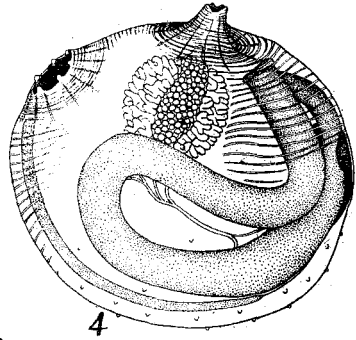
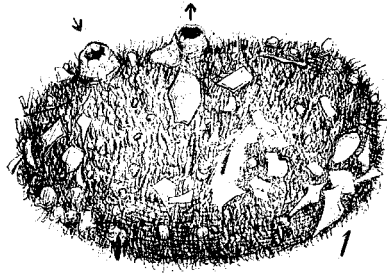














## CONTRIBUTIONS TO THE JAPANESE ASCIDIAN FAUNA.

### I. Ascidians collected by Prof. Miyadi and Mr. Masui during the bottom survey 1939-40.

Takasi Tokioka.

Seto Marine Biological Laboratory.

Before going further, I express my hearty thanks to Prof. D. Miyadi and the late Mr. T. Masui for their kindness offering me the present material, to Prof. T. Komai for his kind guidance and incessant encouragement and to the late Prof. A. Oka for his kind grant lending me his valuable literatures which unfortunately, much to my regret, were completely reduced to ashes during the war. I have received some financial aids from the National Research Council of Japan for the course of the present study.

#### Polyclinidae:

##### 1. *Amaroucium japonicum* n. sp. (Pl. l. figs. 1-4)

One colony consisting of two cormidia, respectively 22 mm. diameter  $\times$  30 mm. height and 10 mm. d.  $\times$  30 mm. h. Test yellowish brown. The distal surface of the cormidium is soft, but other parts, especially the basal portion, are somewhat hard and covered sparsely with sand grains. A system with a central cloacal aperture is found in each of grooves on the distal surface. Zooid reddish orange; this colour is conspicuous in embryos, ova, stomach and the initial portion of the intestine. Expanded zooid may measure 17.5 mm. long, post-abdomen may be 2 times as long as thorax + abdomen when it is well developed.

Thorax: Branchial aperture 6-lobed; atrial languet rather short, with a tip cut into three lobes. Slender mantle musculature of thorax continues posteriorly to a pair of longitudinal muscles along abdomen and post-abdomen. Branchial sac is slightly longer than the abdomen, with 19 rows of stigmata which are elongate and arranged ca. 15-20 in a row. Tentacles 15-20 in number, 3 of which are especially large. The middle one of the three is situated on

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the dorso-median line. Ciliated groove small and ovate. Row of dorsal languets is situated slightly left to the dorso-median line. Usually embryos, up to 9, are found in atrial cavity.

Abdomen: Oesophagus short; stomach wall with many longitudinal folds, about 20 on the right side only. Mid-intestine is divided by a constriction into two portions. A prominent caecum is present at each side of the beginning point of the rectum. Rectum wall at the level of the stomach is provided with many fine folds which may be of the character of the circum-intestinal gland. Anus situated at the level of the 15th transverse vessel, bilobed and with small thickened lips.

Post-abdomen: Ovary located slightly nearer the testis than the intestinal loop. Testicular follicles arranged in a paired rows.

Locality: Matoya Bay, St. 18.

This new species is most closely related with Am. crateriferum SLUITER from the Malay and Philippine waters in the number of rows of stigmata and the shape of the atrial languet, but differs distinctly from the latter in having much more folds on stomach and caeca on intestine.

Didemnidae:

## 2. *Didemnum (Polysyncraton) aspiculatum* n. sp.

(Pl. 2, figs. 1—3)

One colony of 50 mm. × 70 mm. area with less than 3 mm. thickness. Round cloacal apertures, ca. 2—3 mm. in diameter, are found here and there on the surface, although the system is indistinct. Test thin and transparent, calcareous spicule absent. Zooid grayish brown, measuring about 2,5 mm. long when it is well preserved. Thorax is surrounded by lacunae leading finally to cloacal apertures, while the abdomen is embedded in test. Long neck-region separates the thorax widely from the abdomen.

