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Notes on the Marine Bryozoa from Hokkaido

II. Cyclostomata other than Crisiidae

By

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(With 4 Plates)

As to the marine Bryozoa from Hokkaido 10 species of Crisiidae, including three new species, have been recently reported by the authors (S. Mawatari and S.F. Mawatari, 1973), and this is the sequel. The present paper deals with 21 species of Cyclostomata other than Crisiidae, including a species new to science. The species are arranged after the system of Bassler (1953).

Family Diastoporidae Gregory 1899

Berenicea patina (Lamarck)

(Pl. XXX, figs. 5,6)

Tubulipora patina Lamarck, 1816, p. 425; Johnston, 1847, p. 266, pl. 47, figs. 1-3.

Diastopora patina Busk, 1875, p. 29, pl. 29, figs. 1, 2, pl. 30, fig. 1; Hincks, 1880, p. 458, pl. 66, figs. 1-6; Ortmann, 1890, p. 63, pl. 4, fig. 37; Nordgaard, 1897, p. 5; 1906, p. 100; O'Donoghue, 1923, p. 14.

Berenicea patina Borg, 1923, p. 17, figs. 2-7; 1930, p. 48, fig. 27; Sakakura, 1935b, p. 42, pl. 7, fig. 10; Mawatari, 1955, p. 48.

Plagioecia patina O'Donoghue, 1926, p. 21, pl. 2, fig. 16; Canu and Bassler, 1928, p. 64.

Zoarium incrusting, discoidal or elliptical more or less cup-shaped or entirely flat, surrounded by broad and thick extension of basal lamina. Zooecia crowded, immersed in the central portion, erect and distinct in radiating rows in the large part of the colony. Zooecial orifice subelliptical, often produced.

Several colonies were collected at Akkeshi and Muroran.

Berenicea sarniensis (Norman)

Diastopora sarniensis Norman, 1864, p. 89, pl. 11, figs. 4-6; Busk, 1875, pl. 34, fig. 5; Hincks, 1880, p. 463, pl. 66, figs. 7-9.

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Berenicea sarniensis Harmer, 1915, p. 114, pl. 11, figs. 4, 5; Canu and Bassler, 1928, p. 65, pl. 10, figs. 2-6; Sakakura, 1935b, p. 41, pl. 7, fig. 8; Mawatari, 1955, p. 48.

Microecia sarniensis O'Donoghue, 1926, p. 21, pl. 2, fig. 15.

Zoarium incrusting, thin, lobate or irregular in outline, punctate and striated, surrounded by a marginal extension of basal lamina. Zooecia arranged radially, immersed, with slightly projected orifice. Orifice occasionally closed by calcareous plate, and a small tube projected from the upper part of the plate. Ooecium transverse, suborbicular.

A small colony attached to a bivalve shell was found at Shirikishinai.

Stomatopora granulata (Milne-Edwards)

Alecto granulata Milne-Edwards, 1838, p. 205, pl. 16, fig. 3; Johnston, 1847, p. 280, pl. 49, figs. 1, 2; Busk, 1875, p. 24, pl. 32, fig. 1; Ortman, 1890, p. 62, pl. 4, fig. 33.

Stomatopora granulata Hinks, 1880, p. 425, pl. 57, figs. 1, 2; Nordgaard, 1897, p. 3; Norman, 1909, p. 278; Okada, 1917, p. 350; O'Donoghue, 1923, p. 11; Borg, 1926, p. 358, figs. 67, 68; Sakakura, 1935b, p. 37, pl. 6, fig. 5; Mawatari, 1955, p. 47; Kluge, 1962, p. 81, fig. 18.

Zoarium adnate, linear, dichotomously branched, anastomosing in some cases. Branches composed of uniserial decumbent zooecia with produced peristome. Zooecia elongate elliptical or subtubular, with slightly dilated base and faintly striated curved wall. Ooecia not present.

Specimens of this almost cosmopolitan species were obtained at Akkeshi, Muroran, Shirikishinai and Otaru, all attaching to bivalve shells.

Family Tubuliporidae Johnston 1838

Tubulipora dilatans (Johnston)

(Pl. XXVIII, fig. 6)

Alecto dilatans Johnston, 1847, p. 281, pl. 49, figs. 5, 6; Busk, 1875, p. 24, pl. 32, fig. 2.

Stomatopora dilatans Hincks, 1880, p. 429, pl. 57, fig. 3; Nordgaard, 1897, p. 4.

