

CONTRIBUTIONS TO JAPANESE ASCIDIAN FAUNA. XIX  
ADDITIONS TO JAPANESE ASCIDIAN FAUNA, WITH NOTES ON  
TWO ALREADY KNOWN SPECIES<sup>1)</sup>

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With 12 Text-figures

In the present paper are described the following twelve ascidians, seven of which are new species, three are new to Japan and the rest two are already known species in this country on which some supplementary notes are given.

Species	Locality
1. <i>Polyclinum saturnium</i> SAVIGNY	Sagami Bay, Ōsaka Bay
2. <i>Amaroucium rubrum</i> n. sp.	Sagami Bay
3. <i>Synoicum sagamianum</i> n. sp.	Sagami Bay
4. <i>Didemnum (Didemnum) pardum</i> n. sp.	Sagami Bay
5. <i>Didemnum (Didemnum) translucidum</i> TOKIOKA	Sirahama
6. <i>Didemnum (Polysyncraton)</i> sp. aff. <i>arafurense</i> TOKIOKA	Sagami Bay
7. <i>Trididemnum</i> sp. aff. <i>savignii</i> var. <i>jolense</i> (VAN NAME)	Ōsaka Bay
8. <i>Clavelina minuta</i> n. sp.	Sagami Bay
9. <i>Eudistoma amploides</i> n. sp.	Sagami Bay
10. <i>Distaplia miyose</i> n. sp.	Sagami Bay
11. <i>Ascidia zyōgasima</i> n. sp.	Sagami Bay
12. <i>Cnemidocarpa fertilis molguloides</i> (TOKIOKA)	Sagami Bay

Most of the species were collected in Sagami Bay by His Majesty and submitted to me for studies through the Biological Laboratory of the Imperial Household. Here I want to record my hearty thanks for the great privilege conceded by His Majesty. The didemnid from Ōsaka Bay was offered me for examination by Mr. IWAO HAMATANI and a small colony of the first species was sent to me for identification from Mr. Yasuhiko SHIBATA of the Ōsaka Museum of Natural History. To these gentlemen I want to express here my hearty thanks for their kindness.

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1) Contributions from the Seto Marine Biological Laboratory, No. 392.

1. *Polyclinum saturnium* SAVIGNY, 1816

(Text-fig. 1)

SAVIGNY, J. C. (1816): Recherches anatomiques sur les ascidies composées et sur les ascidies simples. Système de la classe des ascidies. Mémoires sur les Animaux sans Vertèbres, Part II, Fasc. I, pp. 190-191; Pl. 19, fig. 1.

? *Polyclinum cythereum* SAVIGNY (1816): Ibid., p. 191; Pl. 19, fig. 3.

? *Polyclinum uranium* SAVIGNY (1816): Ibid., pp. 193-194; Pl. 18, fig. 2.

A small grayish brown colony, 30 mm × 25 mm in extent and 9 mm thick, from the south-eastern part of Ôsaka Bay off the northern coast of Tomogasima Island. The specimen belongs to Ôsaka Museum of Natural History.

Two moderately large colonies from Sagami Bay, Okinoyama 80 m deep; collected on Feb. 7, 1962 and preserved in formalin. The specimens belong to the Biological Laboratory of the Imperial Household (Sp. No. 704). The larger colony is 90 mm × 75 mm in extent and 20 mm in height, while the smaller one is 75 mm × 70 mm in extent and 30 mm in height. Both colonies are roughly ovoid; the surface is smooth, but encrusted in various degrees with fine sand and with a rough feeding to the touch. The colony is attached to the substratum by some part of the underside where the test is quite soft and gelatinous.

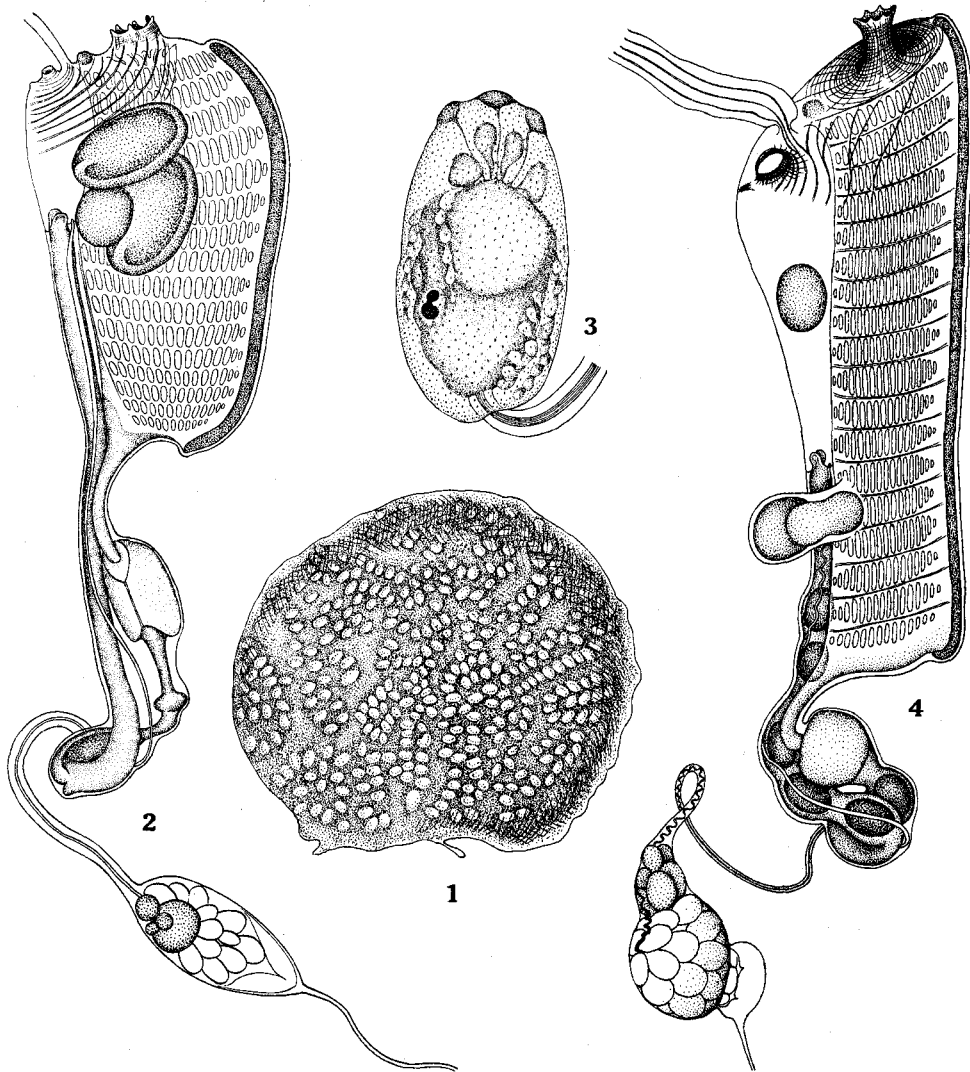
Twenty to twenty-six systems on the colonies from Sagami Bay. Zooids are roughly arranged in two rows and linear groups thus formed converge on the roundish common cloacal aperture with a 2 mm diameter. The arrangement of these linear groups is not strictly radial, but rather irregular as seen on the colony from Ôsaka Bay (Fig. 1) which has a few systems each with a common cloacal aperture with a 1 mm diameter. Thus the systems are very complicated, but never so regular as in *P. constellatum* SAVIGNY.

The test is relatively hard on the surface, but it is very soft, gelatinous and quite free from sand grains inside. The surface is encrusted with sand on colonies from Sagami Bay, while it is quite free from any foreign matters on the small specimen from Ôsaka Bay. Zooidal layer 6-7 mm thick in large colonies, the axial portion of the colony contains only vascular vessels. The soft part of the test is translucent, nearly transparent in small colony and milky white (colony from Ôsaka Bay) to deep red or dark orange brown (colonies from Sagami Bay) in colour; the preservative turns to yellow~dark orange.

*Zooid*: Reddish orange to red in colour. Thorax is 1.5-2.0 mm long in the small specimen from Ôsaka Bay, but attains 4-5 mm in large colonies from Sagami Bay. Abdomen is less than a quarter of the thorax length in larger zooids, but attains 1/2 to 2/3 of the thorax length in smaller zooids. Postabdomen is about two thirds as long as the abdomen in specimens from Ôsaka Bay, while it may be longer than abdomen in some zooids of the large colonies from Sagami Bay. The neck portion of postabdomen is always long, reaching sometimes 1-2 times

the length of postabdomen itself.

