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FAUNA OF SHELL-BEARING MOLLUSKS IN MUTSU BAY SCAPHOPODA AND GASTROPODA (1)[1)]

By

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(With 3 plates)

Class SCAPHOPODA

Family DENTALIIDAE

1. *Dentalium* (*Paradentalium*) *octangulatum* Donovan (Pl. II, Fig. 11)

Japanese name: Yakado-tsunogai

Dentalium octangulatum Donovan 1804, p. 5, Pl. 162; Nomura et Hatai 1932, p. 8.
Dentalium octogonum Lamarck 1818, p. 344.
Dentalium hexagonum Gould 1859, p. 166.
Dentalium sexcostatum Sowerby 1866, p. 103, Pl. 233, Fig. 11.
Dentalium japonicum Dunker 1877, p. 68.

The task shell is about 4–5 cm in length, well curved backwards, grayish white in color and generally octagonal in cross section, owing to the longitudinal ribs, the spaces between the ribs sometimes have the interstitial riblets.

Locality: Asamushi, Yunoshima, and St. 24.

Distribution: China, Korea, Kyushu to Honshu (up to the bay).

Habitat: Common on muddy bottom in shallow waters.

Remarks: According to Nomura, the number of longitudinal ribs of this species varies 6 to 10, so that *D. hexagonum* Gould does not differ from this species even in subspecific value.

2. *Episiphon makiyamai* Kuroda et Kikuchi (Pl. II, Fig. 9)

Japanese name: Rosoku-tsunogai

Dentalium (*Episiphon*) *filum* Makiyama 1927, p. 58 (non Sowerby).
Dentalium (*Episiphon*) *makiyamai* Kuroda et Kikuchi 1933, p. 11, Pl. 1, Fig. 8.

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Dentalium yamakawai Nomura et Hatai 1932, p. 8 (non Yokoyama).

The small task shell is characterized by the small, terminal tube on the top and reddish rose coloration.

Locality: Asamushi, Yunoshima, Natsudomari and all over the muddy bottom of the bay.

Habitat: Rather common on muddy bottom in shallow waters.

Remarks: Besides the above two species, an indetermined species of the genus *Cadulus* in the family Siphonodentaliidae had been reported by Nomura and Hatai from this bay, but this is not a species of the task shell, but an annelid species *Ditrupa arietina* (Müller) (Japanese name: Tsunogai-damashi) (Pl. II, Fig. 10) synonymizing *Dentalium edoense* Yokoyama which commonly and widely distributes in bays in Japan.

Class GASTROPODA
Subclass STREPTONEURA
Order ARCHAEOGASTROPODA
Superfamily PLEUROTOMARIACEA
Family HALIOTIDAE

1. *Notohaliotis discus* (Reeve) (Pl. I, Figs. 3, 4)

Japanese name: Kuro-awabi

Haliotis discus Reeve 1846, sp. 31; Nomura et Hatai 1932, p. 8.

This is one of the important abalones for the fisheries purpose. The shell is elongate and oval in shape and somewhat inflat at the large body whorl and is covered with an olivaceous periostracum on the outer surface which is rather roughly corrugated. The whorl increases in width suddenly at the base forming an ear shape. Interior is pearly green. The number of the elevated and opened holes is 4 to 6. The aperture is nearly as large as the body whorl. The outer lip is not widely expanded outwards and inserts to the parietal margin with a narrow connection at its posterior end.

Locality: Nonai, Kugurizaka, Asamushi, Yunoshima, Gomejima, Moura, Futagojima, Oshima, Asadokoro and Noheji.

Distribution: China, Korea, Kyushu to Honshu and west coast of Hokkaido.

Habitat: Creeps along the surface of rocks from the intertidal zone to 20 m in depth.

Remarks: The northern form of this species had been renamed as *Haliotis discus hannai* by Ino, because of the missidentification with *N. kamtschatkana* (Jonas) from Alaska, but the writers do not find any exact distinction between *N. discus* and *N. discus hannai* with various intermediate forms. Therefore this subspecific name is unneccessary. *N. sieboldi* Reeve (Japanese name: Madaka-awabi) (Pl. I, Figs. 1, 2) differs from this species in having the broad shell with the expanded outer lip which has the broad connection with the parietal margin at its posterior end.

Family FISSURELLIDAE

2. *Puncturella nobilis* (A. Adams) (Pl. III, Fig. 13)

Japanese name: Kodaka-sukashigai

Cemoria nobilis A. Adams 1860, p. 422.
Puncturella nobilis Nomura et Hatai 1932, p. 9.

The shell is white and conical with a slit just in front of the apex. The surface has radial cords of about 20 in number.

Locality: Asamushi, Yunoshima, Kominato and Noheji.

Distribution: Northern Honshu, Hokkaido, Saghalien and Kuriles.

Habitat: Very common on the gravelly bottom below the low tide mark to about 50 m in depth.

3. *Tugalina gigas* (v. Martens) (Pl. III, Fig. 12)

Japanese name: Saru-awabi

Subemarginula gigas v. Martens 1881, p. 103, pl. 19.
Tugalia gigas Nomura et Hatai 1932, p. 9.

This is a species with a very large shell for the family, attaining 10 cm in shell length. The limpet-like shell is oval, attenuating to the anterior end at which a shallow notch is found and has about twenty thick and radial ribs and several secondary riblets between each two ribs. Soft part is also large and reddish in color.

Locality: Yunoshima, Gomejima and Futagojima.

Distribution: Northern Honshu, southern Hokkaido and Korea.

Habitat: Creeps on rocks at the low tide mark.

4. *Tugali decussata* A. Adams (Pl. III, Fig. 5)

Japanese namae: Shiro-susokakegai

Tugali decussata A. Adams 1852, p. 89.
Emarginula angustata Thiele 1915, p. 108, Pl. 15, Figs. 27, 28.

The limpet-like shell is rather small, measuring about 10 mm in length, white and ellipsoidal in shape. Surface radiates many ribs to the margin from the apex which is situated at the posterior third, crossing the concentric growth lines with the restricted aspects. A very shallow notch presents at the anetrior end.

Locality: Asamushi.

Distribution: Kyushu to southern Hokkaido.

Habitat: Creeps on the gravels and rocks at the tidal zone.

Superfamily PATELLACEA
Family PATELLIDAE

5. *Cellana toreuma* (Reeve) (Pl. I, Figs. 7, 10, 12)
Japanese name: Yome-gakasa

Patella toreuma Reeve 1855, sp. 69.
Cellana toreuma Nomura et Hatai 1932, p. 9.

The rather flat limpet reaches to about 50 mm in length and ornaments the surface with many unequal radial ribs and blackish spots of various sizes on the bluish ground. Interior is pearly.

Locality: Kugurizaka, Asamushi, Yunoshima, Gomejima, Futagojima, Mourajima and Noheji.

Distribution: China, Korea, Formosa to southern Hokkaido.

Habitat: Adheres to rocks at the intertidal zone.

6. *Cellana dorsuosa* (Gould) (Pl. I, Figs. 5, 17)
Japanese name: Bekko-gasa

Patella dorsuosa Gould 1859, p. 162.
Helcioniscus eucosmius Pilsbry 1892, p. 148.
Cellana eucosmia Nomura et Hatai 1932, p. 9.

The limpet is very close similar to the preceding species, but has a solid and convex shell with stout radial ribs on the surface. Interior is pearly and has a dark brown spatula surrounded by the mantle scar at the center, and on the surface purplish bands and spots radiated from the apex to the margin.

Locality: Nonai, Asamushi, Yunoshima, Tsuchiya, Mourajima and Futagojima.