Thorax: Branchial aperture 6-lobed; atrial aperture a huge opening longer than half the branchial sac and extending beyond halfway across the side, with prominent languet ending in a bifurcated tip. Thoracic organ on the inner surface of the thoracic mantle of

each side, containing a granulated calcareous concretion within it. About 10 stigmata in each of 4 rows. Tentacles about 12 in number, 3 large+2 moderate+7 small for instance. Ciliated groove small and oval. Row of long finger-shaped dorsal languets situated slightly left to the dorso-median line.

Abdomen: Oesophagus very long; stomach smooth-walled; mid-intestine indistinct.

Intestine figures behind the stomach a loop situated somewhat horizontally. Circum-intestinal gland is present, though it is very hard to discern. Anus opens at the level of the 3rd transverse vessel and is bordered with thickened margin. Testicular follicles are 5-7 at a superficial glance, but much more ones (11-12) may be found if dissected carefully. Vas deferens coils  $3\frac{1}{2}$ — $4\frac{1}{2}$  times; ova situated aside the testis. Bud of thorax and that of abdomen are formed near the mid-way of the oesophagus.

Locality: Matoya Bay, St. 18.

I cannot believe that the absence of the calcareous spicule is due to the acidity of the formalin in which the present specimen is preserved. for the calcareous concretion in the thoracic organ is preserved finely. The absence of the spicule and the wide atrial aperture are the characteristics of the present new species.

### 3. *Didemnum* (*Polysyncraton*) *simaensis* n.sp.

(Pl. 2, figs. 4—7)

A colony of 15 mm. × 9 mm. area with 2-2.5mm. thickness. Test yellowish white, semitransparent, with very smooth and glistening surface. It is somewhat frothy and contains many spindle-shaped cells, but none of the calcareous spicules. Zooid measures ca. 1.5mm. long; both thorax and abdomen are embedded firmly in test. Neck-region moderate.

Thorax: Branchial aperture 6-lobed; atrial aperture situated near the middle of the thorax, with long languet ending in a bifurcated tip. About 8 stigmata in each of 4 rows. Tentacles ca. 12, comprising large and small ones. Dorsal languets finger-shaped.

Abdomen: Oesophagus of moderate length; stomach smooth-walled; mid-intestine distinct and consisting of two chambers; simple circum-intestinal gland on rectum at the level of the stomach. Anus situated at the level of the 3rd transverse vessel and bordered with thickened margin. Testicular follicles 5-8, vas deferens coils 3-4 times. Budding on oesophagus as in the preceding species.

Locality: Matoya Bay, St. 5.

I cannot take up the absence of the calcareous spicule as an important characteristic in this species. Sima is the name of the province comprising the locality.

#### 4. *Leptoclinides komaii* n.sp. (Pl. 1, figs. 5-8)

One colony of 40mm. × 25 mm. area with 3-5 mm. thickness. Test pale flesh in colour, rather compact and containing minute (10-20  $\mu$  in diameter) stellate calcareous spicules sparsely in surface layer only. Zooid measures 4 mm. long; it is thoroughly colourless excepting ova which are somewhat yellowish.

Thorax: Branchial siphon rather long, aperture 6-lobed. Atrial aperture situated near the postero-dorsal corner of the thorax and projected backwards. About 11-13 elongate stigmata in each of 4 rows. Tentacles 24 in number, arranged in the following formula: large-small-moderate-small-large. Row of finger-shaped dorsal languets situated slightly left to the dorso-median line. Ciliated groove is minute and oval in shape.

Abdomen: Oesophagus of moderate length; stomach smooth-walled; mid-intestine divided by a distinct constriction into two portions; rectum with a sharp curve at the level of the pyloric end of the stomach; anus opens at the bottom of the thorax and is provided with two lobes. Testicular follicles up to 20-24; vas deferens figures merely a loop at its initial portion. A conspicuous constriction occurs on the mid-way of the neck-region and a bud of thorax is formed on oesophagus behind this constriction. The anterior half of the body in front of the constriction degenerates gradually and at last is cut off at the constricted point. The posterior half, however,

remains functional as an abdomen for the newly formed thorax on oesophagus. This is the way of recreating the colony.

