

MOLLUSCS SYMBIOTIC WITH COELENTERATES IN JAPAN,
WITH SPECIAL REFERENCE TO OVULIDAE AND ALLIED FORMS¹⁾

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With 12 Text-figures

The molluscs hitherto recorded as symbiotic with coelenterates in Japanese waters comprize the following groups: Fam. Pteridae (Lamellibranchia) with genera *Pteria* and *Pterelectroma* (with gorgonians and hydrocorals), Fam. Ovulidae (Gastropoda) with genera *Primovula* and *Prionovolva* (with gorgonians, alcyonarians, and hydrocorals), Fams. Montactidae and Galeommatidae (Lamellibranchia) respectively with genera *Nipponomontacuta* and *Ephippodonta* (both with anthozoans), Fams. Pholadidae and Mytilidae (Lamellibranchia) respectively with genera *Jouannecta* and *Lithophaga*, Fam. Coralliophilidae (Gastropoda) with five genera comprising popular *Coralliophilla* (with stony corals), and Fams. Epitoniidae and Architectonicidae (Gastropoda) respectively with genera *Gyroscala* and *Spiniscalia* and with genus *Heliacus* (with sea anemones).

These molluscs may then be classified into the following three ecological groups:

1. Merely attaching externally Pteriidae
2. Ectoparasitic Ovulidae, etc.
3. Boring into the soft part or skeletal structure of host *Coralliophilla*,
Lithophaga, etc.

Of these symbiotic molluscs, members of Fam. Ovulidae and allied forms are apparently most remarkable in number of species and seemingly in their adaptive morphology and behaviour. This group is represented in Japanese waters by following 26 species of 7 genera in 2 families, whose hosts have been so far confirmed, though about fifty species have been recorded inclusive of those, of which no records are available to learn their hosts.

Family Ovulidae

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| 1. <i>Primovula striatula</i> (SOWERBY) | 5. <i>P. myrakeenae</i> AZUMA & CATE |
| 2. <i>P. formosa</i> (ADAMS & REEVE) | 6. <i>P. tigris</i> T. YAMAMOTO |
| 3. <i>P. frumentum</i> (SOWERBY) | 7. <i>P. tosaensis</i> AZUMA & CATE |
| 4. <i>P. rhodia</i> (A. ADAMS) | 8. <i>P. (Dentiovula) dorsuosa</i> (HINDS) |

1) Contributions from the Seto Marine Biological Laboratory, No. 574.

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| 9. <i>P. (Prosimnia) coarctata</i> (ADAMS & REEVE) | 18. <i>D. florida</i> (KURODA) |
| 10. <i>Prionovolva fruticum</i> (REEVE) | 19. <i>Phenacovolva birostris</i> (LINNÉ) |
| 11. <i>P. bulla</i> (ADAMS & REEVE) | 20. <i>Ph. longirostris</i> (SOWERBY) |
| 12. <i>P. hervieri</i> (HEDLEY) | 21. <i>Ph. recurva</i> (ADAMS & REEVE) |
| 13. <i>P. brevis</i> (SOWERBY) | REEVE) |
| 14. <i>Diminovula marginata</i> (SOWERBY) | 22. <i>Ph. sowerbiana</i> (WEINKAUFF) |
| 15. <i>D. margarita</i> (SOWERBY) | 23. <i>Ph. (Pellasimnia) subreflexa</i> (ADAMS & REEVE) |
| 16. <i>D. punctata</i> (DUCLOS) | 24. <i>Kuroshiovolva shingoi</i> AZUMA & CATE |
| 17. <i>D. cristallina</i> (KIENER) | 25. <i>Ovula ovum</i> LINNÉ |

Family Pediculariidae

26. *Pedicularia (Pediculariona) pacifica* PEASE

The writer would like to express his hearty gratitude to Dr. Tokubei KURODA who has guided him during the course of the present study. Cordial thanks are due to Prof. Huzio UTINOMI of the Seto Marine Biological Laboratory for identification of host coelenterates and to Messrs. Kentarô SASAKI and Kinya MASE for valuable specimens and ecological information. The writer is indebted to Messrs. Tadasu TANAKA, Chûichi ARAGA and Dr. Shin'ichiro FUSE for some important photographs appeared in this paper.

Family Ovulidae

Genus *Primovula* THIELE

1. *Primovula striatula* (SOWERBY)

1828 *Ovulum striatum* SOWERBY, Zool. Jour., 4, p. 155.

1848 *Ovulum dentatum* ADAMS & REEVE, Zool. Samarang, Moll., 21, pl. 6, figs. 4a, b (non FISCHER De WALDHEIM, 1807).

Host and locality confirmed: Gorgonid, *Euplexaura erecta* KÜKENTHAL, (Seto, Sirahama, Wakayama Prefecture, February 1959; Tōsima, Sirahama, Wakayama Prefecture, September 1963; Seto, Sirahama, Wakayama Prefecture, February 1963; Minabe, Wakayama Prefecture, February 1969)

Distribution: Honsyû (northerly to Sagami Bay), Sikoku and Kyûsyû in Japan. Widely in the Indo-Pacific Region. (type locality-Indonesia).

2. *Primovula formosa* (ADAMS & REEVE)

1848 *Ovulum formosum* ADAMS & REEVE, Zool. Samarang, Moll., p. 22, pl. 6, fig. 6.

1856 *Amphiperas (Ovulum) trailli* A. ADAMS, Proc. Zool. Soc., London, 23 (298), (1855), p. 222.

Host and locality confirmed: Gorgonid, *Euplexaura sanguinea* UTINOMI, (Seto, Sirahama, Wakayama Prefecture, April 1958).

Gorgonid, *Euplexaura rigida* KÜKENTHAL, (Seto, Sirahama, Wakayama Prefecture, March 1959).

Gorgonid, *Euplexaura erecta* KÜKENTHAL, (Seto, Sirahama, Wakayama Prefecture, April 1960).