Distribution: Formosa to southern Hokkaido and southern Korea.

Habitat: Adheres on rocks at the tidal zone.

Remarks: This was formerly well known as *Cellana eucosmia* (Pilsbry).

Family ACMAEIDAE

7. *Acmaea* (*Niveotectura*) *pallida* (Gould) (Pl. III, Figs. 6, 7)
Japanese name: Yuki-nokasa

Patella pallida Gould 1859, p. 162.
Patella lamanonii Schrenck 1867, p. 303, Pl. 14, Figs. 6-9.
Patelloida pallida Nomura et Hatai 1932, p. 9.

This has a white, large, solid and conical limpet, exceeding 50 mm in length and 25 mm in height. The primary ribs and one to three secondary finer ones in the interspaces of them radiates on the surface of shell. Interior is white.

Locality: Kugurizaka, Asamushi, Gomejima, Mourajima, Futagojima, Oshima, Karibasawa, Noheji and Wakinozawa.

Distribution: Honshu (down to Sagami Bay), Hokkaido, Saghalien, Kuriles, North China, Korea and Maritime Prov. of Siberia.

Habitat: Adheres on rocks at the low tide mark.

8. *Patelloida* (*Chiazacmea*) *pygmaea* (Dunker) (Pl. I, Fig. 14)
Japanese name: Hime-kozara

Patella pygmaea Dunker 1860, p. 234.
Patelloida pygmaea Nomura et Hatai 1932, p. 9.

The small ellipsoidal limpet measures about 15 mm in length and is characterized by minute and brown net all over the surface and by black radial bands from the apex to the margin. The apex is pointed anteriorly. The interior is bluish white to white usually having the blackish and narrow border and spatula.

Locality: Kugurizaka, Asamushi and Futagojima.

Distribution: Formosa to southern Hokkaido, China and Korea.

Habitat: Creeps along the surface of gravels and rocks at the low tide mark.

Remarks: *P.* (*C.*) *p.* forma *lampanicola* Habe (Japanese name: Tsubomigai) (Pl. I, Fig. 16) has a highly conical shell as an ecological form adhered on the shell of the lampanicolid species such as *Batillaria multiformis* and *B. cumingii*.

9. *Collisella grata* (Gould) (Pl. I, Fig. 8)
Japanese name: Kamogai

Patella grata Gould 1859, p. 161.
Patelloida grata Nomura et Hatai 1932, p. 9.

This has a rather large, solid and conic shell with the strongly convexed and long posterior slope, and the concaved and short anterior one, on the shell surface strong and distantly placed radial ribs are present. The shell attains about 20 mm in length in the adult specimen.

Locality: Asamushi, Tsuchiya, Gomejima and Oshima.

Distribution: Formosa to Honshu (up to this bay) and Korea.

Habitat: Usually found on rocks at the high level hardly reached by the spray in summer, but at the low tidal level in winter.

10. *Collisella heroldi* (Dunker) (Pl. I, Figs. 6, 13, 15)
Japanese name: Kogamogai

Patella heroldi Dunker 1861, p. 24, Pl. 3, Fig. 13.
Patella conulus Dunker 1861, p. 24, Pl. 3, Fig. 19.
Acmaea kolarovai Grabau et King 1928, p. 235, Pl. 11, Fig. 114.
Acmaea testudinalis minor Grabau et King 1928, p. 235, Pl. 11, Fig. 115.
Patelloida conulus Nomura et Hatai 1932, p. 9 (non Dunker).

This is so close to *Patelloida* (*Chiazacmea*) *pygmaea* (Dunker) in shape as being confused with each other. The shell is ornamented with white to bluish black and scattered rays and ovate in shape narrowing to the anterior end. The radula of this species apparently differs from the latter species, in having a small

marginal tooth outside the lateral teeth instead of two narrow marginals. The egg is purple in color in the former species, as for the latter, green.

Locality: Asamushi, Moura, Karibasawa and Noheji.

Distribution: Formosa to southern Hokkaido and Korea.

Habitat: Commonly found on rocks at the intertidal zone.

11. *Notoacmea concinna* (Lischke) (Pl. I, Fig. 11)
Japanese name: Kodaka-aogai

Acmaea concinna Lischke 1870, p. 17.

The shell is thin, roundly ellipsoidal in shape, greenish olive in color and moderately convex at the posterior slope. The apex is anteriorly pointed. The surface radiates serrated threads all over. The interior is greenish blue except for the blackish border and spatula.

Locality: Asamushi and Tsuchiya.

Distribution: China, Korea and Formosa to southern Hokkaido.

Habitat: Very common on rocks at the intertidal zone.

12. *Notoacmea schrenckii* (Lischke) (Pl. I, Fig. 9)
Japanese name: Aogai

Patella schrenckii Lischke 1868, p. 220.
Patelloida schrencki Nomura et Hatai 1932, p. 9.

This species differs from the preceding species in having an elongated oval and low conic shell, whose apex is more anteriorly situated.

Locality: Asamushi, Yunoshima, Tsuchiya, Futagojima and Noheji.

Distribution: Formosa to Honshu (north to Sagami Bay and Akita Pref.), China and Korea.

Habitat: Found on gravels and rocks at the low tide mark.

Remarks: Though this had been reported from the bay the present writers have never collected any specimen until to-day. The writers wonder that the specimens reported as this species were the present species.

Family LEPETIDAE

13. *Lepeta kuragiensis* (Yokoyama)
Japanese name: Kuragi-amigasa

Acmaea kuragiensis Yokoyama 1920, p. 100, Pl. 6, Fig. 9.

The small conic shell is finely striated on the white surface. The radula has a large central tooth as the other member of this family.

Locality: Asamushi, Kominato and Kawauchi.

Distribution: Northern Honshu and southern Hokkaido.

Habitat: Dwells on the gravels in the shallow waters.

Remarks: *Lepeta caeca* Müller is an ally to this species, but has a low conic shell. Another allied species *Cryptobranchia lima* Dall has a larger shell sculptured with distinctly serrated, radial ribs.

Superfamily TROCHACEA

Family TROCHIDAE

14. *Turcica coreensis* Pease (Pl. II, Fig. 31)
Japanese name: Makiage-ebisugai

Turcica coreensis Pease 1860, p. 189, Pl. 51, Fig. 2.
Turcica imperialis A. Adams 1863, p. 507; Nomura et Hatai 1932, p. 10.
Trochus adamsianus Schrenck 1867, p. 358, Pl. 15, Fig. 5.

The elegant shell has a conical spire with a deep sutural groove. The whorl bears granulated cords two of which on the periphery are strong forming a deep groove between them. The surface scatters blackish brown blotches on the purplish brown ground. The aperture is pearly within and has two large denticules on the columellar lip.

Locality: Kugurizaka, Asamushi and Kameda.

Distribution: Kyushu to Honshu, the west coast of Hokkaido and southern Korea.

Habitat: Dwells on the fine sandy and muddy bottom of 50–200 m in depth. Therefore this species may be collected at the entrance of this bay and brought to these localities.

15. *Hybochelus* (*Granata*) *lyratus* (Pilsbry) (Pl. II, Figs. 3, 4)
Japanese name: Ashiyagai

Stomatella lyrata Pilsbry 1890, p. 12, Pl. 2, Figs. 3-5.

This has a small, ear-shaped shell owing to the large body whorl. The light purplish and gray surface is covered with narrow spiral cords on which dark spots are scattered. The aperture is very large and very oblique downwards. Operculum is small and does not enough to close the aperture.

Locality: Kugurizaka.

Distribution: Kyushu to Honshu (up to this bay) and Korea.

