

REPORT OF THE BIOLOGICAL SURVEY OF MUTSU BAY
28. ASCIDIAE SIMPLICES¹⁾

By

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(With thirty-five figures)

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The material of Ascidiæ of Mutsu Bay, entrusted to me for description by the authorities of the Biological Survey, was collected in the summers of 1926 and 1927, and was placed in my hands shortly afterwards. It contained nineteen species of Simple Ascidiæ, arranged in nine genera, among which nine of the species and one of the genera were new to science. Two years later, I received another lot of Ascidiæ collected by Prof. S. TAKATSUKI in the same region, which contained among others two species (one of which was new) and one genus of Simple Ascidiæ not represented in the "Biological Survey" collection. Quite recently, in January of this year (1934), a large specimen of *Cynthia michaelsoni* was sent to me, which was obtained apparently for the first time in Mutsu Bay. In the present paper, I have incorporated these additional forms, so that the total number of species dealt with amounts to twenty-two, and that of genera to ten. Curiously enough, the most common and best known Ascidian of Northern Japan, *Cynthia roretzi*, was represented in the collection only by very small and immature individuals. Of *Styela plicata* and *Ciona intestinalis* too, both cosmopolitan and common throughout Japan, the collection contained only very small and poorly preserved specimens, totally inadequate to serve as the bases for description.

The Compound Ascidiæ of the collection, which are rather few in number, will be described in a separate paper.

LIST OF THE SPECIES

The twenty-two species of Simple Ascidiæ now known to occur in Mutsu Bay are, systematically arranged, as follows:

¹⁾Contribution from the Marine Biological Station, Asamushi, Aomori-Ken. No. 130.

Molgulidae

1. *Molgula hozawai* OKA (n. sp.) 2. *Eugyrioides asamusi* OKA (n. sp.)

Cynthiidae

3. *Cynthia roretzi* DRASCHE 6. *Cynthia vittata* STIMPSON
4. *C. hilgendorfi* TRAUSTEDT 7. *C. iburi* OKA (n. sp.)
5. *C. michaelsoni* OKA

Styelidae

8. *Styela clara* HARTMER 13. *Styela macrogastra* n. sp.
9. *St. clava* HERDMAN 14. *St. monogamica* n. sp.
10. *St. esther* HARTMEYER 15. *St. plata* OKA (n. sp.)
11. *St. plicata* LESUEUR 16. *Azygocarpa mutuensis* OKA (n. sp.)
12. *St. aomori* n. sp. 17. *Dendrodoa tuberculata* RITTER

Corellidae

18. *Corella japonica* var. *asamusi* OKA 19. *Chelyosoma siboja* OKA

Asciidiidae

20. *Ascidia samea* n. sp. 21. *Ascidia zara* n. sp.

Cionidae

22. *Ciona intestinalis* LINNÉ

Five of the new species, those marked (n. sp.), have already been named and briefly described in the Proceedings of the Imperial Academy during the years 1930 to 1933. The remaining five are made known for the first time in the present report.

Key to the families and genera.

- | Tentacles compound 1
 | Tentacles simple 3
1 | Stigmata curved Molgulidae, 2
 | Stigmata straight Cynthiidae, *Cynthia*
2 | Branchial sac with folds *Molgula*
 | Branchial sac without folds *Eugyrioides*
3 | Branchial sac with folds Styelidae, 4
 | Branchial sac without folds 6
4 | Gonads on both sides *Styela*
 | Gonads on one side only 5
5 | Gonads two, simple *Azygocarpa*
 | Gonad one, branched *Dendrodoa*

- 6 | Stigmata curved Corellidae, 7
 | Stigmata straight 8
7 | Surface soft *Corella*
 | Surface with horny plates *Chelyosoma*
8 | Muscle bands not distinct Ascidiidae, *Ascidia*
 | Muscle bands distinct Cionidae, *Ciona*

Species easily identified.

Before proceeding to the description of the species, it is thought useful to insert here a list of those species which can be identified at first sight, and which, on account of their abundant occurrence in Mutsu Bay, may form suitable objects for physiological and experimental researches. I have appended the Japanese names in parentheses.

Cynthia roretzi (Maboya): red, with numerous nipple-like projections.

Styela clava (Eboya): stalked.

St. plicata (Siroboya): white, with rounded elevations and furrows.

St. plata (Hirataboya): very much depressed, test opaque, attached to shell of Pecten.

Corella japonica var. *asamusi* (Asamusiboya): test transparent, with numerous root-like processes, red internal body showing through.

Chelyosoma siboja (Suboya): upper surface covered with polygonal horny plates.

Ciona intestinalis (Yureiboya): test transparent, longitudinal muscles forming separate bundles.

Description of Species.

The descriptions here given have been prepared almost exclusively from material contained in the "Biological Survey" collection. The only exceptions are *Cynthia roretzi*, *Styela plicata*, and *Ciona intestinalis*, of which it was found necessary to substitute specimens from other sources, as these forms were represented in the collection only by very small and immature individuals.

In every case the end at which the branchial aperture is placed is considered as anterior, and the opposite end as posterior; the edge along which the endostyle runs is ventral, and the other edge, with the nerve ganglion placed on it, is dorsal. Consequently, in some species of *Ascidia* the upper and lower surfaces correspond to the right and left sides of the animal respectively, while in *Corella* the reverse is the case. By length of the body is always meant the antero-posterior extension, by

breadth the dorso-ventral diameter, and by thickness the measurement from side to side.

The text-figures are either rough sketches of the entire animal or diagrammatic representations of the internal body, and are simply meant as an aid to speedy identification of the species. In figures of animals removed from the test, the mantle is supposed to be transparent, so as to allow the positions of the alimentary and reproductive viscera to be distinctly seen through it.

1. *Molgula hozawai* OKA.

OKA, A. Über eine neue *Molgula*-Art aus Mutsu-bai. Proc. Imp. Acad., Vol. VIII. 1932.

External Appearance. The body is round ovate in shape, with the longest axis transverse, and not compressed laterally; it is not attached. The apertures are placed on distinct siphons which form two short divergent truncated cones at the anterior end of the body. The branchial siphon is nearly straight, and is directed anteriorly and slightly ventrally, while the atrial is strongly recurved, so that the opening looks almost backwards; they are close together, with their bases directly touching.

The surface is entirely covered with a uniform, but not very thick coating of sand grains attached to fine hair-like processes of the test. The latter are so long that their free ends project beyond the outer surface of the sandy coating in the form of thin wool. The siphons are also covered with sand. The colour of the animal, due to sand, is a light greenish grey.

Length of the body (antero-posterior) 13 mm; breadth of the body (dorso-ventral) 17 mm; thickness 12 mm.

The Test is very thin, not more than 0.2 mm in thickness, but fairly tough. It is colourless and transparent, and bears on the outer surface

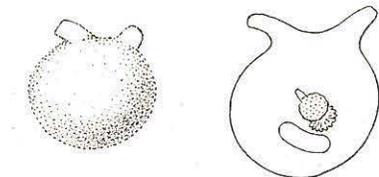


Fig. 1.

Fig. 1. *Molgula hozawai*, entire animal. $\times 1$.

Fig. 2. *Molgula hozawai*, with test removed. $\times 2$.

long, slender, but not much branched hair-like processes, which may attain a length of 8 mm. The inner surface is smooth and closely united to the mantle below.

The Mantle is also very thin and transparent. The siphons are well marked, and the apertures are distinctly 6- and 4-lobed respectively. The

musculature is rather weak, and consists mainly of longitudinal muscle bands which radiate from the bases of the siphons, but do not reach the posterior half of the body. The region next the endostyle on each side is devoid of any musculature. The siphons have well marked sphincters.

The Tentacles are about 24 in number, and of three sizes placed alternately. They are all pretty well developed, those of the first and second orders differing but little in length. They bear broad membranes on the side directed towards the branchial sac, and are rather sparsely branched.

The Dorsal Tubercle is exactly horse-shoe shaped, the horns being neither bent nor coiled. The opening is directed posteriorly and a little to the left.

The Branchial Sac has seven folds on each side, of which all but the seventh, i. e. the most ventral, are well developed. There are six internal longitudinal bars on each fold, except the seventh which has only two, and none in the interspace. The bars are flat, broad and ribbon-like, with the free margin pigmented with black, which makes it very easy to count them. The transverse vessels of the first order are five in number, and between these occur shorter vessels which are confined to the folds. The stigmata are rather short and only slightly curved; they are arranged in spirals and form moderately deep infundibula under the folds, but in the interspace between the folds they are mostly arranged in irregularly curved longitudinal rows.

The Dorsal Lamina is a moderately broad plain membrane, not ribbed nor toothed

The Alimentary Canal forms a curved loop, whose position is mainly horizontal, but bent almost into a semicircle with the concavity directed anteriorly. The stomach is only slightly wider than the intestine, from which it is not clearly marked off, and is provided on one side with numerous irregular projections representing the liver. The branches of the intestinal loop approach each other a short distance from the reflected end and run parallel in the rest of their course. The anus lies a little below the base of the atrial siphon, its margin is smooth.

The Excretory Organ is a sausage-shaped sac of moderate size, only slightly curved, and placed nearly horizontally in the lower part of the right side of the body.

The Reproductive Organs are present one on each side. That of the left side is placed in the concavity of the curved intestinal loop, while that of the right side occupies the corresponding position just in front of

the renal sac. Each gonad consists of a disc shaped ovary and a disc shaped testis, the latter partially covering the former on the inner surface, so that the ovary appears to be half surrounded by testicular follicles, when viewed from outside through the mantle. A short thick oviduct is seen springing from the outer surface of the ovary near its anterior edge.

Two specimens of this species were obtained off Yunosima near Asamusi, August 29, 1927.

2. *Eugyrioides asamusi* OKA.

OKA, A. Über eine neue Spezies von *Eugyrioides* aus Japan. Proc. Imp. Acad., Vol. VI. 1930.

External Appearance. The body is globular or roundish oval, scarcely compressed laterally; it is not attached. The apertures are on short but wide siphons placed close together at the anterior end. The branchial is, contrary to all the other species of the genus, distinctly four-lobed, and has in addition four finger-like processes alternating with the lobes. The atrial siphon has a distinctly four-lobed aperture, and is in most cases a little longer than the branchial.

The surface is on the whole smooth, though it bears a number of short filiform processes placed rather wide apart. Sand particles are found here and there adhering to the surface. The colour is light grey.

Size of the largest specimen: length of the body, 15 mm; breadth of the body, 18 mm; thickness, 14 mm.

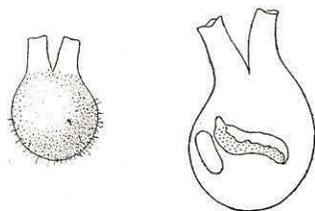


Fig. 3.

