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New Taxa and New Distribution Records of Deepsea Gastropods Collected from or near the Chemosynthetic Communities in the Japanese Waters

By

Takashi OKUTANI*, Katsunori FUJIKURA and Takenori SASAKI***

(*Tokyo University of Fisheries, 4–5–7, Konan, Minato-ku, Tokyo 108 and **Japan Marine Science and Technology Center, 2–15, Natsushima, Yokosuka 237)

Abstract From the biological samples collected by the sumbmersible *Shinkai 2000* and ROV *Dolphin-3K* within and near bathyal chemosynthetic communities around Japan, eight new species of gastropods are described: *Puncturella rimaizenaensis* (Izena Hole, 1430 m), *P. parvinobilis* (Minami Ensei Knoll, 690 m), *Bathyacmaea secunda* (Minami Ensei Knoll, 700 m and Iheya Ridge, 1380 m), *Rhynchopelta*? *nux* (Izena Hole, 1340 m), *Leptodrilus japonicus* (Minami Ensei Knoll, 700–710 m), *Laeviphitus japonicus* (Kaikata Seamount, 440 m), *Oenopota ogasawarana* (Kaikata Seamount, 440–450 m) and *Phymorhynchus buccinoides* (off Hatsushima, 1160 m). New distribution records of four snails associated with or guest of chemosynthetic communities are also given herewith.

Introduction

Since the exploration of benthic communities associated with cold and warm seepages and hydrothermal vents around Japanese Islands was commenced in 1985 in use of the submersible *Shinkai 2000* (*2K*) and the ROV *Dolphin-3K* operated by the Japan Marine Science and Technology Center (JAMSTEC), only eight gastropods including seven new taxa and one guest species have been reported from or near these chemosynthetic communities. They are:

Serradonta vestimentifericola OKUTANI, TSUCHIDA & FUJIKURA, 1992 (Acmaeidae) from off Hatsushima, Sagami Bay, 1110–1200 m deep;

Bathyacmaea nipponica OKUTANI, TSUCHIDA & FUJIKURA, 1992 (Acmaeidae) from off Hatsushima, Sagami Bay, 1110–1200 m deep;

Margarites shinkai OKUTANI, TSUCHIDA & FUJIKURA, 1992 (Trochidae) from off Hatsushima, Sagami Bay, 1110–1200 m deep;

Thermocollonia (=*Cantrainea* by WARÉN & BOUCHET, 1993) *jamsteci* OKUTANI & FUJIKURA, 1990 (Turbinidae) from the Minami Ensei Knoll, 700 m deep;

* Guest Researcher at Japan Marine Science & Technology Center.

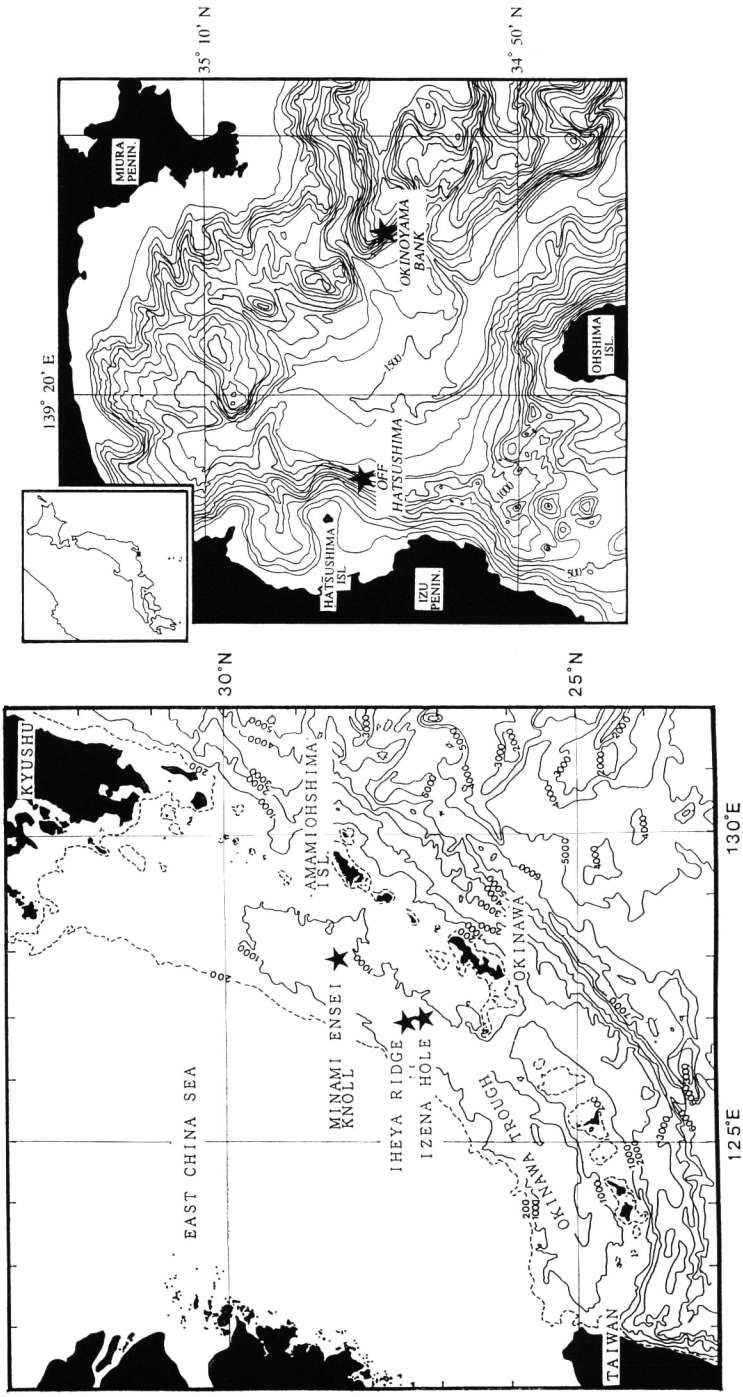


Fig. 1. Locations of chemosynthetic communities (stars) in the southwestern Japan (left) and Sagami Bay (right).

Table 1. Source of the materials under the present study

Locality	Vehicle	Dive No.	N. Latitude	E. Longitude	Depth (m)	Date	Observer
Minami Ensei Knoll	*Shinkai 2000*	428	28° 23.5′	127° 38.5′	710	July 26, 1989	J. Hashimoto (JAMSTEC)
(West of Amami-Oshima	*Shinkai 2000*	547	28° 23.3′	127° 38.4′	700	June 3, 1991	J. Hashimoto (JAMSTEC)
Island)	*Shinkai 2000*	549	28° 23.3′	127° 38.4′	700	June 5, 1991	J. Hashimoto (JAMSTEC)
	Shinkai 2000	610	28° 23.5′	127° 38.4′	690	May 24, 1992	K. Fujikura (JAMSTEC)
Iheya Ridge	*Shinkai 2000*	368	27° 32.8′	126° 58.5′	1380	Sept. 17, 1988	K. Mitsuzawa (JAMSTEC)
(West of Okinawa Island)	*Shinkai 2000*	426	27° 32.9′	126° 58.2′	1350	July 21, 1989	K. Mitsuzawa (JAMSTEC)
	Shinkai 2000	427	27° 32.9′	126° 58.2′	1350	July 22, 1989	T. Naganuma (JAMSTEC)
Izena Hole	*Shinkai 2000*	360	27° 16.1′	127° 04.9′	1340	Sept. 3, 1988	K. Nakamura (Geol. Survey)
(West of Okinawa Island)	*Shinkai 2000*	364	27° 16.1′	127° 04.9′	1340	Sept. 10, 1988	M. Kimura (Ryukyu Univ.)
Kaikata Seamount	*Shinkai 2000*	339	26° 42.3′	141° 04.6′	450	May 17, 1988	J. Naka (JAMSTEC)
(West of Ogasawara)	*Shinkai 2000*	559	26° 42.5′	141° 04.5′	440	July 16, 1991	K. Fujikura (JAMSTEC)
	Shinkai 2000	634	26° 42.5′	141° 04.5′	440	July 23, 1992	K. Fujikura (JAMSTEC)
Okinoyama Bank	*Dolphin-3K*	45	34° 58.2′	139° 31.4′	1110	May 17, 1989	
(South of Miura Peninsula)	*Dolphin-3K*	75	34° 58.3′	139° 31.4′	1100	July 11, 1990	
Off Hatsushima (East of Izu Peninsula)	*Shinkai 2000*	584	35° 00.2′	139° 13.5′	1160	Nov. 18, 1991	K. Fujikura (JAMSTEC)

