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Arthropoda, Crustacea, Cirripedia

The cirripedes or barnacles are crustaceans found permanently attached as adults. They occur in brackish as well as marine conditions, ranging from rigorous habitats such as estuaries and the highest reaches of the tides to the relatively benign depths of the oceans. There are three superorders, the Acrothoracica, Rhizocephala and Thoracica, and it is in the last that the greatest diversity is found. While the barnacle suborders associated with hydrothermal vents and seeps are, like their deep-sea counterparts, predominantly pedunculates belonging to the Scalpellomorpha and the asymmetrical sessile Verrucomorpha, their representatives, such as *Ashinkailepas* and *Neoverruca*, are remarkably generalized. Surprisingly, vents also include representatives of the two symmetrical sessile suborders, the Brachylepadomorpha and Balanomorpha. The former were thought to have gone extinct in the Miocene, until *Neobrachylepas* was discovered at Lau. The latter, represented by *Eochionelasmus*, first appear in the Paleocene and include the dominant shallow-water barnacles today. All four of these genera are judged to be the most primitive surviving members of their suborders; e.g., relics of bygone ages.

In addition to being unusual in composition and primitive character, as a group the vent and seep barnacles differ from all other thoracicans in having their mandibles uniquely modified for feeding on very fine particles such as bacteria and fine debris. Some of the species have filamentous chemoautotrophic bacteria growing profusely on modified cirral setae, which they nurture by holding in prevailing vent currents and upon which they presumably feed. Furthermore, while vent barnacle larvae are non-feeding, they are relatively large and yolky and studies to date indicate they can remain in the plankton for three months or so before having to settle. This is five to six times longer than any known shallow-water barnacle which, as one would expect, indicates they are very good dispersers.

1: Barnacle *Vulcanolepas* "Lau A" sp. from Lau Back-Arc Basin; cruise TUIM07; by courtesy of C.R. Fisher.

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The relative abundance of vent barnacles appears to differ greatly from place to place as well as between species. While *Neolepas zevinae* is common along the Central East Pacific Rise, dense stands are rarely encountered. However, an undescribed neolepadine from the Central Indian Ocean Ridge, *Vulcanolepas osheai* from the Kermadecs, *Leucolepas longa* from off New Guinea, *Neoverruca brachylepadoformis* from the Mariana Back-Arc Basin, and *Eochionelasmus ohtai* from Lau, may occur in extremely dense populations around vents or seeps. But curiously, the remains of vent barnacles have yet to be reported from vent or seep deposits of any age. On the other hand, no specimens of *Neobrachylepas relica* or *Imbricaverruca yamaguchii* have been taken since first discovered, despite several subsequent expeditions to Lau, and to date *Neoverruca* spp. are known only by a chance photograph from Lau and in a sample from Manus, and both were among crowded *Eochionelasmus*. It thus seems likely many new and exciting forms remain to be discovered.

Vent-seep barnacles are now known to range pretty much throughout the Indo-Pacific vent-seep systems, except in the NE Pacific and the Galapagos where they are conspicuously absence. They are also absent from the Atlantic, but so are numerous other ancient groups of marine invertebrates. The center of distribution, where representatives of most genera are presently found, is in the SW Pacific, specifically the Lau Basin, Tonga. It is noteworthy that the centers of diversity at high taxonomic levels in numerous other relic groups of marine invertebrates are also found in the SW Pacific. Taxonomic diversity attenuates to north and south, as well as to the east, and apparently also to the relatively unexplored vents of the far west. Barriers, such as disjunctions in active venting, the sill between the Marianas vents and the vents of Japan, or the Eastern Pacific and the Galapagos, have been proposed to explain these attenuations. However, considering the ephemerality and patchiness of vent and seep fields, extinction rates associated with them must be relatively high. It follows that the center of distribution is where availability of the vent-seep habitat has been the least interrupted in space and time, for otherwise such a high taxonomic endemicity could not have accumulated. Like the high taxonomic endemicity of the SW Pacific in general, that of the vent barnacles appears to be the result of reliction due to habitat restriction rather than to barriers to dispersal per se.

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Eochionelasmus ohtai YAMAGUCHI, 1990

Size: This species, measuring up to 25 mm in height, is substantially larger than its bathyal and more highly derived counterpart, *Chionelasmus darwini*, which is about 15 mm in height.