Tubulipora dilatans Borg, 1930, p. 42, figs. 17, 18; 1933, p. 517; Osburn, 1933, p. 11, pl. 2, fig. 9; Kluge, 1962, p. 93, fig. 29.

Zoarium adherent, ramified dichotomously or irregularly, with bifurcate terminal end. Branches convex, usually more or less expanded to form clavate end. Zooecia alternate, tubular, punctate, a little raised terminally. Ooecium at the distal part of the branch.

Several fragments and colonies were collected at Muroran and Shirikishinai.

Tubulipora pulchra MacGillivray

(Pl. XXVIII, fig. 1)

Tubulipora pulchra MacGillivray, 1885, p. 95, pl. 2, fig. 1; Waters, 1887, p. 258, pl. 7, figs.

1-3; Robertson, 1910, p. 250, pl. 23, figs. 32-35; Okada, 1917, p. 347; O'Donoghue,

1923, p. 8; 1926, p. 25; Sakakura, 1935b, p. 40, pl. 7, fig. 4; Okada and Mawatari, 1937, p. 445, pl. 11, fig. 9; 1938, p. 447; Mawatari, 1947, p. 49; 1955, p. 46.

Zoarium incrusting fan-shaped, discoidal or lobate, flat, consisting of radiating zooecial rows. Zooecia tubular, distinct, with suberect distal half carrying a circular orifice. Ooecium spreading among zooecial rows, opening in a compressed ooeciopore supported on a low ooeciostome situating besides a zooecium. Primary disk circular, surrounded by minute quadrangular teeth. Early zooecia, distinctly curved backwards, provided with lateral serrate expansion of basal lamina. Basal lamina with concentric striations and radiating processes.

Several colonies were collected at Akkeshi, Muroran, Shirikishinai, Hakodate and Otaru.

Tubulipora flabellaris Fabricius

(Pl. XXVIII, fig. 7, Pl. XXIX, fig. 1)

Tubulipora flabellaris Fabricius, 1780, p. 430; Johnston, 1847, p. 274, pl. 46, figs. 5, 6; Smitt, 1867, pp. 401, 455, pl. 9, figs. 6-8; Busk, 1875, p. 25, pls. 24, 25; Hincks, 1880, p. 446, pl. 64, figs. 1-3; Harmer, 1898, p. 99, pl. 8, fig. 4; Osburn, 1912, p. 218, pl. 20, fig. 11; Sakakura, 1935b, p. 41; Mawatari, 1955, p. 45; Kluge, 1962, p. 91, fig. 26.

Zoarium incrusting flabellate, suborbicular or indistinctly lobate. Zooecia tubular, usually transversely wrinkled, crowded and connate in somewhat obscure radiating rows, with distal half projecting obliquely outwards. Primary disk circular, smooth, without marginal denticles. Ooecium lobate, finely punctate, extending among fascicles. Ooeciopore simple, circular, without distinct ooeciostome.

Several specimens were found at Akkeshi, Muroran and Shirikishinai attaching to Laminarian fronds.

Tubulipora misakiensis Okada

Tubulipora misakiensis Okada, 1917, p. 346; 1928, p. 490, fig. 7, pl. 24, fig. 8; Mawatari, 1948, p. 74; 1955, p. 46.

Zoarium incrusting, fan-shaped or circular. Zooecia elongate tubular, erect or suberect in distal half, arranged in distinct radiating rows and more or less connate to form linear fascicles. Ooecium inflated, minutely punctate, spreading among fascicles, provided with tubular recurved ooeciostome. Basal lamina smooth, only presenting concentric faint striations. Primary disk circular, smooth. Early zooecia strongly recurved, with slight expansion of basal lamina not serrated.

A number of specimens were obtained at Akkeshi, Muroran, Shrikishinai, Hakodate and Otaru, attached to fronds of seaweeds

***Idmonea atlantica* Johnston**

(Pl. XXVIII, fig. 1)

Idmonea atlantica Johnston, 1847, p. 278, pl. 48, fig. 3; Busk, 1875, p. 11, pl. 9; Hincks, 1880, p. 451, pl. 65, figs. 1-4; Ortman, 1890, p. 58, pl. 4, fig. 20; Waters, 1904, p. 166, pl. 21, figs. 2, 3; Norman, 1909, p. 278, pl. 33, figs. 1, 2; Canu and Bassler, 1920, p. 778, pl. 140, figs. 1-13; Kluge, 1962, p. 110, fig. 44; Powell, 1968, p. 2280.