Shinkailepas kaikatensis OKUTANI, SAITO & HASHIMOTO, 1989 (Shinkailepadidae) from the Kaikata Seamount, Ogasawara, 470 m;
Provanna glabra OKUTANI, TSUCHIDA & FUJIKURA, 1992 (Provannidae) from off Hatsushima, Sagami Bay, 1110–1200 m deep;
Buccinum soyomaruae Okutani, 1977 (Buccinidae) from off Hatsushima, Sagami Bay, 1110–1200 m deep; and
Oenopota sagamiana OKUTANI & FUJIKURA, 1992 (Turridae) from off Hatsushima, Sagami Bay, 1170 m deep.

The present paper describes more new taxa and new distribution records of gastropods collected by JAMSTEC activities from and near chemosynthetic communities that are hitherto discovered in Japanese waters.

Materials

The sources of gastropod materials under the present study are all listed in Table 1 (Fig. 1).

Taxonomy

Family FISSURELLIDAE FLEMING, 1822

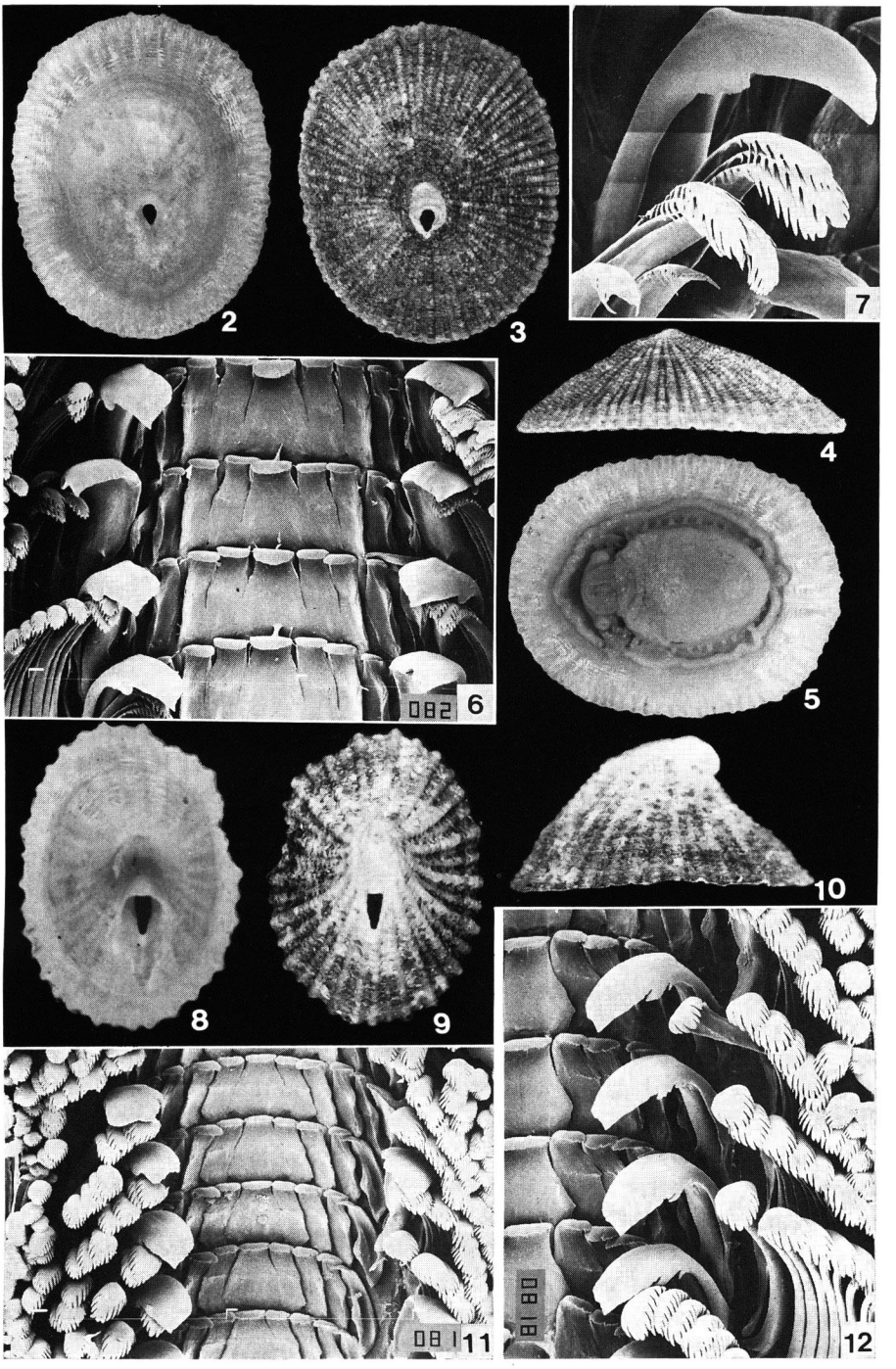
Puncturella rimaizenaensis sp. nov.

(Figs. 2–7)

Materials examined: Three specimens from Izena Hole (*2K* Dive 360)
Description: The shell is low patelliform, with the oval aperture, the width being about 80% and the height less than 30% of the length, respectively. The apex is situated at one-third anteriorly, eroded, with small, drop-shaped apical orifice situated slightly anteriorly to the highest point. The shell surface is dirty grayish, and ornamented with strong 80–90 radial ribs of various prominency with irregularly intercalated riblets. They are crossed by concentric growth lines that are raised into minute but strong concentric scales thereupon (Figs. 3, 4).

The apertural margin is finely crenulated in accordance with external ribs that also create shallow radial grooves inside. The internal surface has strong silverly lustre and microscopic, discontinuous concentric lines. The muscle scar is not distinct. The septum behind the orifice is very low, semicircular (Figs. 2, 5).

Figs. 2–12. Fissurellidae
2–7. *Puncturella rimaizenaensis* sp. nov. 2–5. Type specimen from Izena Hole, 1430 m. 18.6×15.1×5.5 mm; 6. A part of radula ribbon; 7. Innermost and other marginals, enlarged.
8–12. *Puncturella parvinobilis* sp. nov. 8–10. Type specimen from Minami Ensei Knoll, 690 m. 5.2×3.5×3.0 mm; 11. A part of radula ribbon; 12. Halves of several rows, enlarged.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The radula is rhipidoglossate, typical for the family. The central tooth is trapezoid, the inner laterals are slender but similar in shape to the central, and the outer laterals have peculiar flare in the middle of shaft that make them interlocked with each other. The innermost marginal (outermost lateral) is extremely large and robust with broad top which is hook-shaped in profile and carries small denticles and a knob-like lateral cusp. The outer marginals are innumerable in number with fine serration on top (Figs. 6, 7).

Remarks: This species is characterized by a very low shell and scale-like sculptures on radial ribs. There is no Japanese fissurellid referrable to such a flat and strongly sculptured species. *P. kawamurai* HABE, 1961 has much higher shell with smoother ribs. A deepsea species *P. regia* SHIKAMA & HABE, in HABE, 1961 has also a high shell and finer and more numerous riblets.

