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Three Species of *Flustrellidra* (Bryozoa, Ctenostomata) from Hokkaido¹⁾

By

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(With 3 Text-figures, 1 Table and 2 Plates)

The bryozoan fauna along the coasts of Hokkaido has been very poorly known except a small paper of Shizuo Mawatari (1957) on calcareous species.

The author has interested in the bryozoan fauna of Hokkaido, especially in ctenostomatous species, and the present paper is the first result of the study, treating three species of *Flustrellidra*.

The materials were collected at Akkeshi (July 1969, July and August 1970), Nemuro (August 1970) and Notsuke (August 1970) in the Pacific coast of Eastern part of Hokkaido.

All the type specimens are deposited in the Zoological Institute of Hokkaido University.

The author wishes to express here his cordial thanks to Prof. M. Yamada and Dr. Sh. F. Sakagami for their valuable suggestions and encouragement. He is also indebted to Prof. Y. Kanoh of Akkeshi Marine Biological Station for giving the author many facilities for the study in Akkeshi.

Flustrellidra corniculata (Smitt, 1872)

(Fig. 1, Tab. 1, Pl. IX, A-C)

Alcyonidium corniculatum: Smitt, 1872, p. 1123, Pl. 20, figs. 10-16.

Flustrella corniculata: Silén, 1947, p. 137, text-figs. 5-6. Kluge, 1962, p. 204, text-fig. 110.

Flustrellidra corniculata: Cook, 1964, p. 284, text-fig. 2B.

Description: The colony usually consists of numerous rather thickened strap-like bilamellar lobes standing on stones or clustering around the stems of algae. The lobe is formed of parallel series of fleshy ovoid or hexagonal autozooids and much smaller kenozooids freely intercalated between autozooids. The orifice of autozooid is bilabiate with thickened chitinous lower lip leaving the aperture as

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a narrow transverse slit. From the interposed kenozooid arises a branched and thickly chitinized spine, giving the colony a coarse fuzzy appearance.

Medullary kenozooids are not observed in sections. The tentacles are 17-18 in number, determined by transverse sections.

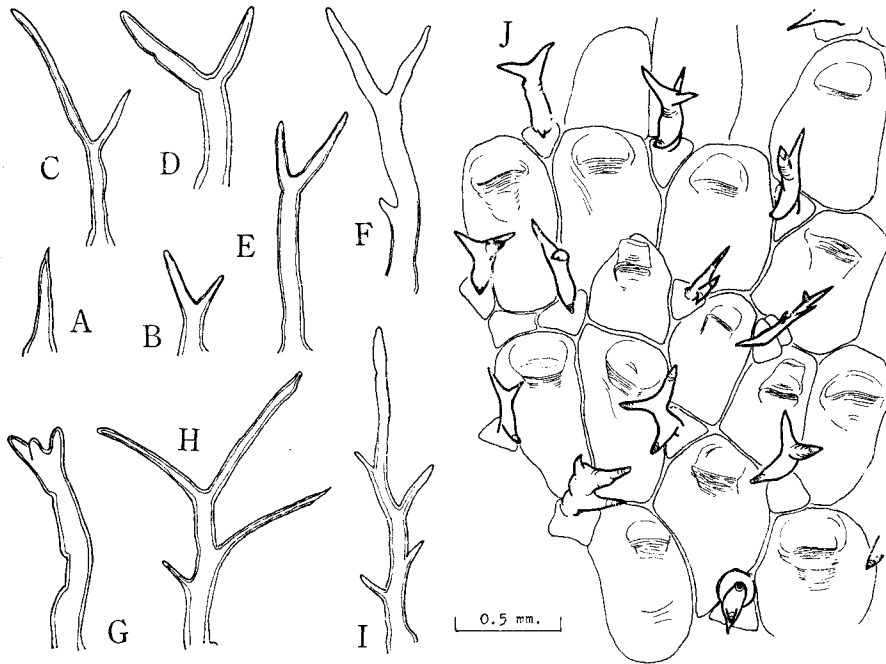


Fig. 1. *Flustrellidra corniculata*. Kenozooidal spines. A, single spine. B, C, D, E, spines with two terminal prongs. F, G, with three terminal prongs. H, with four terminal prongs. I, with five terminal prongs. J, surface view of a younger part.

Dimensions (on average):

Autozooid; length 0.72 mm., width 0.47 mm.