Tubulipora atlantica Osburn, 1912, p. 217, pl. 19, fig. 5; Harmer, 1915, p. 124, pl. 10, figs. 4, 5; Okada, 1917, p. 345; Sakakura, 1935a, p. 116; Okada and Mawatari, 1938, p. 447; Mawatari, 1955, p. 45.

Idmidronea atlantica Canu and Bassler, 1928, p. 75; Osburn, 1947, p. 5; Hansen, 1962, p. 10.

Zoarium erect, slender, branching dichotomously or somewhat irregularly. Branches roundish, celluliferous frontally, smooth or pitted basally. Zooecia tubular, slender, erect or suberect, three or four of them forming alternate transverse rows on each side of the branch. Ooecium pyriform, prominent, involving the neighbouring tubes.

Several fragments were collected at Akkeshi and Shirikishinai.

***Idmonea serpens* (Linnaeus)**

(Pl. XXIX, fig. 2)

Tubipora serpens Linnaeus, 1758, p. 790; 1767, p. 1271.

Tubulipora serpens Johnston, 1847, p. 275, pl. 47, figs. 4-6; Busk, 1875, p. 26, pl. 22; O'Donoghue, 1923, p. 8; 1926, p. 25.

Idmonea serpens Hincks, 1880, p. 453, pl. 60, fig. 2, pl. 61, figs. 2, 3; Nordgaard, 1897, p. 4.

Zoarium adnate or partly attached by the base. Branches celluliferous frontally, club-shaped or dichotomously branched and bifid at the extremity. Zooecia tubular, partly connate, disposed in oblique, alternate rows, more or less curved upwards and outwards, the innermost the longest.

Ooecium elongate, small, with a small, simple ooeciopore.

Several fragments were obtained at Akkeshi, Muroran and Shirikishinai.

Family Oncousoecidae Canu 1918

***Proboscina adichotoma* D'Orbigny**

Criserpia dichotoma D'Orbigny, 1837, p. 19, pl. 9, figs. 7-13.

Stomatopora dichotoma Waters, 1904, p. 87; 1905, p. 14.

Proboscina dichotoma Canu and Bassler, 1929, p. 518, pl. 76, figs. 1, 2; Mawatari, 1952, p. 262; 1955, p. 48.

Zoarium incrusting shells and stones, branching dichotomously to form more or less curved club-shaped narrow arms. Zooecia decumbent, suberect distally to form short peristome with circular orifice. Branches consisting of two to four longitudinal rows of alternate zooecia. Ooecia not developed.

Several colonies were collected at Akkeshi and Shirikishinai. The specific determination may not be very exact in *Proboscina* since the members of the genus seem to be insufficiently distinguished mainly by the simple structure. The materials at hand resemble well Canu and Bassler's photographs. The species was recorded in China Sea.

Family Entalophoridae Reuss 1869

Entalophora proboscidea (Milne-Edwards)

Pustulopora proboscidea Milne-Edwards, 1838, p. 219, pl. 12, fig. 2; Johnston, 1847, p. 278, pl. 48, fig. 4; Busk, 1875, p. 21, pl. 17A (right).

Entalophora proboscidea Waters, 1909, pp. 9, 91, pl. 9, fig. 4; Norman, 1909, p. 280, pl. 35, figs. 1-3; Thornely, 1912, p. 156; Harmer, 1915, p. 108, pl. 10, figs. 1, 2; Okada and Mawatari, 1938, p. 446; Mawatari, 1955, p. 47.

Entalophora raripora, Okada, 1917, p. 350; 1923, p. 219; Okada and Mawatari, 1935, p. 143.

Mecynoezia proboscidea Canu and Bassler, 1920, p. 726, pl. 108, figs. 1-15; 1929, p. 531, pl. 80, figs. 7-9.

Zoarium erect, branching dichotomously. Branches tubular, consisting of many longitudinal rows of slender, tubular zooecia facing in all directions. Zooecia alternate, distinctly projecting into a long peristome, giving a branch very spiny appearance. Ooecium small but inflated, at the base of dichotomous branches.

Several fragments of branching colonies were obtained at Akkeshi, Shirikishinai and Otaru.

Entalophora unifasciata (Canu and Bassler)

Mecynoezia unifasciata Canu and Bassler, 1929, p. 530, pl. 79, figs. 7, 8; Mawatari, 1955, p. 48.