Gorgonid, *Echinogorgia praelonga* (RIDLEY), (Tôshima, Sirahama, Wakayama Prefecture, May 1962).

Distribution: Honsyû (northerly to Bôsô peninsula), Sikoku, Kyûsyû and Indo-Pacific Region. (type locality-Japan).

3. *Primovula frumentum* (SOWERBY)

1828 *Ovulum frumentum* SOWERBY, Zool. Jour., 4 (14), p. 155.

1865 *Ovulum frumentum* REEVE, Conch. Icon., *Ovulum*, sp. 25.

Host and locality confirmed: Alcyonarian, *Stereonephthya japonica* UTINOMI, (Bansyozaki, Sirahama, Wakayama Prefecture, August 1952; Tôshima, Sirahama, Wakayama Prefecture, May 1958).

Alcyonarian, *Stereonephthya rubriflora* UTINOMI, (Tôshima, Sirahama, Wakayama Prefecture, June 1958).

Alcyonarian, *Dendronephthya gigantea* (VERRILL), (Bansyozaki, Sirahama, Wakayama Prefecture, March 1958).

Gorgonid, *Euplexaura erecta* KÜKENTHAL, (Seto, Sirahama, Wakayama Prefecture, February 1963).

Distribution: Honsyû (northerly to Bôsô peninsula), Sikoku, Kyûsyû. Tropical Pacific region. (type locality unknown).

4. *Primovula rhodia* (A. ADAMS)

1830 *Ovulum triticum* SOWERBY, in BRODERIP & SOWERBY, Spec. Conch., *Ovulum*, 1 (1), p. 6 (non Lamarck, 1810).

1855 *Amphiperas rhodia* A. ADAMS, Proc. Soc., London, 22 (1854), p. 130.

Host and locality confirmed: Alcyonarian, *Stereonephthya japonica* UTINOMI, (Bansyozaki, Sirahama, Wakayama Prefecture, May 1958).

Gorgonid, *Melithaea flabellifera* (KÜKENTHAL), (Kozima, Ôkawa, Ôsaka Prefecture, September 1959, collected by I. HAMATANI; Seto, Sirahama, Wakayama Prefecture, July 1959; Sirasaki, Yura, Wakayama Prefecture, May 1961; Katu'ura, Wakayama Prefecture, June 1966).

Gorgonid, *Euplexaura erecta* KÜKENTHAL, (Seto, Sirahama, Wakayama Prefecture, August 1960; Bansyozaki, Sirahama, Wakayama Prefecture, August 1960; Tôshima, Sirahama, Wakayama Prefecture, July 1970).

Distribution: Southern Hokkaidô, Honsyû, Sikoku, Kyûsyû, Korea and China. (type locality-Japan).

5. *Primovula myrakeenae* AZUMA & CATE

1970 *Primovula myrakeenae* AZUMA & CATE, Veliger, 13, p. 263, fig. 7.

Host and locality confirmed: Gorgonid, *Acalycigorgia inermis* (HEDLUND),

(Sakai, Minabe, Wakayama Prefecture, November 1971).

Distribution: Honsyû (Sagami Bay and type locality-off Kirimezaki, Wakayama Prefecture).

6. *Primovula tigris* T. YAMAMOTO

1971 *Primovula tigris* T. YAMAMOTO, Publ. Seto Mar. Biol. Lab., 19 (4), 191-195, pl. 8, figs. 1-3.

Host and distribution confirmed: Gorgonid, *Euplexaura erecta* KÜKENTHAL (off Yuzaki, Sirahama, Wakayama Prefecture, December 1957; off Yuzaki, Sirahama, Wakayama Prefecture, March 1961; Bansyozaki, Sirahama, Wakayama Prefecture, July 1963; Maguti, Miura Peninsula, Kanagawa Prefecture, April 1971, collected by K. MASE).

Distribution: Honsyû (Sagami Bay and type locality-off Yuzaki, Sirahama, Wakayama Prefecture).

7. *Primovula tosaensis* AZUMA & CATE

1971 *Primovula tosaensis* AZUMA & CATE, Veliger, 13 (3), p. 264-265, figs. 9, 18.

Host and locality confirmed: Gorgonid, *Antipathes japonica* BROOK, (Sakai, Minabe, Wakayama Prefecture, April 1972, collected by K. SASAKI).

Distribution: Honsyû (northerly to Sagami Bay), Sikoku (type locality-off Kirimezaki, Wakayama Prefecture).

8. *Primovula (Dentiovula) dorsuosa* (HINDS)

1844 *Ovulum dorsuosum* HINDS, Zool. Sulphur, p. 47, pl. 16, figs. 3, 4.

1930 *Prosimnia renovata* IREDALE, Mem. Queensl. Mus., 10, p. 85.

1932 *Primovula dorsuosa*, SCHILDER, Proc. Malac. Soc. London, 20, pp. 52, 58.

1968 *Primovula striatula* GERNOHORSKY, Veliger, 10 (4), p. 361, pl. 50, fig. 8.

Host and locality confirmed: Gorgonid, *Acanthogorgia japonica* KÜKENTHAL & Gorzawsky, (Sakai, Minabe, Wakayama Prefecture, December 1971).

Gorgonid, *Acalycigorgia grandiflora* KÜKENTHAL & GORZAWSKY, (Iti-no-hai, near Uwazima, Ehime Prefecture, August 1964, collected by T. ITO).

Distribution: Honsyû (northerly to Bôsô peninsula), Sikoku and Kyûsyû. Also in the Western Pacific Region. (type locality-Straits of Malacca).

9. *Primovula (Prosimnia) coarctata* (ADAMS & REEVE)

(Figs. 1-2)

1848 *Ovulum coarctata* ADAMS & REEVE, Zool. Samarang, Moll., 21, pl. 6, figs. 2a, b.

1881 *Ovulum sempieri* WEINKAUFF, Conch. Cab., ed. 2, 5, 190, pl. 48, figs. 14, 15.