Locality: Matoya Bay, St. 24.

This new species resembles Polysyncraton dubium SLUITER, especially the Philippine specimens described by Van Name, in the morphology of the alimentary canal and branchial sac as well as in the shape of the calcareous spicule, but differs from the latter in having much more testicular follicles and the vas deferens not coiled so much.

##### 5. Leptoclinum okai n. sp. (Pl. 2, figs. 8—9)

Many colonies on leaves of Zostera and on stem of a certain species of sea weeds, measuring 9 mm. × 7 mm. area in the largest specimen, with ca. 2 mm. thickness. Test semitranslucent and containing many groups of bladder cells in surface layer. Bottom layer contains many ova and embryos. Zooid measures ca. 1.5 mm. long and coloured dark brownish violet at several parts of body.

Thorax: Branchial siphon indistinct, aperture is bordered with 6 lobes marked with dark coloured spots in some specimens; atrial aperture is so large that thoracic mantle covers merely the small areas at the anterior and ventral extremities of the thorax. About 7-11 elongate stigmata in each of 4 rows. Tentacles 16, arranged large-small-small-small-large. Ciliated groove small and ovate. Dorsal languets very long.

Abdomen: Stomach, thick mid-intestine and two globular testicular lobes are covered with epithelium pigmented darkly. Anus bilobed. Budding occurs on the posterior part of the oesophagus. Embryo just before hatch contains two zooids and four buds in its trunk.

Locality: Matoya Bay, St. 24 and 110.

The present Japanese species related most closely with Diplosoma listerianum MILNE-EDWARDS known from the European waters and Diplosoma pizoni RITTER AND FORSYTH from Californian Coast. Differences between these species are rather minute, although the individuality of each species is impressed strongly when we compare

the general configurations of these species one another.

Agnesiidae :

**6. *Agnesia himeboja* OKA 1915** (Pl. 3, fig. 1)

The present specimens differ from those from Tateyama (Oka 1915) in having 6 lobes around the branchial aperture in place of 7 in the original specimens. The branchial sac is provided with 12 (exceptionally 13) transverse rows of infundibula, each of which comprises 11-13 infundibula. Stigmata coils  $3\frac{1}{2} \sim 5-6$  times.

Tentacles 32-53, the dorsal uniting portion of the peripharyngeal bands figures a complex configuration. A curious elliptical depression is found regularly on the outer surface of the mantle behind the endostyle on the right side.

Locality: Matoya Bay, St. 10, 11, 27, 76, 78, 80, 88, 92. Nanao Bay, St. 14, 20, 21, 37, 48, 52, 88, 140.

Asciidiidae :

**7. *Ascidia matoya* n. sp.** (Pl. 3, figs. 2-4)

The largest specimen measures 33mm. long  $\times$  19 mm. broad. Test gelatinous and soft, transparent and colourless; surface with many hairy processes adhering various objectives. The animal attaches to the substratum by its whole left side. Branchial siphon is terminal and bordered with 8 lobes which are marked distinctly by ocelli. Somewhat long atrial siphon is situated at the middle of the dorsal edge and provided with 6 lobes marked by ocelli. Mantle thin and transparent, musculature on the right side consists of many transverse muscles and somewhat fewer longitudinal or oblique ones.

Branchial sac: Tentacles 50-60 in number, comprising large, moderate and small ones. Dorsal ganglion apart from the dorsal tubercle about half of its own length. Ciliated groove U-shaped, with terminals incurled slightly. Dorsal lamina, a broad membrane; transverse ribs projecting slightly the edge. Branchial sac extends the entire length of the animal. Internal longitudinal vessels bear papillae at their intersections with the transverse vessels. Papilla has a bulge on the concave surface. Meshes rectangular, about 9-10

stigmata in one plication (consequently in a mesh) at the central part of the branchial sac.

Alimentary system: Mouth of oesophagus about one fourth the length of branchial sac from the posterior end. Stomach large and smooth-walled, gradually tapering to intestine. Anterior end of intestinal loop beyond the level of the atrial siphon as far as a half the distance between the bases of both siphons. Margin of anus smooth.