Zoarium erect, slender, tubular, branching dichotomously in wide angles. Branches delicate, consisting of alternate tubular zooecia arranged in less than ten rows. Zooecia rather immersed, transversely wrinkled, with short robust peristome facing in one direction. Ooecium long, convex, wrinkled with large ooeciostome.

A few fragments were obtained at Otaru, Hakodate and Shirikishinai.

Family Diaperoecidae Canu 1918

Diplosolen obelia (Johnston)

Tubulipora obelia Johnston, 1838, p. 269, pl. 38, figs. 7, 8.

Diastopora obelia Johnston, 1847, p. 277, pl. 47, figs. 7, 8; Busk, 1875, p. 28, pl. 26; Hincks, 1880, p. 462, pl. 66, fig. 10; Nordgaard, 1897, p. 5; 1906, p. 100; 1917, p. 20;

O'Donoghue, 1923, p. 14.

Berenicea obelia Okada, 1917, p. 352.

Diplosolen obelia O'Donoghue, 1926, p. 24, pl. 2, fig. 17; Canu and Bassler, 1927, p. 42; 1928, p. 68; Borg, 1930, p. 46, fig. 25; Osburn, 1933, p. 14, pl. 1, fig. 7; 1940, p. 333; Marcus, 1940, p. 71, fig. 38; Mawatari, 1955, p. 49; Hansen, 1962, p. 9; Kluge, 1962, p. 121, fig. 53; Powell, 1968, p. 2280.

Zoarium incrusting, thin, flat, circular or irregularly lobate, surrounded by narrow basal lamina. Zoecia disposed alternately and radially, elongate tubular, minutely punctate, with short peristome of circular orifice. Small adventitious tubes among normal zoecia. Ooecium inflated, transverse, with a small, short peristome near the center.

Specimens of this characteristic species were found at Shirikishinai on seaweeds.

Family Theonoidae Busk 1859

Actinopora japonica Canu and Bassler

Actinopora japonica Canu and Bassler, 1929, p. 522, pl. 77, fig. 4; Mawatari, 1955, p. 45.

Zoarium incrusting, discoid, not surrounded by a basal lamina. Zoecia tubular, immersed, with peristomes arranged in radiating fascicles. Interfascicular spaces faintly wrinkled transversely. Central area smooth, occupied by a small number of radiating tubes.

A specimen was found on a bivalve shell collected at Otaru.

Family Frondiporidae Busk 1875

Fasciculipora yesoensis sp. nov.

(Pl. XXVIII, figs. 4,5)

Zoarium erect, cylindrical, thick, dichotomously branched. Branches stout, expanded terminally to form somewhat flat disk consisted of a number of columner fascicles. Fascicles made of several tubular zooids firmly associated with each other. Stout stems present also a number of columner fascicles projecting nearly at right angles to the surface.

The present species bears some resemblances to *F. ramosa* D'Orbigny in its fungiform zoarium, but differs in the expanded disk not composed of a large fascicle but of several columner fascicles arranged irregularly. It shows another resemblance to *F. digitata* Busk mainly in its columner fascicles, but clearly differs in the branching form of colonies with fasciculated stems.

A complete colony was obtained at Akkeshi.

Family Lichenoporidae Smitt 1866

Lichenopora buski Harmer

(Pl. XXX, fig. 2)

Discoporella ciliata Busk, 1875, p. 31, pl. 30, fig. 6, pl. 33, fig. 4.

Lichenopora buski Harmer, 1915, p. 161, pl. 12, figs. 4, 5; Okada, 1917, p. 354; Canu and

Bassler, 1929, p. 558, pl. 88, figs. 7-10; Mawatari, 1952, p. 262; 1954, p. 50.

Zoarium incrusting, discoid, with much developed marginal rim of basal lamina. Central area depressed, minutely porous. Zooecia arranged in uniserial radiating rows. Interfascicular space consisting of one or two rows of small pores. Visors of zooecial tubes sometimes indistinct.

A specimen was collected at Otaru.

***Lichenopora mediterranea* Blainville**

(Pl. XXX, fig. 3)

Lichenopora mediterranea Blainville, 1834, p. 407; Harmer, 1915, p. 164, pl. 12, figs. 2, 3; Okada, 1917, p. 354; Canu and Bassler, 1929, p. 561, pl. 90, figs. 1-3; Sakakura, 1935b, p. 43.

Discoporella mediterranea Busk, 1875, p. 33, pl. 24, fig. 4.

Zoarium incrusting, discoid, with depressed central area and radiating distinct fascicles composed of two series of zooecial tubes. Interfascicular area consisting of two or three rows of large pores. Central area with distinct pores.