Habitat: Creeps along the surface of gravels between the tide mark.

16. *Tristichotrochus unicus* (Dunker) (Pl. II, Fig. 2)
Japanese name: Ebisugai

Trochus unicus Dunker 1860, p. 238.
Calliostoma affinis Dall 1872, p. 125, Pl. 15, Fig. 14.
Calliostoma sagamianum Yokoyama 1928, p. 334.
Calliostoma unicum Nomura et Hatai 1932, p. 10.

The shell has a conical spire with the moderately inflated whorls and a round

periphery at the body whorl. The surface bears spiral cords of which peripheral one is somewhat strong and maculated blackish brown spots with yellowish brown ones alternately. The umbilicus is closed by a dilation of the columellar callus. The coloration is yellow to brown with regularly arranged dark brown and light yellow markings.

Locality : Futagojima.

Distribution : China, Korea and Kyushu to Honshu (up to this bay).

Habitat : Dwells in shallow waters of gravelly bottom or rocks at the low tide mark to 20 m in depth.

17. *Tristichotrochus consors* (Lischke) (Pl. II, Fig. 1)
Japanese name : Koshitaka-ebisugai

Trochus consors Lischke 1872, p. 104.
Ziziphinus multistriatus Sowerby 1875, p. 127, Pl. 24, Fig. 10.
Calliostoma hungerfordi Sowerby 1888, p. 568, Pl. 28, Fig. 14 ; Nomura et Hatai 1932, p. 10.
Calliostoma sagamianum Yokoyama 1920, p. 93, Pl. 6, Fig. 1.
Calliostoma ishiianum Yokoyama 1926, p. 373, Pl. 43, Fig. 9.

The conical shell is yellowish brown to reddish brown scattering regularly darker qlotches and bears many spiral cords of which shoulder one is remarkably providing a shoulder angle. The spiral cords at the base of body whorl are weak and densely set.

Locality : Moura, Futagojima, Oshima and Kameda.

Distribution : Kyushu to Hokkaido, Saghalien, China and Korea.

Habitat : Dwells in shallow waters of gravelly or rocky bottom.

18. *Cantharidus jessoensis* (Schrenck) (Pl. II, Fig. 7)
Japanese name : Ezo-chigusagai

Trochus jessoensis Schrenck 1863.
Cantharidus callichroa jessoensis Nomura et Hatai 1932, p. 10.

This has a broad and conical shell with the convex sides and rather convex whorls. Surface is rather smooth and polished, and variable in coloration, and is usually scattered flame-like blotches and dotted, narrow bands of red or black on the light yellowish ground. Umbilicus is closed or narrowly perforated as a slit. It measures 14.0 mm in height by 14.0 mm in breadth.

Locality : Asamushi, Moura, Kawauchi and mouth of the bay.

Distribution : Northern Honshu and Hokkaido.

Habitat : Common on leaves of seaweeds below the low tide mark.

19. *Cantharidus callichroa bisbalteatus* Pilsbry (Pl. II, Fig. 5)
Japanese name : Shirobuto-hana-chigusagai

Cantharidus bisbalteatus Pilsbry 1901, pp. 199, 398, Pl. 21, Fig. 33.

This is very close to the preceding species in shape and coloration, but the former has a proportionately taller shell than the latter and is characterized by several narrow bands dotted by black spots on the reddish surface. It measures 15.5 mm in height by 11.5 mm in breadth.

Locality : Asamushi.

Distribution : The west coast of Kyushu, the Japan Sea coast of Honshu and Korea.

Habitat : On the leaves of seaweeds at the low tide mark.

20. *Cantharidus hilaris* (Lischke) (Pl. II, Fig. 6)
Japanese name : Midori-chigusagai

Trochus hilaris Lischke 1871, p. 41.

This species is also very close to the preceding two species in coloration and shape, but has the highest conical shell with rather straight side lines. The surface is usually colored in red or greenish brown with yellowish, oblique stripes and spiral bands. It measures 13.5 mm in height by 9.5 mm in breadth.

Locality : Asamushi, Moura, Futagojima and Oshima.

Distribution : Kyushu to southern Hokkaido and Korea.

Habitat : Common on the leaves of seaweeds below the low tide mark.

21. Monodonta labio (Linne) (Pl. II, Fig. 21)
Japanese name : Ishi-datamigai

Trochus labio Linne 1758, p. 759.
Monodonta confusa Tapparone-Canefri 1874, p. 61, Pl. 1, Fig. 8.
Monodonta trochiformis Grabau et King 1928, p. 238, Pl. 11, Fig. 119.
Monodonta labio chinensis Jaeckel 1929, p. 197.
Monodonta labio Nomura et Hatai 1932, p. 9.

This has a solid and globular shell with an elevated spire. The surface is sculptured with a number of spirals intersected by the growth lines giving many reticulated granules and is colored in greenish olive maculated with yellowish rose spots. The aperture is lirated within and has a strong notch on the white columellar lip forming a well-developed tooth.

Locality : Kugurizaka, Asamushi, Yunoshima, Tsuchiya, Futagojima, Oshima, Asadokoro and Ominato.

Distribution : Widely distributes in the Indo-Pacific region, Kyushu to southern Hokkaido and Korea.

Habitat : Abundantly among the gravels at the intertidal zone.

22. *Monodonta neritoides* (Philippi) (Pl. III, Fig. 20)
Japanese name : Kurotsukegai

Trochus neritoides Philippi 1849, p. 170.

Monodonta neritoides Nomura et Hatai 1932, p. 9.

The globular shell is smooth and polished and black in color with yellowish or rosy small spots. The aperture is pearly and lirated within and has a notch on the white columellar lip forming a tooth.

Locality: Asamushi, Futagojima and Karibasawa.

Distribution: Kyushu to southern Hokkaido and Korea.

Habitat: Dwells among gravels at the intertidal zone.

23. *Chlorostoma* (*Omphalius*) *rusticum* (Gmelin) (Pl. II, Figs. 19, 20)
Japanese name: Koshitaka-gangara

Trochus rusticus Gmelin 1791, p. 3572.
Trochus (*Livona*) *ephebocostalis* Grabau et King 1928, p. 11, Fig. 118.
Tegula rustica Nomura et Hatai 1932, p. 9.

This has a solid and conically trochoid shell of grayish black, the surface is sculptured with stout longitudinal ribs crossed by oblique growth lines. The suture is well incised. The base of the body whorl is rather flat and grayish in color. The aperture is oblique downwards, pearly and has a tooth at the lower end of columellar lip. The umbilicus is perforated deeply.

Locality: Nonai, Asamushi, Yunoshima, Moura, Oshima, Asadokoro, Karibasawa, Noheji and Ominato.

Distribution: China, Korea, Formosa to Hokkaido and Maritime Prov. of Siberia.

Habitat: Abundantly in the intertidal zone of gravels and rocks.

24. *Chlorostoma* (*Omphalius*) *pfeifferi carpenteri* (Dunker) (Pl. II, Figs. 32, 33).
Japanese name: O-koshitaka-gangara

Trochus carpenteri Dunker 185, p. 237; Lischke 1869, p. 98, Pl. 7, Figs. 8–10.
Chlorostoma achates Gould

This has a more solid and higher conical shell than the preceding species. The base of body whorl is flat and sculptured with spiral cords. The surface has stout longitudinal ribs. The umbilicus perforated. The aperture has a tooth at the lower end of the columellar lip.

Locality: Asamushi.

Distribution: The west coast of Kyushu and Japan Sea coast of Honshu and Korea.

Habitat: Dwells among the gravels or rocks at the intertidal zone.