Gonad: Ovary consisting of many lobes and situated in intestinal loop. Testicular follicles spread on stomach and intestine.

Locality: Matoya Bay, St. 58, 76, 78, 80, 85, 87, 89, 92, 94.

The present species resembles Ascidia depressiuscula HELLER in the arrangement of alimentary canal and the number of stigmata in a mesh, but differs from it distinctly in the level of the anterior end of the intestinal loop and the margin of the anus which is fringed with lobules in the latter species. Ascidia californica RITTER and FORSYTH is also related closely to the present species, although the former shows the characteristic pectination on the margin of the atrial lobes and has much fewer stigmata in a mesh than the latter.

#### Botryllidae:

##### **8. Botrylloides violaceum OKA 1927 (Pl. 3, figs. 5—6)**

One colony of 35 mm. × 35 mm. area with 2-3 mm. thickness. Test thin and transparent; several coloured spots around the margin of the cloacal apertures. Zooid measures 2.5 mm. long. Mantle rather thick, sprinkled with brownish violet or sepia pigments. Branchial aperture round and margined smoothly; atrial aperture a huge opening, with a large triangular languet.

Branchial sac: Branchial sac with 12 rows of stigmata which are 8-9 in a row and arranged between inner longitudinal vessels as D. 2. 2-3. 2. 2. V. Tentacles 15-16; 4 large, 4 moderate and 7-8 small ones. Ciliated groove elliptical and situated longitudinally. Dorsal lamina, a plain membrane.

Alimentary system: Stomach with distinct folds and a small caecum, circumintestinal gland is present. Anus situated at the level of the 8th transverse vessel, margin smooth.

Gonad: Testis consists of many follicles, ovary situated at the anterodorsal side of the testis. A bud is formed at the ventral side of the testis on each side.

Another colony of 10 mm. × 9 mm. area comprises zooids coloured reddish-brownish orange. Stigmata are 11-16 in a row and arranged as D. 3-5. 2-3. 2. 4. V for instance.

Locality: Matoya Bay, St. 5 and 54.

Styelidae:

9. *Cnemidocarpa* (*Cnemidocarpa*) *miyadaii* n.sp.

(Pl. 4, figs. 1-3)

Two specimens of 8-9 mm. long × 6 mm. broad. Surface covered densely with fine sand. The animal lies the left side down. Fine long hairy processes along the ventral side of the left side. Both apertures indiscernible. Mantle musculature consists of surface transverse muscles and longitudinal or oblique muscles running under them. Both siphons 4-lobed; the branchial subterminal, the atrial situated near the branchial and slightly larger than it. 11-17 atrial tentacles around the internal margin of the atrial siphon.

Branchial sac: Inner longitudinal vessels arranged as follows:

Specimen 1. left D. 0 (7) 2 (4) 3 (9) 2 (6) 3 V.

right D. x (3+x) 2 (7) 3 (7) 3 (5) 3 V.

Specimen 2. left D. 0 (8) 2 (3) 4 (7) 3 (5) 3 V.

right D. 0 (12) 0 (9) 2 (7) 2 (5) 2 V.

True transverse and parastigmatic vessels are arranged alternately; stigmata elongate. Tentacles 22-23, consisting of large, moderate and small ones. Dorsal lamina, a plain membrane. Ciliated groove C-shaped.

Alimentary system: Stomach situated at the postero-ventral side of the body, 9 folds counted on the right side; a ridge along S-coursed intestine; the margin of the anus faintly cut into 4 lobes in a specimen, while fringed with 16 lobules in the other.

Gonad: 4-6 on the left, 7-9 on the right. Ova occupy the free surface of the gonad, testicular follicles are arranged in two rows on



the attachment side.

Locality: Hakata Bay.

10. *Cnemidocarpa (Cnemidocarpa) masuii* n. sp.

(Pl. 4, figs. 4—5)

Two specimens, respectively 9mm. and 13mm. long. Test rather thick, surface covered densely with fine sand. Many fine and long hairy processes on the ventral and the posterior sides. Apertures indiscernible. Mantle rather thick, adhering firmly to test; whitish yellow in colour. Both siphons 4-lobed; the branchial terminal, the atrial subterminal. Atrial tentacles slender.