Fig. 3. *Eugyrioides asamusi*, entire animal. $\times 1$.

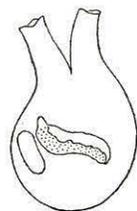


Fig. 4.

Fig. 4. *Eugyrioides asamusi* with test removed. $\times 2$.

The Test is very thin, colourless and transparent, so that the siphonal muscles and the internal viscera are distinctly visible through it.

The Mantle is also very thin and transparent. The siphons are well developed and show the configuration of the apertures most clearly. The musculature is but feebly developed, consisting mainly of a wide meshed network of longitudinal and circular bands in the region round the siphons.

The Tentacles are numerous, but mostly very small and only slightly branched. There are about twelve larger ones representing two orders, between which smaller tentacles of the third to fifth order are arranged

regularly after the formula 5.4.5.3.5.4.5. The smallest tentacles are very minute and not branched.

The Dorsal Tubercle is exceedingly simple, with an elongated or crescentic opening. In the latter case the concavity is directed anteriorly and slightly to the left.

The Branchial Sac is not folded, but has seven broad ribbon-like internal longitudinal bars upon each side. Beneath each bar is a row of pyramidal infundibula with square bases. The number of infundibula in a row is constantly six, except in the most ventral row, i. e. that next to the endostyle, which contains twelve infundibula, in consequence of splitting of each into two. Each infundibulum is formed of a double uninterrupted spiral stigma with eight to ten turns. As the infundibula are arranged in transverse as well as in longitudinal rows, the branchial sac has a beautifully regular appearance.

The Dorsal Lamina is a narrow plain membrane with a somewhat thickened margin.

The Alimentary Canal lies on the left side of the body and forms a horizontally placed loop, of which the intestinal portion is bent in the form of an S. The oesophagus is short and narrow, and is distinctly marked off from the stomach. The latter organ is elongated pyriform in shape and has a number of longitudinal folds of yellowish colour. The intestine is of uniform width throughout. The rectum is attached to the dorsal edge of the branchial sac, and the anus bears eight to ten blunt teeth on its margin.

The Excretory Organ is bean shaped and is placed obliquely near the dorsal edge of the right side.

The Reproductive Organs are present one on each side. They are both elongated dorso-ventrally and lie somewhat obliquely to the horizontal axis of the body. The left gonad is situated partly within the intestinal loop and partly on its inner surface, while the right gonad occupies the corresponding position on the opposite side, ventral to the renal sac. Each organ consists of an elongated ovary bounded dorsally and posteriorly by numerous opaque white testicular follicles.

Twenty-seven specimens of this species were collected by Prof. S. TAKATSUKI at Asamushi, July 10, 1929.

3. *Cynthia roretzi* DRASCHE.

DRASCHE, R. v. Über einige neue und weniger bekannte aussereuropäische einfache Ascidien. Denkschr. Kais. Akad. Wien, XLVII. 1884.

External Appearance. The body is erect ovate in shape, and is attached by the posterior end. It is not compressed laterally. Sometimes the posterior end is more or less elongated, so as to give the appearance of a short thick stalk. The siphons are both at the anterior end; the branchial is terminal and directed anteriorly, the atrial is placed a short distance back on the dorsal edge and is directed anteriorly and a little dorsally; both are short but conspicuous. The branchial aperture is always cross-slit, while the atrial is usually reduced to a simple transverse slit by the suppression of the vertical slits.

On the anterior half or two thirds of the body the surface is divided into polygonal areas of variable size, each of which bears a large blunt nipple-like process in the centre. In very young individuals each process terminates with a sharp spine, and spines of similar nature are also found

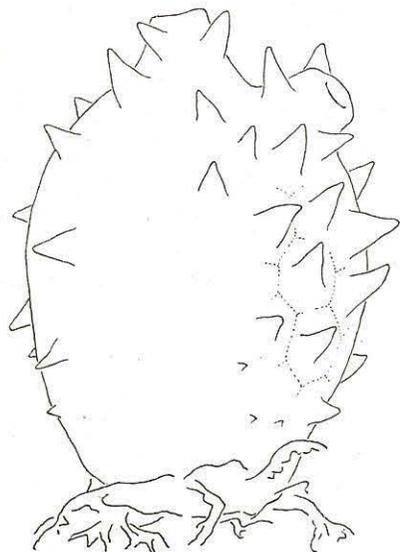


Fig. 5. *Cynthia roretzi*, entire animal.
× 1/2.

scattered all over the surface. The posterior end of the body is provided with a large number of strong branched root-like processes, by which the animal is attached.

The colour is a beautiful vermilion red, fading into pale yellow towards the posterior end. As a rule, no foreign bodies are found adhering to the surface.

Large specimens of this species may attain a length of 160 to 190 mm, and a breadth of 90 mm.

The Test is coriaceous, rather thin for the size but quite tough. On the inner surface, which is greyish in colour, it shows a number of crypts, corresponding to the nipple-like processes on the outside.

The Mantle adheres very closely to the test. Its outermost layer consists of translucent connective tissue with projections fitting into the hollow processes of the test. The musculature is unusually well developed, and consists of an external layer of circular muscle bands and an internal layer of strong longitudinal bundles. At the posterior end of the body the muscle bands are more irregularly interlaced.

The Tentacles are about twenty-four in number, and of different sizes, the smaller ones being placed alternately with the larger. They are all compound, but rather sparsely branched, and only the larger branches bear a few secondary branchlets.

The Dorsal Tubercle is prominent, being formed of two spiral cones with their apices directed away from one another. The opening between the spirals is turned forwards or only slightly obliquely.

The Branchial Sac is rather strong and has fifteen very wide folds upon each side; the most dorsal and the five most ventral folds, however, do not reach the anterior border of the sac, but end at some distance from it, making acute angles with the dorsal lamina or the endostyle. More than twenty-five internal longitudinal bars are found on each side of each fold, and about seven to nine in the interspace. The transverse vessels are of two sizes, of which the larger are placed on the external surface of the branchial sac and do not take part in the formation of the folds, while the narrower ones form with the internal longitudinal bars small meshes of nearly quadrate shape. There are about fifteen narrower transverse vessels between each pair of wider. The meshes contain each about five stigmata and are regularly divided transversely by a delicate parastigmatic vessel.

The Dorsal Lamina is in a rudimentary condition, being only represented by a row of minute triangular languets in the neighbourhood of the oesophageal opening. A row of similar languets, parallel to, but shorter than the former, is seen on its right side.

The Alimentary Canal is large and occupies the posterior two-thirds of the left side of the body. It forms a simple open loop placed horizontally, with the oesophagus and rectum vertical. As the oesophagus is relatively wide, and the stomach is not well marked, the whole tube is of nearly the same width throughout. There is a large greenish cauliflower-like liver appended to the stomach. The anus lies on the dorsal edge of the branchial sac and has a plain margin.

The Reproductive Organs consist, on each side, of about ten long, slightly undulating, tubular hermaphrodite glands placed nearly parallel to the longitudinal axis of the body. Those of the right side lie directly on the inner surface of the mantle, while those of the left side are internal to the anterior branch of the intestinal loop, which they cross nearly at right angles. Each gland has a short oviduct turned towards the base of the atrial siphon.

It is strange to find that this most common and best known Ascidian

should not be represented in the present collection by a single adult specimen. One small individual was obtained off Itazaki, July 24, and three very young ones off Kusodomari, August 9, 1926.

The range of distribution of this large species extends southwards to Sikoku and Kyusyu, but the limit of its abundant occurrence seems to lie somewhere about Ozika peninsula on the Pacific and Oga peninsula on the Japan Sea coast.

4. *Cynthia hilgendorfi* TRAUSTEDT.

TRAUSTEDT, M. P. A. *Ascidiae simplices* fra det Stille Hav. Vidensk. Meddel. Kjob., ann. 1884.

Syn. *Cynthia ritteri* OKA in: OKA, A. Notizen über japanische Ascidien, I. Annot. Zool. Japan., Vol. VI. 1906.

External Appearance. The body is erect ovate in shape, and is attached by the posterior end. It is scarcely compressed laterally. The apertures lie on short but thick prominent siphons, placed rather far apart at the anterior end. The branchial is terminal, and is usually bent ventrally, the atrial is on the dorsal edge and is straight. Both are distinctly four-lobed.

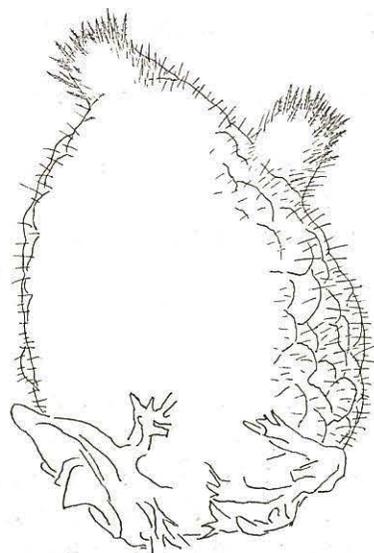


Fig. 6. *Cynthia hilgendorfi*, entire animal. $\times 2/3$.

The surface is slightly wrinkled, and is covered with short but thick, radially branched spines all over. On the siphons, and somewhere else, the spines are longer and may attain a length of 7 mm. The colour of the body is mostly reddish brown, of the spines yellowish grey.

Length of the body, 60 to 70 mm; breadth of the body, about 50 mm.

The Test is 2 to 3 mm thick, coriaceous, light grey on the inner surface, more reddish in the anterior region.

The Mantle is of light grey colour, and the musculature is not especially strong.

The Tentacles are about sixteen in number, all much branched. They are of different sizes and are arranged mostly alternately.

The Dorsal Tubercle is prominent, both horns are coiled in spirally so as to form two low cones with their apices directed away from each other. The opening between the cones is turned anteriorly and to the right.

The Branchial Sac has nine wide folds upon each side, of which the 8th and 9th do not reach the oesophageal opening. There are about twenty internal longitudinal bars on a fold, and five in the interspace. The transverse vessels are of two sizes, about twelve narrower occur between each pair of wider. The meshes are elongated transversely, and contain each five or six short stigmata; they are not divided by horizontal membranes.

The Dorsal Lamina is represented by a row of long slender languets. Besides these there are a number of small languets arranged irregularly on the right side.

The Alimentary Canal is large and lies on the left side of the branchial sac. It is disposed very much in the same way as that of *Cynthia roretzi*, and there is also a large greenish hepatic appendage. The anus has a plain edge.

The Reproductive Organs consist, on each side, of a group of about ten tubular hermaphrodite glands arranged like those of the preceding species. Numerous clear endocarps project from the inner surface of the mantle.