25. *Chlorostoma argyrostomum* (Gmelin) (Pl. II, Figs. 22, 23, 24)
Japanese name: Hesoaki-kubogai

Trochus argyrostomus Gmelin 1791, p. 3583.

Chlorostoma turbinatum A. Adams 1853, p. 182.
Chlorostoma rugatum Gould 1861, p. 20.
Trochus argyrostomaus umblicatus Lischke 1869, Pl. 7, Fig. 5.
Chlorostoma rugatum sublaevis Pilsbry 1904, p. 33, Pl. 5, Fig. 50.
Tegula rugata Nomura et Hatai 1932, p. 9.

This very closely resembles *Chlorostoma argyrostomum lischke* (Tapparone-Canefri) (Japanese name: Kubogai) (Pl. II, Fig. 30) in shape. The shell is turbinate, solid with a little elevated spire and an inflated body whorl. The surface is colored in purplish black and is sculptured with longitudinal ribs crossed by growth lines. The base of the body whorl is rather convex and has spiral cords. The suture is well incised. The aperture bears a tooth at the low end of the columellar lip. The umbilicus is perforated or closed showing the umbilical excavation and is stained green or yellowish orange.

Locality: Asamushi, Mourajima and Oshima.

Distribution: The west coast of Kyushu to Hokkaido, Kuriles, China, Korea and Kamtchatka.

Habitat: Rather common among gravels and rocks at the intertidal zones.

26. *Lirularia iridescens* (Schrenck) (Pl. III, Fig. 1)
Japanese name: Akoya-chigusagai

Trochus iridescens Schrenck 1863, p. 512; 1867, p. 356, Pl. 15, Figs. 19–24.
Trochus (*Gibbula*) *yamadana* Smith 1875, p. 111.
Gibbula derjungini Bartch 1929, p. 134, Pl. 4, Fig. 1.

This has a solid, turbintate shell with somewhat elevated spire. The surface is weekly nacreous and is sculptured with narrow and purplish blue, spiral cords which are maculated with olivaceous, purple and white spots alternately, though some specimens have white blotches on the periphery. The aperture is circular and pearly within. The umbilicus is almost closed by a dilation of the columellar lip. It measures 7 mm in height and breadth in the adult.

Locality: Asamushi, Kugurizaka and Noheji.

Distribution: Northern Honshu, Hokkaido, Maritime Prov. of Siberia and Okhotsk Sea.

Habitat: Common on the leaves of eel-grasses below the tide marks.

Remarks: *Awajitrochus mustelina* (Gould) (Japanese name: Awaji-chigusagai) is an allied species, but has a smaller and globular shell of olivaceous brown, usually maculated yellowish spots along the suture. This should be collected from this bay. Because this rather commonly distributes in the northern Honshu and southern Hokkaido.

27. *Ethminolia stearnsi* (Pilsbry) (Pl. II, Fig. 8)
Japanese name: Kinu-shitadami

Minolia stearnsi Pilsbry 1895, p. 98; Nomura et Hatai 1932, p. 10.

The shell is turbinate and depressed. The surface is sculptured with very narrow and spiral threads, and is irregularly maculated with olivaceous brown or red spots or lines. The columellar lip of the aperture is straight forming an angle at the distal end and does not provide a columellar callus. The umbilicus is widely and perspectively perforated.

Locality: Karibasawa and Noheji.

Distribution: Kyushu to Honshu (up to the bay).

Habitat: On the fine sandy bottom of shallow waters.

28. *Umbonium (Suchium) costatum* (Kiener) (Pl. II, Figs. 28, 29)
Japanese name: Kisago

Rotella costata Kiener 1838, p. 10, Pl. 2, Fig. 5.
Rotella superba Gould 1861, p. 17.
Umbonium costatum Nomura et Hatai 1932, p. 10.

This has a solid, depressed and turbinate shell with a low spire. The whorls are somewhat appressed at the suture and with a round periphery at the body whorl. The upper surface is alternately maculated with yellow and bluish black and bears 4–5 spiral grooves and the basal surface is smooth and flatly concave and has a purplish umblical callus as just to cover the umbilical region less than a half of the breadth of shell. It measures 15–20 mm in breadth and 12–13 mm in height.

Locality: Ohura, Kugurizaka, Moura, Asadokoro and Noheji.

Distribution: Formosa, Kyushu to Honshu, west coast of Hokkaido, Saghalien, Korea and Maritime Prov. of Siberia.

Habitat: Common on the fine sandy bottom in shallow waters.

Remarks: *U. moniliferum* (Lamarck) (Japanese name: Ibo-kisago) (Pl. II, Figs. 26, 27) is frequently confused with this species, but is easily distinguished from the latter in having an umbilical callus which covers the marginal region of larger than the half of the diameter. This dwells between the tide marks of sheltered waters.

Family TURBINIDAE

29. *Lunella coronata* (Gmelin) (Pl. II, Figs. 17, 18)
Japanese name: Sugai

Turbo coronata Gmelin 1791, p. 3594.
Turbo coronata coreensis Recluz 1853, p. 245, Pl. 8, Fig. 2.
Turbo coronata granulata Nomura et Hatai 1932, p. 10.

This has a solid and turbinate shell with a low spire and a large and inflated body whorl. The surface bears granulated sprial cords and is covered with an olivaceous periostracum. A cord below the suture and two or three cords on the peripheral area are strong, making the shoulder. The aperture is smooth and

early within, and the columellar lip is stout and produced downwards. The mbilicus is closed. The operculum is calcareous, thick and paucipiral with a rown chitinous layer on its inner surface. The outer surface is ovlivaceous green nd granulated.

Locality: Asamushi, Futagojima, Oshima, Ominato and Wakinozawa.

Distribution: Formosa to Honshu (up to this bay), Korea and China.

Habitat: Common among gravels between the tide marks.

30. *Homalopoma amussitatum* (Gould) (Pl. III, Fig. 9)
Japanese name: Ezo-sanshogai

Turbo amussitata Gould 1861, p. 22.
Collonia purpurascens Dunker 1882, p. 129, Pl. 12, Figs. 1–3.
Leptothyra amussitata Nomura et Hatai 1932, p. 10.

The reddish shell is very solid and rather highly conic in the adult specimen. The whorls are convex and the sutures are very deep. The surface has spiral cords of various sizes intersected by the distinct growth lines forming a restricted appearance. The base of the body whorl is rather flat and shows densely at narrow spiral cords. The umbilicus is closed by the columellar callus. The operculum is white and calcareous and has an excavated central area covered by a callus. The inner surface is brown with a chitinous membrane and rather multispiral showing the nucleus centrally. It measures 15 mm in height and 13 mm in breadth in the adult.

Locality: Kanita, Kugurizaka, Asamushi, Moura, Futago, Natsudomari, Urata, Kominato, Asadokoro, Noheji, Ominato, Kawauchi, Wakinozawa and Oma.

Distribution: Northern Honshu (down to Choshi) and Hokkaido.

Habitat: On the rocks in shallow waters.

31. *Homalopoma sangaranse* (Schrenck) (Pl. III, Fig. 8)
Japanese name: Yama-sanshogai

Turbo sangarensis Schrenck 1867, p. 363, Pl. 16, Figs. 6–11.

This has a conic shell colored in purplish blue. The surface is sculptured with about seven stout spiral cords and thinner threads between two cords except for the flat base of the body whorl which is weakly sculptured spirally. The umbilicus is closed. The outer surface of the operculum is white and grooved spirally and weakly bears the excavated central area.

Locality: Asamushi.

Distribution: Northern Honshu, Hokkaido, Korea and Maritime Prov. of Siberia.