Measurements: Holotype (National Science Museum Tokyo, NSMT Mo-69966) length 18.6 mm, width 15.1 mm, height 5.5 mm; Paratypes (NSMT Mo-69967 a, b) 17.0×13.5×4.8 mm; 12.8×10.5×3.9 mm.

Distribution: Hitherto known only from the type locality (Izena Hole, 1430 m deep).

Puncturella parvinobilis sp. nov.

(Figs. 8–12)

Materials examined: Four specimens from Minami Ensei Knoll (*2K* Dive 610).

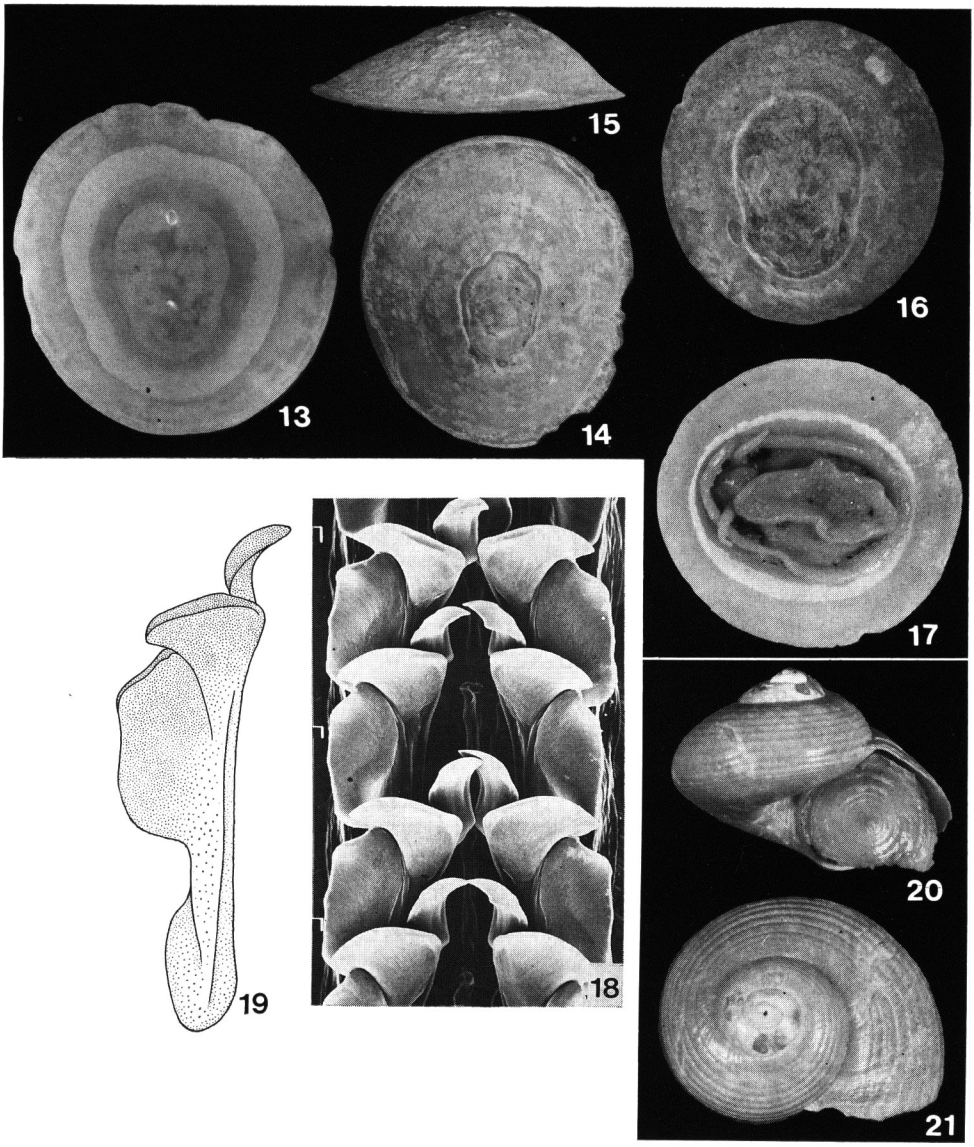
Description: The shell is small, tall patelliform with posteriorly involuted apex situated at about the center. The aperture is oval, with width being two-thirds, and height about half the length, respectively. The elongate triangular orifice is situated near the top with a very short selenizone behind. The surface is ornamented with strong radial ribs, about 35 in number including intercalated secondary riblets. They are all crossed by concentric growth lines that make the shell surface rather rough (Figs. 9, 10).

The internal surface of the shell is white, shining and is ornamented with radial grooves corresponding to external ribs and weak, discontinuous, concentric lines. The septum behind the orifice is well raised, halfly encircling the orifice (Fig. 8).

The radula is rhipidoglossate, typical for the family. The central tooth is broadly based, trapezoid in shape, with overhanging top. The laterals are similar in shape, but the outer ones have peculiar flare on the shaft. The innermost marginal (outermost lateral) is extremely large, with broadly curved top that has a pointed tip and a few blunt cusps with irregular dentitions. The marginals have forked top and diminish their size outwardly (Figs. 11, 12).

Measurements: Holotype (NSMT Mo-69968) length 5.2 mm, width 3.5 mm, height 3.0 mm. Paratypes (NSMT Mo-69969 a–c) 4.1×3.1×2.9 mm (a).

Remarks: This species is a tiny fissurellid somewhat similar to a Japanese shelf species, *P.* (*Cranopsis*) *pelex* A. ADAMS, 1860, but the latter has more anteriorly situated orifice and posteriorly situated apex. The northern species, *P. nobilis* A. ADAMS, 1860 is larger than the present new species and has fewer and lower ribs.



Figs. 13–21. Acmaeidae and Trochidae

13–19. *Bathyacmaea secunda* sp. nov. from Minami Ensei Knoll, 700 m. 13. Paratype 16.0×14.9×4.4 mm; 14, 15. Holotype 17.1×15.0×4.5 mm; 16, 17. 16.9×15.0 ×4.4 mm. 18. A part of radula ribbon, 19. A single lateral tooth.

20–21. *Margarites shinkai* OKUTANI, TSUCHIDA & FUJIKURA, 1992 from Izena Hole, 1340 m. 8.5×11.0 mm.

McLEAN (1984) stated that there are few specific differences in the central and inner lateral teeth in this genus except for the large outer lateral (innermost marginal). It is true for the above two new species of which that particular tooth exhibits slight differences, but the other radular characters are common with each other regardless of remarkably differences in shell characters.

Distribution: Not known from other than the type locality (Minami Ensei Knoll, 690 m deep).

Family ACMAEIDAE FORBES, 1850

Bathyacmaea secunda sp. nov.

(Figs. 13–19)

Materials examined: 11 specimens from Minami Ensei Knoll (*2K* Dive 547) and 10 specimens from Iheya Ridge (*2K* Dive 368).

Descriptions: The shell is low patelliform, thin, and oval in outline. The width is about 80% and height is about 30% of length, respectively. The surface is white, usually heavily eroded, remaining only the trace of radial and growth lines, but young specimens exhibit very fine, crowded, white radiating threads that are crossed by concentric growth lines (Figs. 14–16).

The internal surface is white and smooth, with a low, thick ridge running along the mantle edge. This ridge exhibits an opaque ring (Figs. 13, 17). The marginal area, a broad prismatic region, outside of the above-mentioned ring, is translucently white with traces of white radial lines. The central part, within the muscle scar, has a microscopic vermicular surface (Figs. 13, 17).