Branchial sac: Inner longitudinal vessels arranged as follows:

Specimen 1. left	D. 0 (6) 0 (5) 0 (7) 1 (5) 1 V.
right	D. 1 (8) 0 (8) 0 (9) 0 (6) 0 V.
Specimen 2. left	D. 0 (7) 0 (8) 0 (7) 0 (7) 0 V.
right	D. 0 (7) 0 (6) 0 (9) 1 (5) 2 V.

True transverse and parastigmatic vessels are arranged alternately; stigmata elongate. Tentacles 22-28, consisting of large, moderate and small ones. Dorsal lamina, a plain membrane. Ciliated groove, a simple groove slightly undulated. Many fine papillae arranged in a circular zone in front of the tentacular band.

Alimentary system: Stomach situated at the posterior end; surface smooth, although the folded structure of the stomach epithelium can be seen through the wall. Intestine runs rather straightly; anus is fringed with many lobules.

Gonad: 5-6 on the left, 7-11 on the right. Each gonad as in the preceding species.

Locality: Matoya Bay, St. 14 and 48.

The differences between the two Japanese *Cnemidocarpae* are seen most distinctly in the appearance and the arrangement of the alimentary canal, the shape of the ciliated groove and in the formula of the inner longitudinal vessels of the branchial sac. The plication II on the left side is less developed in *Cn. miyadaii*, while it is developed as well as the others in *Cn. masuii*.

Pyuridae :

11. *Pyura lepidoderma* n. sp. (Pl. 5, figs. 1—3)

A small specimen of 9 mm. long × 6.5 mm. broad, with 6 mm. height. Test yellowish brown, with a faint orange tint around the apertures. It is thick and strong; surface covered with many horny plates. Apertures 4-lobed and roughly terminal, not projected; the atrial smaller than than the branchial. The animal attaches by the left ventral side. Mantle very thick; the ventral half whitish yellow measuring 0.5 mm. thick, while the dorsal half is reddish. Branchial siphon terminal, atrial siphon subterminal. The inner surface of the siphons is pretty orange. Atrial velum well developed.

Branchial sac: 6 folds on both sides. Inner longitudinal vessels arranged as follows:

left D. 0 (9) 1 (14) 1 (14) 2 (13) 2 (12) 2 (7) 1 V.

right D. 0 (11) 1 (12) 1 (14) 2 (13) 2 (10) 1 (5) 1 V.

Transverse vessels arranged: large - parastigmatic - small - parastigmatic - large. 2-3 stigmata between longitudinal vessels. Tentacles 12, large and moderate, excluding minute ones; branches 1 order. Ciliated groove U-shaped, with the right terminal incurled.

Alimentary system: Liver consisting of several lobes aggregated compactly; rectum with a sharp curve as shown in the figure; anus smoothly margined.

Gonad: Arranged as in common Pyurids.

Locality: Matoya Bay, St. 18.

12. *Pyura aspera* n. sp. (Pl. 4, figs. 6—8)

One specimen of 28 mm. long × 17 mm. broad, with 17 mm. height. Test cartilaginous, whitish and semitransparent, with a reddish tint around the apertures. It is 1.5 mm. thick; inner surface white. Apertures situated at terminals of the narrow area bordered by deep grooves on the dorsal side, which are provided with many acute processes. The animal attaches by its left ventral side. Mantle thin and adhering firmly to test; it is pinkish as a whole, with a pretty red colour at the tips of the siphons. Musculature

feeble, conspicuous only around the bases of the siphons. Siphons 4-lobed, the branchial situated about one fourth the length of the animal from the anterior end, the atrial about one third the body length from the posterior end. Atrial velum well developed.

Branchial sac: 6 folds on both sides; inner longitudinal vessels as follows:

left    D. 2 (17) 2 (16) 2 (17) 2 (18) 2 (15) 2 (11) 2 V.  
right   D. 2 (17) 2 (16) 2 (17) 2 (17) 2 (15) 2 (13) 2 V.