Host and locality confirmed: Gorgonid, *Melithaea flabellifera* (KÜKENTHAL), (Sirasaki, Yura, Wakayama Prefecture, July 1947; Seto, Sirahama, Wakayama Prefecture, September 1963; Tôsima, Sirahama, Wakayama Prefecture, November 1963; Tôsima, Sirahama, Wakayama Prefecture, September 1970; Sihara, Hikigawa, Wakayama Prefecture, October 1972).

Gorgonid, *Melithaea ocracea* (LINNÉ), (Mirozu, Susami, Wakayama Prefecture, November 1970, collected by K. KITAO)

Distribution: Honsyû (northerly to Bôsô peninsula), Sikoku and Kyûsyû, Also in the Indo-Pacific Region. (type locality Straits of Sunda, near Java).

Genus *Prionovolva* IREDALE

10. *Prionovolva fruticum* (REEVE)

1848 *Ovula nubeculatum* ADAMS & REEVE, Zool. Samarang, Moll., P. 23, pl. 6, fig. 12.

1865 *Ovulum fruticum* REEVE, Conch. Icon., *Ovulum*, sp. 16.

1932 *Prionovolva fruticum*, SCHILDER, Proc. Malac. Soc. London, 20, pp. 53, 59, pl. 4, fig. 35.

Host and locality confirmed: Alcyonarian, *Dendronephthya* (*Mörchellana*) *habereri* KÜKENTHAL, (Ezura, Sirahama, Wakayama Prefecture, April 1956; Setozaki, Sirahama, Wakayama Prefecture, January 1960; Sionomisaki, Wakayama Prefecture, May 1960; Nada, Gobô, Wakayama Prefecture, January 1960; Ezura, Sirahama, Wakayama Prefecture, January 1961; Nada, Gobô, Wakayama Prefecture, April 1962; Sionomisaki, Wakayama Prefecture, March 1971).

Alcyonarian, *Dendronephthya* (*Roxasia*) *golgotha* UTINOMI, (Nada, Gobô, Wakayama Prefecture, February 1962)

Alcyonarian, *Dendronephthya* (*Dendronephthya*) *gigantea* (VERRILL), (Nada, Gobô, Wakayama Prefecture, March 1971; Sisôzima, Sirahama, Wakayama Prefecture, March 1971; Sionomisaki, Wakayama Prefecture, March 1971).

Alcyonarian, *Dendronephthya* (*Dendronephthya*) *nipponica* UTINOMI, (Sionomisaki, Wakayama Prefecture, April 1972).

Distribution: Honsyû (northerly to Bôsô Peninsula), Sikoku, Kyûsyû and also in the western Pacific Region. (type locality-Malacca).

11. *Prionovolva bulla* (ADAMS & REEVE)

1848 *Ovulum bulla* ADAMS & REEVE, Zool. Samarang, Moll., p. 21, pl. 6, figs. 5a, b.

1932 *Prionovolva bulla*, SCHILDER, Proc. Malac. Soc. London, 20, pp. 53, 59, pl. 4, figs. 27, 28.

Host and locality confirmed: Alcyonarian, *Dendronephthya* (*Dendronephthya*) *gigantea* (VERRILL), (Sakai, Minabe, Wakayama Prefecture, March 1968, collected by K. SASAKI)

Alcyonarian, *Dendronephthya* (*Roxasia*) *golgotha* UTINOMI, (Nada, Gobô, Wakayama Prefecture, May 1965)

Distribution: Honsyû (northerly to Sagami Bay), Sikoku, Kyûsyû, China Seas, Malayan Archipelago from Malacca to New Guinea. (type locality Malacca).

12. *Prionovolva hervieri* (HEDLEY)

1899 *Ovula hervieri* HEDLEY, Mem. Austr. Mus., 3, pp. 448, 449.

1930 *Prionovolva hervieri*, IREDALE, Queensl. Mus., 10, pl. 1, pp. 73-88, pl. 9.

1932 *Primovula hervieri*, SCHILDER, Proc. Malac. Soc. London, 20, pp. 51, 58.

Host and locality confirmed: Alcyonarian, *Dendronephthya (Roxasia) suensoni* (HOLM), (Seto, Sirahama, Wakayama Prefecture, April 1954).

Alcyonarian, *Dendronephthya (Dendronephthya) nipponica* UTINOMI, (Takui, near Gobô, Wakayama Prefecture, December 1963; Seto, Sirahama, Wakayama Prefecture, March 1964; Sionomisaki, Wakayama Prefecture, March 1971; Sionomisaki, Wakayama Prefecture, May 1971).

Alcyonarian, *Dendronephthya (Morchellana) habereri* KÜKENTHAL, (Seto, Sirahama, Wakayama Prefecture, December 1957; Sionomisaki, Wakayama Prefecture, March 1959; Sionomisaki, Wakayama Prefecture, May 1960; Sionomisaki, Wakayama Prefecture, January 1961; Mirozu, Susami, Wakayama Prefecture, December 1970; Sionomisaki, Wakayama Prefecture, May 1971).

Alcyonarian, *Dendronephthya (Dendronephthya) gigantea* (VERRILL), (Seto, Sirahama, Wakayama Prefecture, April 1959; Seto, Sirahama, Wakayama Prefecture, November 1959; Sionomisaki, Wakayama Prefecture, April 1957; Sionomisaki, Wakayama Prefecture, May 1960; Sionomisaki, Wakayama Prefecture, January 1961; Ezura, Sirahama, Wakayama Prefecture, April 1961; Kusimoto, Wakayama Prefecture, March 1962; Sionomisaki, Wakayama Prefecture, March 1971; Sionomisaki, Wakayama Prefecture, March 1972).

Distribution: Honsyû (northerly to Sagami Bay), Sikoku, Kyûsyû and Micronesia (type locality-Funafuti, Queensland).

13. *Prionovolva brevis* (SOWERBY)

1828 *Ovulum breve* SOWERBY, Zool. Jour., 4 (14), pp. 152, 153.