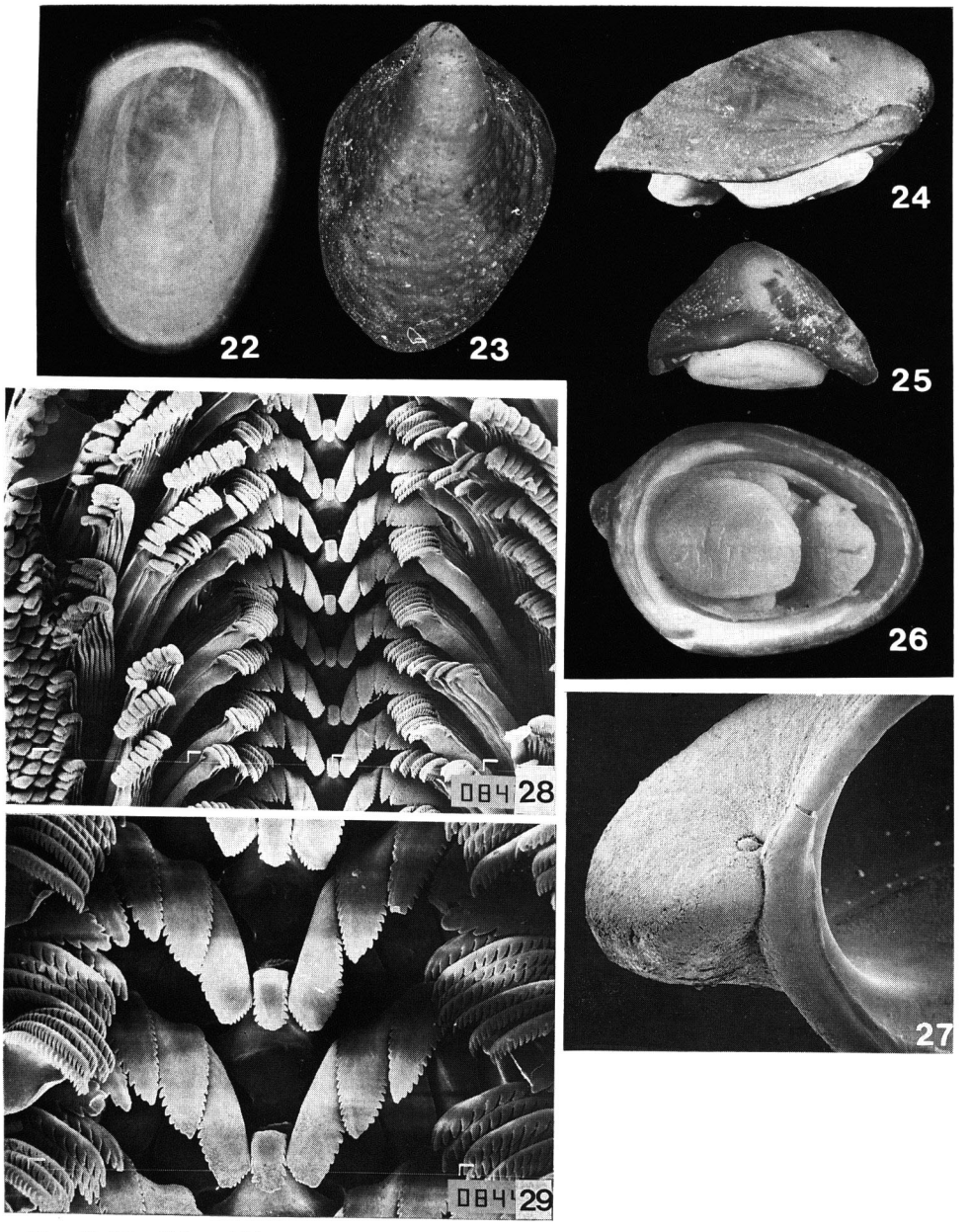
The radula is docoglossate. The central tooth is absent, but present a ridge-like structure in the center. The lateral tooth is trilobate distally and has a long shaft with a deep longitudinal groove inside. The innermost ramus is skinny with a sharp tip, the central one is broadly triangular, and the outermost one is quadrate in outline (Figs. 18, 19).

Measurements: Holotype (NSMT Mo-69970) length 17.1 mm, width 15.0 mm, height 4.5 mm; Paratype (NSMT Mo-69971) 16.0×14.9×4.4 mm.

Remarks: This is the second species of the genus *Bathyacmaea* established in 1992 on the basis of *B. nipponica* OKUTANI, TSUCHIDA and FUJIKURA from the seep area in Sagami Bay. This genus is characterized by trifid lateral tooth. The occurrence of congeneric species from chemosynthetic communities from the southwestern Japan is most interesting.

This species is characterized by broad foliated layer extending far beyond the crossed lamellar layer which represents an opaque ring inside.

Distribution: Minami Ensei Knoll, 700 m deep (type locality) and Iheya Ridge, 1380 m deep.



Figs. 22–29. Peltospiridae

22–29. *Rynchopelta*? *nux* sp. nov. Paratypes from Izena Hole, 1350 m. 22–23. 10.1 × 7.0 × 4.4 mm; 24–26. 11.0 × 7.2 × 4.6 mm; 27. Apex, enlarged; 28. A part of radula ribbon; 29. Central part, enlarged.

Family TROCHIDAE RAFINESQUE, 1815

Margarites shinkai OKUTANI, TSUCHIDA & FUJIKURA, 1992

(Figs. 20–21)

Materials examined: 8 specimens from Izena Hole (*2K* Dives 360 and 364)
Remarks: The present materials contains the small specimens measuring only 3.9 mm in diameter up to 11.0 mm. Every character does not conflict with the type specimens from Hatsushima site. Therefore, this trochid is one of the species in common with Sagami Bay and the Izena Hole among gastropods associated with seeps and vents.

Family PELTOSPIRIDAE McLEAN, 1989

Rynchopelta? *nux* sp. nov.

(Figs. 22–27)

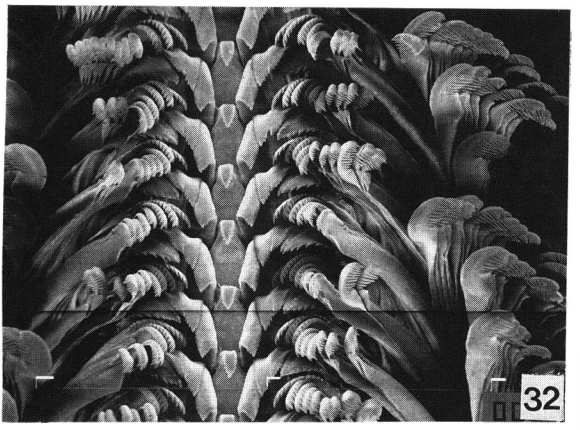
Materials examined: Many specimens from Izena Hole (*2K* Dive 364) and Iheya Ridge (*2K* Dive 427).
Description: The shell is limpet-form, with oval aperture which is slightly narrowing anteriorly and coiled apex behind below the highest point. The shell surface is covered by a thick, dark brownish periostracum which is somewhat lamellated marginally and with broad margin reflected over the shell margin (Fig. 23). The protoconch small, presenting a tiny button-like appearance offset on the right on the apex (Fig. 27).

The apertural margin is not on the same plane, but undulating a little. The posterior margin is roundly curved and thickened but the anterior margin is flared. The internal surface is white with a weak lustre. There is a pair of elongated muscle scar on both sides and they are connected with each other posteriorly exhibiting a horseshore shape (Figs. 22, 24, 25).

The cephalic tentacles are thick and short. There is no eye. The pedal sole is rather small. The epipodial fold is smooth except for a bump or tumid epipodial knob situated near the anterior end of the foot. The mantle margin has fine pallial tentacle. The penis is not present (Fig. 26).