A colony was obtained at Murooran attached to a bivalve shell.

***Lichenopora radiata* (Audouin)**

(Pl. XXX, fig. 1)

Melobesia radiata Audouin, 1826, p. 235, pl. 6, fig. 3.

Discoporella radiata Busk, 1875, p. 32, pl. 34, fig. 3; Waters, 1879, p. 276, pl. 24, fig. 1.

Lichenopora radiata Hincks, 1880, p. 32, pl. 68, figs. 9, 10; Ortmann, 1890, p. 64, pl. 4, fig. 23; Robertson, 1900, p. 329; Waters, 1909, p. 237; Okada, 1917, p. 355; 1928, p. 494, fig. 11; Sakakura, 1935b, p. 42; Okada and Mawatari, 1935, p. 146; 1938, p. 447; Mawatari, 1955, p. 50.

Zoarium incrusting, discoid, surrounded by marginal extension of basal lamina, convex with central area depressed. Zooecia tubular, produced, connate in uniserial radiating fascicles. Zooecial orifice somewhat mucronate. Interfascicular space consisting of one or two rows of pores. Central area porous, without zooecia. Ooeciopore large, trumpet-shaped, near the margin of central area.

Numerous colonies were obtained at Akkeshi, Murooran, Shirikishinai and Otaru.

***Lichenopora verrucaria* (Fabricius)**

(Pl. XXX, fig. 4)

Madrepora verrucaria Fabricius, 1780, p. 430.

Discoporella verrucaria Busk, 1875, p. 31.

Lichenopora verrucaria Hincks, 1880, p. 478, pl. 64, figs. 4, 5; Waters, 1881, p. 452, pl. 21, fig. 5; 1904, p. 176; Harmer, 1897, p. 130, pl. 7, figs. 1-9; Nordgaard, 1906, p. 37;

Osburn, 1912, p. 276; 1932, p. 5; 1936, p. 540; Okada, 1928, p. 495; Sakakura, 1935a, p. 117; Mawatari, 1955, p. 49; Hansen, 1962, p. 13; Kluge, 1962, p. 169, fig. 84; Powell, 1968, p. 2281.

Zoarium subcircular, small, convex with a small central area and narrow laminar border. Zooecia tubular, raised with acuminate terminal end surrounding obliquely elliptical orifice, arranged more or less regularly in radial rows. Ooecium disk-like, inflated with trumpet-shaped ooeciopore.

Several colonies were obtained at Akkeshi and Muroran on seaweeds and bivalve shells.

Lichenopora hispida (Fleming)

(Pl. XXXI, figs. 1-7)

Discopora hispida Fleming, 1828, p. 530.

Tubulipora hispida, Johnston, 1847, p. 268, pl. 47, figs. 9-11.

Discoporella hispida, Busk, 1875, p. 30, pl. 30, fig. 3; Smitt, 1867, pp. 406, 483, pl. 11, figs. 10-12; Hansen, 1962, p. 13.

Lichenopora hispida Hincks, 1880, p. 473, pl. 68, figs. 1-8; Nordgaard, 1917, p. 21; O' Donoghue, 1926, p. 28; Canu and Bassler, 1928, p. 76, pl. 10, fig. 1; Osburn, 1932, p. 5; 1940, p. 335; Powell, 1968, p. 2280.

Zoarium incrusting, subcircular, simple, saucer shaped but frequently subconical or irregular, sometimes with basal lamina turned up and free marginally. Zooecia in radiating rows around a central space, tubular, suberect, terminating in one to three spinous processes. Basal part of a zooecial tube often angulated or spinous, the space between the rows porous with a longitudinal rib.

Many specimens of various stages of development were collected at Akkeshi, Muroran, Shirikishinai and Otaru, attaching to seaweeds and shells.

Bimulticavea variabilis D'Orbigny

(Pl. XXIX, figs. 3-5)

Bimulticavea variabilis, Canu and Bassler, 1920, p. 817, fig. 269D; Bassler, 1953, p. 73.

Zoarium incrusting stones, forming thick, large discoid crust of two or three layers. Groups of eight or ten protuberances arranged in radial lines are scattered here and there on the frontal surface of a colony. Zooecia tubular, small, arranged closely with each other to give fasciculated appearance. Orifice polygonal with thin wall or subcircular with thickened margin. Smaller pores scattered among ordinary apertures. The produced part consisted of thickened pores seems to be a ooecium.

Several fragments were collected at Akkeshi.