Two specimens of this species were collected, one off Simodate, July 24, 1927; the other at Oma-simote, August 18, 1927.

This species, though more abundant in Northern Japan, has also been found in other localities along the coast of Honsyu.

5. *Cynthia michaelsoni* OKA.

OKA, A. Notizen über japanische Ascidien, I. Annot. Zool. Japon., Vol. VI. 1906.

External Appearance. The body is irregularly ovate in shape, with the long axis dorso-ventral, and is attached by the greater part of the posterior end. The siphons are short but large, irregularly hemispherical in shape; they are both on the anterior end, the branchial near the ventral edge, and the atrial about in the middle. The apertures are indistinctly four-lobed.

The surface is uneven and corrugated, and is partly covered with sand grains and shell fragments on the posterior half. The siphons are especially irregular, being covered with large and small protuberances,

which make the positions of the apertures somewhat obscure. The colour is reddish grey.

Length of the body (antero-posterior) 68 mm; breadth of the body (dorso-ventral) 90 mm; thickness, 40 mm.

The Test is unusually thick, 4 to 8 mm, in places up to 10 mm; soft cartilaginous. It is pale reddish grey in section and on the inner surface.

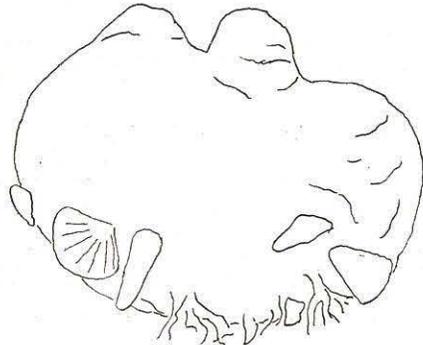


Fig. 7. *Cynthia michaelsoni*, entire animal.
×4/5.

The Mantle is pale yellowish, more reddish in the anterior region. The siphons are large, and slightly darker in colour. The musculature is on the whole very weakly developed, the radial and circular muscle bands being found only about the siphons. In the greater part of the mantle, the wall contains, imbedded in its thickness, the flat diffuse layer of reproductive glands clearly visible from the outside.

The Tentacles are of three sizes, all much branched. There are about thirteen larger, alternating more or less regularly with smaller ones.

The Dorsal Tubercle forms two spirals with the opening directed anteriorly. The groove is bent in zigzags in parts, so as to produce a rather complicated pattern.

The Branchial Sac has six rather narrow folds on each side. There are about twenty internal longitudinal bars on a fold, and eight or nine in the interspace. Large transverse vessels are found on the outside of the sac, which do not enter into the formation of the folds. Three or four very small transverse vessels occur between each pair of larger. The meshes are slightly elongated transversely and contain each about five stigmata. Parastigmatic vessels are always present.

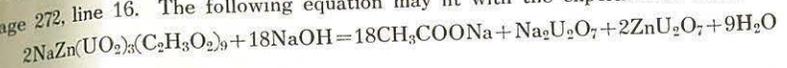
The Dorsal Lamina is represented by a row of short pointed languets.

The Alimentary Canal is closely united to the inner surface of the mantle. It forms a wide open loop placed horizontally in the posterior half of the left side. There is no distinct stomach, but the tube is provided with a large cauliflower-like liver of greenish colour, divided into several unequal parts. The rectum is directed anteriorly, and the anus

INSERTION

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Page 272, line 16. The following equation may fit with the experimental facts.



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Length of the (dorso-ventral) 90 r

The Test is uncartilaginous. It is

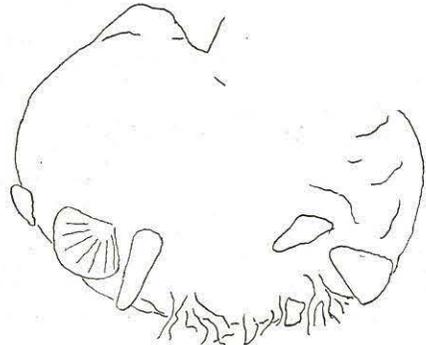


Fig. 7. *Cynthia michaelsoni*, entire animal. $\times 4/5$.

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has a plain margin.

The Reproductive Organs are for the greater part imbedded in the mantle. The ovaries form a flat, rather diffuse layer, 2 to 3 mm in thickness, extending over the whole of the posterior half of the body, and a part of the anterior too, and have a wide oviduct on each side. The tests consist, on each side, of two rows of closely placed, disc shaped bodies united to a vas deferens running between them. Those of the left side lie in the loop of the intestine.

This species was not contained in the original collection of the Biological Survey, but a fine specimen of it was sent to me quite recently by Mr. S. KOBAYASHI, who obtained it off Utomai, November 10, 1933.

This is a rather common species on Japanese coasts. Specimens of it have also been collected on the coast of Corea.

6. *Cynthia vittata* STIMPSON.

STIMPSON, W. Several New Ascidiæ from the coast of the United States. Proc. Nat. Hist. Soc. Boston, Vol. IV. 1852.

Syn. *C. karasboja* OKA in: OKA, A. Notizen über japanische Ascidiæ, I. Annot. Zool. Japon., Vol. VI. 1906.

External Appearance. The body is irregularly ovate in shape, with the longer axis directed antero-posteriorly, and is attached by the posterior end and a large part of the ventral side. Usually numerous individuals grow close together, so as to form a large mass. The siphons are always prominent, conical; the branchial is at the anterior end, and the atrial about half way down on the dorsal edge. The apertures are distinctly four-lobed.

The surface is irregularly wrinkled, and is usually covered with mud, sometimes also with Hydrozoa, etc. The colour is yellowish brown to dark greyish brown, except the tips of the siphons which are deep red.

Length of the body, 50 mm; breadth of the body, 37 mm.

The Test is rather thick, up to 3 mm, opaque, coriaceous and tough; it is reddish on the inner surface.

The Mantle is of a light orange or flesh colour, except the siphons, which are deep carmin-red. The musculature is well developed, and consists of an external layer of fine felting, beneath which strong bands radiating from the bases of the siphons cross one another obliquely.

The Tentacles are numerous; there are about fifteen larger, between which much smaller ones occur. The larger tentacles are very regularly pinnate.

The *Dorsal Tubercle* has a circular outline, with both horns coiled inwards. The opening is directed anteriorly.

The *Branchial Sac* has six moderately wide folds on each side. There

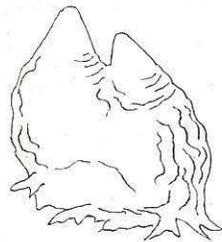


Fig. 8.

Fig. 8. *Cynthia vittata*, entire animal. $\times 1$.

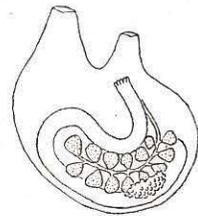


Fig. 9.

Fig. 9. " " with test removed. $\times 1.2$.

are sixteen to eighteen internal longitudinal bars on a fold, and only three or four in the interspace. The transverse vessels are of three or four different sizes, but are not arranged regularly, those of the higher orders being only found here and there. The meshes are elongated transversely and contain each five or six stigmata.

The *Dorsal Lamina* is represented by a series of narrow pointed languets.

The *Alimentary Canal* forms a wide loop placed horizontally on the left side of the body. The stomach is not well marked, but is provided with a large hepatic gland. The intestine is a tube of uniform width bent in the shape of an S. The anus, which lies near the base of the atrial siphon, has a lobed margin. Usually a number of large endocarps are attached to the dorsal border of the intestinal loop.

The *Reproductive Organs* form upon each side two rows of rounded or lobed hermaphrodite glands joined to a common central duct. Each gland is composed of a male and a female portion, different in colour and provided with separate ducts. The glands on the left side lie in the intestinal loop, while those of the opposite side, which are somewhat larger, occupy the corresponding position on the inner surface of the mantle.

This species was not represented originally in the collection of the Biological Survey. A specimen of it, however, was obtained later by Prof. S. TAKATSUKI off Moura-zima, July 26, 1929.

This widely distributed species was first recorded from the Atlantic coast of North America. It is also found in the West Indies.

7. *Cynthia iburi* OKA.

OKA, A. Über *Cynthia iburi* n. sp., eine neue *Cynthia*-Art mit querverrichteten Kiemen-spalten. Proc. Imp. Acad., Vol. X. 1934.

External Appearance. The body is ovate or broad cordate in shape, with the dorso-ventral axis considerably longer than the antero-posterior. The anterior end is broad and slightly concave in the middle, the posterior end, by which the animal is attached, is more or less narrowed, in some individuals only very slightly. The dorsal and ventral edges are both strongly convex. The apertures are on the anterior end, rather far apart, the branchial close to its ventral, the atrial near its dorsal extremity; they are distinctly cross-slit, being surrounded each by four small hemispherical prominences, but not borne on any recognisable siphons.

The surface is covered with large branched spines with expanded bases. Each spine consists of a straight pointed stem with short lateral branches, which may be forked, placed quite irregularly. Between larger spines, which attain a length of 3 mm, the test bears minute spines of the same nature. The colour is a pale yellowish grey, with a slight reddish tinge round the apertures. The bases of large spines are sometimes slightly reddish.

Length of the body (antero-posterior) 22 mm; breadth of the body (dorso-ventral) 33 mm; thickness, 20 mm.

The *Test* is coriaceous, thin but tough, and shining on the inner surface.

The *Mantle* is not thick but muscular, especially on the anterior half of the body. The musculature consists of a thin outer layer of transverse fibres and an inner layer of stronger longitudinal bundles. At the posterior end the muscle bands run in dorso-ventral direction. The siphons are very short.

The *Tentacles* are about sixteen in number, placed larger and smaller alternately. They are slender and have only short branches.

The *Dorsal Tubercle* is horse-shoe shaped, with the horns simply turned toward each other. The opening is directed to the right.

The *Branchial Sac* has seven folds upon each side; the seventh or the most ventrally placed is more or less rudimentary. There are sixteen to eighteen internal longitudinal bars on a fold, and four or five in the interspace. The stigmata run transversely, and a certain number of inter-

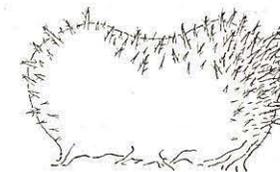


Fig. 10.

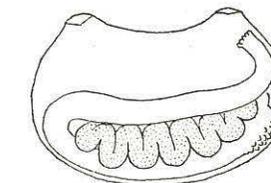


Fig. 11.

Fig. 10. *Cynthia iburi*, entire animal. $\times 1$.