*Thorax*: In zooids from the colony from Ōsaka Bay, the thorax is somewhat elliptical in outline, while that from the colonies from Sagami Bay is much elon-



Text-fig. 1. *Polyclinum saturnium* SAVIGNY. 1-3 Specimen from Ōsaka Bay. 1...Small colony with a 30 mm diameter, 2...Right side of zooid, 3...Right side of larva,  $\times 80$ ; 4...Specimen from Sagami Bay, right side of zooid.

gated, the breadth being only one third the length. The branchial aperture six-lobed, rarely 7-lobed. The atrial languet is very long and with a simple tip; the proximal portion is always constricted remarkably in zooids of the Sagami colonies.

It is issued usually from the middle of the range between the atrial aperture and the dorsal ganglion. The atrial aperture roundish and opened at the tip of a very short siphon situated very anteriorly, at the level of the first-third stigmatal row. A minute prominence on the dorsomedian line just behind the aperture. The thoracic muscles are rather few, weak and very short; they are all oblique extending from behind the atrial aperture to the branchial siphon. About eight of such muscles are defined. Most part of the thorax is quite free from any mantle muscles, resultantly the thorax is always found expanded without any contraction. The details of the branchial sac differs considerably between the Sagami colonies and Ôsaka colony.

	Ôsaka colony	Sagami colonies
Number of stigmatal rows	13 in small zooids 16 in large zooids	16-19
Number of stigmata in a row	16-18	14-18
Anus opens at the level of the	6th-7th transverse vessel	11th-14th transverse vessel

Fine muscle fibres are found along the transverse vessels in zooids from Sagami colonies. Papillae on the transverse vessels are roughly as many as stigmata or slightly fewer than the latter. Tentacles consist of 12 large and the same number of small ones alternate regularly and intervened by a minute one at some intervals. In zooids from the Ôsaka colony, the entrance to the pharyngeal portion was so strongly contracted that only about eight slender tentacles were found there. The ciliated groove is a minute oval opening. Dorsal languets are median in the anterior half, but they are displaced to the left side for one-two stigmata (Sagami colonies) or three stigmata (Ôsaka colony) in the posterior half. Distinct incubatory pouch is projected out prominently from the right posterior side of the bilobed anus and contains one or two eggs within it, besides an ovum was found freely in cloaca in many zooids from Sagami colonies. Up to five embryos and ova were found in the incubatory pouch in zooids from Ôsaka colony, which is, however, not projected so prominently as in Sagami colonies. Usually two faecal pellets were found in the distal part of rectum in thorax in zooids of Sagami colonies. Thorases are coloured deep orange in fresh specimens.

*Abdomen*: Stomach is globular in zooids from Sagami colonies, but it is more elongate in those from Ôsaka colony. Hind-stomach is flattened and as long as stomach in zooids of Ôsaka colony, but it is very short in those of Sagami colonies. Middle intestine is about two times as long as hind-stomach. The proximal end of rectum is distinctly constricted off from the middle intestine. Very probably the abdomen of zooids of the Sagami colonies is in a considerably contracted state.

*Postabdomen*: Ovary is proximal, testicular follicles up to 28. A single

vascular vessel is issued from the distal end.

*Larva*: Trunk elliptical, 490-540 $\mu$  in length and about 520 $\mu$  on an average. Three disc-shaped attachment processes are arranged lineally. Four pairs of large ampullae are found at the base of the attachment processes, besides four series of ampullary vesicles, two on each of dorsal and ventral sides. Pigment flecks of the sensory organ are arranged antero-posteriorly in fully developed larvae.

*Remarks*: The colonies from Sagami Bay and that from Ôsaka Bay differ remarkably from each other in the size of thorax, the situation of anus and the appearance of incubatory pouch and abdomen. Especially the difference in the situation of anus is noticeable. However, the appearance of colony systems, the thoracic musculature, and the structure of test are quite common to both samples. The second of these features seems to be most significant, and therefore the colonies from two different localities are treated here under a single species. SAVIGNY (1816) reported six species of *Polyclinum* from the Gulf of Suez. Judging from figures given by SAVIGNY, three of them, *Polyclinum saturnium*, *P. cythereum* and *P. uranium* are considered to be provided with a short thoracic musculature just like that shown by Japanese specimens. The stigmatal rows range from 13 (*P. uranium*) to 15-16 (*P. saturnium* and *P. cythereum*). Very probably these three species are to be united into a single one to which our Japanese specimens belong, too. Evidently, *P. saturnium* is valid according to page priority.

## 2. *Amaroucium rubrum* n. sp.

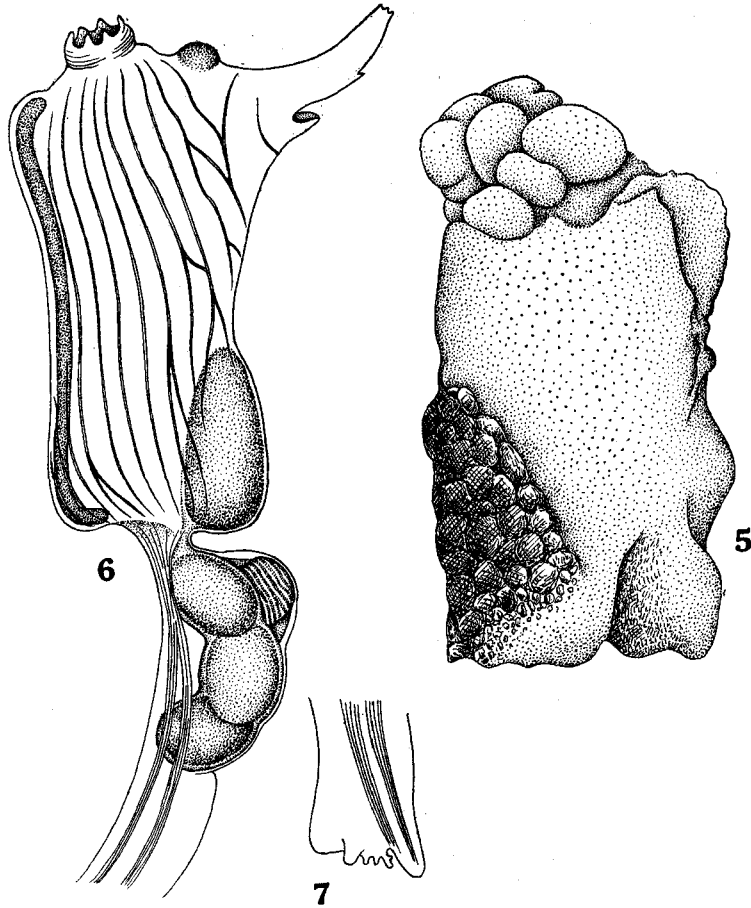
(Text-fig. 2)

Two massive scarlet-red colonies collected on Dec. 6, 1959, in Sagami Bay, at Kwannontuka-dasi in Amadaiba, 48 m deep. The specimens belong to the Biological Laboratory of the Imperial Household, Sp. No. 603.

Larger colony, the holotype, is oval in section, about 20 mm in long diameter, and 29 mm in height. There are six small cormidia at the distal end of the colony. They are respectively 7-8 mm in diameter and 3-4 mm in height and gathered on a low cushion which is then continued to the large basal mass. The test of cormidium is soft, gelatinous, translucent and grayish brown in colour, while the cushion and basal mass are rather hard and attach some minute algae on the surface. The basal portion of the colony carries a small amount of sand grains on the surface. Peduncular portion is not defined between the corona and the basal mass including the cushion. The other colony, the paratype, consists of four small cormidia attached to the basal mass of about 9 mm long and 5 mm high. The details of systems on cormidium could not be cleared.

*Zooid*: Thorases are about 2 mm long, abdomens 1 mm and postabdomens are as long as thorases. Thus zooids are usually about 5 mm long throughout the three portions.

Branchial aperture 6-lobed; atrial aperture may form a kind of short siphon in some zooids, the anterior margin of which is protruded into a stout atrial languet. The tip of the languet is serrated with 3-5 small prominences and the lateral sides are usually marked each with a single slight sinus. Eight or nine longitudinal muscles on each side of the thorax, several dorsal ones are rather oblique in their course. Stigmatal rows ten. Tentacles ca. 20 (?). Anus is



Text-fig. 2. *Amaroucium rubrum* n. sp.  
5...Larger colony (holotype), 6...Left side of thorax and abdomen,  
7...Distal end of postabdomen.

opened approximately at the level of the 6th transverse vessel.

The stomach is situated in the anterior half of the abdomen and furnished with 25-30 plications over the surface. The proximal end of the rectum is constricted strongly off from the preceding part of the alimentary canal, but the existence

of coeca could not be ascertained because of a strongly contracted state of examined specimens. No gonad was found in any examined zooids.

*Remarks:* The present new form resembles *A. monotonicum* TOKIOKA 1954 from the Tokara Islands south of Kyūshū Island in the appearance of the colony, but the former seems to differ from the latter in numbers of stigmatal rows and longitudinal plications on the stomach.