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Explanation of Plates XXVIII-XXXI

Plate XXVIII

- Fig. 1. *Idmonea atlantica* Johnston ×10
2. *Tubulipora pulchra* MacGillivray ×6
3. *Diplosolen obelia* (Johnston) ×15
4. *Fasciculipora yesoensis* sp. nov. ×4
5. The same. Columnar fascicles ×15
6. *Tubulipora dilatans* (Johnston) ×15
7. *Tubulipora flabellaris* Fabricius Young colony. ×15

Plate XXIX

- Fig. 1. *Tubulipora flabellaris* Fabricius ×6
2. *Idmonea serpens* (Linnaeus) ×15
3. *Bimulticavea variabilis* D'Orbigny ×1
4. The same. Marginal part. ×15
5. The same. Part of a colony ×6

Plate XXX

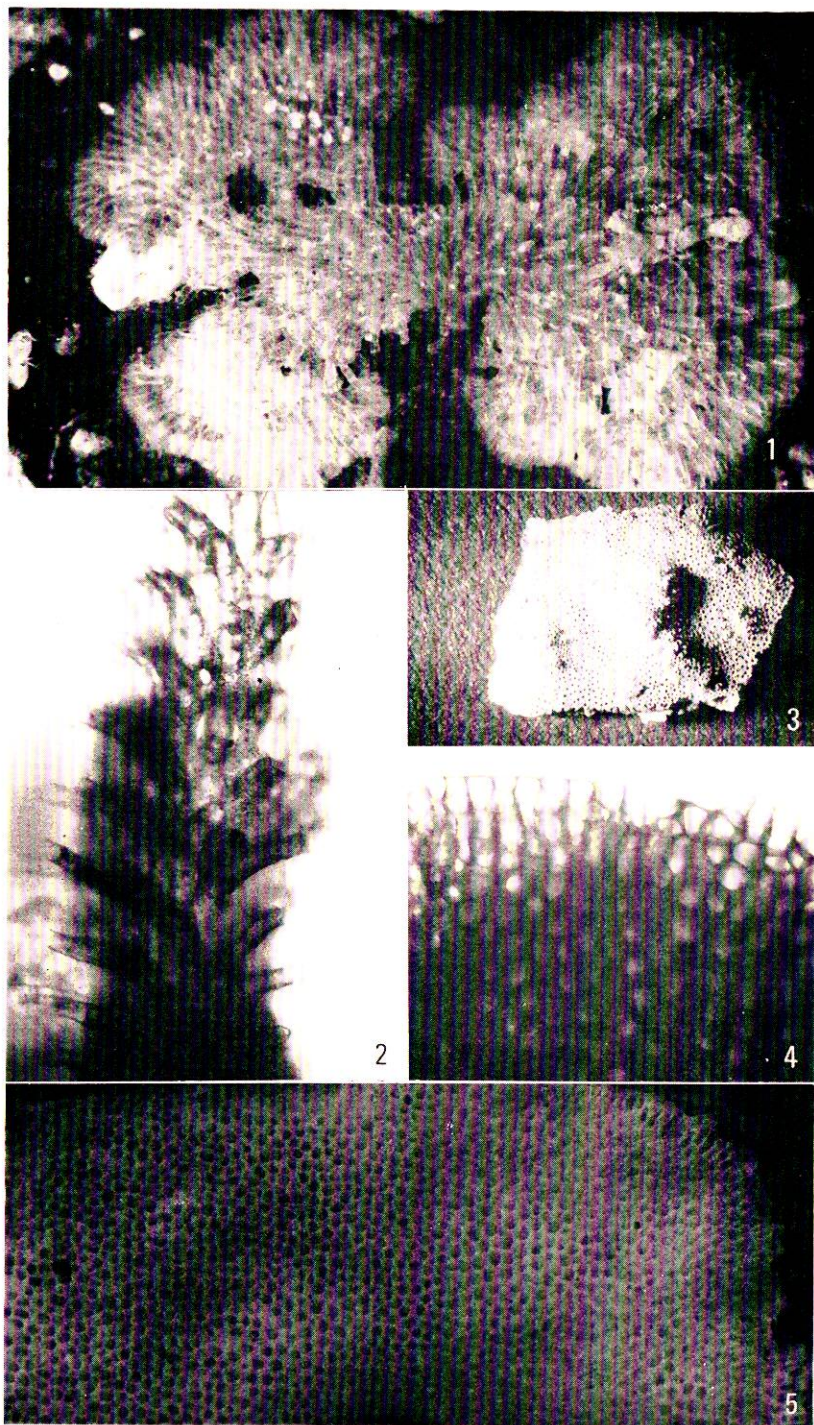
- Fig. 1. *Lichenopora radiata* (Audouin) $\times 15$
2. *Lichenopora buski* Harmer $\times 15$
3. *Lichenopora mediterranea* Blainville $\times 15$
4. *Lichenopora verrucaria* (Fabricius) $\times 15$
5. *Berenicea patina* (Lamarck) $\times 15$
6. The same. Cup-shaped colony $\times 15$