Transverse vessels in the central portion arranged as: large-small-moderate-small-large. Parastigmatic vessels present. About 6 stigmata between longitudinal vessels. Tentacles about 30 excluding minute ones. Dorsal tubercle rosette-formed; ciliated groove U-shaped with terminals incurled strongly.

Alimentary system: Yellowish hepatic lobes are divided into anterior and posterior groups; rectum with many slender protuberances on the surface; anus smoothly margined.

Gonad: As in common Pyurids.

Locality: Matoya Bay, St. 85.

### 13. *Hartmeyeria longistigmata* n. sp.

(Pl. 5, figs. 4—7)

Ten specimens up to 11 mm. long. Test rather thin, covered sparsely with sand grains. Apertures indiscernible. Rhizom 2—2½ times the body length when it is long; tip free from sand grains. Long hairy processes on the left side of the body and on rhizom. Mantle yellowish brown, thick; musculature well developed, with longitudinal and transverse muscles arranged nicely. Siphons extremely short and 4-lobed; the branchial subterminal, the atrial about one fourth the body length from the posterior end of the body.

Branchial sac: 6 folds on both sides, inner longitudinal vessels as follows:

left    D. 0 (10) 0 (1) 0 (9) 0 (8) 0 (8) 0 (4) 0 V.  
right   D. 0 (10) 0 (1) 0 (10) 0 (9) 0 (8) 0 (6) 0 V.

Two rudimentary infundibula between large transverse vessels under the fold. Stigmata in folded regions long and straight as in intermediate regions. Tentacles arranged on a sort of velum, consisting of 7-8 large ones and small or minute ones situated between the large members; branches 1 order. Ciliated groove C-shaped. Dorsal lamina, a plain membrane.

Alimentary system: Stomach is slightly thicker than the intestine; liver consisting of distinct lobules; anus margined smoothly. Excretory organ present.

Gonad: Ovary centered and testis marginal; the left gonad situated partly in intestinal loop, the right one along the excretory organ.

Locality: Matoya Bay, St. 23. Nanao Bay, St. 87.

The present new species differs from *H. orientalis* OKA in the following characteristics: 1...siphons indistinct, 2...stigmata straight under the folds, consequently infundibula rudimentary, 3...liver distinct, 4...excretory organ present.

#### Molgulidae:

#### 14. *Eugyra* (*Gamaster*) *japonicus* OKA 1934 (Pl. 3, figs. 7—8)

Many individuals up to 12 mm. long. The following features of the present specimens may be worthy ~~to~~ note: 1...dorsal tubercle with a simple longitudinal ciliated groove, 2...dorsal lamina two plain membranes, one of which much more developed than the other, 3...the free margin of the anus fringed with ca. 15 lobules.

Locality: Nanao Bay, St. 19, 32, 33, 35, 38, 40, 42, 47, 50, 54, 62, 64, 65, 66, 71, 72, 73, 78, 79, 80, 86, 92, 152.

#### 15. *Eugyra* (*Eugyrioides*) *asamusi* OKA 1930

Many individuals up to 17 mm. long. Branchial aperture 4,5 or 6-lobed; atrial aperture always 4-lobed. Dorsal lamina usually a plain membrane, though it may be consisting of two membranes of

equal or unequal height in some individuals.

Locality: Matoya Bay, St. 23, 32, 42, 58, 76. Nanao Bay, St. 21, 26, 34, 47, 51, 60, 69, 70, 74, 81, 133, 145, 148, 149.

**16. Eugyra (Eugyrioides) hexarhiza n. sp.**

(Pl. 6, figs. 1—4)

Many individuals up to 10 mm. long. Body spherical or slightly oblong. Surface covered with fine sand grains. The animal lies the ventral side down, regularly with conspicuous 6 tufts of hairy processes around the body. Apertures distinct, but not prominent.

Mantle thin, with weak musculature arranged nicely. Branchial siphon subterminal and 12-lobed (probably 6 lobes, each divided into 2 lobules), atrial siphon about one third the body length from the posterior end and 4-lobed. 6 groups of small protuberances are found around the body, just opposite the tufts of hairy processes.