Morphology: Chionelasmatines are balanomorphs having a wall comprising two pairs of dedicated latera, in addition to the rostrum, carina and basal imbricating plates seen in brachylepadomorphs. *Eochionelasmus* is distinguished from *Chionelasmus* by the basal whorls of imbricating plates of several to numerous distinct whorls rather than being condensed into what appears to be a single whorl, and by its trophi being much like those of other vent species. Two subspecies of *Eochionelasmus* were proposed by YAMAGUCH & NEWMAN (1997), *E. ohtai ohtai* and *E. ohtai manusensis* from Lau, Fiji and Manus Back-Arc Basins, respectively. They are distinguished from each other by differences in the frequency of appearance of the rl^1 and cl^1 plates of the imbricating whorls (see *E. paquensis*).

Remarks: *Eochionelasmus* represents the most primitive living balanomorph. While the order in which the whorls of imbricating plates are added during ontogeny is the reverse of that in brachylepadomorphs, the most parsimonious explanation was that balanomorphs evolved from them rather than independently from scalpellomorphs. However, forthcoming genetic evidence indicates the balanomorphs evolved from very different scalpellomorph stocks than the neoverrucids whereby the notable similarities between neoverrucids and verrucids are convergent.

Biology: *Eochionelasmus* apparently occupies the same microhabitat as *Neoverruca*, but when co-occurring it tends to be physically closer to the mussels then are sympatric neolepadines. Equipped for feeding on the same material as all vent barnacles studied to date. Eggs are relatively large, but rarely recovered brooding whereby the nature of the larval stages is unknown.

Distribution: Lau, North Fiji and Manus Back-Arc Basins. Morphological differences between the Lau-Fiji and Manus populations are considered sub-specific (see above) while differences between these three and a population from near Easter Island were interpreted as being specific (*E. paquensis*).

1: *E. o. othai*, collected at Lau Back-Arc Basin; by courtesy of T. Yamaguchi.

2: Group of *E. o. manusensis* from N-Fiji Back-Arc Basin; cruise Starmer II; P. Briand © Ifremer.

References:

BUCKERIDGE J.S. & W.A. NEWMAN (1992) J. Paleontol. **66**: 341-345.
GALKIN S.V. (1992) Zl. zh. Rss. Akad. Nauk. **71**(11): 139-134.
KLEPAL W, NEWMAN W. A. & W. TUFAR (2006) in SCHRAM F.R. & J.C. VON VAUPEL KLEIN (Eds.) Crustaceans and Biodiversity. Brill, Leiden: 195-199.
PERÉZ-LOSADA M., JARA C.G., BOND-BUCKUP G., PORTER M.L. & K.A. CRANDALL (2002) J. Crust. Biol. **22**: 661-669.
TUFAR W. & H. JULLMANN (1991) Spiegel der Forschung **8**(1): 39-44.
YAMAGUCHI T. & W.A. NEWMAN (1990) Pacific Sc. **44**(2): 135-155.

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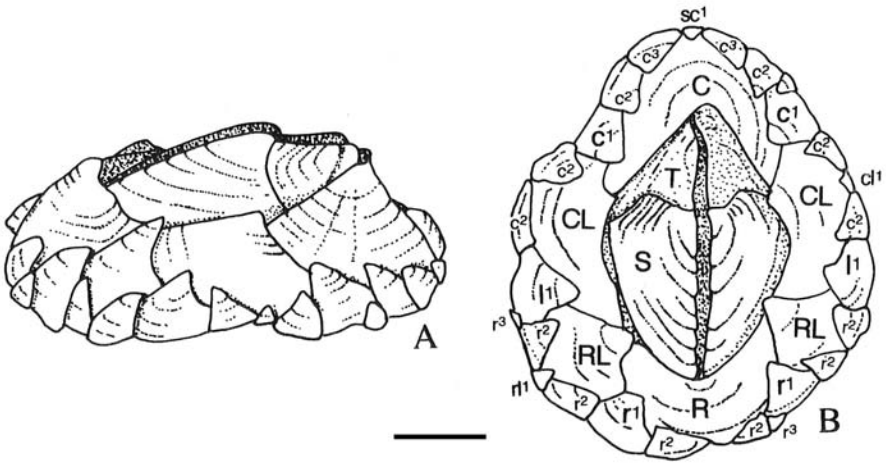
Eochionelasmus paquensis YAMAGUCHI & NEWMAN 1997

Size: 5 mm in diameter.

Morphology: The shell is low conic, its orifice large and rhomboidal. Differs externally from *E. ohtai* in the alae of primary plates being very indistinct and by the rostrum rising obliquely rather than nearly vertically to the orifice of the wall. Often coated with ferromanganese. The scutum is very distinct in lacking an articular ridge and adductor muscle pit, a wider articular furrow, and a tergal magin that is indented rather than straight. The tergum has a produced articular ridge. The number of basal imbricating plates ist greatly reduced compared to *E. othai*.