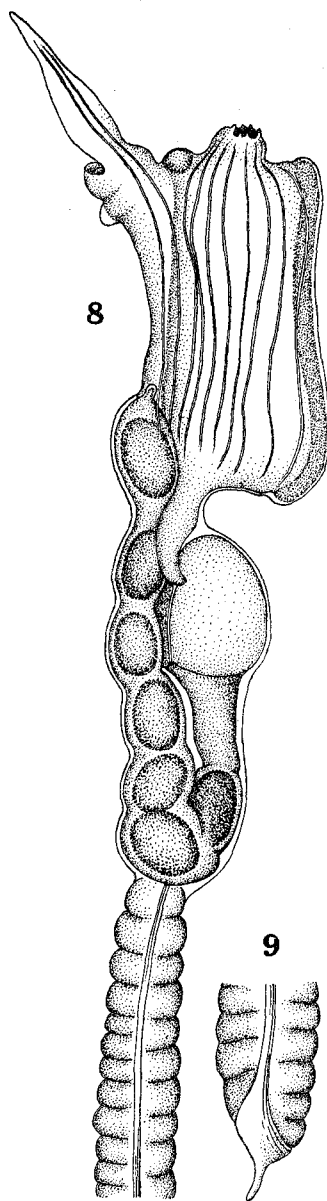
### 3. *Synoicum sagamianum* n. sp.

(Text-fig. 3)

A dark brownish oval colony, 38 mm × 24 mm in extent and 12–13 mm in thickness, and encrusted with sand over the whole surface. It was collected on Feb. 7, 1962, in Sagami Bay, 3.5 k.m. south west by west off Zyōgasima, 93–95 m deep and now it is kept at the Biological Laboratory of the Imperial Household (Sp. No. 705).

The surface of the colony is roughly even, but for several irregular grooves. The inside of the test is gelatinous, very soft, transparent, pale purplish brown in colour and impregnated sparsely with sand grains. Any systems could not be ascertained in the arrangement of zooids. Zooids are coloured orange, formalin in the bottle being coloured deep orange.

*Zooid:* Thorax is about 1.8 mm long in a contracted state, abdomen is usually as long as thorax, and postabdomen is very long, attaining 9 mm at the maximum. Branchial aperture 6-lobed; the atrial forms a kind of short siphon projected out



Text-fig. 3. *Synoicum sagamianum* n. sp.  
8...Right side of thorax, abdomen and the proximal half of postabdomen, 9...Tip of postabdomen.

towards the antero-dorsol side, the anterior margin of which is prolonged into a stout atrial languet with a simple tip and the posterior wall has a median swelling a little behind the aperture. From ten to a dozen longitudinal muscles, partly anastomosing one another, are found on each side of the thorax. As seventeen dorsal languets are found distinctly, stigmatal rows should be 18 or thereabout in number; about a dozen stigmata in each row. Three rows of stigmata behind the level of anus.

Stomach is a little elongate rather than spherical, although it may be roundish in a strongly contracted state, and situated with its pyloric end near the middle of the abdomen; the surface is smooth. Hind-stomach is as long as stomach, a little longer in younger zooids. Middle intestine is half as long as hind-stomach, joints between the middle intestine and the hind-stomach and rectum are usually not so distinct in grown ups as in younger zooids.

Postabdomen is issued from the left posterior end of the abdomen, though in young zooids it is extending from just the posterior end of the intestinal loop. This difference may be attributable to the development of muscle bands running throughout the abdomen and postabdomen which might draw up the postabdomen a little anteriorly in adults. In every examined zooid, the postabdomen was full of mesenchyme cells, and the exact structure of gonad could not be observed.

*Remarks:* Superficially the present colony resembles very closely *S. tukusii* TOKIOKA, 1960 reported from the Ariake Sea along the western coast of Kyūsyū Island which is provided with 14 stigmatal rows each having about a dozen stigmata on each side. Actually, however, it is practically impossible to unite these two forms from different localities into one species at present when the variation in the number of stigmatal rows has not yet been studied.

#### 4. *Didemnum (Didemnum) pardum* n. sp.

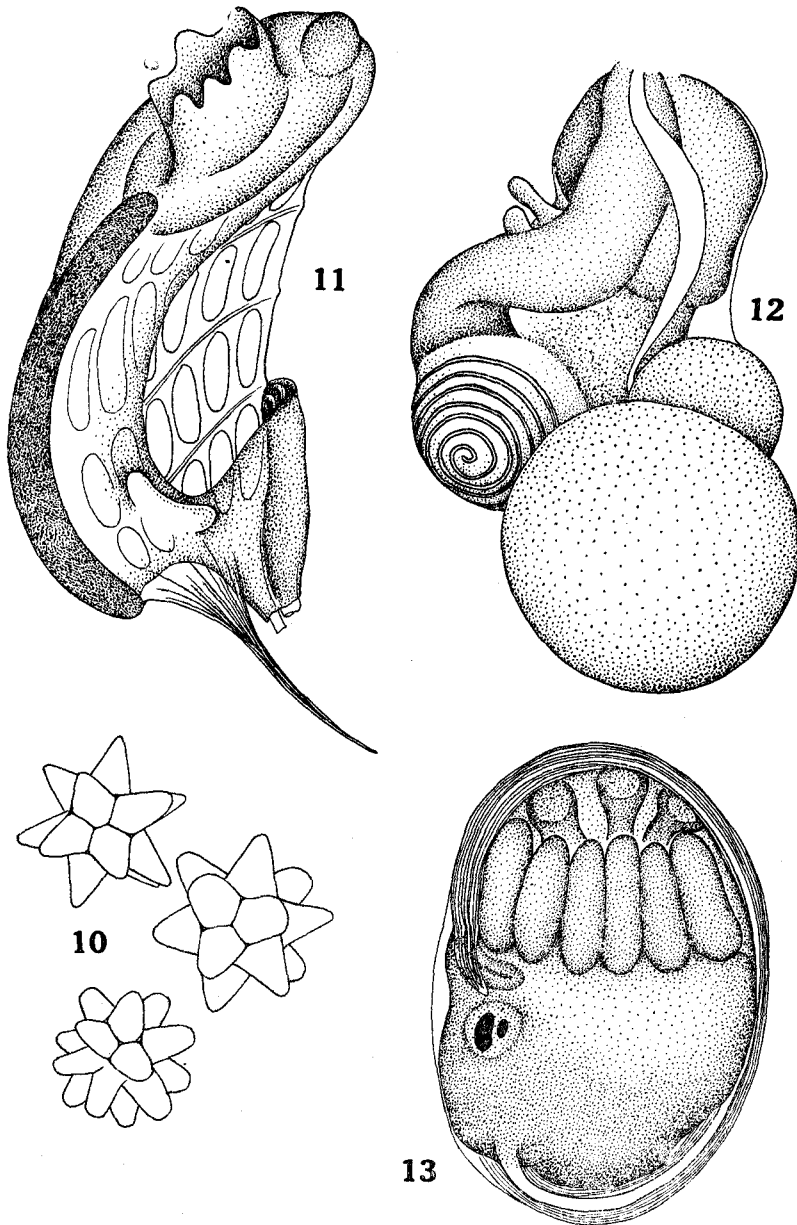
(Text-fig. 4)

Many colonies, less than 22 mm × 10 mm in extent and 0.5–1.0 mm in thickness, collected in Sagami Bay on July 15, 1955, at Miyose-no-takane off Nagai, 10 fathoms deep and preserved in alcohol. Superficial spiculeless layer is not defined. Common cloacal apertures rather few; they are oval and about 0.5 mm in diameter. Preserved specimens are pale grayish brown as a whole, a little darker above zooids. The colouration of living specimens observed by members of the Biological Laboratory of the Imperial Household to which the specimens belong is recorded as the colony is yellowish-yellowish orange on the surface and whitish along the periphery and dark purplish brown or brownish black zooids are seen though the test giving the colony a pattern just like that found on the fur of leopard.

Spicules are distributed evenly throughout the test from the surface to the bottom. They are of the *moseleyi*-type, 31–37 $\mu$  in diameter in measured samples,



and have rather short and stout rays blunt or bluntly pointed at the tip and 6-8, most frequently 6-7, in number on the equatorial plane. Minute roundish spots formed of black pigments and approximately as large as spicules are distributed



Text-fig. 4. *Didemnum (Didemnum) pardum* n. sp.  
 10...Spicules,  $\times 627$ ; 11...Left side of thorax,  $\times 107$ ; 12...Left side of abdomen,  
 $\times 107$ ; 13...Right side of embryo,  $\times 107$ .

sparsely on the bottom or in the bottom layer of the colony. Thoracic lacunae distinct, but hypoabdominal lacunae are absent. Distance between zooids fluctuates from 490 to 1030 $\mu$ , with an average of 670 $\mu$ .