Kenozooid; length 0.24 mm., width 0.15 mm.

Spine; length 1.24 mm., width 0.12 mm.

Note: The colony varies in shape, from small subcylindrical extensions to broad foliaceous expansions (pl. IX, figs. A, B). The fleshy lobe with numerous dark red spines ranges from pale brown to reddish brown in color.

The dimensions of zooids have been so far measured on "typical zooids" only, but the "typical zooids" are only a certain stage in the course of developmental stages in which the dimension is variable. So the author examined the dimensions of zooids in two separate parts, a younger and an older, and the result is in Table 1.

Table 1. *Flustrellidra corniculata*. Dimensions of zooids. Mean length, in millimeter, examined in 30 zooids. Numbers in the parentheses are the minimum and maximum values.

	colony on stone		colony on algae			
	foliaceous type		strap-shaped type		foliaceous type	
	older part	younger part	older part	younger part	older part	younger part
length of zooid	0.66 (0.44-0.75)	0.61 (0.50-0.80)	0.72 (0.51-0.98)	0.61 (0.51-0.70)	0.68 (0.63-0.73)	0.57 (0.48-0.76)
width of zooid	0.44 (0.34-0.50)	0.41 (0.33-0.50)	0.47 (0.35-0.54)	0.41 (0.35-0.48)	0.43 (0.32-0.48)	0.35 (0.29-0.48)
length of kenozooid	0.21 (0.15-0.35)	0.22 (0.19-0.35)	0.24 (0.16-0.38)	0.19 (0.16-0.22)	0.22 (0.19-0.25)	0.21 (0.19-0.29)
width of kenozooid	0.15 (0.10-0.23)	0.16 (0.13-0.23)	0.15 (0.09-0.20)	0.14 (0.09-0.17)	0.17 (0.14-0.22)	0.14 (0.11-0.17)

It is clarified that the dimensions obtained considerably differ from each other.

Affinities: The present material agrees with the descriptions of Kluge (1962) and Cook (1964) on *F. corniculata* in the bilabiate orifice, slender spines and small kenozooids, but differs in the erect habit of colony instead of the encrusting of the latter.

The material is also close to *F. spinifera* in the erect, strap-shaped bilamellar colony, but it differs from the latter in the structure of orifice, kenozooid and spine.

The dimensions and tentacle number of the material at hand show an intermediate type between these two species which were measured by Cook (1964, p. 285).

The differences between *corniculata* and *spinifera* are so little that the distinction of the two species seems to be somewhat doubtful. The confusion of synonymy proposed by many authors might be originated in this fact. Esteeming the characters of zoecial orifice and nature of intercalated kenozooids, the author identifies the Hokkaido material with *F. corniculata*. The encrusting nature of colony may be inconsistent and tentacle number is not considered as essential. Sh. Mawatari (1953), Kluge (1962) and Cook (1964) agree in considering them to be distinct, but the present material shows the intermediate characters between the two species which may be proved to fall into the same species by further studies.

Materials: Several colonies attached to stone or algae were collected from Akkeshi, Nemuro and Notsuke Peninsula.

Distribution: Spitzbergen, E. Finmark, Greenland, Japan.

***Flustrellidra akkeshiensis* sp. nov.**

(Fig. 2, Pl. IX, D-H)

Description: The colony is erect, brown in color, lobate with growing edge which is divided into a number of flabellate rounded lobes. These lobes are not placed on one plane. The thickened lobe consists of two layers of autozooids placed back to back without an interposed medullary kenozooidal layer.

The autozooids are arranged in numerous parallel series, varying in form from an oval to uneven hexagon. Each zooid has a distally raised oral papilla with a bilabiate aperture at the summit. Tentacle number varies from 22 to 24, usually 23.

Two types of spines are present. One of them consists of a long stout main axis with several lateral delicate branches, which vary from one to seven in number, at base (Fig. 2 A-E). They are situated usually at the distal corners of each zooid. The spines of the other type are scattered along the zoecial borders, and each consists of the same lateral branches as in the former but without main axis (Fig. 2 F).