The radula is rhipidoglossate. The central tooth is small with triangular base. The top is overhanging with lateral serrations. The lateral teeth are also serrated and have broader blade than the central. The marginals are numerous in number and has comb-like top with long, gently curved shaft.
Measurements: Holotype (NSMT Mo-69972) length 10.5 mm, width 7.8 mm, height 3.3 mm; Paratypes (NSMT Mo-69973 a-c) 10.1×7.0×4.4 mm (a).
Remarks: This is characterized by having dark brownish thick periostracum, rather

Figs. 30–36. Lepetodrilidae and Provannidae
30–33. *Leptodrilus japonicus* sp. nov. Holotype from Minami Ensei Knoll 600 m. 8.0×6.1×2.3 mm; 32. A part of radula ribbon; 33. Central part, enlarged.
34–36. *Provanna glabra* OKUTANI, TSUCHIDA & FUJIKURA, 1992 from Izena Hole, 1340 m. 34. 10.4×6.4 mm; 35. 9.0×5.4 mm; 36. A part of radula ribbon.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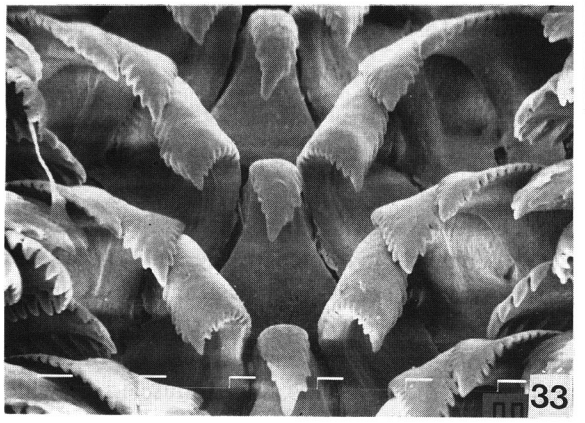
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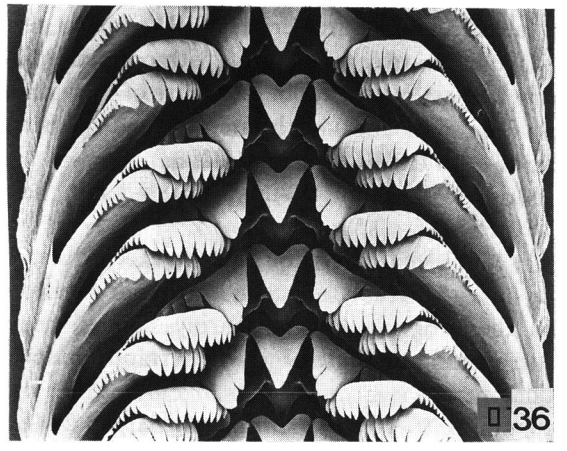
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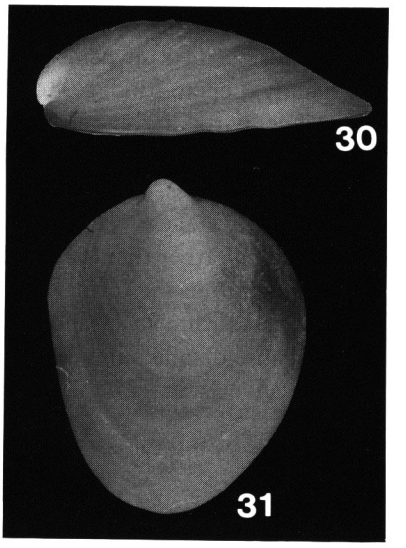
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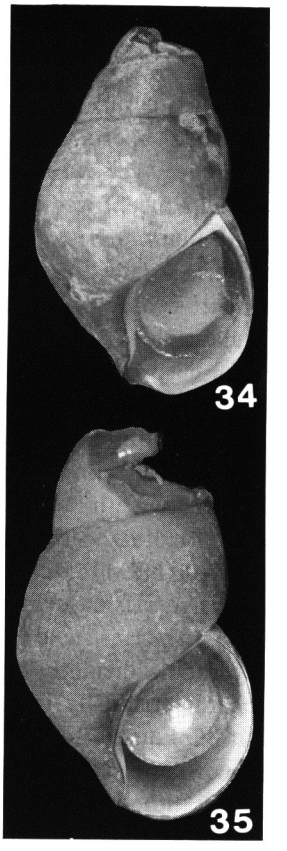
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smooth epipodal fold with an anterior knob, and small and blunt central tooth.

Because of lack of penis and epipodial tentacles, this species does not belong to the Family Lepetodrilidae McLEAN, 1988, although there are some chonchological similarities, particularly the shape of protoconch.

The generic palcement is still tentative, because the present species has different type of early spires, lacks of epipodial tubercles nor evidence of possession of operculum in early stages. However, the radular features seem to be closer to the Family Peltospiridae, rather than Lepetodrilidae which have broadly developed laterals unlike the simple ones in the former.

The establishment of another genus for the present species may be needed on the basis of more detailed anatomical study.

Distribution: Izena Hole, 1340 m and Iheya Ridge 1350 m deep.

Family LEPETODRILIDAE McLEAN, 1988

Lepetodrilus japonicus sp. nov.

(Figs. 30–33)

Materials examined: Two specimens from Minami Ensei Knoll (*2K* Dives 428 and 549)

Description: The shell is limpet-shaped, with posteriorly situated apex which is lowered to the level of oval aperture. The protoconch is involuted in the spire. The shell surface is covered by yellowish-olive periostracum and concentric growth lines that are a little raised as concentric ridges in the posterior part. The aperture is narrowing anteriorly, with blunt angles on both sides of the posterior margin which is thickened. The internal surface is whitish and shining, with horseshoe-shaped muscle scar which becomes elongate-oval impressions anteriorly (Figs. 30, 31).

The radula is rhipidoglossate. The central tooth is triangular with overhanging, pointed central cusp of which both lateral margins are serrated. The lateral teeth, that seem to be arranged obliquely, have broad overhanging top with pointed tip and many denticles on both sides. The innermost lateral tooth is largest of all with the inner edge aligned with the central tooth. The 2nd to 5th laterals are smaller than that. The marginal teeth are numerous, with forked top (Figs. 32, 33).

Measurements: Holotype (NSMT Mo-69974) length 8.0 mm, width 6.1 mm, height 2.3 mm; Paratype (NSMT Mo-69975) $10.5 \times 4.6 \times 2.5$ mm.

Remarks: This species superficially resembles the preceding species except for more yellowish, smooth periostracum, low spire and feebly angulated posterior peristome. However, the radula distantly differs therefrom in having sharply pointed central tooth and characteristically large and slanting first lateral which warrant this species for placing in the Family Lepetodrilidae.

The present new species differs from all *Lepetodrilus* in having larger 2nd and 3rd lateral teeth although the basic pattern in arrangement and structure of them are common to all other members of the family.

This is the first occurrence of *Lepetodrilus* in Japanese waters.
Distribution: Not known from other locality than the type locality (Minami Ensei Knoll, 700–710 m).

Family PROVANNIDAE WARÉN & PONDER, 1991

Provanna glabra OKUTANI, TSUCHIDA & FUJIKURA, 1992

(Figs. 34–36)

Materials examined: A single specimen from Minami Ensei Knoll (*2K* Dive 428); 24 specimens from Izena Hole (*2K* Dive 364); 3 specimens from Iheya Ridge (*2K* Dive 427).
Remarks: The present investigation on specimens from the above-mentioned three localities revealed that they are all identical with the taxon described from Hatsushima site in Sagami Bay, based on both shell (Figs. 34, 35) and radula (Fig. 36) characters. None of the specimens under study is complete but all of them are decollated, and the largest specimen among the lot from Iheya Ridge measured 12.0+ mm in length and 6.7 mm in width.
Distribution: Off Hatsushima, Okinoyama Bank, Minami-Ensei Knoll, Izena Hole and Iheya Ridge, 700 m to 1350 m.