1913 *Ovula nipponensis* PILSBRY, Nautilus, 26 (10), pp. 114-115, pl. 7, fig. 4.

1932 *Prionovolva brevis* (SOWERBY), Proc. Malac. Soc. London, 20, p. 53, pl. 4, figs. 29-31.

1971 *Prionovolva (Prionovolva) nebula* AZUMA & CATE, Veliger, 13 (3), p. 262, fig. 4.

Host and locality confirmed: Alcyonarian, *Dendronephthya (Dendronephthya) gigantea* (VERRILL), (Seto, Sirahama, Wakayama Prefecture, April 1959)

Alcyonarian, *Dendronephthya (Morchellana) habereri* KÜKENTHAL, (Nada, Gobô, Wakayama Prefecture, April 1960; Sionomisaki, Wakayama Prefecture, May 1960)

Alcyonarian, *Dendronephthya (Morchellana) castanea* UTINOMI, (Sisôzima, Sirahama,

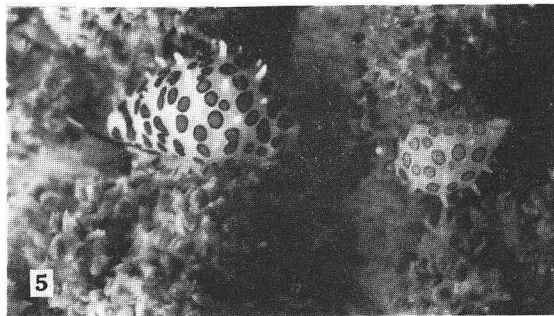
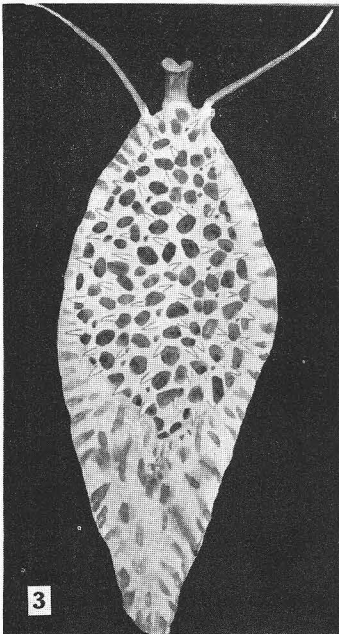
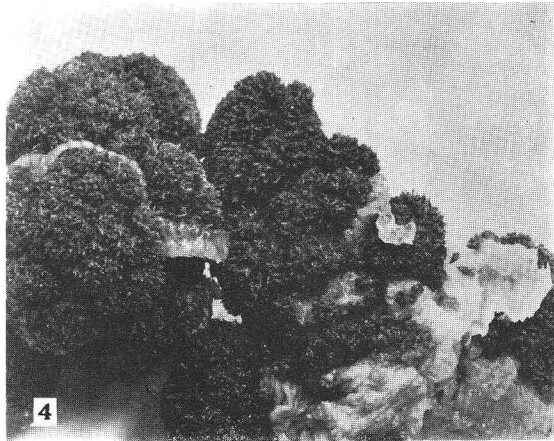
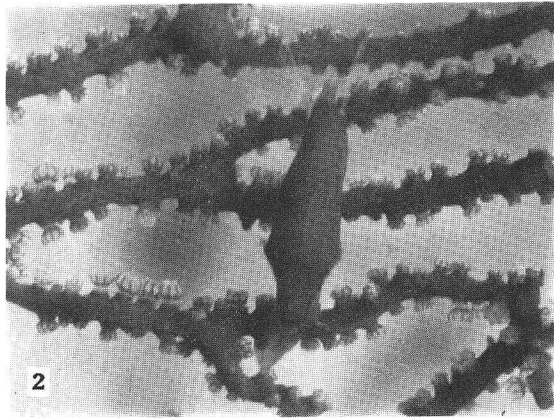
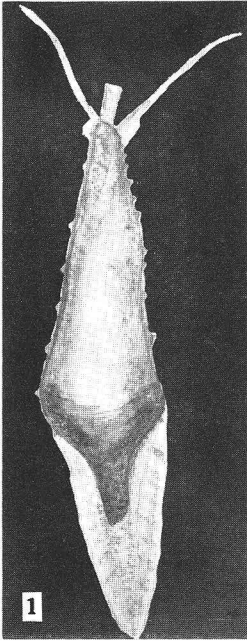
Fig. 1. *Primovula (Prosimnia) coarctata* (ADAMS & REEVE), 12mm in length. Tôsima, Sirahama, Wakayama Prefecture, September 1962 (collected by Mr. K. SASAKI).