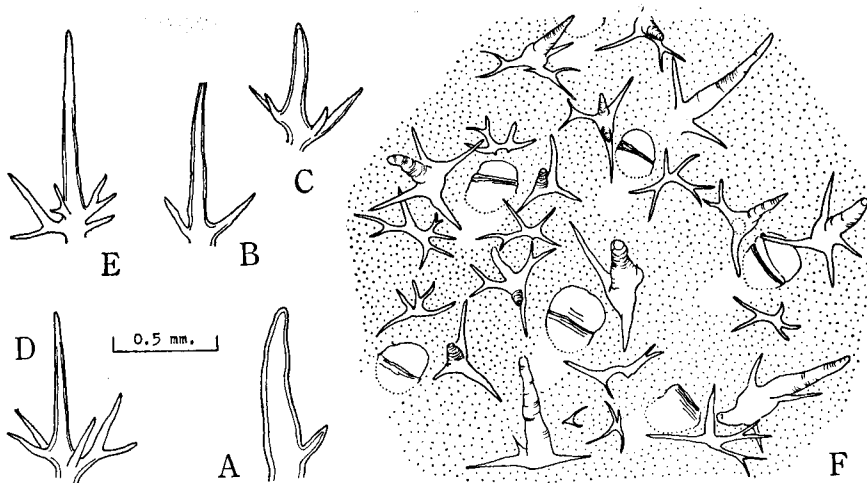


Fig. 2. *Flustrellidra akkeshiensis* sp. nov. Kenozooidal spines. A, main axis with one branch. B, with two branches. C, with four branches. D, with five branches. E, with seven branches. F, surface view of a lobe, showing the arrangement of two major types with or without main axis.

The spines of both types are raised from the kenozooids which are not much larger than the swollen base of the spine, and are situated only at the surface of autozooids along the zoecial borders (Pl. IX, H).

Dimensions (on average):

Autozoid; length 0.9 mm., width 0.6 mm.

Kenzoid; length 0.2 mm.

Spine (with main axis); length 0.9 mm., width 0.09 mm.

Note: The present material attains 5 cm. in height and branches 3–5 mm. in breadth and about 1.5–2 mm. in thickness.

In observation with naked eyes, the lateral branches of spines and another scattered spines are so delicate and obscure that only the main axes are noticeable as several rows of distinct long spines.

The lateral zooecial walls are obscure in older areas of colony on account of opacity owing to thick chitinous frontal walls. In younger portions, on the contrary, they are so thin, and so unpigmented as to be observed. The zooecial characters are, therefore, determined by sections.

Affinities: The present species is similar to *F. hispida* first described by Fabricius (1780), partly in the feature of some small kenozooids surrounding marginal part of autozoid, and partly in the thickened bilabiate orifice of autozoid, but is clearly different from *F. hispida* in the many other specific characteristics, those of the latter are simple unbranched spines, tentacles of 28–40 in number, encrusting feature of colony and the dimensions of autozooids and kenozooids measured by Cook (1964, p. 284).

The present species is easily distinguishable from all known species in the distinct feature of the spines with two types.

Material: A single colony standing on a stone was obtained from Akkeshi.

Flustrellidra filispina sp. nov.

(Fig. 3, Pl. X)

Description: The colony is erect, brown in color, bilamellar with a somewhat distinct stem and several lobate branches which are placed on one plane. The oval and hexagonal zooids are very large with bilabiate orifice not so much thickened, and are arranged alternately in distinct series.

The kenozooids are rather small, not placed transversely back to back, situated only at peripheral part of the colony, and provided with delicate, profusely bi- and tri-furcated tree-like spines. Some of these spines are transformed into extremely long whip-like chitinous threads giving curious entangled appearance. Polypide with 20–22 tentacles.

Dimensions (on average):

Autozoid; length 1.0 mm., width 0.7 mm.

Kenzoid; length 0.2 mm.

Branched spine; length (vertically to first bifurcation) 0.3 mm.
width 0.12 mm.

length (of spread of spines from tip to tip) 1.0 mm.

Chitinous thread; length 3 cm., width 0.1 mm.