Fig. 11. *Cynthia iburi* with test removed. $\times 1.2$.

stigmatic vessels form a group, being bounded by larger transverse vessels. In the interspace between the folds the internal longitudinal bars cross the stigmata without interrupting them, while on the folds, where they are more closely placed, every other internal longitudinal bar occupies the same position in relation to the stigmata. The stigmata are all of one length and are arranged in longitudinal rows, separated from one another by the interstigmatic longitudinal vessels. In the interspace between the folds, these vessels alternate with the internal longitudinal bars.

The Dorsal Lamina is represented by a row of long pointed languets.

The Alimentary Canal forms a rather long open loop placed horizontally in the posterior half of the left side. There is no distinct stomach, but the tube is provided with numerous hepatic caeca of a greenish tinge. The anus lies close to the atrial aperture and has a crenated margin.

The Reproductive Organs are very large. There is one on each side, that of the left side lying in the intestinal loop. Each organ consists of a tubular mass closely folded on itself in zigzags. The oviduct and vas deferens of the left gland open directly behind the anus.

Six specimens of this species were contained in the collection. They were obtained at the following localities: 1) Off Ozawa, August 9, 1926. Two specimens. 2) Off Karibazawa, August 22, 1926. Two specimens. 3) At the point of crossing of Nozawa-Osima line and Bentenzima-Kurosaki line, July 31, 1926. Two specimens.

Specimens of this species were collected many years ago on the coast of Iburi, Hokkaido.

8. *Styela clara* HARTMEYER.

HARTMEYER, R. Ein Beitrag zur Kenntnis der japanischen Ascidiën-fauna. Zool. Anz., Bd. XXXI. 1906.

External Appearance. The body is irregularly ovate in shape, somewhat flattened antero-posteriorly, and attached by the entire posterior end, which is more or less expanded along the margin. The anterior end is broad and convex, the dorsal and ventral edges slope towards the margin of the area of attachment. The apertures are on the anterior end, rather close together; they are both distinctly cross-slit and conspicuous, being surrounded each by four small knob-like projections of the test.

The surface is irregularly corrugated, and for the most part naked. The posterior half is partly covered with adhering shell fragments, egg-

capsules of whelk, etc. The colour is a pale yellowish grey. In the specimen before me, four dark brown dots surrounding the branchial aperture constitute a characteristic feature.

Length of the body (antero-posterior) 12 mm; breadth of the body (dorso-ventral) 20 mm; from side to side, 16 mm.

The Test is coriaceous, thin but tough, and is of the same colour throughout.

The Mantle is not thick, but the musculature is fairly well developed, especially in the anterior half of the body. There is an outer layer of circular muscle fibres, beneath which lies a layer of stronger longitudinal muscle bands. The siphons are very short.

The Tentacles are about fifteen in number; they vary much in size, but do not seem to be arranged in any regular order.

The Dorsal Tubercle is horse-shoe shaped, with the horns not coiled inwards. The opening is directed anteriorly.

The Branchial Sac has four folds upon each side, the most dorsal being the broadest. There are eight to twelve internal longitudinal bars on a fold and three or four in the interspace. The transverse vessels are of two sizes placed alternately. Parastigmatic vessels are found in most places. The meshes are somewhat elongated transversely, and contain each five to seven stigmata.

The Dorsal Lamina is a narrow plain membrane with a smooth edge.

The Alimentary Canal forms a closed loop occupying the dorsal half of the left side. The oesophagus is long. The stomach is elongated ovate, voluminous, and is placed obliquely; its wall has longitudinal folds. The intestine is bent, so that its first half lies in contact with the stomach, while the remaining portion is directed towards the atrial aperture. The margin of the anal opening is toothed.

The Reproductive Organs are four in number upon each side. They are large, strongly undulating, tubular, hermaphrodite gonads, attached to the inner surface of the mantle. Those of the left side are partly covered by the stomach and intestine. All converge towards the atrial aperture.

One specimen of this species was obtained off Oku-uti Mura, July 31, 1926.

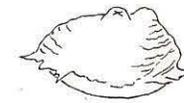


Fig. 12.

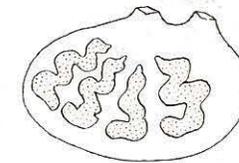


Fig. 13.

Fig. 12. *Styela clara*, entire animal. $\times 1$.

Fig. 13. *Styela clara* with test removed. $\times 2$.

The type specimen was collected at Hakodate. The species has not been known from any other locality.

9. *Styela clava* HERDMAN.

HERDMAN, W. A. Report on the Tunicata collected during the voyage of H. M. S. Challenger. 1882.

External Appearance. This species is club-shaped, the pyriform body being supported on a stalk of variable length; it stands erect, and is not compressed. The anterior end is narrow, but generally straight for a short distance; from this the body widens rapidly for the first two-fifths of its length, and then narrows more gradually in the remaining three-fifths, the posterior end being prolonged into the stalk, which is generally about equal to the body in length. The apertures are both at the anterior end; they are four-cleft, and more or less projecting, but minute and inconspicuous. The branchial is at the ventral edge of the anterior end, and is directed ventrally; the atrial is at the dorsal edge of the anterior end, is more prominent than the branchial, and therefore more anterior, and is directed anteriorly.

The surface is very irregular; the posterior half of the body and the stalk are creased longitudinally, and the anterior half of the body is nearly covered by irregularly shaped, but smooth and blunt knobs, mostly directed anteriorly. The colour is a pale brownish yellow, somewhat darker about the apertures and on the stalk.

Length (total) 120 mm; breadth (at broadest part of head) 25 mm.

The Test is tough but thin, and almost papery, except in the knobs and processes

The Mantle is very delicate, and is closely united to the test; the musculature is very feeble.

The Tentacles are about thirty in number, and are rather closely placed; they are not large and are all of about the same length, but some are rather stouter than others.

The Dorsal Tubercle is transversely elongated, and the horns are simply curled inwards.

The Branchial Sac has four narrow folds upon each side. The internal

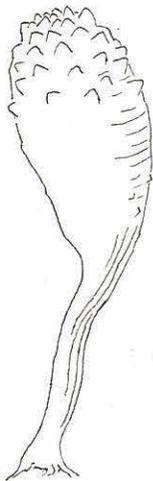


Fig. 14. *Styela clava*, entire animal. $\times 1$.

longitudinal bars are rather numerous, about nine on a fold and twelve in the interspace. The transverse vessels are of two sizes, the larger is very wide and only occurs here and there, the other size is much smaller and more numerous. The meshes are transversely elongated, contain each six stigmata, and are occasionally divided transversely by a narrow membrane.

The Dorsal Lamina is a smooth and plain membrane, with no ribs and no teeth.

The Alimentary Canal forms a large but simple closed loop placed vertically on the left side of the body. The oesophagus is very short. The stomach is ovate in shape, with the longer axis vertical; its wall is folded longitudinally. The intestine is wide but short, and for the most part nearly straight. The anal opening has many teeth.

The Reproductive Organs are present on both sides, but always less numerous on the left side than on the right, where there may be as many as seven. Each organ consists of a long, nearly straight, tubular ovary, to which a number of rounded testicular masses are attached on both sides. The organs are placed closely together, and all converge toward the atrial aperture.

This is a common species of *Styela* in Mutsu Bay. Specimens of it were obtained at the following localities: 1) Off Yunosima, May 29, 1926. One specimen. 2) Off Hanakuri, Sirasuna Mura, July 2, 1926. One specimen. 3) Off Tutiya, July 17, 1926. One specimen. 4) Four specimens. 5) Off Itazaki, July 24, 1926. One specimen. 6) Off Oku-uti Mura, July 31, 1926. One specimen. 7) Off Yomogida Mura, July 31, 1926. One specimen. 8) Off Tubaki Yama, August 2, 1926. Two specimens. 9) Off Itazaki, August 5, 1926. One specimen. 10) At crossing point of Wakinozawa-Osima line and Bentenzima-Kurosaki line, August 9, 1926. Three specimens. 11) Off Kusodomari, 500 meters from the coast, August 9, 1926. One specimen. 12) Off Ominato, $1\frac{1}{2}$ mile from the coast, August 11, 1926. Five specimens.

This species is very widely distributed, being found almost everywhere along the coast of Japan.

10. *Styela esther* HARTMEYER.

HARTMEYER, R. Ein Beitrag zur Kenntnis der japanischen Ascidiensfauna. Zool. Anz., Bd. XXXI. 1906.

External Appearance. The body is irregularly ovate in shape with

the longer axis dorso-ventral, and flattened antero-posteriorly; it is attached by the entire posterior end. The anterior end is broad and slightly convex, the dorsal and ventral edges are short and strongly convex. The posterior end is very broad, and bears short flat processes for attachment along the margin. The apertures are on the anterior end, the branchial is at the ventral edge, and the atrial about in the middle; both are cross-slit, sessile and inconspicuous.

The surface is uneven, being covered with irregular ridges and furrows. The colour is dirty white.

Length of the body (antero-posterior) 26 mm; breadth of the body (dorso-ventral) 36 mm; thickness (from side to side) 25 mm.

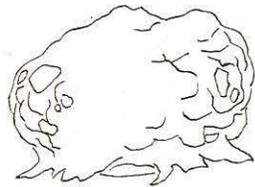


Fig. 15.

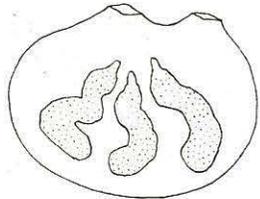


Fig. 16.

Fig. 15. *Styela esther*, entire animal. $\times 1$.

Fig. 16. *Styela esther* with test removed. $\times 1.5$.

The *Branchial Sac* has four moderately wide folds upon each side. There are about fourteen internal longitudinal bars on a fold, and five or six in the interspace. The transverse vessels are of two sizes, five to seven smaller ones occurring between each pair of larger. The meshes are nearly square and contain each about six elongated stigmata.

The *Dorsal Lamina* is moderately wide, not ribbed and not toothed.

The *Alimentary Canal* forms a simple loop on the left side of the body. The oesophagus is rather long. The stomach is ovate in shape; its wall is smooth externally, but has longitudinal folds on the inner

The *Test* is moderately thick, coriaceous; it is white and glistening on the inner surface.

The *Mantle* is not thin, but the musculature is only weakly developed, forming a coarse net-work of fine muscle fibres running in all directions.

The *Tentacles* are about sixteen in number; they are not arranged in regular order, and there may be one or two much smaller than the rest.

The *Dorsal Tubercle* is always circular in outline, but the form of the ciliated groove seems to be somewhat variable. It is mostly horse-shoe shaped with the horns either turned inwards or outwards; in rare cases, one of the horns may be bifurcated. The opening is always directed anteriorly.