*Zooid*: Thorax is up to 720 $\mu$  and abdomen to 680 $\mu$  excluding mature ovum. Branchial aperture 6-lobed, atrial aperture is a huge opening and without any languet. About six stigmata in each of four rows. Tentacles 13-14. Anus opens at the level of the third transverse vessel. An ear-shaped thoracic organ is located near the posteroventral corner of the atrial aperture on each side. Retractable muscle rather long, it may attain 1~1-1/2 times the length of contracted thorax. Testicular follicle 1, the proximal portion of vas deferens coils 7-8 times. Ovary is always situated on the right side of the testis.

*Larva*: Trunk is oval and attains 590 $\mu$  in length. Three attachment processes are cup-shaped and arranged lineally. Six pairs of ampullae are present. Pigment flecks of the sensory organ are arranged dorso-ventrally. Ampullae and the posterior portion of the body proper are coloured orange, while the anterior part of the body proper is yellowish.

*Remarks*: The appearance of calcareous spicules of the colony and the existence of 12 ampullae at the base of the attachment processes of larva remind us of *D. (D.) areolatum* TOKIOKA, 1953 from Sagami Bay. However, in *D. areolatum* the superficial layer of the test above the thoracic lacuna-system is quite devoid of spicules and this gives the colony an areolate appearance. It is not known whether such a difference found in the distributional feature of spicules between the two species under consideration is significant or not. Then, at present, the colonies described here are treated provisionally as a distinct species and named after the colour pattern of living specimens.

##### 5. *Didemnum (Didemnum) translucidum* TOKIOKA, 1953

(Japanese name: *Sumizome boya*)

(Text-fig. 5)

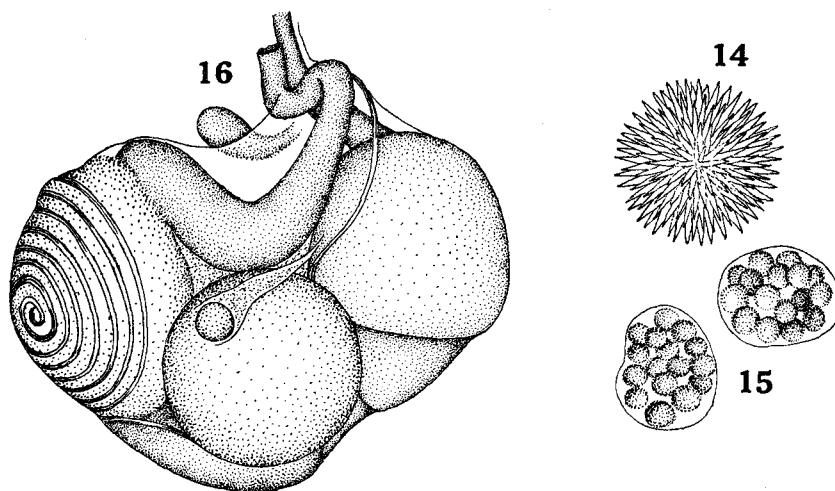
TOKIOKA, T. (1953): Ascidians of Sagami Bay, pp. 37-38 and 189-190; Pl. 18, figs. 5-7.

*Loc.*: Hatakezima near Sirahama, Kii. Many colonies encrusting the underside of stones in shallow pools near the low water mark of the intertidal zone.

*Colony*: Large colonies may attain 25 mm $\times$ 25 mm in extent, but usually they are less than 15 mm $\times$ 10 mm~25 mm $\times$ 10 mm in extent; thickness is about 1 mm. The surface is smooth and wholly exposed. Generally the colony is purplish black, ranging from faint purplish gray to grayish black through purplish and purplish black. Faintly coloured colonies are somewhat translucent. Some ones are coloured darkly on some parts, but nearly colourless in other parts of the same colony. Common cloacal apertures are rather few, one and a half or two times as large as branchial apertures and coloured darkly along the margin.

Branchial apertures are also fringed with dark pigments and marked with six white spots formed of aggregated spicules.

There is a transparent superficial spiculeless layer over the colony surface. Spicules are generally found sparsely at some places of the upper and bottom strata of the thoracic layer. They are very small, the maximal diameter measured is  $18\mu$  and  $15\mu$  on an average. Most of them are composed of needles, about 25 in number on the equatorial plane. Exceptionally a few spicules resembling those of *D. candidum* can be found among usual ones. Spicules may sometimes aggregate to form small masses at some places of the colony. The abdominal layer seems to



Text-fig. 5. *Didemnum (Didemnum) translucidum* TOKIOKA.  
14...A spicule,  $\times 1200$ ; 15...Granular cells,  $\times 1200$ ; 16...Left side of abdomen,  $\times 73$ .

be always devoid of spicules. Many granular cells are found in the test. They are slightly smaller than spicules, oval to elliptical in shape and those of a medium size contain respectively about 15 granules within them. The purplish black pigments are deposited in the thoracic layer and easily soluble in formalin so that formalin in the bottle turns grayish purple only a day after fixation.

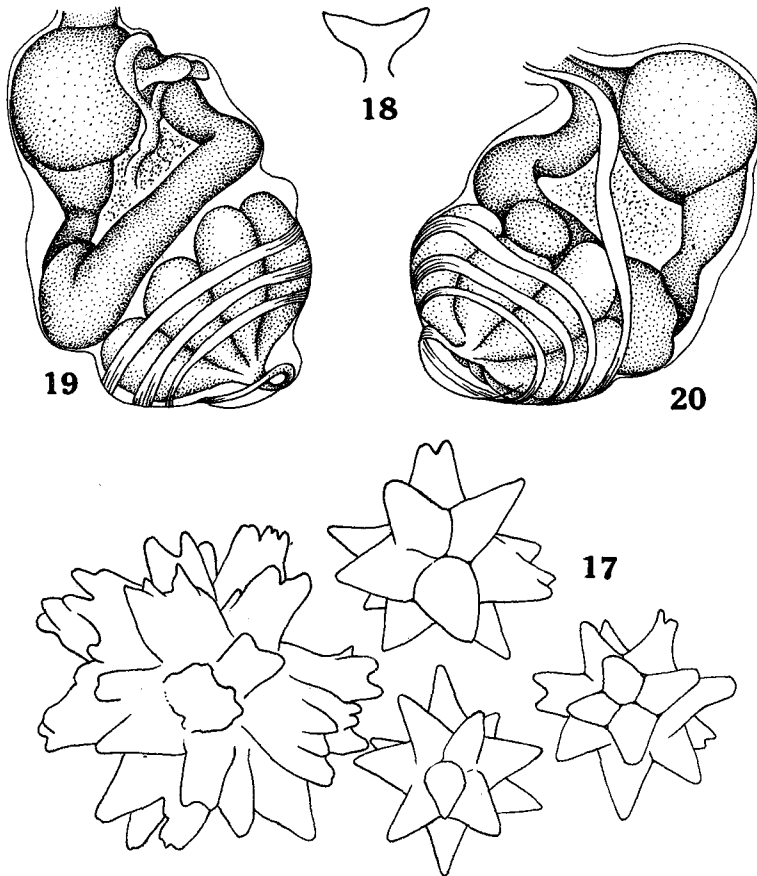
*Zooïd*: Thorax is up to  $540\mu$ , with an average of  $420\mu$  in a contracted state; abdomen is up to  $750\mu$ . Distance between zooïds is  $760\mu$  on an average. Thorax is colourless; about six stigmata in each of four rows on the branchial sac; retractile muscle is about half as long as thorax. Testicular follicle 1, the proximal portion of vas deferens coils 7-10 times. Stomach, intestine, ova and embryos are all orange. Hind-stomach and middle intestine are much paler in colouration. The trunk of embryo is about  $440\mu$  long in a not fully matured state. The specimens collected on August 27, 1961 contained zooïds with mature gonad and larvae of early developmental stages.

*Remarks:* This is the description on fresh specimens made as a supplementary one to that made on two small preserved specimens collected in Sagami Bay.

6. *Didemnum (Polysyncrator)* sp. aff.

*arafurense* TOKIOKA, 1952

(Text-fig. 6)



Text-fig. 6. *Didemnum (Polysyncrator)* sp. aff. *arafurense* TOKIOKA.  
17...Spicules,  $\times 627$ ; 18...Atrial languet, 19...Right side  
of abdomen,  $\times 73$ ; 20...Left side of abdomen,  $\times 73$ .

*Didemnum (Polysyncrator) arafurense*...TOKIOKA, T. (1952): Ascidiens collected by Messrs. RENZI WADA and SEIZI WADA from the pearl-oyster bed in the Arafura Sea in 1940. Publ. Seto Mar. Biol. Lab., II (2), pp. 91-92, text-fig. 1.