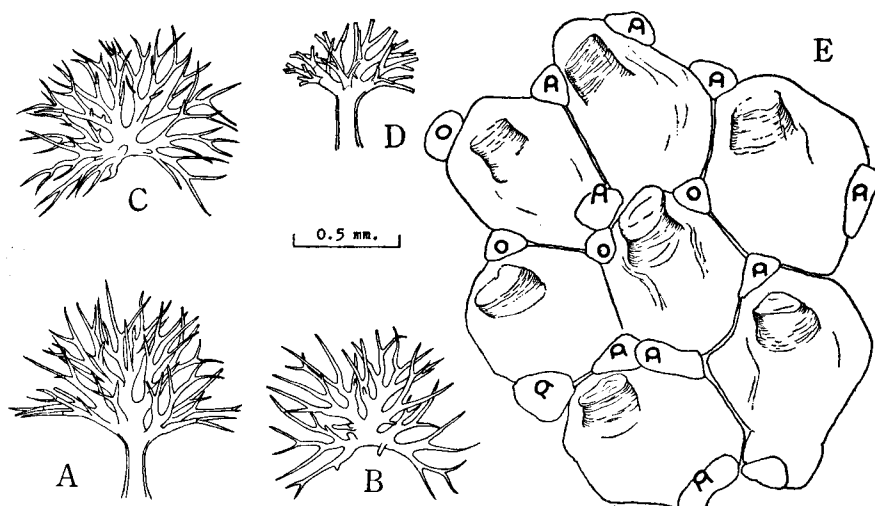


Fig. 3. *Flustrellidra filispina* sp. nov. Tree-like spines. A, tree-like spine, side view. B, upper view, with 46 terminal prongs. C, upper view, with 70 terminal prongs. D, a younger spine, side view. E, surface view, accessory spines are not illustrated.

Note: The present material attains 7 cm. in height and its branches are 0.7–1.1 cm. in breadth and about 2–3 mm. in thickness except spines.

In upper view of the colony, detailed structures on the surface are scarcely observed even at younger portions, because horizontally branched fuzzy tree-like spines hide those frontal surface of zooids. The zooecial borders are obscure particularly in the older areas of colony, partly because of absence of projections or depressions, partly because of opacity by brown colored and thick chitinous frontal walls of zooids. The zooecial characteristics described were determined by saggittal sections of the colony.

The spines of younger portions differ from those of older areas of the colony in the following structures, the less number and unsharpened shape of terminal prongs, and weaker and paler color of chitin.

Affinities: The present material resembles *F. gigantea* in large zooids, small kenozooids and tree-like form of spines. *F. gigantea* was first described from Bering Sea by Silén (1947), and also recorded from Okhotsk Sea and Japan Sea by Kluge (1962).

The shape of colony, arrangement of zooids and kenozooids in the present material almost agree with those of *F. gigantea*, and the dimensions (see above description) also almost agree with those of the latter measured by Cook (1964, p. 287–288).

But the spines of the present material are divided more profusely and with

more delicate and attenuated terminal prongs. In the present material, terminal prongs of spines are 46–71 in number at growing part (65 on average) and 49–105 at older part of colony (80 on average). *F. gigantea* has also tree-like spines with terminal prongs, 8–15 in number by Silén (1947, p. 135, figs. 1–3), 15–22 by Kluge (1962, p. 207, fig. 112B) and 10 by Cook (1964, p. 288, fig. 2A). These numbers are suggested from their figures, while 9–21 in the material from Alaska according to the description by Osburn (1953). The present material has 46 such spines in the minimum number, while the maximum number within the species of *F. gigantea* so far recorded is 22 by Kluge. The author, therefore, thinks that such difference in the number of the terminal prongs is of specific value.

The material has no such spines as the irregular branched ones of *F. gigantea* figured by Silén (1947, p. 135, fig. 3) and described by Osburn (1953, p. 733).

The most distinct feature in the material is the occurrence of curious thread-like chitinous appendages (Pl. X, figs. D, F) which are clearly formed by the transformation of ordinary tree-like spines on kenozooids.

The present material is easily distinguishable from *F. gigantea* in two striking structures, the curious filiform spines and the number of branched tips of tree-like spines.

The name of the new species is owing to the curious structure of the filiform spines.

Material: Holotype; a large complete colony was obtained from Akkeshi Bay by dredging.