Plate XXXI

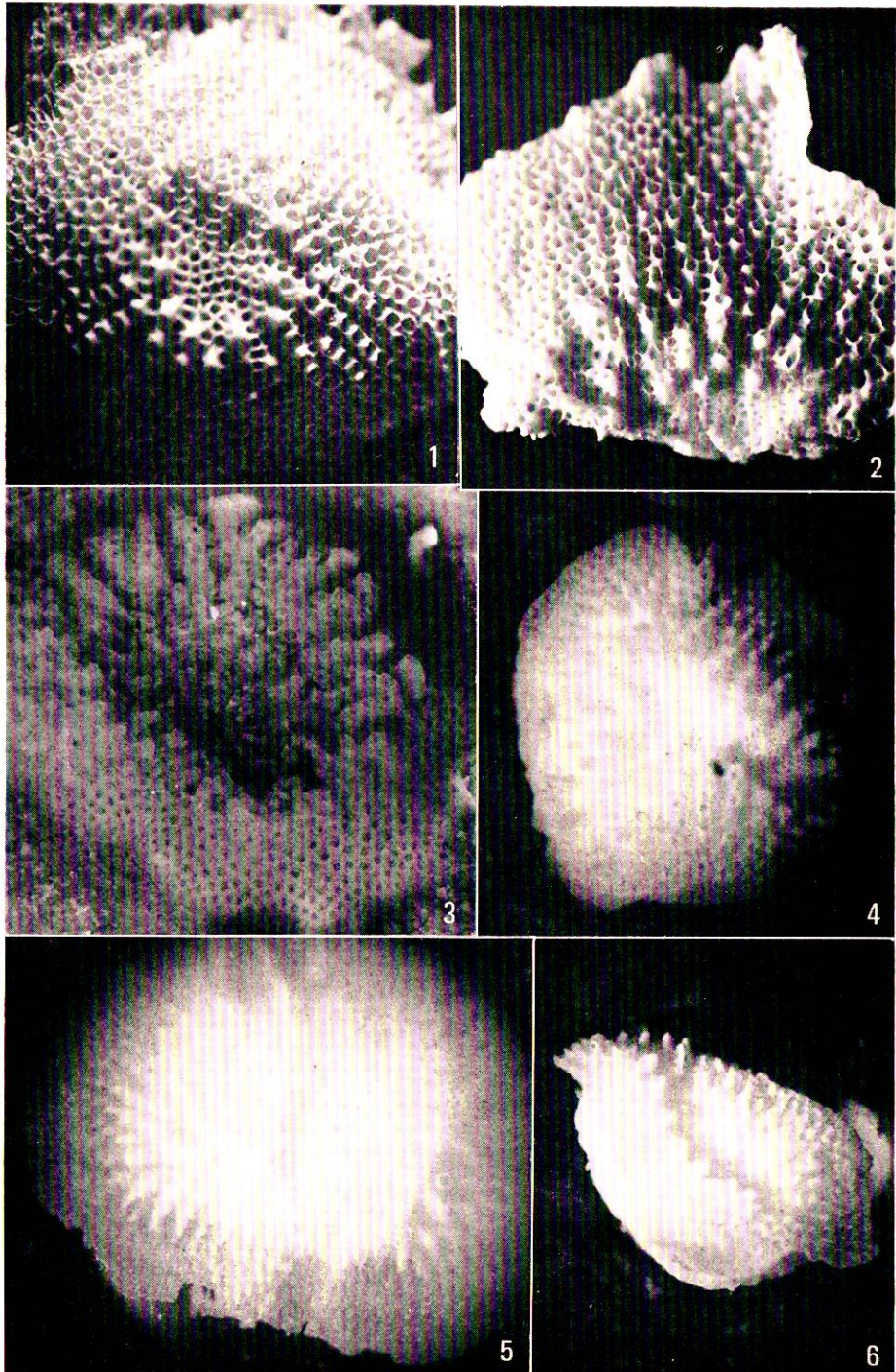
- Fig. 1-5. *Lichenopora hispida* (Fleming) Various stages of growth $\times 15$
6, 7. The same. $\times 20$
-