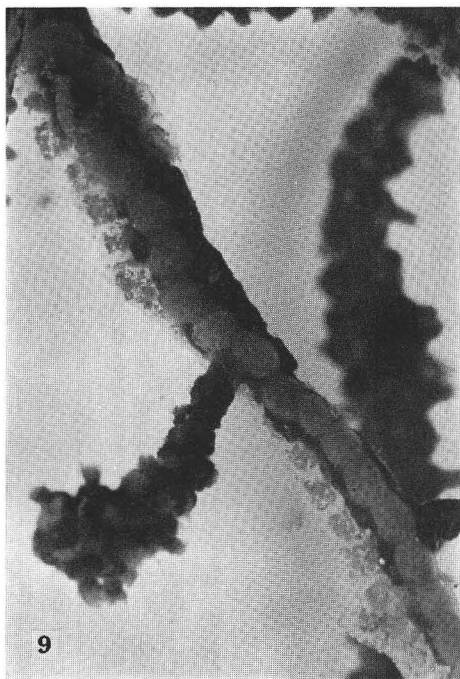
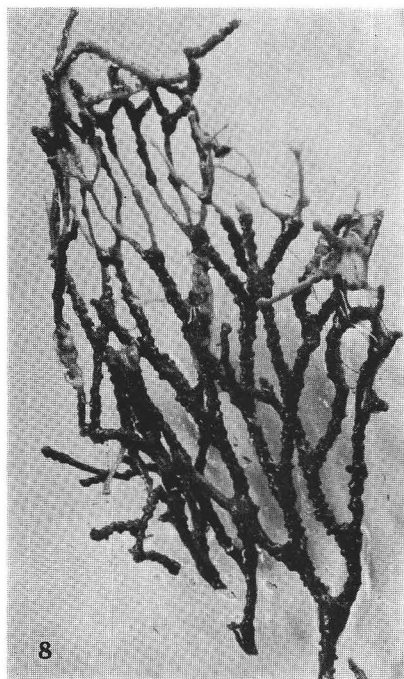
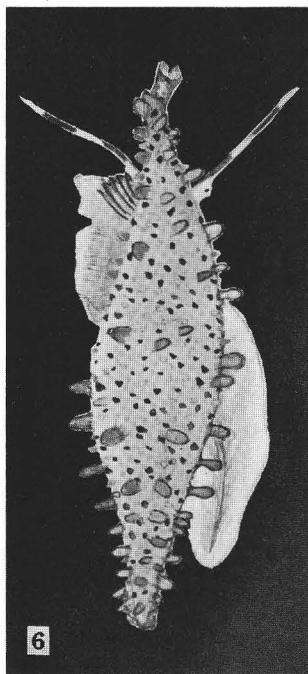
Fig. 2. *Primovula (Prosimnia) coarctata* (ADAMS & REEVE) on the gorgonid, *Melitaea flabellifera* (KÜKENTHAL), Tôsima, Sirahama, Wakayama Prefecture, September 1963 (photo by Mr. T. TANAKA).

Fig. 3. *Diminovula punctata* (DUCLOS), 18mm in length. Tôsima, Sirahama, Wakayama Prefecture, June 1958.

Fig. 4. Egg ribbon of *Diminovula punctata* laid on the Alcyonarian, *Dendronephthya gigantea* (VERRILL), Tôsima, Sirahama, Wakayama Prefecture, August 1963 (collected by Mr. K. SASAKI and photo by Mr. T. TANAKA).

Fig. 5. *Diminovula cristallina* (KIENER) on the Alcyonarian, *Stereonephthya japonica* UTINOMI, Seto, Sirahama, Wakayama Prefecture, September 1963 (photo by Mr. T. TANAKA).





Wakayama Prefecture, March 1971)

Distribution: Honsyû (northerly to Sagami Bay), Sikoku, Kyûsyû and Indo-Pacific Region. (type locality-Australia)

Genus *Diminovula* IREDALE

14. *Diminovula marginata* (SOWERBY)

1828 *Ovulum marginata* SOWERBY, Zool. Jour., 4 (14), p. 151.

1862 *Ovulum marginatum* REEVE, Conch. Icon., *Ovulum*, sp. 8.

1932 *Prinovula marginata* SCHILDER, Proc. Malac. Soc. London, 20, pp. 53, 59, pl. 4, figs. 33, 34.

1942 *Primovula marginata* YEN, Proc. Malac. Soc. London, 24, p. 212, pl. 16, fig. 98.

Host and locality confirmed: Alcyonarian, *Dendronephthya tuberculata* UTINOMI, (Nada, Gobô, Wakayama Prefecture, April 1970, collected by Y. TOKI; Sionomisaki, Wakayama Prefecture, March 1971)

Alcyonarian, *Stereonephthya japonica* UTINOMI (Nagasima, Mie Prefecture, collected by S. SIRAI).

Distribution: Honsyû (northerly to Bôsô Peninsula), Sikoku, Kyûsyû, Formosa and China. (type locality-China).

15. *Diminovula margarita* (SOWERBY)

1828 *Ovulum margarita* SOWERBY, Zool. Jour., 4, p. 150.

1849 *Ovulum umbilicatum* SOWERBY, Proc. Zool. Soc. London, 16 (188), p. 135.

1932 *Primovula (Diminovula) margarita*, SCHILDER, Proc. Malac. Soc. London, 20, pp. 51, 58, pl. 3, fig. 1.

Host and locality confirmed: Alcyonarian, *Stereonephthya rubriflora* UTINOMI, (Seto, Sirahama, Wakayama Prefecture, July 1953; Seto, Sirahama, Wakayama Prefecture, May 1954; Tôsima, Sirahama, Wakayama Prefecture, June 1958)

Alcyonarian, *Stereonephthya japonica* UTINOMI, (Tôsima, Sirahama, Wakayama Prefecture, June 1958; Bansyozaki, Sirahama, Wakayama Prefecture, May 1959)

Distribution: Honsyû (northerly to Bôsô Peninsula), Sikoku, Kyûsyû, Formosa and China. (type locality-China)

16. *Diminovula punctata* (DUCLOS)

(Figs. 3—4)

1828 *Ovula punctata* DUCLOS, Mem. Soc. Hist. Nat. Paris, 4, p. 248.

Fig. 6. *Phenacovolva birostris* (LINNÉ), 35mm in length. Tôsima, Sirahama, Wakayama Prefecture, May 1962 (collected by Mr. H. INAGAKI).

Fig. 7. *Phenacovolva birostris* (LINNÉ) on the gorgonid, *Anthoplexaura dimorpha* KÜKENTHAL, Tôsima, Sirahama, Wakayama Prefecture, September 1963 (collected by Mr. K. SASAKI and photo by Mr. T. TANAKA).

Fig. 8. *Anthoplexaura dimorpha* KÜKENTHAL partly grazed by *Phenacovolva birostris* (LINNÉ) and with egg masses laid by the latter. Tôsima, Sirahama, Wakayama Prefecture, September 1963 (collected by Mr. K. SASAKI and photo by Mr. T. TANAKA).

Fig. 9. A part of the same egg masses magnified.