The *Branchial Sac* has four moderately

surface. The intestine is short and wide, and is bent in the form of an S. The margin of the anal opening is slightly crenated.

The *Reproductive Organs* are two or three in number on each side. They are large sausage-shaped hermaphrodite glands converging towards the atrial aperture. In one case, two of the three glands on the left side were found to be partially fused together, so as to present the form of a Y.

Seven specimens of *Styela esther* were obtained at Oma-simote, August 18, 1927.

This species seems to be rather widely distributed, as the type specimens studied by HARTMEYER were collected at Fuku-ura, Sagami Bay.

11. *Styela plicata* LESUEUR.

LESUEUR, C. A. Descriptions of several new species of Ascidia. Journ. Acad. Philad., Vol. III. 1823.

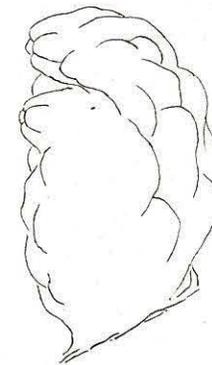
External Appearance. The general outline of the body is oval or rounded, attached by the posterior end or more or less obliquely by one side. The branchial aperture is terminal or nearly so, the atrial a little way back on the dorsal side; both usually surrounded by four rounded prominences, corresponding to the four sides of the square opening which lies in the depression between them. In many individuals there is a curvature of the long axis of the body, by which the apertures are brought towards each other and the ventral side becomes more convex.

The surface is covered with low but large dome-shaped elevations, giving it an appearance suggesting a coarse unevenly laid cobblestone pavement. The colour is white, except for a trifling amount of mud, frequently no more than sufficient to discolour the surface.

Length of the body, 50 mm; breadth of the body, 40 mm.

The *Test* is moderately thick, rather soft but tough; it is whitish throughout.

The *Mantle* is of only moderate thickness. It contains a layer of closely placed muscle bands radiating from the siphons and extending towards the attached end of the body. This layer is best developed an-

Fig. 17. *Styela plicata*, entire animal. $\times 1$.

teriorly, and is overlaid by a layer of slender but also closely placed bands encircling the body.

The Tentacles are of at least four orders, and about fifty in number. The larger ones are placed with considerable regularity.

The Dorsal Tubercle is horse-shoe shaped with inrolled horns; the open interval is directed anteriorly.

The Branchial Sac has four well-developed folds on each side, of which the three first are about equally high and bear twenty to twenty-four internal longitudinal bars, while the fourth is lower and has fewer bars. The folds are sharply defined, arising abruptly from the interspaces, the two halves of each fold being closely pressed together. The interspaces between the folds are generally wide, with six to nine internal longitudinal bars. The transverse vessels are of three or four orders placed alternately. The meshes are nearly quadrate and contain each six to eight stigmata. Parastigmatic vessels are present.

The Dorsal Lamina is plain, but often thrown into lateral undulations.

The Alimentary Canal is large and lies on the left side of the body. The stomach is elongate ovate, somewhat curved, and abruptly distinguished from the beginning of the intestine. Its walls are thin, with thirty to forty narrow but distinct longitudinal folds. The intestine is bent in the form of an S, the second curve extending down so as to lie beside the stomach. The margin of the anus is irregularly lobed.

The Reproductive Organs are compact, hermaphroditic, flask-shaped or elongate, and more or less sinuously curved gonads, ending in a very short neck with a slightly lobed terminal aperture for the ovary. Beside the ovarian aperture there is a small rounded projection on which the common spermduct opens. In each gonad the ovary is central and is bordered by the numerous simply formed testes. There are two gonads on the left side of the body, one anterior to the bend of the intestinal loop, the other between the loop and the rectum. Their necks converge to near the base of the atrial siphon. On the right side there is an irregular group of five to seven gonads, their necks are directed towards the atrial siphon.

Specimens of this species were obtained at the following localities: 1) Yunosima, July 12, 1926. Two specimens. 2) Off Hiradate, July 24, 1927. Three specimens. 3) Oma-simote, August 18, 1927. Three specimens. They were all very small, not exceeding 15 mm in length.

This is really a cosmopolitan species, being found almost in every part of the world.

12. *Styela aomori* n. sp.

External Appearance. The body is erect ovate, or short cylindrical or conical in shape, and attached by the broad posterior end. Both apertures are clearly four-lobed, and borne on short but distinct siphons placed close together at the anterior end. The surface is on the whole even, but finely corrugated transversely, and may be granulated towards the posterior end. The colour is a pale brownish grey, somewhat darker round the apertures and towards the base.

Length of the body, 30 mm; breadth of the body, 17 mm.

The Test is thin, leathery and tough, whitish in section and on the inner surface.

The Mantle is of greyish colour and very thin, the whitish gonads showing through. It consists of two very thin muscle layers, an external transverse and an internal longitudinal, the latter being formed of thicker fibres than the former.

The Tentacles are more than forty in number, larger and smaller placed alternately.

The Dorsal Tubercle is horse-shoe shaped, almost circular in outline, with the opening directed anteriorly.

The Branchial Sac has the longitudinal folds in rudimentary condition. Except the most dorsally placed fold on each side, which too is very narrow, they scarcely project into the lumen of the sac. The number of the internal longitudinal bars, counted from the dorsal edge in one of the specimens, was as follows: 1 (13) 6 (2) 6 (5) 5 (4) 3. The meshes are square and contain about six stigmata each, except on each side of the endostyle, where they are much broader and have twice as many stigmata. The stigmata are elongate or ovate, and their arrangement is in places quite irregular. Parastigmatic vessels are present everywhere.

The Dorsal Lamina is about 1 mm broad. It is simple and has a plain edge.

The Alimentary Canal forms a simple loop bent in the form of an S,

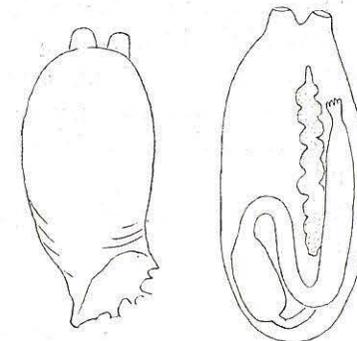


Fig. 18.

Fig. 19.

Fig. 18. *Styela aomori*, entire animal. $\times 1$.

Fig. 19. *Styela aomori* with test removed. $\times 1.5$.

and lies entirely on the left side of the body. The oesophagus is rather long and is bent in a semicircle. The stomach is ovate in shape and is placed antero-posteriorly; its wall is smooth externally, but has on its inner surface a large number (more than 30) of closely placed longitudinal folds. The intestine is rather short and slender, but the rectum is long, straight, and wide, and forms the most conspicuous part of the whole canal. The margin of the anus, below which the rectum shows a constriction, is crenated.

The Reproductive Organs are two in number upon each side. Each organ consists of an elongated, somewhat undulating ovary, placed almost longitudinally and bordered by a large number of rounded testicular follicles. The short conical oviduct is directed towards the atrial opening, and a little below is seen the aperture of the common vas deferens. The ovary and the testes do not differ much in colour, the latter being only slightly paler.

Several specimens of this species were obtained off the coast of Osima, June 9, 1926.

13. *Styela macrogastra* n. sp.

External Appearance. The body is ovoid in shape, flattened dorso-ventrally, and attached by the whole of the broad ventral side. The apertures are both on the dorsal (upper) side; the branchial is almost terminal, the atrial slightly in front of the middle; both are four-cleft and conspicuous, being borne on short but large siphons. The base of attachment is expanded at the margin. The surface is divided into low rounded elevations by shallow grooves, but is not rough. The colour is milky white, sprinkled with minute green dots.

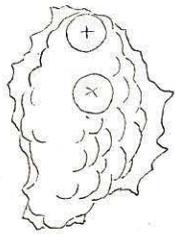


Fig. 20.

Fig. 20. *Styela macrogastra*, entire animal. $\times 1$.

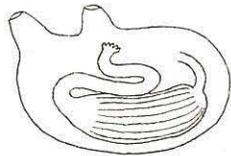


Fig. 21.

Fig. 21. " " with test removed. $\times 1.5$.

Length of the body, 28 mm; breadth of the body, 18 mm.

The Test is leathery, white throughout, and 1.5 mm to 2 mm thick, except on the lower surface where it is very thin.

The Mantle is pale yellowish grey, with well-developed musculature.

The Tentacles are about twenty in number. They are of different sizes, but not arranged in regular order.

The Dorsal Tubercle is horse-shoe shaped, with both horns bent inwards. The opening is directed anteriorly and to the left.

The Branchial Sac has four folds upon each side, fold I being the widest and fold IV the narrowest. There are eight to twelve internal longitudinal bars on a fold, and three to four in the interspace. Large and small transverse vessels alternate with each other, or there may be three small ones between each pair of larger. The meshes are quadrate, with eight or nine long, narrow stigmata, and divided by a delicate parastigmatic vessel.

The Dorsal Lamina is moderately broad, simple, with smooth margin.

The Alimentary Canal lies on the left side of the body, and is bent in the form of a double loop. The oesophagus is moderately long and narrow. The stomach is of an extraordinary size, occupying nearly the whole length of the ventral side; it is elongate ovate in shape, and has longitudinal folds. The intestine is relatively short, and is bent on itself so that the anterior and posterior halves almost touch each other. The rectum is very short, directed towards the atrial aperture, and ends with a crenated anal opening.

The Reproductive Organs are present on both sides of the body, forming a group of about seven elongated gonads arranged close together. Each gonad consists mainly of a cylindrical ovary bent in zigzags, with the short oviduct pointing toward the base of the atrial siphon.

One specimen of this species was obtained off Itanosaki, August 5, 1926. Another, somewhat smaller, was collected at Oma-simote, August 18, 1927.

14. *Styela monogamica* n. sp.

External Appearance. The body is oval in shape, somewhat flattened dorso-ventrally, and is attached by the whole of the broad ventral side. The base of attachment is slightly expanded at the margin. The apertures are both on the dorsal side, rather close together, the branchial at a short distance from the anterior extremity; both are conspicuous, being placed on very short but large siphons.

The surface is wrinkled irregularly round the siphons, but toward the base of attachment the wrinkles become finer and run parallel to the

margin. The colour is reddish brown, slightly lighter round the siphons. Length of the body, 30 mm; breadth of the body, 20 mm.

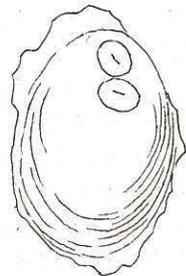


Fig. 22.

Fig. 22. *Styela monogamica*, entire animal. $\times 1$.

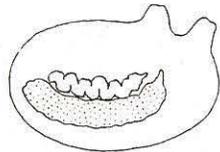


Fig. 23.