Biology: Living with mussels (*Bathymodiolus thermophilus*).

Distribution: East Pacific Rise: 17°S, site Rehu. Undescribed species of this genus are also known from Izu Ogasawara Arc, the Pacific-Antarctic Ridge: 38°S and the Central Indian Ocean.



1A: Right side of the holotype; B: Above side of the same specimen; scale bar 1 mm; from YAMAGUCHI & NEWMAN (1997). Capital letters indicate the principal wall plates: R – rostrum; RL – rostrolateral; CL – carinolateral; C – carina; small letters indicate the imbricating plates

2: Specimen, view from above; scale bar 1 mm; from East Pacific Rise: 17°S, cruise Naudur © Ifremer; from YAMAGUCHI & NEWMAN (1997).

Reference:

YAMAHUCHI T. & W.A. NEWMAN (1997) J. Crust. Biol. **17**(3): 488-496.

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Ashinkailepas seepiophilia Yamaguchi, Newman & Hashimoto, 2004

Size: Up to 36 mm in height.

Morphology: Capitular plates ornamented by conspicuous longitudinal ribs or ridges, peduncular to capitular ratio of 1:1 or less and, if unaltered by bending over to one side, with whorls of six large scales which are considerably wider than high.

Remarks: *Ashinkailepas* is considered as the most primitive of the Neolepadinae. The subfamily Neolepadinae is considered as the most primitive of the living Scalpellomorpha as well as closest relative of the ancestor of the Brachylepadomorpha of which the only living representative is *Neobrachylepas relica* known from Lau.

Biology: This species was collected from a cold deep. Associates included a seep clam (*Calyptogena* sp.), and shrimps (*Alvinocaris* sp. and *Lebbeus* sp.). An ordinary deep-sea crab (*Paralomis multispina*) inhabited crevices between the boulders. Equipped with long cirri for setose feeding in gentle currents and mouth parts uniquely modified for handling extremely fine particles, but no significant differences noted compared too those of ordinary vent barnacles (with the exception of those with cirri having exceptionally long setae generally festooned with filamentous bacteria). Peduncles not elongate, as in some neolepadines, but rather relatively short and bilaterally asymmetrical peduncular plates when individuals are bent over too one side or the other. Function of bending over unknown, but it may be an advantage too extend the cirri closer too the substratum, or perhaps too present a lower profile too marauding predators. Hermaphroditic; eggs large (~300 x 500 µm) and relatively few in number, as in *N. zevinae* Newman, 1979, free nauplii likely present and lecithotrophic (cf. Jones 1993; Tunnicliffe & Southward 2004; Watanabe et al. 2004).

Distribution: Off Hatsushima Island, Sagami Bay (hydrothermally driven cold seep). Undescribed species of this genus are known from Japan: 32°N and 27°N, Lihir and the Kermadec Ridge.

1: Right side; from Yamaguchi et al. (2004).

2: Group of *Ashinkailepas* sp. from Japan; by courtesy of T. Yamaguchi.

References:

Tunnicliffe V. & A.J. Southward (2004) J. Mar. Biol. Assoc. U.K. **84**: 121-132.
Watanabe H., Kado R., Tsuchida S., Miyake H., Kyo M. & S. Kojima (2004) J. Mar. Biol. Assoc. U.K. **84**: 743-745.
Yamaguchi T., Newman W.A. & J. Hashimoto (2004) Mar. Biol. Assoc. U.K. **84**: 797-812.

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Leucolepas longa Southward & Jones, 2003

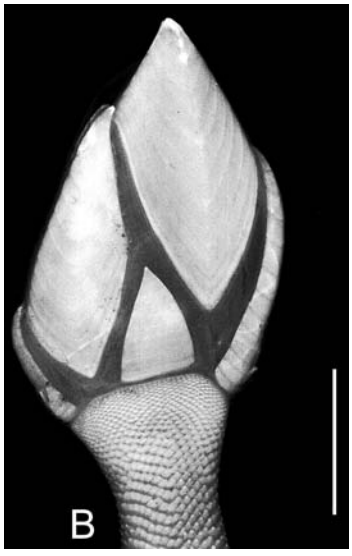
Size: Peduncular length commonly five but up to 12 times height of the capitulum, total length reaching 40 cm or more. This is, proportionately as well as literally, the longest peduncle of any known staked barnacle.