Several colonies collected on July 13, 1955 in Sagami Bay, at Miyose-no-takane off Nagai, 10 fathoms deep and preserved in formalin. Colonies are white, but with a faintly grayish tint and up to 7 mm×10 mm in extent and ca. 1 mm in thickness. The surface is quite even in some colonies, but it may be a little elevated around respective branchial apertures in others. Spicules are found densely in the surface layer, but very sparsely in the bottom layer. They are usually up to 43–48 $\mu$  in diameter, although exceptionally they may attain 74 $\mu$  in diameter. They consist each of rather short and stout rays, pointed shaply at the tip and 8–9 in number on the equatorial plane. The tip of rays may be eroded or broken in some large spicules. Living colonies are yellowish white.

*Zooïd*: Thorases are about 640 $\mu$  in length and abdomens are 590 $\mu$  excluding testis. Distance between zooïds is 490 $\mu$  on an average. Branchial aperture 6-lobed. Atrial languet short, with a bifurcated tip. About eight stigmata in each of four rows. Retractable muscle of the thorax insignificant in examined zooïds. Testicular follicles 5–7, the proximal portion of vas deferens coils 3-1/2~4 times. The specimens belong to the Biological Laboratory of the Imperial Household.

#### 7. *Trididemnum* sp. aff. *savignii* var. *jolense*

(VAN NAME), 1918

*Didemnopis jolense*...VAN NAME, W. (1918): Ascidians from the Philippines and adjacent waters. U. S. National Museum, Bull. 100, Vol. 1, Part 2, pp. 147–148, text-fig. 97.

A small massive colony, 9 mm×6 mm in extent and 4 mm in height, was collected by Mr. I. HAMATANI on July 17, 1959 in Ôsaka Bay, at the *Zostera*-ground near Tannowa. The test is soft gelatinous, milky white, but with a pale brownish tint, and entirely devoid of spicules. Thorases are up to 455 $\mu$  and abdomens are up to 655 $\mu$  in examined zooïds. Retractable muscle short, about half as long as thorax. Atrial aperture forms a short siphon. Stigmatal rows three. Testicular follicle one, the proximal portion of vas deferens coils 4–5 times.

*Remarks*: In the typical colonies of *T. savignii* var. *jolense* (VAN NAME) from the tropical waters of the Pacific, the test contains usually a larger number of dark brownish pigment cells and thus the colony looks brownish in a preserved state. Zooïds are much larger, thorases may attain 630 $\mu$  in a contracted state and abdomens are 1000–1100 $\mu$ . The proximal portion of vas deferens coils 5–7 times. Most of the differences found between the tropical specimens and that from Ôsaka Bay may probably be attributable to the size difference or the age of the colony. However, zooïds of the present specimen seem to be too small as is shown by the length of the abdomen, and thus I hesitate at present to treat the specimen definitely under *T. savignii* var. *jolense*.

8. *Clavelina minuta* n. sp.

(Text-fig. 7)

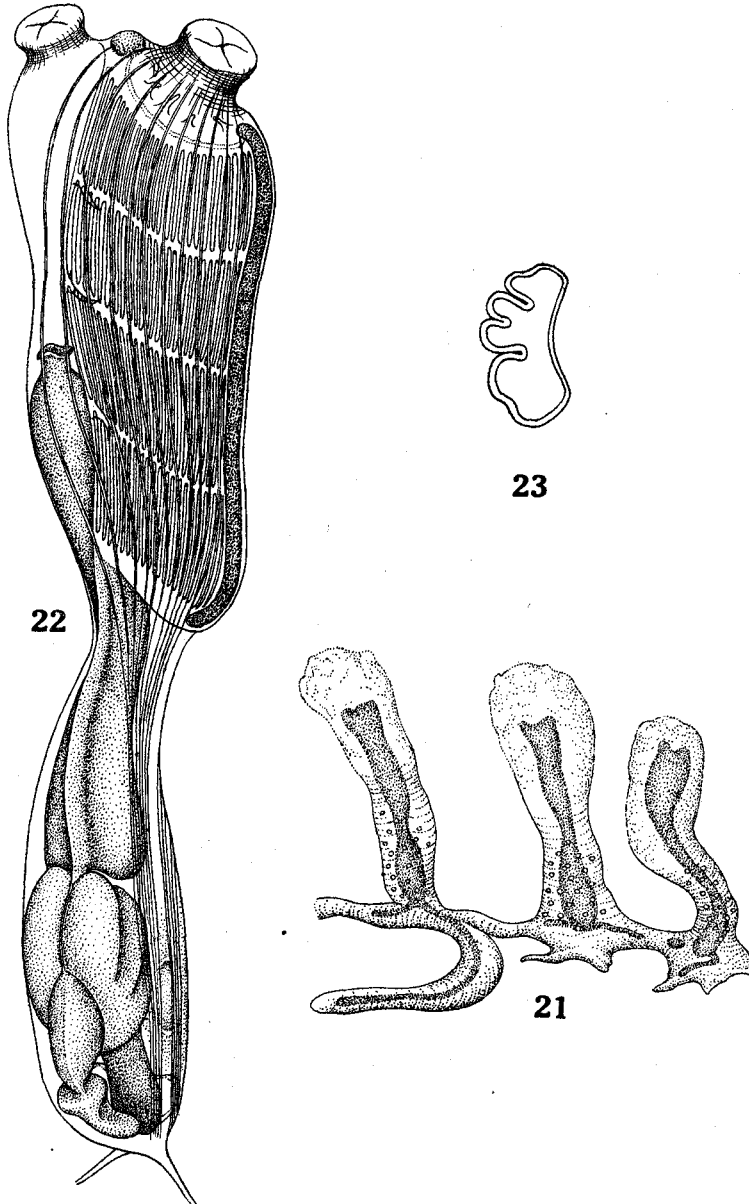
Three colonies creeping on a hydrozoan colony dredged on Feb. 7, 1962, in Sagami Bay, 3.5 k.m. south west by west off Zyôgasima, 93-95 m deep. They are consisting respectively of 6, 7 and 8 zooids connected one another with stolon at their posterior end of the body. Each zooids is less than 7 mm in length; the distal half is occupied by thorax, while the proximal half by abdomen. The test of the thoracic region is soft gelatinous and transparent, while that covering the abdomen is slightly harder, transparent or translucent and sprinkled over the surface with small roundish patches which are spherical bodies with a diameter of  $58-89\mu$  and  $77\mu$  on an average and full of orange brown corpuscles.

*Thorax*: Both apertures 4-lobed in a closed state, exceptionally atrial aperture may be surrounded by 5 lobes. About a dozen longitudinal muscles on each side of the thorax, converging onto the ventral side of the abdomen in a pair of longitudinal muscle bands. Because of the contraction of thoracic muscles, the atrial aperture is usually protruded anteriorly beyond the level of the branchial aperture. Stigmatal rows are only four, each containing about 30 elongate stigmata. Tentacles eight, four large and four small ones alternate regularly. Ciliated groove is a small oval opening. Dorsal languets are nearly median. The anus is opened at the level of the third transverse vessel.

*Abdomen*: Stomach is about one third as long as abdomen and situated with its cardiac end approximately at the middle of abdomen. The surface is marked with three thicker and one or two thinner longitudinal ridges in a preserved state. Oesophagus is swollen conspicuously, but constricted remarkably at the end adjoining to stomach. Hind-stomach is half as long as stomach and middle intestine is as long as hind-stomach. The proximal end of rectum is constricted off from the middle intestine at the posterior end of the abdomen, but any coeca are not formed there. Gonad was immature in all examined zooids, its place was full of mesenchyme cells. Two vascular vessels are issued from the rear end of each zooid. They are running into the stolon, but all ending freely and thus without any organic connection between zooids.

*Remarks*: At first sight, this form reminds me of *Archidistoma* as it is provided with so few stigmatal rows and so distinct hind-stomach and middle intestine. However, the appearance of the colony and the ridged surface of stomach seem to place this form rather under the genus *Clavelina*. As the gonad is not yet formed and hind-stomach and middle intestine are as distinct as in young zooids or individuals of some species of genera such as *Syndiazona* or *Ascidia*, it is very possible that this represents a stage of young blastozoid having much fewer stigmatal rows than in adult form. Anyhow, the existence of four stigmatal rows can not be exceptional in *Clavelina*, as *Clavelina producta* MILNE EDWARDS

from French and English waters is provided with three stigmatal rows and oozoids of *C. lepadiformis* (MÜLLER) and *Pycnoclavella aurilucens* GARSTANG from European waters are respectively provided with two and four stigmatal rows.