Habitat: On the eel-grass and seaweeds on rocks in shallow waters.

32. *Eotricolia tristis* Pilsbry
Japanese name : Komurasaki-bai

Phasianella tristis Pilsbry 1903, p. 69.

This has a minute, purplish black shell of ovate in shape with a small spire and a large body whorl. The surface is smooth. The aperture is closed enough by a white calcareous operculum whose inner surface has a chitinous layer.

Locality : Asamushi and Tsuchiya.

Distribution : Northern Honshu and southern Hokkaido.

Habitat : On the leaves of the seaweeds on rocks in shallow waters.

Remarks : This species very closely resembles *E. megastoma* Pilsbry of southern Japan in shape, but differs from the latter in having a less convex body whorl and in the coloration.

Order MESOGASTROPODA

Superfamily LITTORINACEA

Family LITTORINIDAE

33. *Littorina brevicula* (Philippi) (Pl. III, Figs. 16, 32, 33)
Japanese name : Tamakibigai

Littorina brevicula Philippi 1844, p. 166 ; 1847, p. 100, Pl. 3, Fig. 10 ; Nomura et Hatai 1932, p. 10.
Littorina castanea Adams et Reeve 1850, p. 49, Pl. 11, Fig. 8.
Littorina balteata Reeve 1857, sp. 71.
Littorina souverbiana Crosse 1862, p. 53, Pl. 1, Figs. 6, 7.
Littorina heterospiralis Grabau et King 1928, p. 230, Pl. 11, Fig. 104.
Littorivaga brevicula Kojima 1957 p. 59, Fig. 1.

This has a solid, turbinate shell with a rather low spire and a large body whorl which bears three stronger cords and on the base in addition thinner cords develop. The coloration is usually dark brown marked with a light yellowish maculation or whitish spiral bands in some cases. The floating egg capsule is of helmet type and measures about 350μ in diameter by 170μ in convexity, containing only one egg of 84μ in diameter. The spawning season is from February to April.

Locality : Kugurizaka, Asamushi, Tsuchiya, Gomejima, Moura, Mourajima, Futagojima, Oshima, Asadokoro, Karibasawa and Noheji.

Distribution : China, Korea, Formosa, Kyushu, Honshu, Hokkaido and Maritime Prov. of Siberia.

Habitat : Very common on rocks between the tide marks.

34. *Littorina mandschurica* (Schrenck) (Pl. III, Figs. 14, 25, 26)
Japanese name : Atsu-tamakibigai

Littorina mandschurica Schrenck 1861, p. 409 ; 1867, p. 333, Pl. 14, Figs. 14–41.

Littorivaga mandschurica Habe 1951, p. 89, Pl. 14, Fig. 10, Textfig. 2.

This is allied very closely to the preceding species in shape, but the former has a more solid and thicker shell with two or three stronger spiral cords on the body whorl than the latter. This is also stained unicolored blackish brown. The egg capsule is of helmet type, containing generally 9–12 eggs and measures 1000μ in diameter by 280–350μ in convexity. The egg measures 125μ in diameter. The spawning season is in February.

Locality : Tsuchiya.

Distribution : This bay in Honshu, Hokkaido, Saghalien and Maritime Prov. of Siberia.

Remarks : The egg capsule of this species resembles that of *Ezolittorina squalida* (Broderip et Sowerby) (Japanese name : Ezo-tamakibigai) (Pl. III, Figs. 20, 21). While this is the helmet shaped egg capsule, that is the convexo-convex egg capsule containing more than 12 eggs.

35. *Neritrema sitkana* (Philippi) (Pl. II, Fig. 25 ; Pl. III, Figs. 2, 29)
Japanese name : Maru-tamakibigai (Kuro-tamakibigai)

Littorina sitkana Philippi 1846, p. 140 ; 1847, p. 49, Pl. 6, Figs. 13, 18.
Littorina kurila Middendorff 1848, p. 242.
Littorina subtenebrosa Middendorff 1848, p. 242.
Littorina atkana Dall 1886, p. 211 ; Dall 1902, p. 551, Pl. 39, Fig. 11 ; Nomura et Hatai 1932, p. 10.

The globular shell is solid and black in color, in some cases with white zones. The surface is smooth or has spiral cords all over or partly. This species deposits the egg mass under or at sides of stones between the tide marks. The egg is contained in the transparent egg capsule which measures about 550μ in diameter by 400μ in convexity, and is imbedded in the gelatinous mass. One egg mass includes about 120 egg capsules and usually several masses gather to form a large mass. The egg measures about 200μ in diameter. The breeding season is from January to February.

Locality : Noheji.

Distribution : Northern Honshu, Hokkaido, Kuriles, Saghalien, Siberia and Aleutian Islands.

Habitat : On rocks between the tide marks.

36. *Nodilittorina granularis* (Bray) (Pl. III, Figs. 18, 19, 30)
Japanese name : Arare-tamakibigai

Littorina granularis Gray 1839, p. 140 ; Philippi 1848, p. 63, Pl. 7, Fig. 7.
Littorina millegrana Philippi 1848, p. 65, Pl. 7, Fig. 15 ; Nomura et Hatai 1932, p. 10.
Littorina exigua Dunker 1860, p. 226 ; 1861, p. 13, Pl. 2, Fig. 3.
Nodilittorina granularis Habe 1955, p. 206, Textfigs. 1, 2.

The globular shell is solid, bluish white in color. The surface bears spiral

ribs all over and the ribs are crossed by the growth lines giving the granulated appearance. The aperture is subcircular, interiorly stained in brown. The egg capsule is of drum type with three to six circular ridges, containing only one egg. Egg capsule of *N. pyramidalis* (Quoy et Gaimard) (Japanese name: Ibo-tamakibigai) (Pl. III, Fig. 28) is very similar to this but has more than six ridges on the upper surface. *N. picta* (Philippi) (Japanese name: Taiwan-tamakibigai) (Pl. III, Figs. 22, 23) has a very characteristic egg capsule like a gear with 18–21 teeth.

Locality: Nonai, Asamushi, Yunoshima, Moura, Futagojima, Aburamesaki, Oshima, Noheji, Oma and Kodomari.

Distribution: Indo-Pacific region and Formosa to southern Hokkaido.

Habitat: Common on rocks at the high tide mark.

37. *Peasiella roepstorffiana* (Nevill) (Pl. III, Figs. 3, 4, 34, 35)
Japanese name: Kobito-ura-uzugai

Pisella (Peasiella) roepstorffiana Nevill 1884, p. 161.
Peasiella roepstorffiana Habe 1956, p. 118, Textfig. B.

This has a very small, broad and conical shell with an acute periphery at the large body whorl and a flat base, which bears several spiral cords. The upper surface is stained in blackish brown with regularly arranged large, white blotches.

The floating egg capsule is of helmet shape, measured 150–200μ in diameter and 90μ in thickness and has two ridges on both upper and under sides. Each capsule contains only one egg of 70& in diameter. The breeding season is July and August.

Locality: Asamushi.

Distribution: Andaman Islands, China and Kyushu to Honshu (up to this bay).

Habitat: On rocks between the tide marks.

Family LACUNIDAE

38. *Temanella turrita* (A. Admas) (Pl. III, Fig. 15)
Japanese name: Chairo-tamakibigai

Lacuna turrita A. Adams 1861, p. 375, 305.
Temanella turrita Habe 1953, p. 208, Fig. 4.
Lacuna cf. *unifasciata* Nomura et Hatai 1932, p. 10.

This has a small conical shell colored in brown usually with a white zone on the angular periphery and below the suture.

Locality: Nonai, Ohura, Asamushi, Yunoshima and Moura.