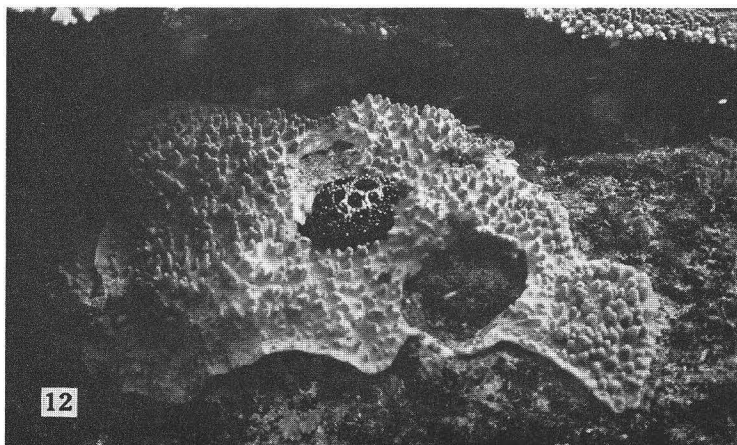
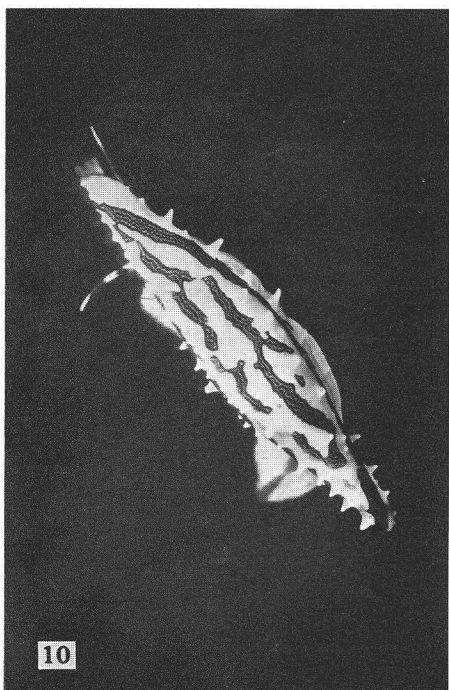


Fig. 10. *Phenacovolva (Pellasmimnia) subreflexa* (ADAMS & REEVE), Tōsima, Sirahama, Wakayama Prefecture, November 1971 (collected and photo by Mr. Ch. ARAGA).

Fig. 11. The same animal on the gorgonid, *Antipathes japonica* BROOK (photo by Mr. Ch. ARAGA).

Fig. 12. *Ovula ovum* LINNÉ on *Lobophyllum pauciflorum* (HEMICH & EHRENBURG), Sabiura, Kusimoto, Wakayama Prefecture, December 1969 (collected and photo by Mr. S. FUSE).

1930 *Diminovula verepunctata* IREDALE, Mem. Queensl. Mus., 10, p. 85.

1932 *Primovula (Diminovula) punctata*, SCHILDER, Proc. Malac. Soc. London, 20, pp. 51, 58, pl. 3, fig. 5.

1962 *Pseudosimnia (Diminovula) punctata*, KIRA, Shells. West Pacific col., 1, p. 44, pl. 19, fig. 5.

Host and locality confirmed: Alcyonarian, *Dendronephthya (Dendronephthya) nipponica* UTINOMI, (Seto, Sirahama, Wakayama Prefecture, July 1954; Seto, Sirahama, Wakayama Prefecture, April 1958; Sionomisaki, Wakayama Prefecture, May 1960; Sionomisaki, Wakayama Prefecture, May 1971)

Alcyonarian, *Dendronephthya (Dendronephthya) gigantea* (VERRILL), (Kusimoto, Wakayama Prefecture, April 1957; Sisôzima, Sirahama, Wakayama Prefecture, April 1958; Bansyozaki, Sirahama, Wakayama Prefecture, May 1958; Tôsima, Sirahama, Wakayama Prefecture, June 1958; Seto, Sirahama, Wakayama Prefecture, April 1959; Seto, Sirahama, Wakayama Prefecture, July 1959; Sionomisaki, Wakayama Prefecture, May 1960; Kusimoto, Wakayama Prefecture, March 1960; Seto, Sirahama, Wakayama Prefecture, April 1961; Takui, near Gobô, Wakayama Prefecture, February, 1961; Nada, Gobô, Wakayama Prefecture, February 1962; Sakai, Minabe, Wakayama Prefecture, December 1969)

Alcyonarian, *Dendronephthya (Morchellana) habereri* KÜKENTHAL, (Sionomisaki, Wakayama Prefecture, May 1960, Sisôzima, Sirahama, Wakayama Prefecture, April 1961)

Alcyonarian, *Dendronephthya (Morchellana) castanea* UTINOMI, (Nada, Gobô, Wakayama Prefecture, February 1962)

Alcyonarian, *Stereonephthya rubriflora* UTINOMI, (Bansyozaki, Sirahama, Wakayama Prefecture, June 1956)

Alcyonarian, *Stereonephthya japonica* UTINOMI, (Tôsima, Sirahama, Wakayama Prefecture, April 1959)

Distribution: Honsyû (northerly to Bôsô Peninsula), Sikoku, Kyûsyû, Also in the Indo-Pacific Region. (type locality-Bourbon, Reunion Island, Indian Ocean)

Remarks: This animal is symbiotic with *Dendronephthya nipponica*, laying eggs on the host and excreting faeces suffused with spicules of the host.

17. *Diminovula cristallina* (KIENER)

(Fig. 5)

1844 *Ovula cristallina* KIENER, Spec. Gen. Icon. Coquilles Vivants. Text 3, p. 14, pl. 4, fig. 3.