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Explanations of Plates**Plate IX***Flustrellidra corniculata*

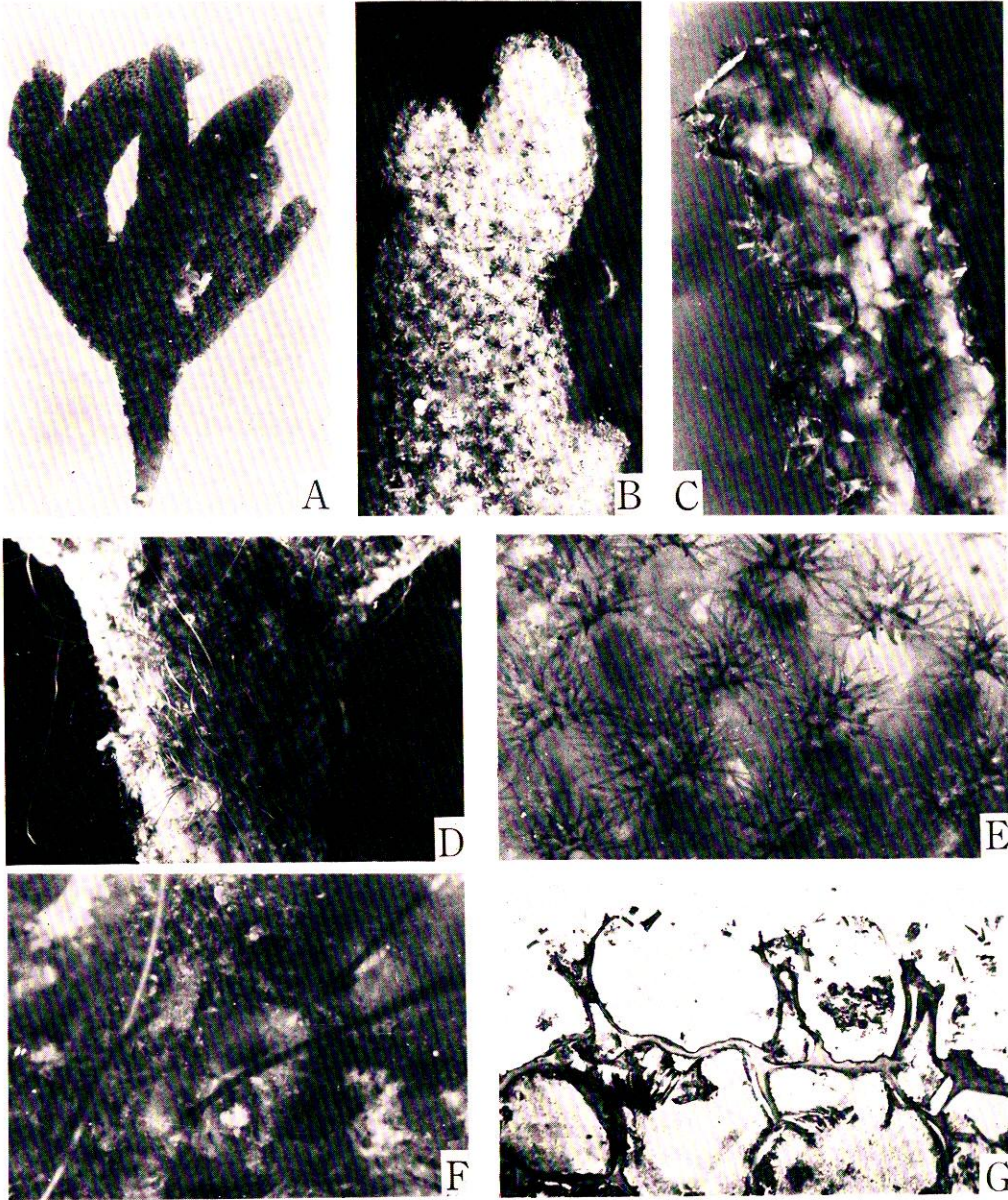
- A. A colony consisting of numerous strap-shaped lobes clustering around *Ptilota pectinata*.
×1.5
- B. An another foliaceous type colony. ×2.5
- C. Surface view of a lobe showing an arrangement of spines. ×35

Flustrellidra akkeshiensis sp. nov.