Branchial sac: Inner longitudinal vessels 7, longitudinal row of infundibula consisting of 8 ones under each inner longitudinal vessel and between the first vessel and the dorsal lamina which is a plain membrane. wide non-stigmata area along both sides of endostyle. Two infundibula between transverse vessels. Infundibulum very prominent, comprising two stigmata coiled spirally 4-5 times.

Tentacles of two types: ca. 20 dendritical and ca. 30 small finger-shaped (rarely bifurcated) ones, the latter situated slightly in front of the former. Ciliated groove is an oval opening placed longitudinally.

Alimentary system: Liver longitudinal folds, greenish black; the margin of the anus smooth or fringed with faint lobules.

Gonad: The left gonad in intestinal loop, the right one along the dorsal side of the stomach and the excretory organ. Ovary elongate; testis situated at the anti-orifice of the ovary and consisting of many lobules arranged stellarly.

Locality: Matoya Bay, St. 10, 11, 15, 23, 32, 35.

6 tufts of hairy processes around the body and the peculiar arrangement of gonads are the most striking characteristics of the present new species.

17. *Ctenicella undulata* n. sp. (pl. 6, figs. 5-7)

4 specimens up to 15 mm. long. A peduncle-like protuberance at the posterior end of the body. Test thin but strong; surface covered with coarse sand. Apertures distinct, but not prominent. Mantle whitish yellow; musculature well developed. Branchial siphon terminal and 6-lobed, atrial aperture 4-lobed and slightly behind the middle of the body.

Branchial sac: 6 folds on both sides; inner longitudinal vessels as follows:

left        D. 1 (11) 1 (14) 1 (15) 1 (14) 1 (11) 1 (9) 0 V.  
right      D. 1 (11) 1 (14) 1 (15) 1 (14) 1 (11) 1 (9) 0 V.

Stigmata transverse. Tentacles ca. 15, excluding small ones. Ciliated groove bar-shaped and placed longitudinally. Dorsal lamina consisting of many languets. Many brown pigment cells are found on dorsal tubercle, peripharyngeal band, dorsal languets and vessels of branchial sac.

Alimentary system: Stomach bulb-shaped, surface folded; liver at the right ventral side of the pyloric end of the stomach; anus smoothly margined.

Gonad: The left gonad along the dorsal side of the rectum, the right one apart widely from the excretory organ. Each gonad undulating conspicuously. Ovary occupies the free surface of the gonad, while testis on the attachment surface.

Locality: Matoya Bay.

18. *Molgula aidae* OKA 1914 (Pl. 7, figs. 1-3)

3 specimens up to 20 mm. long. Branchial aperture 5-6 lobed, atrial aperture 4-lobed. Inner longitudinal vessels arranged in a specimen as follows:

left        D. 0 (6) 0 (9) 0 (10) 0 (10) 0 (10) 0 (9) 0 (6) 0 V.  
right      D. 0 (6) 0 (9) 0 (10) 0 (10) 0 (10) 0 (9) 0 (7) 0 V.

Tentacles ca. 16, excluding minute ones. Ciliated groove U-shaped with terminals incurled. Dorsal lamina, a plain membrane. Anus smoothly margined. Opening of gonoduct with lateral horns.

Locality: Matoya Bay, St. 55 and 87.

19. *Molgula oligostriata* n. sp. (Pl. 7, figs. 4—7)

3 individuals up to 10 mm. long. Body ovate. Test rather thick, surface with many short hairy processes and covered with sand grains. Apertures distinct, but not prominent. Branchial siphon 6-lobed, atrial siphon 4-lobed; each situated at one third the body length from the terminals. Small papillae sparsely on the ventral half of the mantle body.

Branchial sac: Infundibula arranged in 7—8 longitudinal rows, each consisting of 6-8 infundibula with the exception of the ventral-most one which comprises 10-12 infundibula. Inner longitudinal vessels on each longitudinal infundibular row (excepting the dorsal-most one of 8), they are arranged as follows:

Specimen 1. left and right

D. 0 (1) 0 (2) 0 (2) 0 (2) 0 (2) 0 (2) 0 (2) 0 (2) 0 V.

Specimens 2 & 3. left and right

D. 0 (1) 0 (2) 0 (2) 0 (2) 0 (2) 0 (2) 0 (1) 0 V.

Infundibulum comprises two stigmata coiling spirally 4—6½ times. Tentacles 12-17, excluding minute ones. Ciliated groove  $\cup$  or  $\cap$  shaped. Dorsal lamina, a plain membrane.