Host and locality confirmed: Alcyonarian, *Stereonephthya japonica* UTINOMI, (Seto, Sirahama, Wakayama Prefecture, May 1954; Bansyozaki, Sirahama, Wakayama Prefecture, May 1958; Tôsima, Sirahama, Wakayama Prefecture, May 1960; Torinosu, Tanabe, Wakayama Prefecture, June 1969; Seto, Sirahama, Wakayama Prefecture, July 1970; Seto, Sirahama, Wakayama Prefecture, August 1971)

Alcyonarian, *Stereonephthya rubriflora* UTINOMI, (Tôsima, Sirahama, Wakayama Prefecture, March 1959)

Distribution: Honsyû (northerly to Sagami Bay), Sikoku, Kyûsyû, China and

also in the Indo-Pacific Region. (type locality-India)

18. *Diminovula florida* (KURODA)

1958 *Pseudosimnia (Diminovula) florida* KURODA, Jap. Jour. Malac. Soc., 20 (2), pp. 172-173.

1963 *Primovula (Diminovula) florida*, SHIKAMA & HORIKOSHI, Serect. Shells World Illust. Colours, p. 44, pl. 32, fig. 17.

1971 *Pseudosimnia (Diminovula) fulguris* AZUMA & CATE, Veliger, 13 (3), pp. 267-268, fig. 15.

Host and locality confirmed: Alcyonarian, *Alcyonium gracillimum* KÜKENTHAL, (Tōsima, Sirahama, Wakayama Prefecture, November 1964; Ezura, Sirahama, Wakayama Prefecture, October 1970; Sakai, Minabe, Wakayama Prefecture, January 1972; Sakai, Minabe, Wakayama Prefecture, March 1972)

Distribution: Honsyū (northerly to Sagami Bay), (type locality-Sionomisaki, Wakayama Prefecture)

Genus *Phenacovolva* IREDALE

19. *Phenacovolva birostris* (LINNÉ)

(Figs. 6-9)

1767 *Bulla birostris*, Syst. Nat., ed., 12, p. 1182.

1817 *Radius brevirostris* SCHMACHER, Essai Nouv. Syst. Vess. Test., p. 259.

1855 *Volva rosea* ADAMS & REEVE, Proc. Soc. London, (1854), p. 130, pl. 28, fig. 9.

1865 *Ovulum birostris*, REEVE, Conch. Icon., *Ovulum*, sp. 45.

1932 *Volva brevirostris*, SCHILDER, Proc. Malac. Soc. London, 29, pp. 56, 62, pl. 5, figs. 74, 75.

1962 *Volva (Phenacovolva) brevirostris rosea*, Kira, Shells West. Pacific Col., 1, p. 45, pl. 19, figs. 10.

1963 *Volva (Phenacovolva) brevirostris* (ADAMS), SHIKAMA & HORIKOSHI, Select. Shells World Illust. Colours, p. 45, pl. 32, fig. 27.

1963 *Phenacovolva birostris*, CERNOHORSKY, Veliger, 10, p. 363, pl. 50, fig. 10.

Host and locality confirmed: Antipathid, *Antipathes japonica* BROOK, (Seto, Sirahama, Wakayama Prefecture, November 1957)

Gorgonid, *Discogorgia* sp., (Yuzaki, Sirahama, Wakayama Prefecture, April 1961)

Gorgonid, *Anthiplexaura dimorpha* (KÜKENTHAL), (Tōsima, Sirahama, Wakayama Prefecture, May 1962; Tōsima, Sirahama, Wakayama Prefecture, June 1966; Tōsima, Sirahama, Wakayama Prefecture, August 1968, collected by K. SASAKI; Tōsima, Sirahama, Wakayama Prefecture, September 1970, collected by K. SASAKI)

Gorgonid, *Acanthogorgia multispina* KÜKENTHAL & GORZALSKY, (Sakai, Minabe, Wakayama Prefecture, February 1971)

Gorgonid, *Acalycigorgia inermis* (HEDLUND), (Sakai, Minabe, Wakayama prefecture, January 1972)

Distribution: Honsyū (northerly to Bōsō Peninsula), Sikoku, Kyūsyū, also in the Western Pacific Region. (type locality-Ad Javam, Indonesia)

Remarks: This animal eats the polyps of the host (*Anthiplexaura dimorpha*) and exretes faeces suffused with spicules of the host. While breeding in the aquarium this animal laid eggs on the surface of the host.

20. *Phenacovolva longirostris* (SOWERBY)

1828 *Ovulum longirostris* SOWERBY, Zool. Jour., 4 (14), p. 140.

1932 *Volva birostris*, SCHILDER, Proc. Malac. Soc. London, 20, pp. 56, 62, pl. 5, fig. 78.

1962 *Volva (Phenacovolva) birostris*. KIRA, Shells West. Pacific Col. 1, p. 45, pl. 19, fig. 11.

Host and locality confirmed: Gorgonid, *Calicogorgia granulosa* KÜKENTHAL & Gorzawsky, (Sakai, Minabe, Wakayama Prefecture, December 1969)

Distribution: Honsyû (northerly to Bôsô Peninsula), Sikoku, Kyûsyû. Also widely ranging in the Indo-Pacific Region. (type locality-Bourbon, Indian Ocean).

21. *Phenacovolva recurva* (ADAMS & REEVE)

1848 *Ovulum recurvum* ADAMS & REEVE, Zool. Samarang, Moll., p. 21, pl. 6, figs. 3a, b, c.

1931 *Volva recurva*, SCHILDER, Proc. Malac. Soc. London, 20 (1), pp. 56, 62.

Host and locality: Gorgonid, *Antipathes japonica* BROOK, (Sakai, Minabe, Wakayama Prefecture, April 1971, collected by K. SASAKI).

Distribution: Honsyû (northerly to Sagami Bay), Sikoku, Kyûsyû, China. (type locality-China seas).

22. *Phenacovolva sowerbyana* (WEINKAUFF)

1758 *Bulla spelta* LINNÉ, Syst. Nat., p. 1182.

1865 *Ovulum spelta*, REEVE Conch. Icon., *Ovulum* sp. 42, pl. 10, figs. 42a, b.

1931 *Volva sowerbyana*, SCHILDER, Proc. Malac. Soc. London. pp. 56, 62, pl. 5, fig. 73.