Family ELACHISINIDAE PONDER, 1985

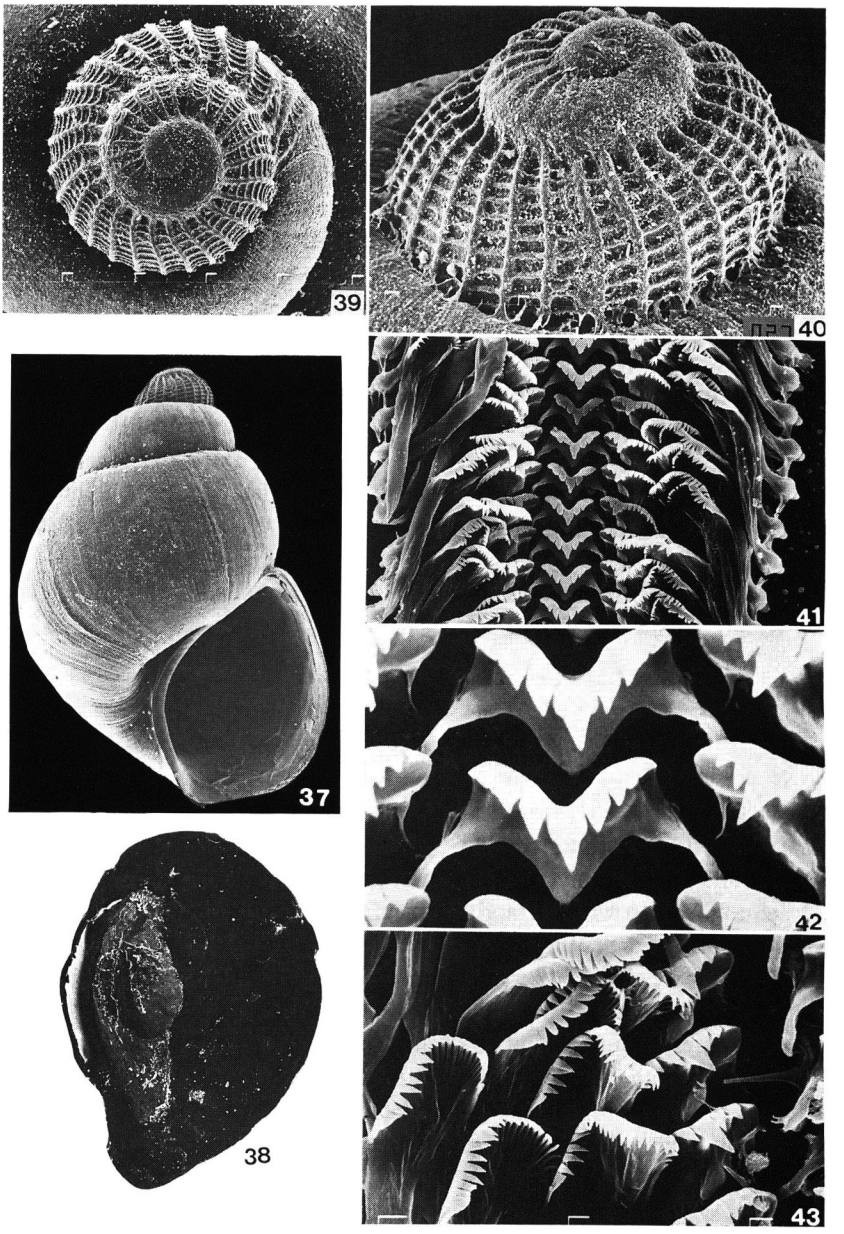
Laeviphitus japonicus sp. nov.

(Figs. 37–43)

Materials examined: 13 specimens (*2K* Dive 634) from Kaikata Seamount.
Description: The shell is tiny rissoaeform with convex whorls (Fig. 37). The protoconch I has a half turn with a rough surface. The protoconch II has about 2 turns with heavily cancellated sculpture consisted of axial ribs (26 in number) that are crossed by 8–9 spiral cords of the similar prominency to the axial ribs (Figs. 39, 40). The teleoconch is pale brownish in color and smooth with weak growth lines. The body whorl occupies about 80% of the total height. The width is about 75% of the same. The base is round. The umbilicus is narrow but evident.

The aperture is oval in outline. The outer lip is smooth and slightly thickened. The inner to columellar lips gently curve with a slight callus deposit. The basal lip very feebly tends to be reflexed. The operculum is flat, thin, oval with eccentric nucleus (Fig. 38).

The radula is taenioglossate with the formula 2.1.1.1.2 (Fig. 41). The central tooth is trapezoid in shape with overhanging cusps, of which the central one is the strongest and has basal lateral flare. The lateral cusps are 3 in number diminishing the size distally until the outermost cusp becomes rather obscure. The base is not straight but has a prominent central bump and elongated, sharp lateral process leaving



Figs. 37–43. Elachisinidae

37–43. *Laeviphitus japonicus* sp. nov. from Kaikata Seamount, 440 m. 37. Paratype 1.59 × 1.14 mm; 38. Operculum, inner view; 39–40. Two views of apex; 41. A part of radula ribbon; 42. Central tooth, enlarged; 43. Lateral and marginal teeth, enlarged.

a deep bay between them (Fig. 42). The lateral tooth is strong with wide top that carries a prominent central cusp with short but still sharp lateral cusps, 3 on each side of the central. A characteristically curved flare is present below the top. The marginals have also widely expanded and somewhat skewed top with long shaft. Both inner and outer marginals have more than 20 small cusps of the similar prominency (Fig. 43).

Measurements: Holotype (NSMT Mo-69976) length 1.81 mm, breadth 1.12 mm; Paratype (NSMT Mo-69977) 1.59×1.14 mm.

Remarks: The conchological character of the present species is almost identical with *Laeviphitus verduini* VAN AARTSEN, BOGI & GIUSTI, 1989 (=*Elachisina versiliensis* WARÉN, CARROZZA & ROCCHINI, 1990) from the shelf solope (320–440 m) in the Mediterranean Sea. Only but distinct superficial difference may be the number of spiral riblets of the Protoconch II. The present new species has 8–9, whereas the Mediterranean species has more than 10. AARSTSEN *et al.* placed his new genus and species in the Family Epitoniidae, but WARÉN *et al.* (1990) correctly placed it in the Elachisinidae PONDER, 1985 despite they examined only empty shells.

The radula morphology basically coincides with the definition of the family by PONDER (1985), but exhibits a considerable divergence. The major differences are: (1) Central tooth has a single lateral process instead of two, and (2) marginal teeth have curved cutting edge with more denticles instead of almost straight cutting edge with fewer denticles. These features along with characters of protoconch may warrant a specialized taxon of the family.

The discovery of *Laeviphitus* from such an oceanic seamont near Ogasawara Islands, subtropical West Pacific, quite away from the Mediterranean Sea, is most interesting. It is assumed that this minute gastropod is associated with chemosynthetic community in the Kaikata Seamount where this species is abundantly observed.

Distribution: Hitherto known only from the type locality (Kaikata Seamount, 440 m).

Family BUCCINIDAE RAFINESQUE, 1816

Neptunea acutispiralis OKUTANI, 1968

(Figs. 51–54)

Materials examined: 4 specimens from Okinoyama Bank (*3K* Dives 45 and 75)

Remarks: This deepsea whelk is characterized by having a thin and white shell which is ornamented by numerous strong and sharp spiral ribs of various prominency with various interspaces. The type specimens were collected from off Miyake Islands (outside of Sagami Bay), 1280–1380 m (holotype) and 1180 m (paratype). Both of them seem to be immature measuring 100.5 mm (type, L/W=2.11) and 65.0 mm (paratype, L/W=2.09). One of the largest specimens in the present specimens is somewhat larger (L=116.5 mm) and inflated in the body whorl (Figs. 51, 52).