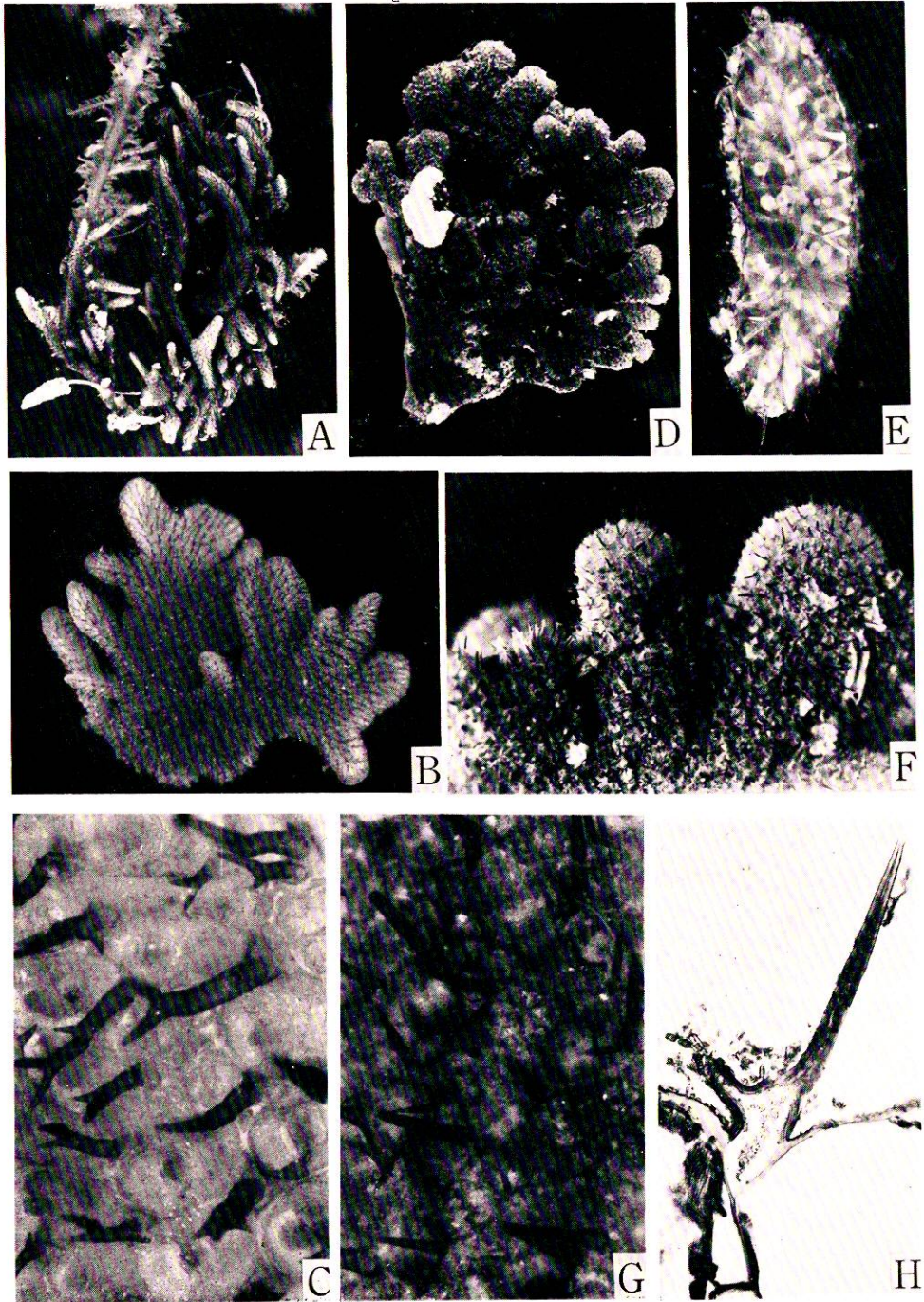
- D. A colony. ×3.2.
- E. Cross section of a lobe showing an arrangement of zooids. ×15
- F. Growing tips of lobes. Only main axes of spines are seen. ×7
- G. Surface view of a lobe showing an arrangement of two types of spines. ×25
- H. Cross section of a small kenozooid with a spine consisting of main axis. ×80

Plate X*Flustrellidra filispina* sp. nov.

- A. A colony. ×15
 - B. Surface view of a lobe. ×6.5.
 - C. Transverse section of a lobe showing an arrangement of zooids. ×12.5
 - D. Peduncle region of colony showing the filiform spines. ×5
 - E. Surface view of a lobe showing an arrangement of tree-like spines. ×20
 - F. The proximal parts of two filiform spines. ×20
 - G. Cross section of small kenozooids with tree-like spines. ×30
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S.F. Mawatari: Three Species of Flustrellidra from Japan



S. F. Mawatari: Three Species of Flustrellidra from Japan