Alimentary system: Liver greenish black. Anus smoothly margined.

Gonad: The left gonad situated between atrial aperture and intestinal loop, with its axis vertical to that of rectum. The right gonad between atrial aperture and excretory organ, with its axis vertical to that of bladder. Ovary centered and with a duct; testis marginal and with many, up to 12, short ducts opening respectively.

Locality: Matoya Bay, St. 27. Nanao Bay, St. 21.

The fewness of the inner longitudinal vessels is the most striking characteristic of this new species.

EXPLANATION OF PLATES.

- (Plate 1) fig. 1 Amaroucium japonicum n. sp. ; zoid, left. × 12  
 2 // // // ; zoid, right. × 12  
 3 // // // ; abdomen. × 12  
 4 // // // ; embryo. × 50  
 5 Leptoclinides komaii n. sp. ; zoid, right. × 26  
 6 // // // ; abdomen, left. × 26  
 7 // // // ; zoid with a bud. × 50  
 8 // // // ; calcareous spicule,  
 highly magnified.

- (Plate 2) fig. 1 Didemnum (Polysyncraton) aspiculatum n. sp. ;  
 zoid, left. × 50  
 2 // // // ; zoid, right. × 50  
 3 // // // ; calcareous concretion  
 in thoracic organ. × 200  
 4 Didemnum (Polysyncraton) simaensis n. p. ;  
 zoid, right. × 50  
 5 // // // ; abdomen, left. × 50  
 6 // // // ; zoid with buds. × 50  
 7 // // // ; circum-intestinal gland.  
 8 Leptoclinum okai n. sp. ; zoid, right. × 50  
 9 // // // ; embryo. × 110

- (Plate 3) fig. 1 Agnesia himeboja Oka ; animal without test, right.  
 2 Ascidia matoya n. sp. ; animal without test, right.  
 3 // // // ; // // // , left.  
 4 // // // ; dorsal tubercle. × 26  
 5 Botrylloides violaceus Oka ; zoid, right. × 50  
 6 // // // ; zoid with a pair of  
 buds. × 50  
 7 Eugyra (Gamaster) japonicus Oka ; dorsal  
 tubercle. × 50  
 8 // // // ; anus. × 18



- (Plate 4) fig. 1 Cnemidocarpa (Cnemidocarpa) miyadaii n.sp. ; right half of body, inside.  
 2 " " ; left half of body, inside.  
 3 " " ; gonad. a...free surface, b...attachment surface.  
 4 Cnemidocarpa (Cnemidocarpa) masuii n. sp. ; left half of body, inside.  
 5 " " ; right half of body, inside.  
 6 Pyura aspera n. sp. ; entire animal.  
 7 " " ; left half of body, inside.  
 8 " " ; right half of body, inside.

- (Plate 5) fig. 1 Pyura lepidoderma n. sp. ; entire animal.  
 2 " " ; left half of body, inside.  
 3 " " ; right half of body, inside.  
 4 Hartmeyeria longistigmata n. sp. ; entire animal.  
 5 " " ; animal without test, left.  
 6 " " ; " " , right.  
 7 " " ; a part of branchial sac. × 26

- (Plate 6) fig. 1 Eugyra (Eugyrioides) hexarhiza n.sp. ; entire animal.  
 2 " " " ; animal without test, left.  
 3 " " " ; " " , right.  
 4 " " " ; a part of branchial sac. × 26  
 5 Ctenicella undulata n. sp. ; entire animal.  
 6 " " ; animal without test, left.  
 7 " " ; " " , right.

- (Plate 7) fig. 1 Molgula aidae Oka ; entire animal.  
 2 " " ; a part of branchial sac. × 26  
 3 " " ; opening of gonoduct.  
 4 Molgula oligostriata n.sp. ; animal without test, left.  
 5 " " ; " " , right.  
 6 " " ; a part of branchial sac. × 26  
 7 " " ; dorsal tubercle. × 50