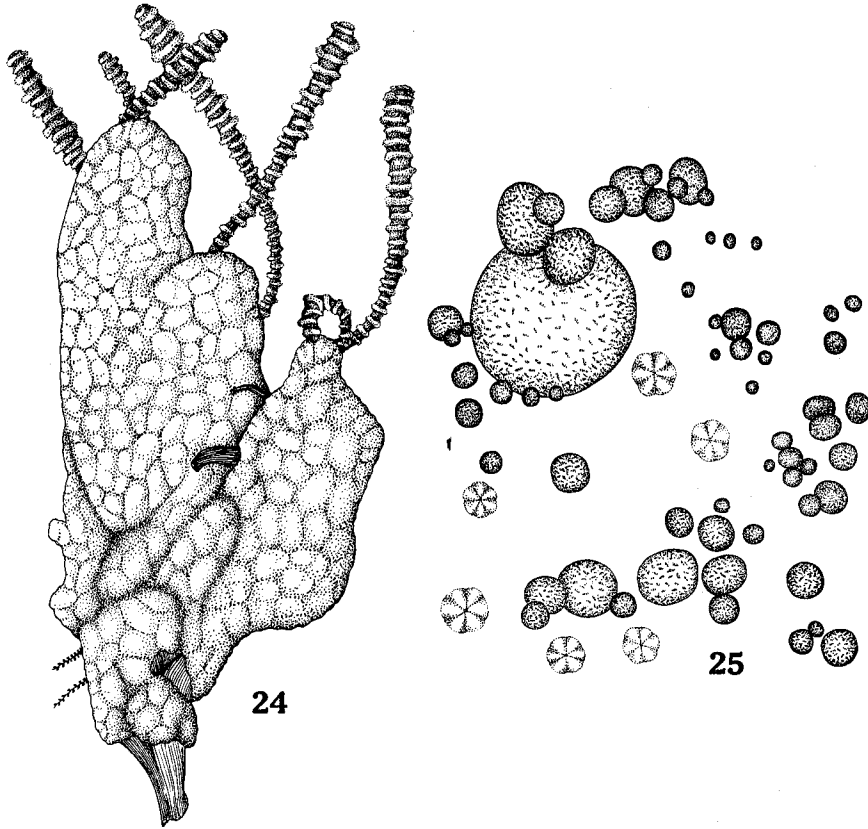
Text-fig. 7. *Clavelina minuta* n. sp.

21...A part of colony, enlarged; 22...Right side of zooid, 23...Cross section of stomach.

Until the specimens having mature gonads are found, the present form is treated provisionally as a new species and named *Clavelina minuta*. The types are deposited at the Biological Laboratory of the Imperial Household; Sp. No. 709.

9. *Eudistoma amploides* n. sp.

(Text-figs. 8-9)

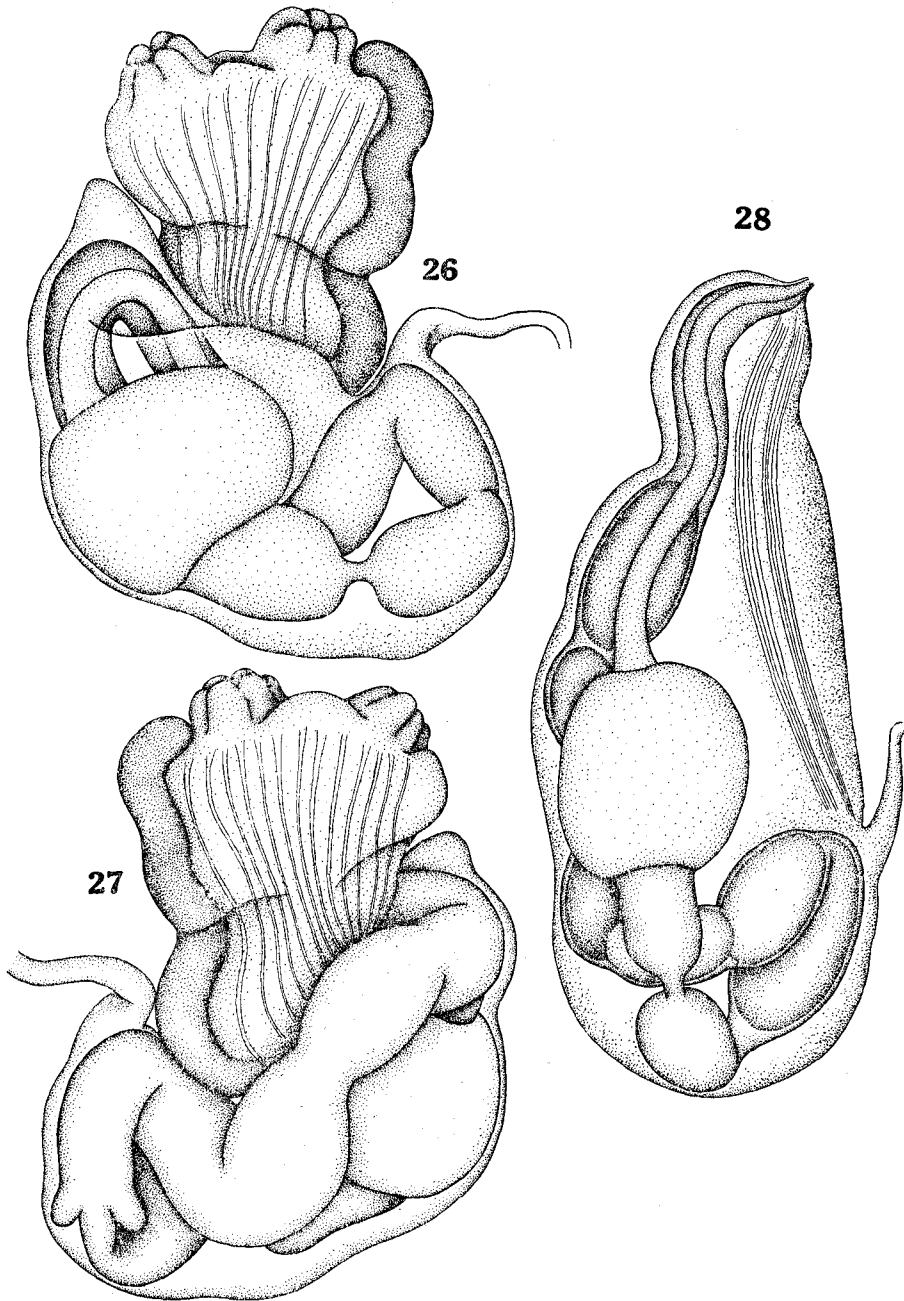


Text-fig. 8. *Eudistoma amploides* n. sp.  
24...Holotype colony, enlarged; 25...A part of test,  $\times 23$ .

Three colonies from Sagami Bay, collected on March 16, 1954 at Nasima off Hayama, 2-3 fathoms deep. One is encrusting the basal portion of *Sargassum* sp., while other two are covering the base of *Acanthopeltis japonica* OKAMURA. The widest portion of colonies stretches for 45 mm  $\times$  25 mm in extent, the thickness varies from 3-5 mm to 10 mm. The specimens belong to the Biological Laboratory of the Imperial Household, Sp. No. 293.

*Test*: Translucent; a little hard, but not so coarse to the touch as in *E.*





Text-fig. 9. *Eudistoma amplexoides* n. sp.  
26, 27...Strongly contracted zooids,  $\times 47$ . 26...Right side of zooid, 27...Left side of zooid,  
28...Right side of extended abdomen,  $\times 47$ .

*amplus* (SLUITER). The surface is free from any foreign matters and in most parts it is divided by many grooves into a number of small areas, 1-2 mm in diameter. In some parts of colonies these grooves may be quite obscure. It is grayish green as a whole or may be pale grayish green and sprinkled with darker spots. The systems of the arrangement of zooids are indistinct. There are many spherical vacuoles scattered in the test, they are usually up to  $340\mu$ , but exceptionally to  $910\mu$  in diameter and packed with dark greenish pigments, besides a few faecal pellets are buried among them. These vacuoles are densely distributed in the surface layer of the colony. The bottom layer of the colony is impregnated with a few sand grains.

*Zooid*: Thorases are all contracted as they are reticulated on each side with 10-12 longitudinal and up to 8 transverse strong muscles. Contracted thorases are less than 1.1 mm and abdomens are up to 2.3 mm in length. Both branchial and atrial apertures are 6-lobed, the atrial aperture is situated a little posterior to the branchial in a contracted state. Tentacles about a dozen. Stigmatal rows three. The stomach is spherical, smoothly surfaced and situated in the posterior half of the abdomen. Hind-stomach and middle intestine distinct. The proximal end of the rectum is constricted markedly from the middle intestine, where it may be swollen into a pair of small coeca in some zooids. A vascular vessel is issued from the posterior end of the abdomen, but it is usually drawn much anteriorly by the contraction of a pair of strong muscle bands along the ventral side.