The radula is typical for the genus and exhibits a certain infraspecific variabilities

in number of cusps (Figs. 53, 54).

This whelk is a guest species that is scavenging on the bathyal sea floor in and out of Sagami Bay.

Distribution: Off Miyake Island, 1180–1380 m; Okinoyama Bank, 1110 m and off Hatsushima, 1110–1200 m, Sagami Bay.

Neptunea insularis (DALL, 1895) var.

(Fig. 55)

Materials examined: A single specimen (*2K* Dive 428) and 6 specimens (*2K* Dive 610) from Minami Ensei Knoll.

Remarks: This is a pale brownish whelk with many spiral ribs among which several primary ones are darkened. The anterior canal is moderate. The general appearance is also close to *N. intersculpta* complex, but the present species has less prominent spiral sculptures and shorter canal than the *intersculpta* species group. The closest kin may be *N. insularis convexa* GOLIKOV, 1963 which seems to be confined in the Sea of Okhotsk. This may be a southern infraspecific invasion from the subarctic Neptunin stock and a scavenger around the chemosynthetic community, particularly on white patches of bacteria mat.

Distribution: Hitherto known from near Minami Ensei Knoll

Family TURRIDAE SWAINSON, 1840

Oenopota ogasawarana sp. nov.

(Figs. 47–50)

Materials examined: Two specimens (*2K* Dive 339) and three specimens (*2K* Dive 559) from Kaikata Seamount, Ogasawara.

Description: The shell is fusiform with decollated apical portion. The color is brownish and covered by greenish periostracum. The whorls are ornamented with strong axial ribs, about 17–18 in number, that are crossed by 5–6 sharp, equally spaced spiral cords. The crossing points of both axial and spiral sculptures are rather nodulous, especially on the shoulder. Below the suture is a row of knobs of various prominency and shape forming a subsutural band. The body whorl occupies more than half the length (because of decollated condition). The base is not so round and has the strong spiral cords.

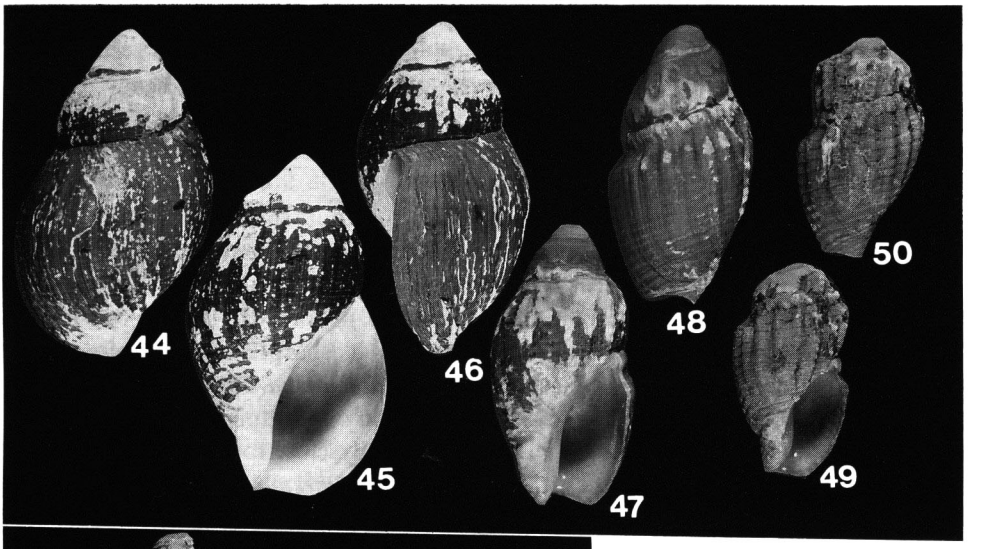
Figs. 44–55. Buccinidae and Turridae

44–46. *Phymorhynchus buccinoides* sp. nov. Holotype from off Hatsushima Isl., Sagami Bay, 50.5×26.0 mm.

47–50. *Oenopota ogasawarana* sp. nov. from Kaikata Seamount, 440 m. 47–48. Holotype, 21.5×11.5 mm; 49–50. Paratype (young specimen) 12.2×6.8 mm.

51–54. *Neptunea acutispiralis* OKUTANI, 1968 from Okinoyama Bank. 51. 116.5×61.0 mm; 52. 107.5×59.2 mm; 53–54. Infraspecific variability in radula.

55. *Neptunea insularis* (DALL, 1895) var. from Minami Ensei Knoll. 115.0×66.5 mm.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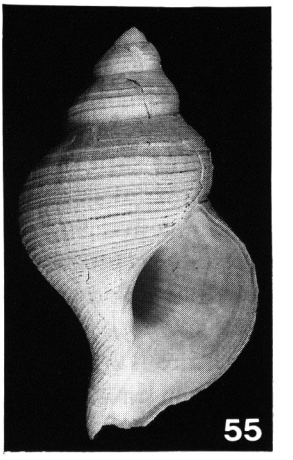
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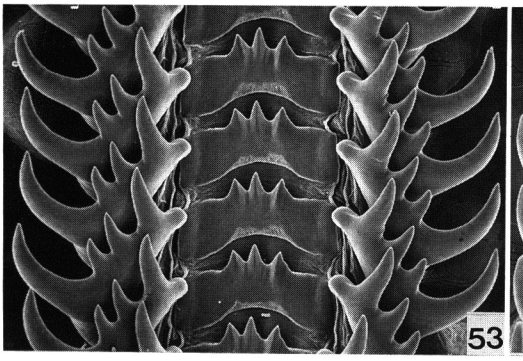
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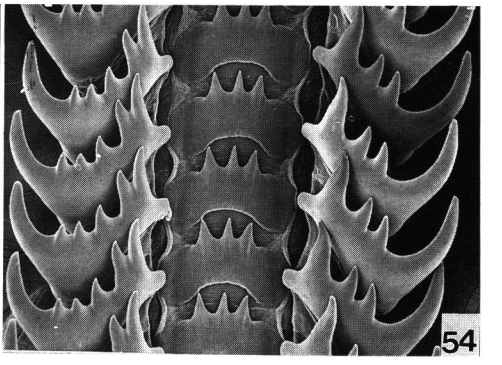
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The aperture is short pyriform, pale brownish white inside. The outer lip is thin, with a very shallow posterior canal. The inner lip to the columellar lip are continuously smooth. The anterior canal is moderate. No operculum is present. Radula was not examined.

Measurtements: Holotype (NSMT Mo-69978) length 21.5 mm, breadth 11.5 mm. Paratype (NSMT Mo-69979) 12.2×6.8 mm.

Remarks: Only the holotype specimen represents the adult shell (Figs. 47, 48) which has a thick greenish periostracum, while the others are all smaller (less than 12 mm in decollated condition) and brownish specimens that look like a different taxon with slenderer and more finely sculptured shell (Figs. 49, 50). In these smaller specimens, the crossing points of axial and spiral sculptures exhibits sharp, even spinous nodules.

The present new species somewhat resembles *O. sagamiana* OKUTANI & FUJIKURA, 1992 but differs in having much crowded axial ribs and strong spiral cords. The Subarctic *Obestoma japonica* BARTSCH, 1941 is superficially close to the present taxon in respect to stout shell with a thick periostracum, but *Obestoma* has a craw-shaped operculum (POWELL, 1966).

Phymorhynchus buccinoides sp. nov.

(Figs. 44–46)

Materials examined: Three specimens from Hatsushima site (*2K* Dive 584)

Description: The shell is obese fusiform, thick and stout. The shell length is about twice the breadth. The protoconch and early teleoconch whorls were all eroded exhibiting whitish ostracum, while penultimate and body whorls are covered with a thick olive-colored periostracum. The surface is basically smooth except low but raised growth lirae and fine spiral grooves around the fasciole on the base. The suture is shallow.