Distribution: Northern Honshu and Hokkaido.

Habitat: Very common on the leaves of eel-grass and seaweeds at the low tide mark to shallow waters of 5 m in depth.

Remarks: *Epheria decorata* (A. Adams) (Japanese name: Kodaka-chairo-tamakibigai) (Pl. III, Fig. 24) is very close to this species, but differs from the latter in having a highly conical shell with two or three brown zones on the yellowish brown whorls and providing the narrowly perforated umbilicus at the upper end of the columellar lip of the aperture.

39. *Stenotis carinifera* (A. Adams) (Pl. III, Fig. 17)
Japanese name: Moroha-tamakibigai

Lacuna (Epheria) carinifera A. Adams 1853, p. 225,
Lacuna unicarinata Smith 1875, p. 104.
Lacuna oxytropopis Pilsbry 1895, p. 63, Pl. 8, Fig. 1.
Stenotis carinifera Habe 1953, p. 209, Fig. 2.

This has a thin, conical shell with a strongly marginated periphery and the aperture descending forwards. The umbilicus is bordered with a carina. The coloration is light yellow, with the white periphery maculated with light brown spots.

Locality: Asamushi.

Distribution: Northern Honshu and southern Hokkaido.

Habitat: On the leaves of the seaweeds in shallow waters.

Superfamily RISSOLACEA
Family AMNICOLIDAE

40. *Cecin amanchurica* A. Adams (Pl. III, Fig. 11)
Japanese name: Kubikiregai-modoki

Cecina manchurica A. Admas 1861, p. 308; Yen 1942, p. 197, Pl. 14, Fig. 42.
Truncatella tatarica Schrenck 1867, p. 310, Pl. 14, Figs. 10–13.

The shell is cylindrical in shape and covered with a smooth, olivaceous periostracum. The protoconch at the apex is large and obtuse. The animal has a pair of short tentacle as in the genus *Blanfordia* (Japanese name: Itsumadegai) and an eye on the outside of the base of tentacle. The penis in the mantle cavity, is simply horn-shaped and white. The base of the central tooth in a transverse row of the taenioglossate radula is elongate posteriorly as a characteristic feature.

Locality: Asamushi, Yunoshima and Kameda.

Distribution: Honshu (The Inland Sea of Japan), Kuriles and Maritime Prov. of Siberia.

Habitat: Among the damp seaweeds and dusts washed ashore at the high tide mark.

Family TRUNCATELLIDAE

41. *Truncatella* (*Tahetia*) *pfeifferi* v. Martens (Pl. II, Figs. 13–15)

Japanese name : Kubikiregai

Truncatella pfeifferi v. Martens 1861, p. 43.
Truncatella kiushiuensis Pilsbry 1902, p. 615.
Truncatella japonica Pilsbry 1905, p. 702.

The shell has many whorls but most of them are lost when the animal becomes adult. Therefore the adult shell is cylindrical in shape with the obtuse apex and consists of three to five whorls whose surface is orange red in color and bears the longitudinal costae, in some cases is smooth. The operculum is paucispiral and possesses the calcareous deposition on its outer surface.

Locality : Asamushi.

Distribution : Kyushu, Shikoku, Honshu (up to this bay) and Korea.

Habitat : Common among gravels and damp dusts at the high tide mark, together with the preceding species.

Family ASSIMINEIDAE

42. *Assiminea lutea* A. Adams (Pl. III, Fig. 16)

Japanese name : Kawa-zanshogai

Assiminea lutea A. Adams 1861, p. 307.
Assiminea japonica v. Martens 1877, p. 116 ; Habe 1942, p. 36, Pl. 1, Fig. 1; Pl. 2, Fig. 1; Pl. 3, Fig. 5.
Littorina lucida Yokoyama 1927, p. 451, Pl. 51, Fig. 9.
Assiminea japonica hiradoensis Habe 1943, p. 38, Pl. 3, Fig. 6.
Assiminea septentrionalis Habe 1942, p. 39, Pl. 1, Fig. 2; Pl. 4, Fig. 13.
Assiminea bella Kuroda 19,

Shell is conical, yellow to red in color with generally four brownish bands on the body whorl. The surface is smooth and polished but frequently becomes durty by the algae and mud in black. The animal has the eye on the top of the short tentacle.

Locality : Ohura.

Distribution : China, Formosa, Ryukyu, Kyushu to Hokkaido, Korea and Maritime Prov. of Siberia.

Habitat : On the roots of the reed near the sea.

Remarks : This snail is an intermediate host of the fluke *Paragonimus ohirai* Miyazaki and *P. iloktsuenensis* Chen.

43. *Angustassiminea satsumana* Habe (Pl. III, Fig. 31)

Japanese name : Satsuma-kawa-zanshogai

Assiminea castanea satsumana Habe 1942, p. 40, Pl. 2, Fig. 3.

This has a small but solid shell with a conical spire consisted of the inflated

s. The surface is colored in light brown to brown and is smooth and polished
ıg a subsutural groove on the whorl. The umbilicus is closed by a dilatation
e columellar lip of the oval aperture. *A. castanea* (Westerlund) is an
form, but differs from this species in having the highly conical shell with
sutural groove on each whorl and colored in chestnut brown.
ocality : Asamushi and Yunoshima.
)istribution : Ryukyu, Kyushu and Honshu (up to this bay).
Iabitat : Among damp dusts washed ashore at the high tide mark, together *Cecina manchurica* and *Truncatella pfeifferi*.

Family RISSOIDAE

44. *Barleeia angustata* (Pilsbry) (Pl. III, Fig. 27)

Japanese name : Togata-kawa-zanshogai

ssiminea angustata Pilsbry 1901, p. 396 ; Habe 1942, p. 41, Pl. Fig. 6.
alsicingula angustata Habe 1958, p. 6, Pl. 1, Fig. 7.

he shell is small, highly conical and chestnut brown in color. The operculum
k, corneous and chestnut brown in color, paucispiral and has a process at
wer part of its inner side.
ocality : Asamushi and Tsuchiya.
istribution : Kyushu to Hokkaido.
abitat : Very common on the seaweeds and gravels between the tide mark.