Morphology: Capitulum relatively narrow, tergal apex more acute than in other neolepadines; e.g., <65° rather than somewhat <75° as in *Neolepas* and >80° as in *Vulcanolepas*; capitular plates of mature individuals separated by a band of arthrodial membrane; basal angle of tergum elevated well above rather than close to capitulo-peduncular junction; ratio of peduncular length to capitular height generally >5:1 to as much as 12:1. *Leucolepas longa* can be distinguished from other neolepadines in the basal angle of the tergum being well separated from the capitulo-peduncular junction. This is true even in early juvenile stages in which the relatively contiguous plates and the more convex occludent margin of the capitulum, as well as short, blunt peduncular scales, suggest affinities with *Vulcanolepas*. In adult *L. longa* the capitular plates are well separated rather than contiguous with each other.

Biology: It occurs in densities of over 1000 m^{-2}, mostly associated with vesicomyid clams, but occasionally on rocks and vestimentiferans over sulfide-rich sediments. The function of the long, often gently curved peduncle appears to be to keep the capitulum above those of its peers rather than adjusting to changes in prevailing currents, as seems to be the case in *Vulcanolepas*. Growth appears to be rapid with reproductive activity and recruitment continuous. Lecithotrophic nauplii, released upon retrieval were cultivated in vitro for 45 days, metamorphosed into stage IV swimming nauplii containing lipid reserves deemed sufficient to insure wide dispersal. In a similar in vitro rearing of larvae of *Neoverruca* sp., it tooks 96 days to reach the cyprid stage.

Remarks: *Leucolepas longa* differs considerably in general from *Neolepas* and *Vulcanolepas*. While what is apparently a new genus from the Izu Ogasawara Arc has the same general appearance, the basal angle of the tergum reaches the capitulo-junction, the plates are contiguous, the median latus has a height to width ratio is two rather than 1.5:1 or less, and the p-c ratio is in the order of eigth rather than 12:1.

Distribution: Tabar-Feni Volcanic Fore-Arc: Edison Seamount. While presently monotypic, undescribed populations range as far East as the Izu Ogasawara Arc (see remarks). An undescribed species is known from North Fiji Back-Arc Basin, another undescribed species from Sunda Trench, and perhaps a related genus from Izu Ogasawara Arc.



1: Capitulum after removal of the prosoma and cirri which emphasizes the uncalfified interspaces between the shell plates; from Southward & Jones (2003).

2: Group of specimens; from Southward & Jones (2003).

3: In situ view of clumps of barnacles, some with cirral net open, at the edge of a bed of live vesicomyids; also visible, associated fauna of *Phymorhynchus* gastropods and squat lobster; scale bar 15 cm; from Tunnicliffe & Southward (2004); by courtesy of P. Hertzig.

References:

Southward A.J. & D.S. Jones (2003) Senckenberg. maritima **32** (1/2): 77-93.
Tunnicliffe V. & A.J. Southward (2004) J. Mar. Biol. Ass. U.K. **84**: 121-132.

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Neolepas rapanuii JONES, 1993

Size: Up to approximately 8.0 cm in total length.

Morphology: Distinguished from *N. zevinae* by the apex of rostrum generally being equal to rather than higher than the median latus, a peduncle often as much as fives times the height of the capitulum and clothed with less robust scales, and a mandible without a strong spine near the superior margin of the second tooth and denticles of the second and third teeth not rolled over toward the inside.

Biology: While little known, its biology is likely much the same as that of *N. zevinae*, except for the development of a longer and often curved peduncle, presumably to keep the cirral net in prevailing currents, and the comb of denticles along the superior margin of the second and third mandibular teeth and the upper part of the inferior angle, that stand nearly erect rather than being rolled over toward the inner surface of the mandible. This is curious as they are rolled over in *N. zevinae* and all subsequently described vents and seep species, but the functional basis for the difference is unknown.

Remarks: Peduncles elongated as in most other neolepadine genera, evidently to keep the capitulum and cirral net in currents rather than to host chemoautotrophic endosymbionts. This is a different strategy than practiced by *Ashinkailepas*, *N. zevinae*, and of course the sessile vent barnacles, *Neoverruca*, *Imbricaverruca*, *Neobrachylepas* and *Eochionelasmus*.

Distribution: East Pacific Rise: 23°S. An undescribed species of this genus is known from Pacific-Antarctic Ridge: 32°S, another species from Izu Ogasawara Arc and another morphologically similar from is known from Toto Caldera Marianos Arc. Three other populations from the Indian Ocean Rigde (25°S, 17°S, 41°S) while genetically close to *Neolepas*, appear intermediate between it and *Leucolepas*.

1: In vivo specimen; scale bar 1 cm; from JONES (1993).