The aperture is pyriform and white within. The outer lip is sharp with an indistinct posterior sinus. The inner to columellar lips are smoothly continuous with a slight callus deposit. The anterior canal is evident. No operculum is present.

Measurements: Holotype (NSMT Mo-69980) length 59.0 mm, breadth 34.1 mm; paratypes (NSMT Mo-69981) 50.5×26.0 mm and 40.2×25.1 mm.

Remarks: The obese and stout shell covered with a thick olive-colored periostracum recalls a buccinid at a glans. There is no comparable turrid so far we have been aware. *Phymorhynchus starmeri* OKUTANI & OHTA, 1933 from the Fiji Basin will be one of the closest kins, but the present species is far stouter than any other known deepsea turrids.

Discussion

As many chemosynthetic communities, including those of hydrothermal/hydrocarbon vents and cold/warm seeps, have been discovered from various parts of the

world oceans, a large number of new gastropod taxa, from the level of species up to the superfamily, have been made public (for the review, see WARÉN & BOUCHET, 1993). The present study on the materials collected through the activities of JAMSTEC along with the previous results clarified that chemosynthetic communities around Japan yield considerable diversity of gastropod fauna. It is not always very clear at present which species are directly associated with vents/seeps and which will be just scavenging guests.

The most noteworthy findings by the present study will be the first discoveries of the Peltospiridae and Lepetodrilidae, which are much diverse in the Eastern Pacific and warrant new superfamilies (MCLEAN 1988, 1989). Another new genus seems to be needed for a peltospirid found in the Izena Hole with the detailed study in progress.

The second species of *Bathyacmaea* is also noteworthy. The unusual dentition of the first species (*B. nipponica*) paused a puzzle of interpretation on the radula structure and relationship to pectinodontins. But, *B. secunda* sp. nov. guarantees the stable status of this limpet genus that is a possible members of the chemosynthetic community.

Another interesting finding may be *Laeviphitus*, which is a specialized Elachisinidae, as a congeneric taxon with the Mediterranean slope species. This species occurs in an oceanic seamount with seepage and collected together with a strange nertitacean *Shinkailepas kaikatensis* OKUTANI, SAITO & HASHIMOTO, 1989 and *Oenopota ogasawarana* sp. nov. which may be a close kin to *O. sagamiana* OKUTANI & FUJIKURA, 1992 that is confined to the metachromatic sea bed near *Calyptogena*-community off Hatsushima Islet, Sagami Bay.

In spite of the fact that the gastropod faunula by locality generally exhibits considerable endemism, there is a few species that occur from more than one site. Particularly, the occurrence of *Margarites shinkai* OKUTANI, TSUCHIDA & FUJIKURA, 1992, which was originally recorded from Sagami Bay, from Izena Hole is noteworthy. *Provanna glabra* OKUTANI, TSUCHIDA & FUJIKURA, 1992 from Sagami Bay is unusual in distribution from more localities, such as Minami Ensei Knoll, Izena Hole and Iheya Ridge in contrast to the fact that the species of *Bathyacmaea* is replaced with each other (*B. nipponica* in Sagami Bay versus *B. secunda* in Minami Ensei Knoll and Iheya Ridge). The mechanisms of dispersion of such a species in distant communities have never been well explained.

Buccinid whelks may be guests, as they were frequently seen through underwater observations on the non-chemosynthetic sea beds. Another neogastropods of the family Turridae are also frequent, but it is assumed that the most of them are still endemic to the vents/seeps communities.

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References

BARTSCH, P. 1941. Nomenclatorial studies on certain North American turrid mollusks. Proc. Biol. Soc. Wash. **54**: 1–14, 1 pl.

BOUCHET, P. & A. WARÉN, 1980. Revision of the Northeast Atlantic bathyal and abyssal Turridae (Mollusca, Gastropoda). Jour. Moll. Stud., Suppl. **8**: 1–119.

DALL, W. H. 1895. Report on Mollusca and Brachipoda dredged in deep water, chiefly near the Hawaiian Is., with illustrations of hitherto unfigured species from North-west America. Proc. U. S. Nat. Mus. **17**: 675–733, 10 pls.

GOLIKOV, A. H. 1963. Gastropod Mollucan Genus *Neptunea* BOLTEN. Fauna USSR, **5** (1): 1–217, incl. 28 pls.

HABE, T. 1961. Colored illustrations of the shells of Japan II. 183+42 pp., 66 pls. Hoikusha, Osaka.

MCLEAN, J. H. 1984. Systematics of *Fissurella* in the Peruvian and Magellanic faunal provinces (Gastropoda: Prosobranchia). Contr. Sci., Nat. Hist. Mus. Los Angeles County, **354**: 1–70.

MCLEAN, J. H. 1988. New archaeogastropod limpets from hydrothermal vents; superfamily Lepetodrilacea, 1. Systematic descriptions. Phil. Trans. R. Soc. Lond. **B319**: 1–32.

MCLEAN, J. H. 1989. New archaeogastropod limpets from hydrothermal vents: new family Peltospiridae, new superfamily Peltospiracea. Zool. Scripta **18** (1): 49–66.

OKUTANI, T. 1968. Bathyal and abyssal Mollusca trawled from Sagami Bay and the south off Boso Peninsula by the R/V *Soyo-Maru*, 1965–1967. Bull. Tokai Reg. Fish. Res. Lab. **56**: 7–55, incl. 3 pls.

OKUTANI, T. & K. FUJIKURA, 1990. A new turbinid gastropod collected from the warm seep site in the Minami-Ensei Knoll, west of the Amami-Oshima Island, Japan. Venus (Jap. Jour. Malac.) **49** (2): 83–91, incl. 1 pl.

OKUTANI, T. & K. FUJIKURA, 1992. A new turrid gastropod associated with metachromatic seabed near the *Calyptogena*-community in Sagami Bay. Venus (Jap. Jour. Malac.) **51** (1 & 2): 1–7, incl. 1 pl.

OKUTANI, T., H. SAITO & J. HASHIMOTO, 1989. A new neritacean limpet from a hydrothermal vent site near Ogasawara Islands, Japan. Venus (Jap. Jour. Malac.) **48** (4): 223–230.

OKUTANI, T., E. TSUCHIDA & K. FUJIKURA, 1992. Five bathyal gastropods living within or near the *Calyptogena*-community of Hatsushima Islet, Sagami Bay. Venus (Jap. Jour. Malac.) **51** (3): 137–148.

PONDER, W. F. 1985. The anatomy and relationships of *Elachisina* DALL (Gastropoda: Rissoacea). Jour. Moll. Stud., **51**: 23–34.

POWELL, A. W. B. 1966. The molluscan families Speightiidae and Turridae, an evaluation of the valid taxa, both Recent and fossil, with lists of characteristic species. Bull. Auckland Inst. Mus. **5**: 1–184, 23 pls.

Van AARTSEN, J. J., C. BOGI and F. GIUSTI, 1989. Remarks on genus *Benthonella* (Rissoidae) in Europe and the description of *Laeviphitus* (nov. gen.) *verduini* (nov. spec.) (Epitoniidae). La Conchiglia **21** (246–249): 19–22.

WARÉN, A. & P. BOUCHET, 1993. New records, species, genera and a new family of gastropods from hydrothermal vents and hydrocarbon seeps. Zool. Scripta, **22** (1): 1–90.

WARÉN, A., F. CARROZZA and R. ROCCHINI, 1990. *Elachisina versiliensis*, a new Mediterranean species of the family Elachisinidae (Prosobranchia, Truncatelloidea). Boll. Malacologico, **25** (9–12): 335–339.