EXPLANATION OF PLATE I

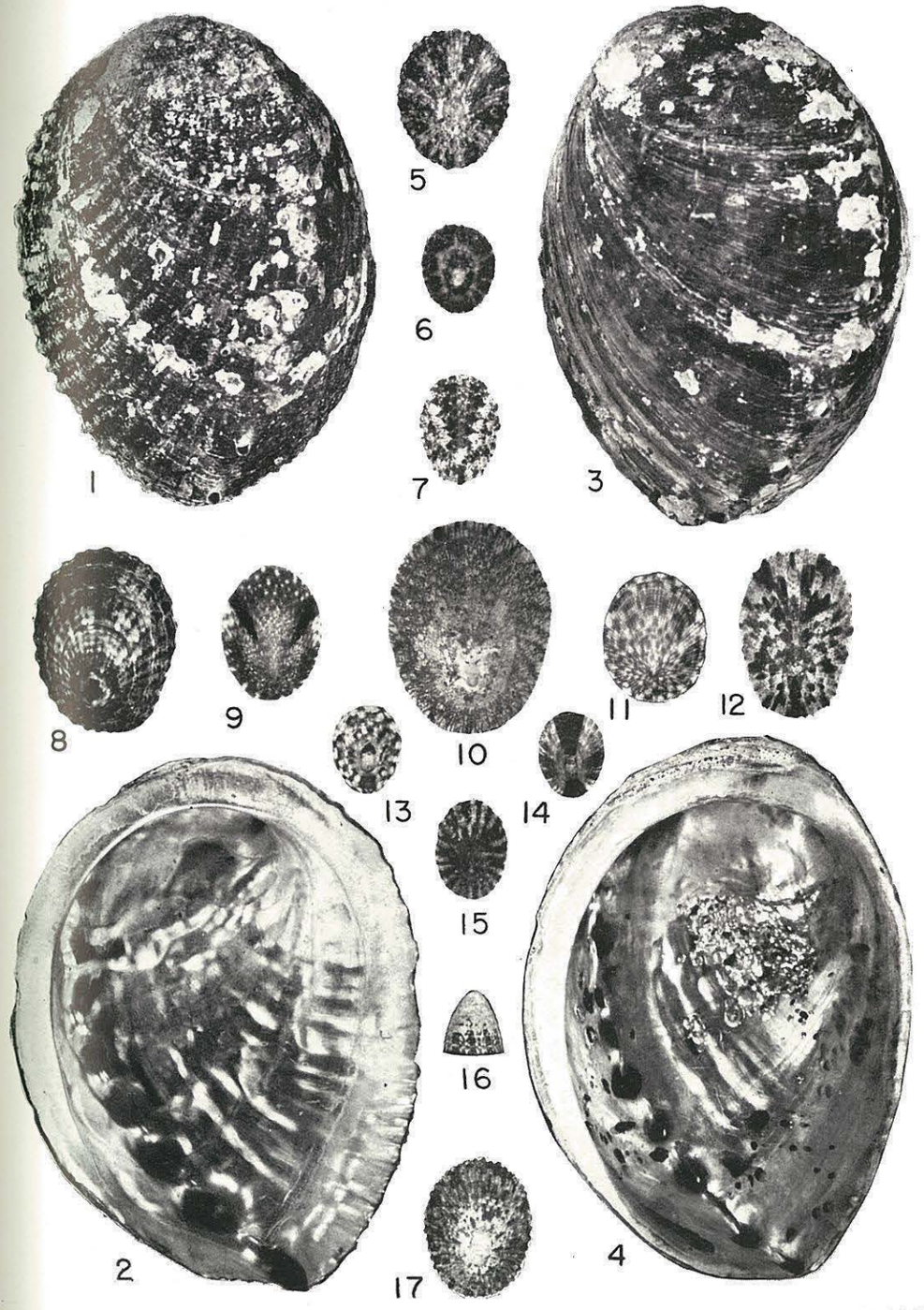
1, 2. *Notohaliotis sieboldi* (Reeve) ×2/3
3, 4. *Notohaliotis discus* (Reeve) ×2/3
5, 17. *Cellana dorsuosa* (Gould) ×1/2
6, 13, 15. *Collisella heroldi* (Dunker) ×1
7, 10, 12. *Cellana toreuma* (Reeve) ×1
8. *Collisella grata* (Gould) ×1
9. *Notoacmea schrenckii* (Lischke) ×1
11. *Notoacmea concinna* (Lischke) ×1
14. *Patelloida* (*Chizacamea*) *pygmaea* (Dunker) ×1
16. *Patelloida* (*Chiazacmea*) *pygmaea* (Dunker) forma *lampanicola* Habe ×1