Fig. 23. " " with test removed. $\times 1.5$.

are short, and are both distinctly four-lobed.

The Tentacles are very slender, filiform, and about twenty in number. They are of unequal length, but there seems to be no regularity in their arrangement.

The Dorsal Tubercle projects in the form of a very short cylinder, with brown-coloured periphery. The slit was observed to be bent in an S.

The Branchial Sac has four very low, scarcely projecting folds on each side. There are seven to eleven internal longitudinal bars on a fold, and four in the interspace. Transverse vessels are of two sizes, large and small placed alternately; in some places, however, the arrangement is more irregular. The meshes are quadrate, or slightly broader than long, and have about ten stigmata each.

The Dorsal Lamina is a broad but simple membrane, with the free edge more or less undulating.

The Alimentary Canal presents nothing particular. The stomach is ovoid, with the walls folded longitudinally. The intestine is bent in the form of an S, and the straight rectum ends in an anus surrounded by about ten lobes. There is no pyloric coecum, and the duct of the intestinal gland opens directly into the stomach.

The Reproductive Organs are placed symmetrically on both sides of the body. There is one ovary and one testis on each side. These organs are both elongated in shape and lie, though distinct, parallel and closely united to each other. The ovary is a slightly curved, massive tube, placed horizontally near the ventral edge, while the testis, which is much more

The Test is not very thick but tough, and is white in section and on the inner surface.

The Mantle is rather thin, with a slight silky lustre. The musculature consists of two layers, a very thin but uniform external layer of circular fibres and a thin internal layer of delicate longitudinal fibres. The siphons

slender than the ovary, is folded in zigzags and lies along the dorsal border of the latter.

One specimen of this species was obtained off Tubakiyama, July 17, 1927.

15. *Styela plata* OKA.

OKA, A. Über eine scheibenförmige *Styela*-Art aus Nordjapan. Proc. Imp. Acad., Vol. VI. 1930.

External Appearance. The body is strongly depressed antero-posteriorly, so that it looks not unlike an *Adamsia* in a much contracted condition. The animal is always found attached to the outer surface of the upper valve of *Pecten jessoensis*. The anterior or upper side of the body is slightly convex, and is surrounded by a thin irregular marginal zone, while the undersurface is flat or even a little concave and fits exactly to the ribbed surface of the substratum. Both apertures lie on the upper surface, the atrial just in the middle, the branchial about half way between the middle and the ventral edge; both are clearly four-lobed, but perfectly sessile. The surface is rather rough, the peripheral parts are more smooth but always covered with sand or mud. The colour of naked parts is mostly brownish.

The largest specimen shows the following dimensions: Dorso-ventral diameter, 27 mm; from side to side, 24 mm; distance of the apertures 5 mm.

The Test is rather thick on the upper side (1-1.5 mm), coriaceous, opaque; it is exceedingly thin on the under side, but still quite tough and resistant.

The Mantle is separated very easily from the test, even at the apertures, a rare case amongst Stolidobranchiate Ascidiaceans. There are no internal siphons, so that the apertures look like simple punctures on the surface of the mantle. The musculature is limited to the upper half of the body, where it forms a uniform layer of fine fibres running in all directions. The mantle is coloured violet grey on the upper side, on the lower half it is transparent and colourless.

The Tentacles are about sixty in number, and are of three different sizes. They alternate in the usual manner, though not with strict regularity.

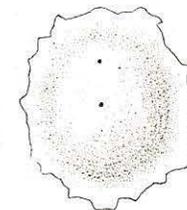


Fig. 24. *Styela plata*, entire animal. $\times 1$.

The *Dorsal Tubercle* is prominent, having the form of a fixed globe. The slit is horse-shoe shaped, occasionally with one of the horns bent outwards. The opening is directed anteriorly.

The *Branchial Sac* has four moderately wide folds upon each side, of which the second and fourth (counted from the dorsal edge) are somewhat narrower than the others. The internal longitudinal bars are arranged on the folds and the interspaces as follows: D 1 (12) 4 (5) 4 (12) 4 (7) 2 E. The transverse vessels are of two sizes alternating regularly; besides, there are very delicate parastigmatic vessels. The meshes in the interspaces are wider than long, and contain eight to ten stigmata each, those along the dorsal lamina are much wider and may contain twenty stigmata. The latter are not very regularly formed, some being short oval or triangular and placed between normally developed ones.

The *Dorsal Lamina* is a moderately wide, simple membrane with smooth edge.

The *Alimentary Canal* occupies the left half of the posterior part of the body, only the oesophagus and rectum extending upwards from the horizontally placed intestinal loop. The oesophagus is very short, almost funnel-shaped. The stomach has a cylindrical form and goes over to the intestine without any definite boundary; its wall has about twenty internal longitudinal folds, distinctly visible from outside. The rectum, which is attached to the ceiling of the body-wall, runs straight toward the atrial aperture and ends in its vicinity. The margin of the anal opening is cut into twelve petal like lobes.

The *Reproductive Organs* are developed upon each side as a single voluminous gland, and fill up, along with the intestinal loop, the whole of the basal half of the body. Each gland consists of a centrally placed large tubular ovary, bordered on both sides by equally large and tubular masses of testicular follicles. The terminal portion, which points toward the atrial aperture, is formed of the ovary only. On the left side the testicular mass is divided into two parts, an anterior and a posterior. The ovary is coloured orange yellow, the testicular masses are rather whitish. Endocarps are present, but not numerous.

Nine specimens of this species were obtained at Asamusi, July 10, 1929. Four very small specimens were also found off Ozawa, August 9, 1926.

This species is no doubt proper to Hokkaido, where it appears to be rather common. Mutsu Bay forms probably the southern limit of its distribution.

16. *Azygocarpa mutuensis* OKA.

OKA, A. Über *Azygocarpa*, eine neue Styelidengattung. Proc. Imp. Acad., Vol. VIII. 1932.

External Appearance. The body is roundish ovate, with the longest diameter horizontal, and adhering by the whole posterior surface. The margin of the base is irregularly expanded at places. No external siphons are present, both apertures being perfectly sessile. The atrial lies just in the middle of the upper surface, while the branchial is placed nearer to the ventral edge; both are distinctly cross-slit. The surface is smooth and naked. The colour is a pale grey, with a little reddish tinge.

The only specimen at hand has the following dimensions: Length of the body, 20 mm; breadth of the body, 18 mm; thickness 14 mm.

The *Test* is soft leathery and relatively thick (1.5 mm) opaque, somewhat reddish on the inner surface.

The *Mantle* is provided with a well developed musculature, especially in the upper half of the body. The circular muscle fibres, which lie exteriorly to the longitudinal, surround partly the base of the branchial siphon and partly the whole body including the atrial siphon, so that there is left a crescentic area devoid of circular muscles, at the centre of which the atrial siphon is placed. The internal siphons are both very low, conical.

The *Tentacles* are all simple, filiform and quite long. There are about forty of them, larger and smaller placed alternately.

The *Dorsal Tubercle* is horse-shoe shaped, but the horns nearly touch, so that the whole appears like a closed ring. The opening is directed anteriorly.

The *Branchial Sac* bears four rather narrow folds upon each side. There are five to seven internal longitudinal bars on a fold, and only two or three in the interspace. The transverse vessels are of three sizes, alternating regularly in the usual manner. Here and there transverse vessels of the third order are replaced by delicate parastigmatic vessels. The meshes are as a rule nearly twice as broad as long, and contain each six to seven elongate oval stigmata. Where parastigmatic vessels

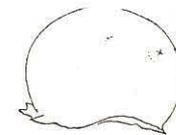


Fig. 25.

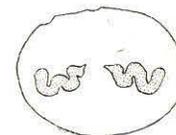


Fig. 26.

Fig. 25. *Azygocarpa mutuensis*, entire animal. $\times 1$.

Fig. 26. *Azygocarpa mutuensis* with test removed. $\times 1.5$.

are present, the meshes are of course more quadrate.

The Dorsal Lamina is rather broad, smooth, and plain edged.

The Alimentary Canal is unusually voluminous. It occupies the greater part of the left side of the body and forms a closed double loop. The oesophagus is not especially wide. The stomach has the shape of a large slightly curved sausage; its walls are smooth externally, but present on the inside a large number of distinct longitudinal folds. There is no pyloric coecum, and the duct of the intestinal gland opens directly into the hinder part of stomach. The intestine and rectum are of uniform considerable width throughout. The anal opening, which is found near the base of the atrial siphon, has a smooth edge.

The Reproductive Organs are developed on one side only, namely on the right. Here they form two strongly undulating tubes placed in such a manner that the distal ends are turned toward each other. Both are nearly horizontal in position, and are rather loosely attached to the inner surface of the mantle. The terminal portions of the oviduct and vas deferens are visible at the pointed end of the glands. The whole inner surface of the mantle, except round the apertures, is closely covered with very numerous small, finger-like endocarps.

One specimen of this curious *Styela* was obtained on the southern coast of Yunosima, June 21, 1926.

Nothing is known of the occurrence of this species elsewhere.

17. *Dendrodoa tuberculata* RITTER.

RITTER, W. E. A contribution to the knowledge of the Tunicata of the Probilof Islands. The Fur Seal and Fur Seal Islands, Pt. III. 1899.

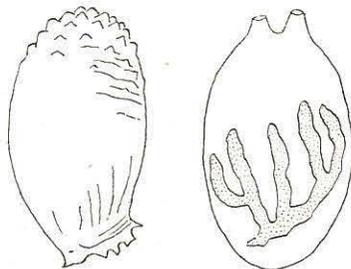


Fig. 27.

Fig. 27. *Dendrodoa tuberculata*, entire animal. $\times 1$.

Fig. 28.

Fig. 28. *Dendrodoa tuberculata* with test removed. $\times 1.2$.

External Appearance. The body is sub-cylindrical, about one third longer than broad, quite regular in form, usually attached by the posterior end, sometimes by one side. The entire surface is closely beset with short blunt, irregular tubercles. The apertures, both placed at the anterior end, not far apart, are scarcely detectable, so completely are they hidden by the tubercles of the test. The colour is brown to yellowish brown, a little darker at the anterior end.

Dimensions of a large specimen:

length, 53 mm; greatest diameter, 35 mm.

The Test is coriaceous, almost horny, scarcely 1 mm thick excepting through the tubercles. It is dull opaque white on cut surfaces; the inner surface, after being separated from the mantle, shows a somewhat pearly lustre.

The Mantle is well developed, being considerably thicker than the test, and is composed mostly of muscle fibres, most of which run length-wise of the animal. An orange colouring matter is present in the mantle, some of which is contained in irregular branched bodies, and some diffused through the muscle fibres themselves.