References:

JONES D.S. (1993) Bull. Mar. Sci. **52**(3): 937-948
SOUTHWARD A.J. & D.S. JONES (2003) Senckenberg. maritima **32**(1/2): 77-93

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Neolepas zevinae Newman, 1979

Size: This species is known to be up to 5.8 cm in total length, whereas alone the peduncle of *N. rapanuii* can exceed that length, and some neolepadines in the western Pacific have peduncles more than a decimeter in length.

Morphology: Capitulum with relatively smooth, unornamented capitular plates and an adult peduncle with whorls of 16 or more scales which are about as wide as high. Distinguished from *N. rapanuii* by the apex of rostrum generally being higher than that of the median latus, a peduncle clothed with proportionately more robust scales and of no more than three rather than as much as five times the height of the capitulum, and a mandible having a strong spine near the superior margin of the second tooth and the denticles of the second and third teeth rolled over toward the inside.

Remarks: Neolepadines are considered the most primitive of the living scalpellomorphs known, and are evidently early Mesozoic in age. They apparently arose in the Triassic (Buckeridge & Grant-Mackie 1985) and are near the base of the clade that gave rise to the first sessile barnacles, the brachylepadomorphs.

Biology: Neolepadines are hermaphroditic, like all vent barnacles studied to date. They are gregarious but, like the cyprid larvae of *Ashinkailepas*, those of *Neolepas zevinae* apparently prefer to settle on the substratum rather than on established individuals, such as on the long peduncles of Neolepadines from elsewhere. Individuals tend to align along ridges and contours facing the prevailing current. Neolepadines and *Eochionelasmus* occur sympatric with mussels, the latter tend to be closer to the vent. Equipped with long cirri for setose feeding in gentle currents and equipped with mouth parts uniquely modified for handling extremely fine particles, as in all vent barnacles studied to date. Peduncles become elongate in some forms, evidently to keep the capitulum and cirral net in currents rather than to host chemoautotrophic endosymbionts. Eggs large in size, egg nauplius present in *Neolepas rapanuii*, but there are likely free lecithotrophic stages, as in other vent barnacles.

Distribution: East Pacific Rise: 9-21°N.

1: Specimen in vivo collected from East Pacific Rise: 21°N; by A. Southward.

2: Specimen in vivo collected from East Pacific Rise: 21°N; by A. Southward.

References:

Buckeridge J.S. & J.A. Grant-Mackie (1985) Géologie de la France **1**: 77-80.
Jones D.S. (1993) Bull. Mar. Sci. **52**: 937-948.
Newman W.A. (1979) Trans. San Diego Soc. Nat. Hist. **19**(11): 153-167.
Newman W.A. (1985) Bull. Biol. Sc. Wash. **6**: 231-242.

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Vulcanolepas osheai (Buckeridge, 2000)

Size: Capitulum up to approximately 20 mm, overall length to at least 120 mm, so pedunclar to capitular 5:1 or 6.8:1.

Morphology: Capitulum broad, tergal apex blunter than in other Neolepadines (>80 versus <75°); capitular plates approximate, not separated by a band of arthrodial membrane; basal angle of tergum close to rather than elevated well above capitulo-peduncular junction; maximal observed ratio of pedunclar length to capitular height 7:1 but usually less.

Biology: Found living on volcanic debris in the vicinity of a new dome forming within the caldera. While no other macrobenthic animals were collected, the presence of shrimp was observed. Cirri apparently equipped with exceptionally long, relatively soft setae (Buckeridge 2000, Fig. 4C, E), which suggests bacterial ectosymbiosis (cf. Southward & Newman 1998), an hypothesis compatible with the molecular phylogenetic and isotopic evidence for ectosymbiosis in *V. osheai* (Suzuki et al., in prep.).

Remarks: This species is very similar in external appearance to "Lau A" of Southward & Newman (1998). In most individuals of Lau A, these setae were festooned with filamentous bacteria. Since the cirral rami as well as the exterior surfaces of the barnacle in general were not covered with such bacteria, Southward & Newman (1998) concluded those on the setae were being farmed for consumption.

Distribution: Kermadec Arc: Brothers Seamount.

1: Habitus; scale bar 1 cm
© T. Yamaguchi.

2: Group of 16 paratypes; from Buckeridge (2000).

References:

Buckeridge J.S. (2000) New Zealand J. Mar. Freshwater Res. **34**: 409-418.
Southward A.J. (2005) Senckenberg. maritima **35**(2): 147-156.
Southward A.J. & W.A. Newman (1998) Cah. Biol. Mar. **39**: 259-262.