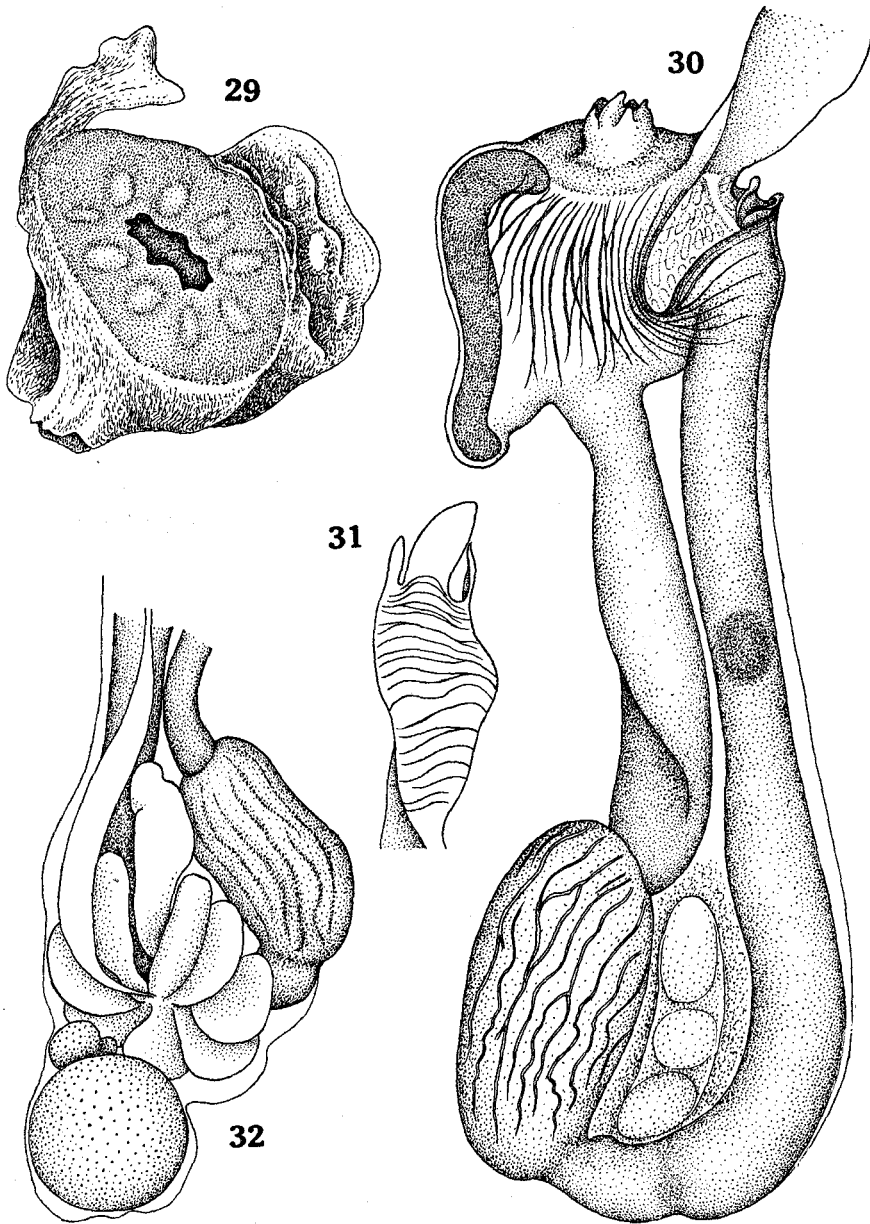
*Remarks*: The existence of many spherical vacuoles in the surface layer of the test resembles closely the structure found in *Eudistoma amplus* (SLUITER) from the Siboga Area. However, the test is not so coarse as in SLUITER's species and rather translucent. Moreover, any distinct systems can not be detected in the arrangement of zooids. In *E. amplus* (SLUITER), the test is very coarse to the touch and zooids are arranged in regular small circular systems.

#### 10. *Distaplia miyose* n. sp.

(Text-fig. 10)

Two small colonies collected in Sagami Bay on August 7, 1953, at Miyoseno-takane off Nagai, 8-9 fathoms deep and preserved in alcohol. The larger one, the holotype, consists of two cormidia, each 4 mm  $\times$  3 mm in extent and 2.5 mm in height, while the smaller one, the paratype, contains only a single cormidium a little smaller than in the former. Both types are deposited at the Biological Laboratory of the Imperial Household.

Each cormidium contains only one system consisting of 7-9 zooids situated vertically surrounding an oval common cloacal aperture, whose margin is fringed with the serration formed by distal ends of atrial languets of zooids surrounding the aperture. The upper surface of the colony is greenish, especially darkly



Text-fig. 10. *Distaplia miyose* n. sp.

29...Paratype colony, enlarged; 30...Left side of a zooid with strongly contracted thorax, 31...Atrial languet, 32...Left side of abdomen.

along the outline of respective zooids, the basal portion of the colony is whitish. The test is pale greenish and translucent.

*Zooid*: Thorax is strongly contracted to about 1 mm long in all examined zooids; abdomen is exceedingly elongate, attaining 2.3 mm. The thorax is pale greenish, its anterior side, especially the dorsal portion of the side, being coloured dark green; the anterior side of the atrial languet is somewhat greenish, too. Eggs are yellowish orange.

Branchial aperture 6-lobed, the atrial languet is stout, ending in a single tip or being trifid at the tip. There are twenty to thirty longitudinal muscles on each side of the thorax; some dorsal ones are running obliquely towards the dorsal side in the posterior half, while about twenty ventral ones are stretching from the anterior end to the bottom of the thorax. Tentacles 12, large and small ones alternate regularly. About fourteen stigmata in each of four rows, parastigmatic vessels present.

Stomach is elliptical, situated near the posterior end of the abdomen and furnished with up to 25 longitudinal plications which can be seen clearly on the surface. Oesphagus is very long. None of distinct boundaries is found between the middle intestinal portion and the adjoining parts of the alimentary canal. Gonads are located on the left side of the intestinal loop a little posterior to the level of the stomach, a few ova and posterior part of the testis may be somewhat protruded posteriorly from the rear end of the intestinal loop. Probably the ovary is originally central. Testicular follicles 10-12, usually they are rather elongate.

*Remarks*: The appearance of the colony resembles those of *D. coronata* TOKIOKA, 1955 and *D. systematica* TOKIOKA, 1958. However, the arrangement of the thoracic muscles differs distinctly one another in these three. *D. coronata* is provided with oblique muscles, while *D. systematica* has a musculature consisting of only transverse muscles. As the present new species has strong longitudinal muscles, the thorax is always contracted antero-posteriorly. Proportionally long abdomen may be taken up as a character unique to this species.

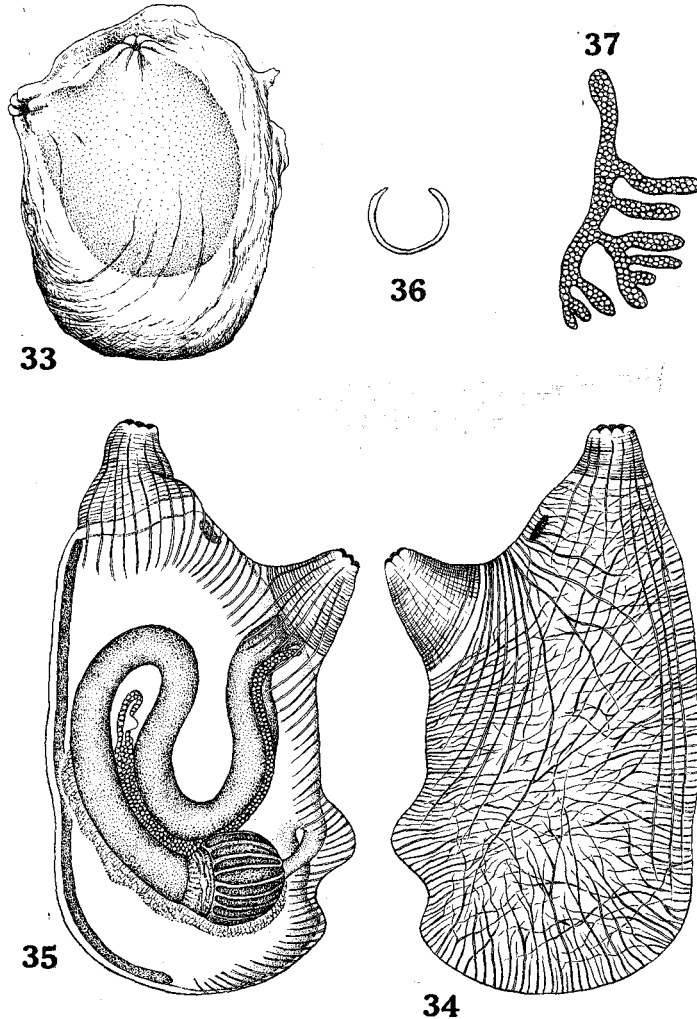
#### 11. *Ascidia zyôgasima* n. sp.