The Tentacles are numerous, short and simple; they are not all of one size, but there seems to be no regularity in their arrangement.

The Dorsal Tubercle is conspicuous. It is biscuit-shaped, with horse-shoe shaped groove on its surface.

The Branchial Sac has four longitudinal folds on each side, the pair nearest the dorsal lamina being somewhat larger than the others. There are about ten internal longitudinal bars on a fold, and two or three only in the interspace. The transverse vessels are numerous, and all of one size. Parastigmatic vessels are frequently present. The meshes are much broader than long and contain each about twenty stigmata.

The Dorsal Lamina is a plain narrow membrane.

The Alimentary Canal is situated on the left side of the branchial sac, the portion posterior to the stomach forming an S, the two loops of which are closed; the end of the limb of the S corresponding to the pylorus is extended to form the stomach and oesophagus. The latter issues from the dorsal side of the branchial sac. The stomach is not well set from the intestine; it is considerably longer than broad, and its walls present numerous internal folds, though smooth on the outer surface. The rectum runs close along the oesophagus, but extends farther forward than the oesophageal opening.

The Reproductive Organs are on the right side of the animal only, closely attached to the inner surface of the mantle. The ovary is a long, branched, cylindrical body of uniform diameter throughout, the whole consisting of a basal portion situated near to and extending approximately parallel with the mid-ventral line, and five or six simple branches given off from this basal piece, these reaching dorsalward and being inclined somewhat toward the anterior end of the animal. Numerous, rather large endocarps are present.

This is a rather common species of *Styelidae* in Mutsu Bay. Speci-

mens of it were collected at the following localities: 1) Off the Biological Station, July 23, 1926. Eighteen specimens. 2) the same locality, September 8, 1926. Sixteen specimens. 3) Off Itazaki, July 24. Nine specimens. 4) the same locality, August 10, 1927. One specimen. 5) Kamome Sima, July 10, 1927. Six specimens. 6) Off Yunosima, June 18, 1929. Six specimens.

This is a decidedly northern Form, of which Mutsu Bay probably forms the southern limit of distribution. It was first described from the Pribilof Islands.

18. *Corella japonica* HERDMAN, var. *asamusi* OKA.

HERDMAN, W. A. *Tunicata*, Part I. *Ascidiae Simplices*. Challenger Reports, Zoology, Vol. VI. 1882.

OKA, A. Über eine nördliche Varietät von *Corella japonica*. Proc. Imp. Acad., Vol. VII. 1931.

External Appearance. The shape is ovate or longish ovate, the anterior end being narrower than the posterior, which is rounded; the ventral edge is rather more convex than the dorsal. The body is somewhat compressed laterally, and is slightly attached by the lower or right side. The base and the edges are generally produced into fine branched processes. The branchial aperture is subterminal, being slightly on the left side of the anterior extremity. The atrial is about one third of the

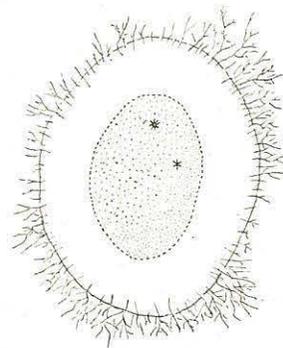


Fig. 29. *Corella japonica* var. *asamusi*, entire animal. $\times 1$.

way from the anterior to the posterior end, and on the left side, not far from the dorsal edge. Both apertures are sessile and inconspicuous. The beautiful orange red colour of the mantle shows through the transparent test.

Length of the body, 45 mm, breadth of the body, 35 mm.

The Test is rather thin, soft cartilaginous, colourless and transparent; no vessels are visible.

The Test is rather thin, soft cartilaginous, colourless and transparent; no vessels are visible.

The Mantle is very delicate over most of the right side and half of the left, while on the anterior and dorsal edge of the right side, and the anterior half of the left side muscular bands are extraordinarily developed, and attain a great thickness. The siphons are muscular and fairly prominent. The branchial aperture is provided with

eight, and the atrial with six ring-shaped ocelli, of a light rust colour.

The Tentacles are very numerous, about fifty in number, touching at their bases; they are all nearly of one size, and are moderately long and filiform.

The Dorsal Tubercle is regular, the outline is between cordate and ovate, and both the horns are coiled inwards.

The Branchial Sac is not plicated. The transverse vessels are large and are all equal in size. They are joined by short wide longitudinal vessels, thus forming square meshes in which the spirally coiled secondary or interstigmatic vessels lie. Internal longitudinal bars are numerous, being in excess of the wide longitudinal vessels. They are delicate but distinct, and are united to the transverse vessels by wide horizontal membranes, which are present in the proportion of two or three to every transverse vessel. The stigmata are curved, and are placed spirally, in rows of square meshes separated by the transverse vessels. The stigmata near the outside of the mesh are usually crescentic, while those further in are longer and are coiled spirally.

The Dorsal Lamina is represented by a series of long tapering languets.

The Alimentary Canal is moderately large, and is placed on the right side of the branchial sac. The stomach is nearly globular. The intestine is wide, and curves round ventrally and posteriorly to the stomach. In consequence of an anterior twist in the oesophagus, the stomach lies nearly antero-posteriorly, and the intestine before turning towards the posterior end, reaches almost to a level with the atrial aperture. The margin of the anal opening is finely crenated.

The Reproductive Organs attain a large volume; they cover the intestine and occupy its loop, and are partly visible from the left side too. The vas deferens is conspicuous, running between the stomach and the posterior part of the intestine, and then between the oesophagus and the rectum towards the atrial aperture.

This is no doubt the most beautiful of Mutsu Bay ascidians, and at the same time one of the most common species. Specimens were obtained at the following localities: 1) Off Hanakuri, July 19, 1926. Seventeen specimens. 2) Off Kozima, Moura, July 20, 1926. Two specimens. 3) Off the Biological Station, July 23, 1926. Four specimens. 4) the same locality, September 8, 1926. Two specimens. 5) Off Itasaki, July 24, 1926. One specimen. 6) the same locality, August 5, 1926. Two specimens. 7) the same locality, August 10, 1927. Eight specimens. 8) Off Urata, July 31, 1926. Four specimens. 9) Off Futatuya, July 24, 1926.

One specimen. 10) the same locality, July 30, 1927. One specimen. 11) Off Isihamamura, July 31, 1926. One specimen. 12) Off Akine, August 22, 1926. Two specimens. 13) Off Hinoki, August 23, 1926. One specimen. 14) Off Yokohama, August 23, 1926. Two specimens. 15) Off Yunoshima, August 29, 1927. Fourteen specimens. 16) Off Tubakiyama, July 17, 1927. Thirteen specimens.

The species *Corella japonica* was first recorded from Kobe, and is rather abundant in Yokohama, but the variety *asamusi* has not been found south of Kesen, where the same form was obtained many years ago.

19. *Chelyosoma siboja* OKA.

OKA, A. Notizen über japanische Asciden, I. Annot. Zool. Japan., Vol. VI. 1906.

External Appearance. The body is irregularly conical, with an oblique base, and is attached by the narrow end corresponding to the apex of the cone; it is somewhat compressed laterally. The basal surface, or the siphonal disc, is elliptical in shape, and is surrounded by thick raised rim, whose peripheral surface is continuous with the lateral walls of the body. The apertures are placed nearly at the centres of the elliptical disc, and

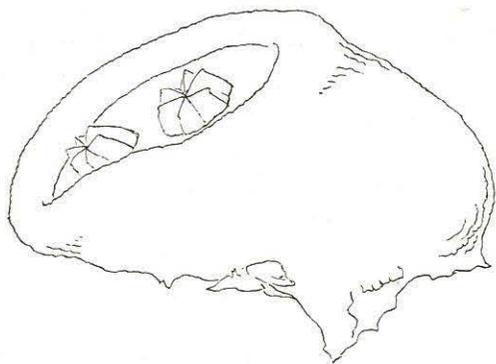


Fig. 30. *Chelyosoma siboja*, entire animal. $\times 2/3$.

form low but conspicuous hexagonal pyramids; both are distinctly six-lobed. The surface, in adult specimens, is irregularly wrinkled, and partly covered with Lithothamnium, Hydrozoa, etc. The colour is greenish brown.

Length of the body, 110 mm; breadth of the body, 70 mm.

The Test is relatively thin, cartilaginous, whitish and semi-transparent on the

inner surface and in section; branched vessels are abundantly present. The siphonal disc consists of twenty-eight horny plates; the siphons are each covered with six triangular plates.

The Mantle is of flesh colour. The margins of the internal siphonal disc are produced into a narrow fringe. The musculature is feeble, there being only short bundles connecting the plates of the siphonal disc.

The Tentacles are very numerous, all simple, filiform; more than forty large ones alternating irregularly with a large number of smaller ones of different sizes.

The Dorsal Tubercle is flat, not projecting, and of simple form, being elongated transversely and slightly bent, with the concavity looking anteriorly.

The Branchial Sac is quite thick, and entirely without folds. The internal longitudinal bars are present in large number. The stigmata are complicatedly bent and arranged in regular longitudinal rows. The endostyle lies along the left side of the branchial sac, so that the left half of the sac is considerably narrower than the right.

The Dorsal Lamina is represented by a crowded row of short pointed languets. It is a little shifted to the right.

The Alimentary Canal lies beneath the branchial sac, somewhat more to the right, and forms an elongated, horizontally placed loop. The anal opening has a plain edge.

The Reproductive Organs form a complicated system of dichotomously branching tubes, and appear like a mass of coarse grains completely covering the digestive tract, both ventrally and dorsally. Their ducts follow the course of the intestine and open in the immediate vicinity of the anus.

This species, although one of the most common forms in Mutsu Bay, is represented in the present collection only by a few small immature specimens obtained on the southern coast of Yunoshima, June 21, 1926.

This is apparently the most characteristic of North Japanese ascidians. It does not occur in regions south of Aomori.

20. *Ascidia samea* n. sp.

External Appearance. The body is elongate ovate, compressed laterally, and fixed by the entire left side, the base of attachment being expanded to form a thin irregular marginal zone. Both apertures are prominent, being borne on short cylindrical or conical siphons, with longitudinal furrows on the outside. The branchial is terminal, it is distinctly eight-lobed, and the siphon has eight longitudinal grooves corresponding to the knitches between the lobes. The atrial is one third to one half of the way from the anterior to the posterior end, close to the dorsal edge of the right side; it is distinctly six-lobed, and the siphon has six longitudinal grooves. The surface is on the whole smooth, but bears here

and there, especially in the anterior region, short conical projections. No foreign bodies are found adhering. The colour is slightly yellowish, horny, the internal body showing through the test.