1964 *Phenacovolva sowerbyana* (WEINKAUFF), Habe, Shells West. Pacific col. 2, p. 64, pl. 19, fig. 12.

Host and locality confirmed: Gorgonid, *Antipathes japonica* BROOK, (Sakai, Minabe, Wakayama Prefecture, March 1970, collected by K. SASAKI).

Distribution: Honsyû (northerly to Ensyû-nada), Sikoku, Kyûsyû. Indo-Pacific Region. (type locality-Madagascar).

23. *Phenacovolva (Pellasimnia) subreflexa* (ADAMS & REEVE)

(Figs. 10—11)

1848 *Ovulum subreflexa* ADAMS & REEVE, Zool. Samarang, Moll., p. 22, pl. 6, fig. 10.

1849 *Ovulum philippinarum* SOWERBY, Proc. Zool. Soc. London, 16, p. 136.

1877 *Volva carpenteri* DUNKER, Malak. Blatt., 24, p. 75.

1877 *Volva adamsi* DUNKER, Malak. Blatt., 24, p. 75. (non *Ovulum adamsi* Reeve, 1865)

1882 *Radius carpenteri*, DUNKER, Index Moll. Mar. Japon., p. 102 pl. 13, figs. 1, 2.

1882 *Radius adamsi* DUNKER, Index Moll. Mar. Japon., p. 102, pl. 13, figs. 3, 4.

1932 *Volva philippinarum*, SCHILDER, Proc. Malac. Soc. London, 20, pp. 56, 62, pl. 5, fig. 77.

1942 *Neosimnia subreflexa*, YEN, Proc. Malac. Soc. London, 24, p. 212, pl. 17, fig. 101.

1962 *Volva (Phenacovolva) philippinarum*, KIRA, Shells West. Pacific col., 1, p. 45, pl. 19, fig. 9.

1968 *Phenacovolva (Pellasimnia) philippinarum*, CERNOHORSKY, Veliger, 10, p. 364, pl. 31, fig. 12.

1971 *Phenacovolva improcera* AZUMA & CATE, Veliger, 13, p. 265, fig. 12.

Host and locality confirmed: Gorgonid, *Melithaea flabellifera* (KÜKENTHAL), (Bansyozaki, Sirahama, Wakayama Prefecture, July 1959; Tôsima, Sirahama, Wakayama Prefecture, November 1963, collected by C. ARAGA).

Distribution: Hosityû (northerly to Bôsô Peninsula), Sikoku, Kyûsyû. Widely ranging in the Tropical Pacific Region. (type locality-China).

Genus *Kuroshiovolva* AZUMA & CATE

24. *Kuroshiovolva shingoi* AZUMA & CATE

1971 *Kuroshiovolva shingoi* AZUMA & CATE, *Veliger*, 13 (3), pp. 266-267, figs. 14, 20, 21, 22, 23.

Host and locality confirmed: Gorgonid, *Plumarella cristata* KÜKENTHAL & GORZAWSKY, (Sakai, Minabe, Wakayama Prefecture, April 1972, collected by K. SASAKI)

Distribution: Honsyû (type locality-off Hinomisaki, Kii Peninsula).

Genus *Ovula* BRUGUIÈRE

25. *Ovula ovum* LINNÉ

(Fig. 12)

1758 *Bulla ovum* LINNÉ, *Syst. Nat.*, ed. 10, p. 725, no. 327.

1796 *Volva cygnea* RÖDING, *Mus. Bolt.*, p. 21, no. 255.

1811 *Ovula oviformis* LAMARCK., *Ann. Mus. Hist. Nat.*, 16, p. 110.

1817 *Ovula alba* SCHMACHER., *Essei Nouv. Syst.*, p. 258.

1828 *Ovulum ovum* var. *pygmaea* SOWERBY, *Zool. Jour.* 4, p. 149.

1908 *Amphiperas ovum* (LINNÉ). Berch, *Siboga Exp.*, 50, pl. 5, fig. 21 (animal).

Host and locality confirmed: Alcyonarian, *Cladiella digitulata* (KLUNZIGER), (Ezura, Sirahama, Wakayama Prefecture, April 1957; Tôsima, Sirahama, Wakayama Prefecture, August 1972, collected by T. ÔSUKA).

Alcyonarian, *Lobophytum pauciflorum* (HEMRICH & EHRENBERG), (Sabiura, Kusimoto, Wakayama Prefecture, December 1969, collected by S. FUSE).

Alcyonarian, *Lobophytum batarum* MOSER (owing to SIRAI's report).

Distribution: Honsyû (northerly to Kii Peninsula), Sikoku, Kyûsyû, Also wide ranging in the Tropical Indo-Pacific Region. (type locality-Amboina).

Remarks: While breeding in the aquarium the animal ate up *Cladiella digitulata*, (Diameter about 15cm.) in 12 days.

Family **Pediculariidae**

Genus *Pedicularia* SWAINSON

26. *Pedicularia (Pediculariona) pacifica* PEASE

1863 *Dentiora rubica* PEASE, *Proc. Zool. Soc. London*, (1862), p. 240.

1865 *Pedicularia pacifica* PEASE, *Proc. Zool. Soc. London*, p. 516.

1903 *Pedicularia stylastris* HEDLEY, *Mem. Austral. Mus.*, 4, p. 342, figs. 69, 70.

Host and locality confirmed: Hydrocoral, *Stylaster profundiporus* BROCH f. *crassicaulis* BROCH, (Sakai, Minabe, Wakayama Prefecture, December 1968; Sakai, Minabe, Wakayama Prefecture, February 1970; Nada, Gobô, Wakayama Prefecture, April

1971; Nada, Gobô, Wakayama Prefecture, May 1971; Sakai, Minabe, Wakayama Prefecture, March 1972)

Distribution: Honsyû (northerly to Bôsô Peninsula), Sikoku, Kyûsyû. Also wide ranging in the Tropical Pacific Region. (type locality-Gilbert Island)

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