(Text-fig. 11)

A single 23 mm long specimen found in a dredged material obtained on April 9, 1960 in Sagami Bay, 5 k.m. south west off Zyôgasima and 300-450 m deep. The specimen is deposited at the Biological Laboratory of the Imperial Household, Sp. No. 609.

The body is roughly oval and attached to the substratum by the whole left side. The branchial aperture is terminal and 7-lobed, the atrial is 6-lobed and situated at the level of the anterior one third. The test is soft gelatinous and

transparent; the surface is smooth, quite devoid of any grooves or papillae and carries a little mud. Mantle is very delicate; the right side is wholly reticulated with muscles as shown in Fig. 34. The anterior end of the intestinal loop does not reach beyond the level of the base of the atrial siphon. The second intes-



Text-fig. 11. *Ascidia zyogasima* n. sp.  
 33...Entire animal, right side; 34...Right side of mantle body, 35...  
 Left side of mantle body, 36...Ciliated groove, magnified; 37...Ovary,  
 from the right side.

tinal loop is very deep; its axis passes approximately through the short mid-intestinal portion next to the pyloric end of the globular stomach which is furnished with about eight plications on the left side.

About forty tentacles; large and small ones alternate regularly, but partly the arrangement of large-small-medium-small-large can be seen. Ciliated groove is simple, C-shaped and open anteriorly; it is situated anterior to the dorsal ganglion apart from the ganglion for the length of dorsal tubercle. There are 68 inner longitudinal vessels on the right side; transverse vessels are 38-45. The arrangement of transverse vessels, thick-thin-medium-thin-thick, is prevailing in the anterior half, while in the posterior part of the branchial sac this arrangement becomes somewhat irregular as the thinner vessels become to be parastigmatic vessels. Plications are insignificant. Supporting papillae of longitudinal vessels are of the usual shape, but they are generally small and rather slender; intermediate papillae are found in the posterior part of the branchial sac at the places where parastigmatic vessels cross the longitudinal ones. Dorsal lamina is ribbed, the tip of ribs is protruded out from the laminal edge.

The ovary is a dendroid gland covering the inner surface of the testis that stretches over the inner surface of the stomach and the proximal half of the ascending branch of the first intestinal loop.

*Remarks:* The present new species of *Ascidia* is characterized most remarkably by the existence of so many inner longitudinal vessels for such a small body size.

## 12. *Cnemidocarpa fertilis molguloides* (TOKIOKA), 1953

(Text-fig. 12)

*Cnemidocarpa fertilis* f. *molguloides* TOKIOKA, T. (1953): *Ascidians of Sagami Bay*, pp. 119-120 and 259-260, Pl. 58.

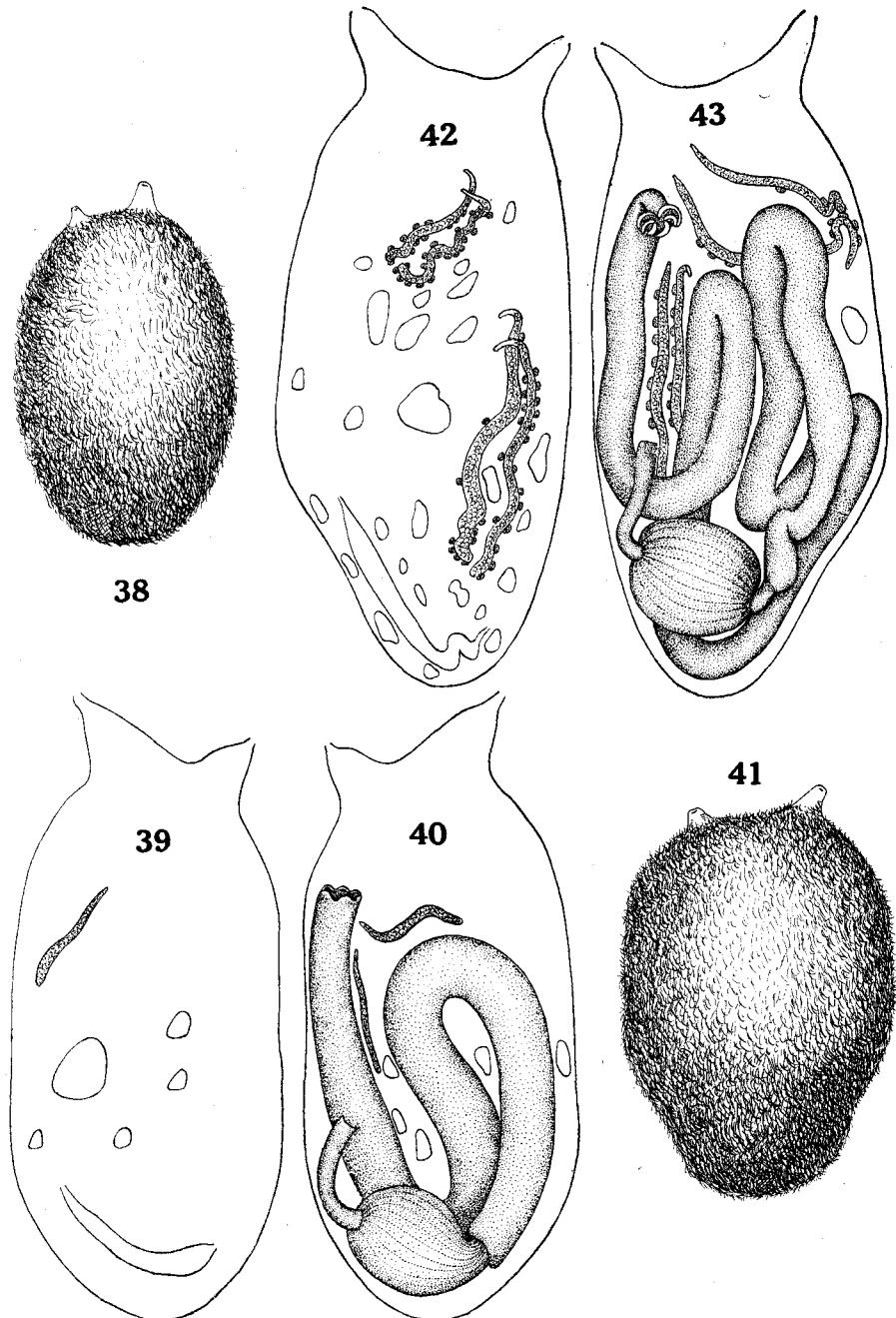
After I described on the present form in 1953, three more samples were examined. All were collected in Sagami Bay and belong to the Biological Laboratory of the Imperial Household.

No. 1) Eleven specimens dredged on July 13, 1955, at Barane off Hitiriga-hama, 60-70 m deep, and preserved in alcohol. Ten of the specimens are nearly spherical in shape, up to 10 mm×14 mm in size and 11 mm in height, while the rest one is very elongate, 22 mm long and 8 mm wide.

No. 2) A single 25 mm long oval individual collected on Feb. 8, 1962, at Hiramom off Enosima, 60 m deep.

No. 3) Seven 12-25 mm long specimens collected off Hayama on Feb. 13, 1961.

Of the above-mentioned 19 specimens, three (the elongate one of No. 1 sample, No. 2 sample and the 25 mm long individual of No. 3 sample) are very remarkable in having an especially long intestinal canal that is looped once or twice on its way to the anus. The most complicated one is shown in Fig. 43. Indeed, this is a very striking feature, but yet this can not be considered to be a character unique to some specimens, but seems to be merely a special state occurred on



Text-fig. 12. *Cnemidocarpa fertilis molguloides* (TokioKa). 38-40...19 mm long individual, 41-43...25 mm long individual.

38...Entire animal (19 mm long), 39...Inner side of the right half of mantle body, 40...Inner side of the left half of mantle body, 41...Entire animal (25 mm long), 42...Inner side of the right half of mantle body, 43...Inner side of the left half of mantle body.

some rather large, elongate individuals. Anyhow, the prolongation of the intestinal tract in molguloid forms, especially that of the distal half of the intestinal loop, is very remarkable. In addition, gonads are very elongate and numbers of gonads and endocarps seem to be smaller than in typical form of the species. Moreover, the external appearance of the molguloid forms furnished with hairy prominence carrying mud all over the surface is very unique and any intermediate forms between the molguloid forms and typical ones have not yet been discovered. These circumstances seem to urge to raise the situation of the molguloid form above the rank of *form*, although it is uncertain which rank is then fit this form. Here I propose only to treat the molguloid form as a subspecies of *Cn. fertilis* until the results of more crucial comparative studies on respective organs are published and the ultimate situation of the form can be settled.