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Vulcanolepas parensis SOUTHWARD, 2005

Size: Capitulum up to 15 mm in height and peduncular length of 103 mm; peduncular to capitular ratio 6.86:1, while perhaps a smaller species than *V. osheai*, peduncular to capitular ratio essentially the same.

Morphology: Tergum shorter (basal angle well above capitulo-peduncular margin) and median latus is taller than in *V. osheai*, median latus forming an approximately equilateral triangle whereas in *V. osheai* and *Leucolepas longa* it is curved along the tergal margin.

Remarks: Morphologically this species appears to be a *Vulcanolepas*, and if so, it is relatively isolated since the genus is otherwise only known from Lau, East to the Kermadecs. However, there could be a vent fauna along the Pacific-Antarctic and Indian-Antarctic Ridges to be discovered that would help explain the situation.

Biology: Posterior cirri with ctenopod rather than lasiopod cirri as in *Vulcanolepas* sp.

Distribution: Pacific-Antarctic Ridge: 37°S to 38°S. A bacteria-farming form from Lau Back-Arc Basin is representative of this genus.

1: Capitulum of a specimen with the capitular plates; from SOUTHWARD (2005).

2: Cluster of specimens on a small fragment of the substratum, peduncles of medium length; from SOUTHWARD (2005).

Reference:

SOUTHWARD A.J. (2005) Senckenberg. maritima **35**(2): 147-156.

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Neobrachylepas relica Newman & Yamaguchi, 1995

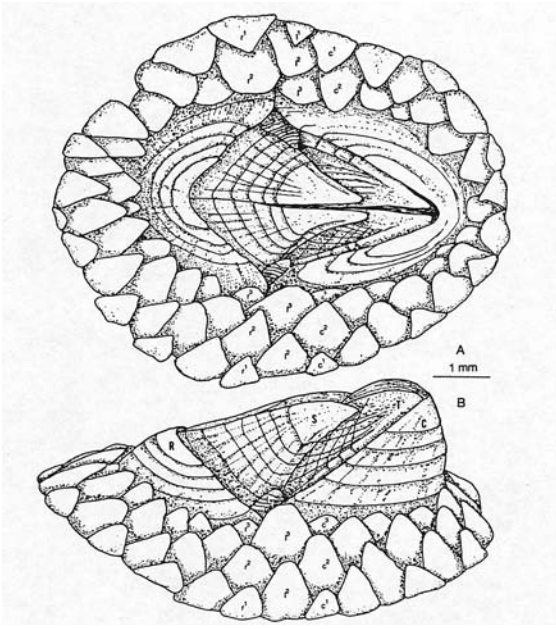
Size: Only a few possibly juvenile or protandric specimens have been collected, suggesting they may have been waifs; that is, the microhabitat of the adult populations likely has yet to be sampled. The largest specimen was mature as a male, but there were no eggs and it was only 6 mm high. It is nonetheless possible this is a small species compared to other vent barnacles.

Morphology: A living representative of the Brachylepadomorpha (U. Jurassic-Miocene), symmetrical sessile barnacles with basal whorls of imbricating plates surrounding a wall consisting of but two principal plates, the rostrum and carina. *Neobrachylepas* differs from †*Brachylepas* in the rl-l-cl tiers of imbricating plates covering the gap between the principal wall plates standing three rather than four plates high (compare to *Imbricaverruca* in this regard). Distinguished from neolepadines in being sessile and operculate, from neoverrucids in being symmetrical, and from balanomorphs in the operculum including a pair of median latera and the oldest whorl of imbricating plates being basal rather than situated between the younger imbricating whorls and the wall.

Biology: Unfortunately a reproductive population of this species has yet to be discovered, but one would expect its members to occupy much the same situations occupied by *Neoverruca brachylepadoformis* and *Eochionelasmus ohtai* because, while perhaps a smaller species, it has essentially the same feeding mechanism and is hermaphroditic. The first and often the second pair of cirri in vent barnacles are antenniform and likely serve in part in orienting the cirral net to currents. However, in *Neobrachylepas*, the second pair is not only shorter than the first but it apparently functions as maxillipeds. Another unique feature in *Neobrachylepas* is a median-dorsal appendage on the prosoma that may serve to hold the egg mass in place while brooding, but ovigerous individuals have not been observed.

Remarks: *Neobrachylepas relica* is the only known surviving member of the Brachylepadomorpha, fossil representatives of which are known from the Jurassic to the Miocene.

Distribution: Lau Back-Arc Basin.



1: Viewed from above (A) and from the right (B). Median latera (L), scuta (S) and terga (T) comprise the operculum; rostrum (R) and carina (C) are in contact at their lateral margins; the other letters indicate the imbricating plates; from Newman & Yamaguchi (1995).