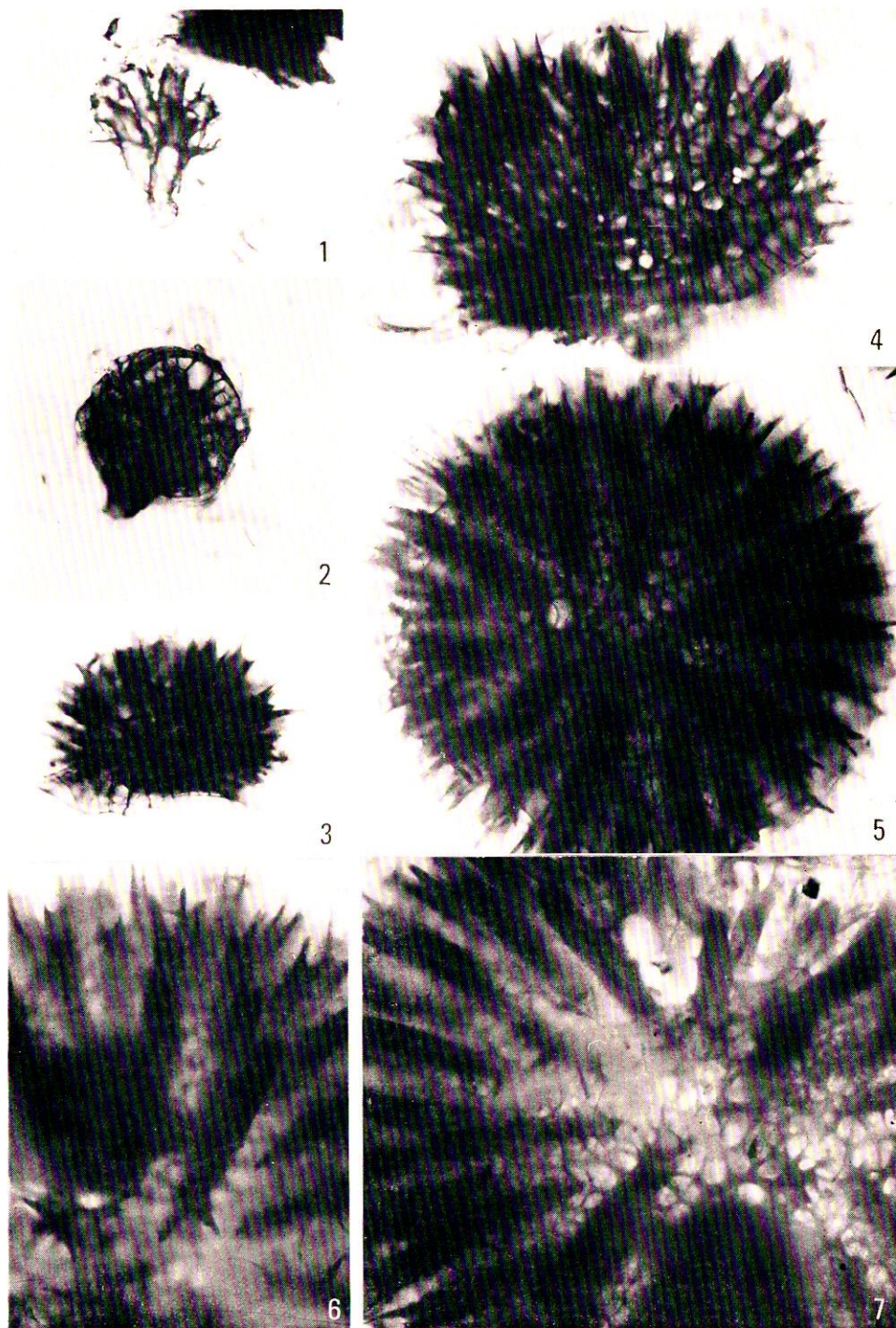
S. Mawatari and S. F. Mawatari: Bryozoa from Hokkaido, II



S. Mawatari and *S. F. Mawatari*: Bryozoa from Hokkaido, II



S. Mawatari and *S. F. Mawatari*: *Bryozoa from Hokkaido, II*



S. Mawatari and *S. F. Mawatari*: *Bryozoa from Hokkaido, II*