Length of the body, 43 mm; breadth of the body, 24 mm.

The Test is thin, cartilaginous, almost colourless and transparent.

The Mantle is moderately thick over the right side of the body and on the siphons, it is membranous and transparent over the left side. The musculature consists mainly of two longitudinal rows of short and rather thick transverse fibres, run-

ning along the dorsal and ventral edges of the right side. The siphons, which are darker coloured than the mantle proper, show distinct longitudinal furrows on the outside.

The Tentacles are very numerous, more than fifty; they are all long and filiform, but not exactly of one size.

The Dorsal Tubercle is horse-shoe shaped, with one or both of the horns bent to the left. The opening is directed anteriorly.

The Branchial Sac is of moderate size; it is long, and pointed at the dorsal edge of the lower end, and longitudinally plicated. The transverse vessels are narrow, and all of much the same size. The internal longitudinal bars are strong, and the papillae are large, but of one size only. The meshes are square and contain five or six stigmata each.

The Dorsal Lamina is rather wide; it is closely ribbed transversely, and the margin is serrated.

The Alimentary Canal forms a large closed double loop, occupying the posterior two-thirds of the left side. The stomach is nearly globular, with smooth walls externally. The anus lies a little posteriorly to the point of bending of the intestine, its margin is smooth.

The Reproductive Organs lie chiefly between the stomach and proximal part of the intestine and the branchial sac, encroaching a little upon the

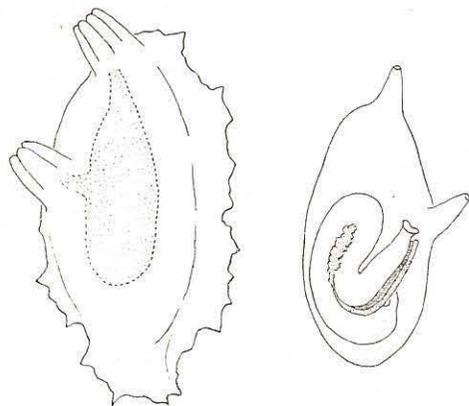


Fig. 31.

Fig. 32.

Fig. 31. *Ascidia samea*, entire animal. $\times 1$.

Fig. 32. " " with test removed. $\times 1.5$.

side of the stomach which lies against the mantle. The oviduct accompanies the rectum and ends near the anus. The vas deferens, running along the oviduct, is sometimes very conspicuous.

One specimen of this species was collected on the eastern coast of Yunosima, August 5, 1926. Another, off Futatuya, July 24, 1927.

The type specimens of this species were collected at Same more than thirty years ago, and several additional specimens have recently been obtained from Kesen. It appears to be a northern species.

21. *Ascidia zara* n. sp.

External Appearance. The body is strongly compressed laterally, forming a flat, irregularly ovate disc, attached by the entire left side. The upper or right side is slightly convex, the left side is quite flat, and the peripheral zone is very thin, consisting of the test only. Both apertures are sessile and inconspicuous. The surface of the right side is densely covered with small, short and blunt papillae. The colour is pale yellowish or horny, translucent.

Length of the body, 37 mm; breadth of the body, 20 mm; thickness, 5 mm.

The Test is rather thick on the upper or right side, but very thin beneath the internal body; it is soft cartilaginous, slightly yellowish and almost transparent. It contains numerous branched vessels.

The Mantle is very small relatively to the size of the entire animal. It is very thin, with the musculature feeble and on the right side only. The siphons are both conical, the branchial is terminal and distinctly eight-lobed, the atrial is about half way down the dorsal edge, and is six-lobed.

The Tentacles are long, filiform, and about fifty in number; they are of somewhat different lengths, though not regularly alternating.

The Dorsal Tubercle is horse-shoe shaped, with both horns curved inwards. The opening is turned anteriorly. The ganglion lies about 3 mm behind the tubercle.

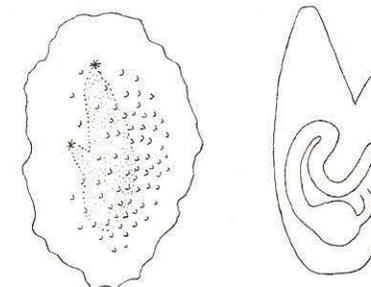


Fig. 33.

Fig. 34.

Fig. 33. *Ascidia zara*, entire animal. $\times 1$.

Fig. 34. *Ascidia zara* with test removed. $\times 1.5$.

The *Branchial Sac* reaches to the posterior extremity of the body. The transverse vessels are nearly all of one size; only here and there wider ones occur. The meshes are regularly quadrate, with four or five stigmata each. The papillae are short and simple. Neither parastigmatic vessels nor intermediate papillae are present.

The *Dorsal Lamina* is rather narrow; it is ribbed transversely and the margin is toothed.

The *Alimentary Canal* occupies the greater part of the left side. The stomach is nearly spherical in shape. The intestine is bent as usual in an S, of which the second curve is open. The anus is placed a little behind the point of bending of the intestine; it has a plain edge.

The *Reproductive Organs* are placed in the first intestinal loop and also on its inner side. Both the oviduct and vas deferens run parallel to the rectum.

Seven specimens of this species were obtained on the coast of Yunosima, July 12, 1926.

Specimens of this species have previously been collected in Hokkaido. The area of its distribution seems to reach southward to Kesen, where a few specimens in my collection come from.

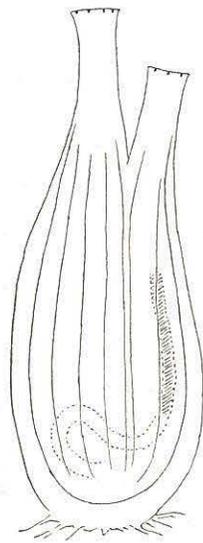


Fig. 35. *Ciona intestinalis*, entire animal. $\times 1$.

22. *Ciona intestinalis* LINNÉ.

LINNÉ, C. Systema Naturae, ed. 10, Tom. I. 1767.

External Appearance. The body is elongate oblong and somewhat tapering towards the anterior end. The orifices are on short tubes, near together, the branchial terminal, the atrial more to one side. The surface is smooth and naked. The colour is pale yellowish, the internal body showing through the transparent test. The branchial aperture has eight, and the atrial six red or orange spots about its margin.

Length of the body, 100 mm; breadth of the body, 40 mm.

The *Test* is soft, gelatinous, colourless and transparent.

The *Mantle* is thin and transparent. There are a number of broad strong longitudinal muscle bands on each side, extending nearly the whole length of

the body. Outside these are fairly numerous but very narrow circular muscles, not gathered into definite bands. The sphincters of the siphons are well developed.

The *Tentacles* are simple, rather numerous and of three sizes arranged with some regularity.

The *Dorsal Tubercle* is C-shaped with incurved or inrolled horns.

The *Branchial Sac* is without folds, though a slight degree of minute fluting or plication is sometimes noticeable. The transverse vessels are narrow; they are of two sizes placed alternately, the smaller ones crossing without interrupting the stigmata. The internal longitudinal bars are numerous but slender; they bear long curved papillae at the intersection with all of the transverse vessels. The papillae at the intersection with the smaller vessels are slightly smaller than the others. A membrane is borne on the concave side of each papilla. The number of stigmata intervening between adjacent internal longitudinal bars is very variable in different individuals as well as in different parts of the sac of the same one, but averages more in larger than in small or immature specimens. It varies from four or six in the latter to six, seven, or occasionally eight in the former.

The *Alimentary Canal* lies partly on the left side of the posterior part of the branchial sac, and partly below it. The stomach is small and short, with a small number of moderately distinct longitudinal folds in its wall. The intestinal loop is small, and the rectum is long, so that the anus lies far above the former. The margin of the anal opening is crenated.

The *Reproductive Organs* are placed mainly in the intestinal loop, but spread also over its outer surface. The ovary is a pear-shaped mass occupying the space in the loop. The testis consists of a great number of small pyriform glands connected by branching ducts, and ramifies over more or less of the surface of the intestinal loop and stomach. Both the oviduct and vas deferens accompany the rectum and open near the anus.

The collection contains a number of small and rather poorly preserved specimens of this species collected at the following localities: 1) Coast of Yunosima, June 21, 1926. Two specimens. 2) the same locality, August 29, 1927. Two specimens. 3) Off Aburakawa, August 7, 1926. Six specimens. 4) Off Sirogasawa, August 11, 1926. One specimen. 5) Moura, August 23, 1926. One specimen. 6) Off Aburakawa, September 11, 1926. Three specimens. 7) Kamomesima, March 13, 1927. Two specimens. 8) Tubakiyama, July 17, 1927. One specimen.

This is a cosmopolitan species, and specimens of it have been found

in abundance in various localities along the coast of Honsyu, Sikoku, and Kyusyu.

SUMMARY.

The species comprising the Ascidian fauna (Ascidiae Simplices) of Mutsu Bay may be divided zoo-geographically into three groups, namely: 1) species characteristic of North Japan, 2) species whose area of distribution covers entire Japan, and 3) cosmopolitan species.

To the first group belong: *Molgula hozawai*, *Eugyrioides asamusi*, *Cynthia roretzi*, *C. iburi*, *Styela clara*, *St. aomori*, *St. monogamica*, *St. plata*, *Azygocarpa mutuensis*, *Dendrodoa tuberculata*, *Corella japonica* var. *asamusi*, *Chelyosoma siboja*, *Ascidia samea*, *A. zara*.

To the second group: *Cynthia michaelsoni*, *C. vittata*, *Styela clava*.

And to the third: *Styela plicata*, *Ciona intestinalis*.

It will be seen from the above list that the greater part of Mutsu Bay Simple Ascidiaceans belong to species which are limited to North Japan, i. e. to that part of Japanese coast lying north to Sendai on the Pacific and Akita on the Japan Sea side. Among these, the most conspicuous forms are no doubt *Cynthia roretzi* and *Chelyosoma siboja*, both being of large size and characteristic appearance. *Styela plata*, though much smaller, is no less characteristic, being disc shaped and attached to the shell of Pecten.

Corella japonica var. *asamusi* also deserves to be specially mentioned. Though the species *Corella japonica*, as originally described by HERDMAN in the Challenger Report, is known to occur at several localities on the coast of Honsyu, Sikoku, and Kyusyu, the specimens are much smaller, the branched processes of the test by far more scanty, and the whole animal is rendered inconspicuous by being covered with mud. Specimens from Mutsu Bay, on the contrary, are really splendid, with luxuriant growth of dendritic processes, transparent test, and the bright red internal body showing through. The two forms, although almost identical in internal structure, are so different in external appearance that I thought it right to distinguish them as separate varieties. *Corella japonica* var. *asamusi* occurs also in Kesen.