2: Specimen viewed from the left side, almost completely buried beneath sulfide and oxide deposits on a small block of basalt; cruise Biolau © Ifremer; from Newman & Yamaguchi (1995).

References:

Newman W.A. & T. Yamaguchi (1995) Bull. Mus. natl. Hist. nat., Paris. 4e sér **17A** (3-4): 211-243.
Newman W.A. (1993) in Trusedale J. (Ed.) The History of Carcinology. Crustacean Issues **8**: 349-434.

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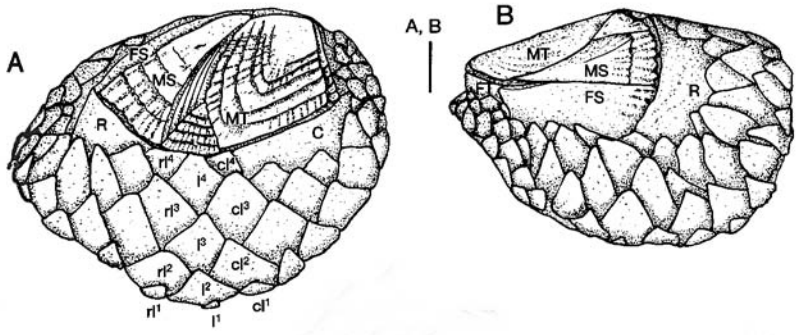
Imbricaverruca yamaguchii Newman, 2000

Size: Apparently a small species, largest of several specimens having a rostro-carinal diameter of 7 mm and standing about 5.5 mm high.

Morphology: Differs from *Neoverruca* in having 1) a more verrucid-like operculum albeit including a well developed median latus, 2) a fixed scutum and tergum much wider than high rather than at least as high as wide, and 3) in retaining a complete set of well-developed imbricating plates on the movable side of the wall essentially for life whereas the imbricating system in *Neoverruca* is incomplete (at least plates r^4 -l^4-c^4 fail to develop) and the older (marginal) imbricating plates tend to fall off.

Biology: No data.

Distribution: Known only from the type locality; Lau Back-Arc Basin, site Hine Hina.



1A: Oblique view of movable side; B: Viewed from scutal end; C – carina, FS, MS – scutum, FT, MT – tergum, R – rostrum, cl – carinolaterale, l – laterale, rl rostrolaterale; from Newman (2000).

Reference:

Newman W.A. (2000) Zoosystema **22**(1): 71-84.

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Neoverruca brachylepadoformis Newman, 1989

Size: Moderately large sessile barnacle measuring up to 25 mm in height.

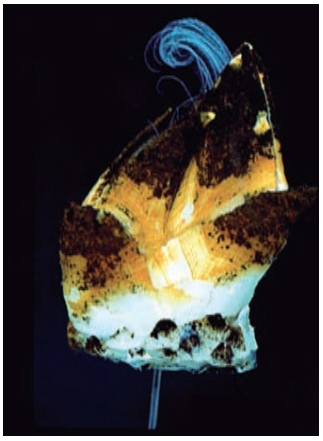
Morphology: Neoverrucids are bilaterally asymmetrical sessile barnacles built the same general plan as the brachylepadomorphs. They are distinguished from verrucids in having basal whorls of imbricating plates surrounding the wall and an operculum including a median latus, which in *N. brachylepadoformis* becomes vestigial with age and may even be lost, but in *Imbricaverruca* it remains relatively large and significant part of the operculum. *Imbricaverruca* is further distinguished from *Neoverruca* in having the rl and cl tiers of imbricating plates as in †*Brachylepas*; e.g., standing four rather then three or less plates high, and in having the basal-most ones well attached rather than easily shed.

Remarks: Neoverrucids appear not only to be the most primitive living verrucomorphs but to represent the "missing link" between the Brachylepadomorpha and the remainder of the Verrucomorpha.