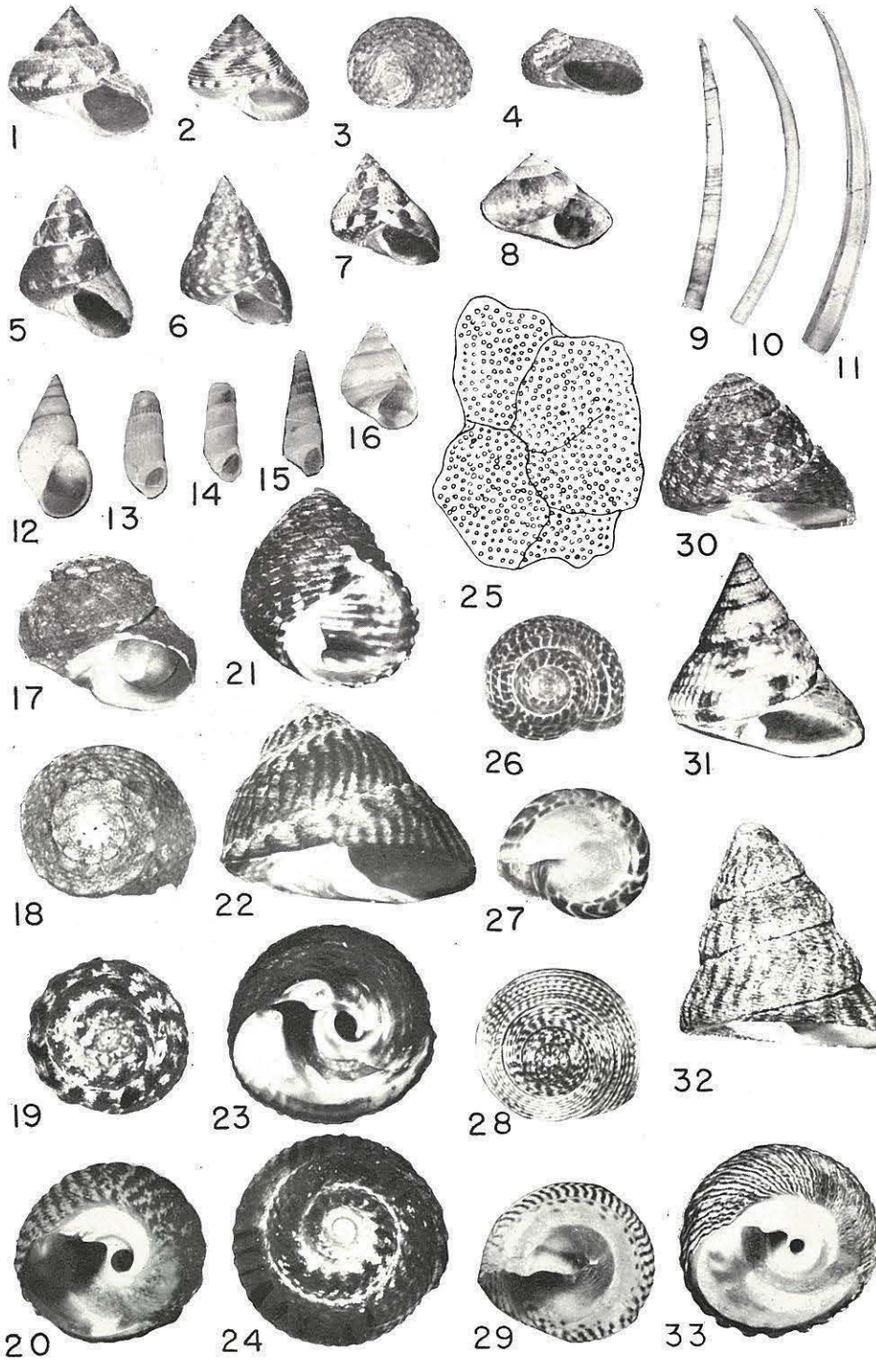
EXPLANATION OF PLATE II

Fig. 1. *Tristichotrochus consors* (Lischke) ×1
Fig. 2. *Tristichotrouchus unicus* (Dunker) ×1
Figs. 3,4. *Hybochelus* (*Granata*) *lyratus* (Pilsbry) ×1.2
Fig. 5. *Cantharidus callichroa bisbalteatus* Pilsbry ×1.2
Fig. 6. *Cantharidus hilaris* (Lischke) ×1.2
Fig. 7. *Cantharidus jessoensis* (Schrenck) ×1
Fig. 8. *Ethminolia stearnsi* (Pilsbry) ×1.5
Fig. 9. *Episiphon makiyamai* Kuroda et Kikuchi ×1.5
Fig. 10. *Ditrupa arietina* (Müller) ×1.5
Fig. 11. *Dentalium* (*Paradentalium*) *octangulatum* Donovan ×1
Fig. 12. *Australaba picta* (A. Adams) ×1.5
Figs. 13, 14, 15. *Truncatella* (*Tahetia*) *pfeifferi* v. Martens ×1.5
Fig. 16. *Assiminea lutea* A. Adams ×1.5
Figs. 17. 18. *Lunella coronata* (Gmelin) ×1
Figs. 19. 20. *Chlorostoma* (*Omphalius*) *rusticum* (Gmelin) ×1
Fig. 21. *Monodonta labio* (Linne) ×1.2
Figs. 22, 23, 24. *Chlorostoma argyrostomum* (Gmelin) ×1
Fig. 25. The egg masses of *Neritrema sitkana* (Philippi) (after Kojima 1958)
Figs. 26, 27. *Umbonium* (*Suchium*) *moniliferum* (Lamarck) ×1
Figs. 28, 29. *Umbonium* (*Suchium*) *costatum* (Kiener) ×1
Fig. 30. *Chlorostoma argyrostomum lischkei* (Tapparone- Canefri) ×1
Fig. 31. *Turcia coreensis* Pease ×1
Figs. 32, 33. *Chlorostoma* (*Omphalius*) *pfeifferi carpenteri* (Dunker) ×1

EXPLANATION OF PLATE III

Fig. 1. *Lirularia iridescens* (Schrenck) ×2
Figs. 2, 29. *Neritrema sitkana* (Philippi) ×3
Figs. 3, 4. *Peasiella roepstorffiana* (Nevill) ×2.5
Fig. 5. *Tugali decussata* A. Adams ×1.5
Figs. 6, 7. *Acmaea* (*Niveotectura*) *pallida* (Gould) ×1.5
Fig. 8. *Homalopoma sangarense* (Schrenck) ×2
Fig. 9. *Homalopoma amussitatum* (Gould) ×2
Fig. 10. *Monodonta neritoides* (Philippi) ×1.5
Fig. 11. *Cecina manchurica* A. Adams ×2
Fig. 12. *Tugalina gigas* (v. Martens) ×0.5
Fig. 13. *Puncturella nobilis* (A. Adams) ×1.5
Fig. 14. *Littorina mandschurica* (Schrenck) ×2
Fig. 15. *Temanella turrita* (A. Adams) ×2
Fig. 16. *Littorina brevicula* (Philippi) ×2
Fig. 17. *Stenotis carinifera* (A. Adams) ×2
Figs. 18, 19. The egg capsules of *Nodilittorina granularis* (Gray) (after Kojima 1958)
Figs. 20, 21. The egg capsules of *Ezolittorina squalida* (Broderip et Sowerby) (after Kojima 1958)
Figs. 22, 23. The egg capsules of *Nodilittorina picta* (Philippi) (after Tokioka et Habe 1953)
Fig. 24. *Epheria decorata* (A. Adams) ×2
Figs. 25, 26. The egg capsules of *Littorina mandschurica* (Schrenck) (after Kojima 1958)
Fig. 27. *Barleeia angustata* (Pilsbry) ×2
Fig. 28. The egg capsule of *Nodilittorina pyramidalis* (Quoy et Gaimard)
Fig. 30. *Nodilittorina granularis* (Gray) ×7
Fig. 31. *Angustassiminea satsumana* Habe ×3
Figs. 32, 33. The egg capsules of *Littorina brevicula* (Philippi) (after Kojima 1957)
Figs. 34, 35. The egg capsules of *Peasiella roepstorffiana* (Nevill) (after Tokioka 1950)

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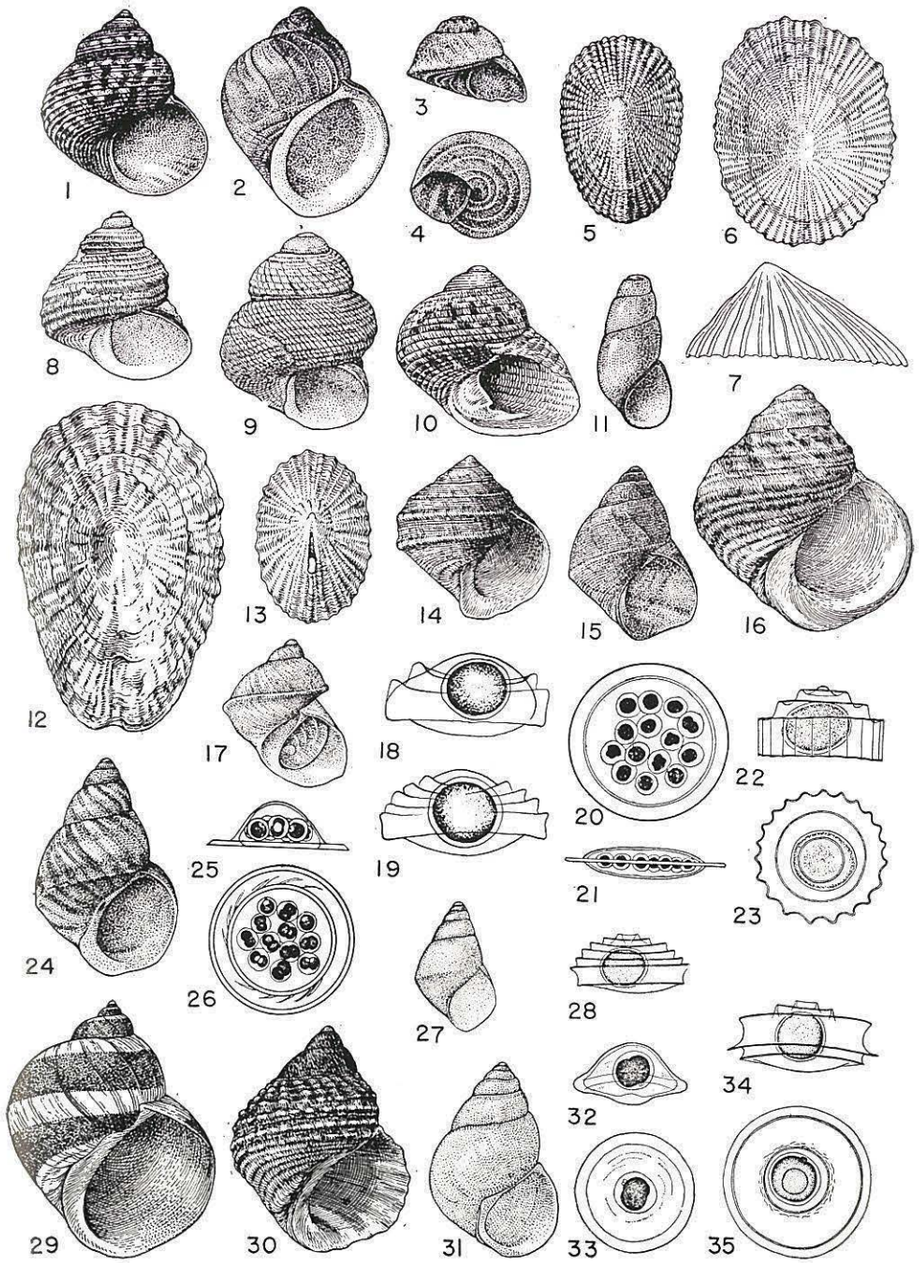
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