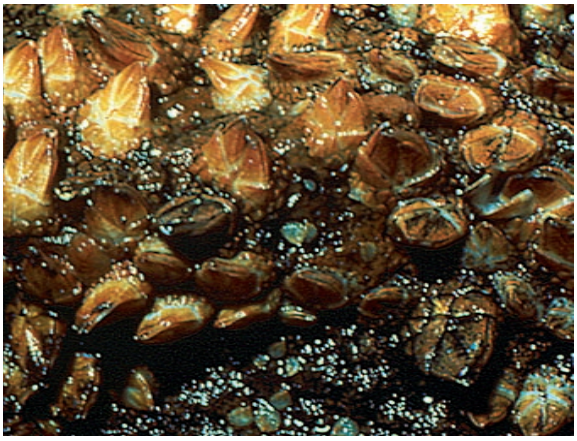
Biology: *Neoverruca brachylepadoformis* is hermaphroditic. It is gregarious, and the cyprid larvae settle on established individuals as well as on the substratum. Settled juveniles first pass through several pedunculate stages before undergoing metamorphosis into the first sessile stage. Cyprids metamorphosis into juveniles with their cirral nets facing the prevailing current, and those that settled on the right side of an established individual develop their operculum on the right side, while those settling on the left develop it on the left side. Thus right and left-sidedness is ecotypically determined, as is likely the case in other verrucomorphans where right and left-sidedness occurs in the same species. It appears that some species of the genus are occasionally sympatric with *Eochionelasmus*, at Lau and Manus Basins for example.

Equipped to feed on the same material as all vent barnacles studied to date. Eggs are relatively large and held in place by ovigerous frenae. Lecithotrophic nauplii in vitro pass through six stages before metamorphosis after to the cyprid stage, and this took 96 days in the deep-water form from the Okinawa Trough reared in vitro. Unusual among sessile barnacles in passing through several pedunculate stages resembling neolepadids during ontogeny, as likely do the brachylepadomorphs. While the earliest pedunculate stages are essentially symmetrical, asymmetry becomes apparent before an abrupt metamorphosis into the first sessile juvenile, during which the peduncle becomes buried beneath an expanded membranous basis, and the basal whorl of capitular plates becomes the oldest or basal-most whorl of imbricating plates of the sessile form. Additional whorls are added between it and the wall plates until at least the median latera of the movable side stand four plates high.

Distribution: Mariana Back-Arc Basin. Undescribed species are found in Marianas, Japan, Manus and Lau.



1: Large specimen (2.1 cm high), right side, with two juveniles lacking ferromanganese deposit; Mariana Back-Arc Basin; from Newman & Hessler (1989)



2: Closely packed aggregation; Mariana Back-Arc Basin; by courtesy of R.R. Hessler.

References:

Newman W.A. (1989) Bull. Mar. Sci. **45**(2): 467-477.
Newman W.A. & R.R. Hessler (1989) Trans. San Diego Soc. Nat. Hist. **21**(16): 259-273.
Watanabe H., Kado R., Tsuchida S., Miyake H., Kyo M. & S.J. Kojima (2004) Mar. Biol. Assoc. U.K. **84**(4): 743- 745.

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Dahlella caldariensis Hessler, 1984

Size: Up to 10 mm.

Morphology: Carapace ovoid, posterior edge emarginate, exposing at least part of pleonite one dorsally. Rostrum 0.4 times of carapace length, 3 time longer than wide. First thoracomere seen from carapace even dorsally, postero-lateral angles of pleonites 1-3 rounded, that of pleonite 4 pointed. Anal plates like equilateral triangles. Eyestalk boomerang shaped (see upper centre figure) and denticulate articulated to head without visual elements. Scale of the first antenna with the anterior margin densely clothed with setae ranging from stout and dentate to long and slender (see upper right figure).

Biology: In washings of mussels and vestimentiferan worms. Observed swimming above clumps of animals at vents.

Distribution: Galapagos Spreading Center and East Pacific Rise: 21°N to 18°S.

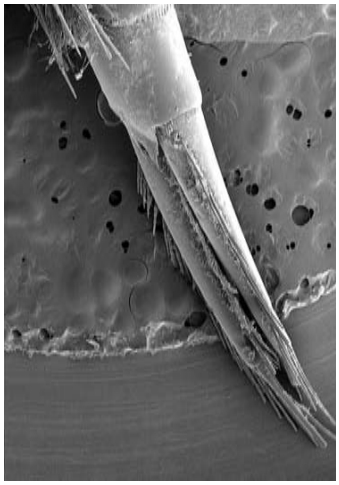
1: Habitus (critical point dried specimen) © Ifremer.

4: Lateral side of pleonites (SEM) © Ifremer.

3: Distal penduncular article of the first antenna (SEM) © Ifremer.

2: Eyestalk (carapace removed) SEM © Ifremer.

5: Pleopods (SEM) © Ifremer.



6: Caudal ramus (SEM) © Ifremer.

References:

Hessler R.R. (1984) J. Crustac. Biol. **4**(4): 655-664.
Ledoyer M. (1995) Mar. Life **4**(1): 25-29.

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Atlantocuma bidentatum LEDOYER, 1988

Size: 3.9 mm.

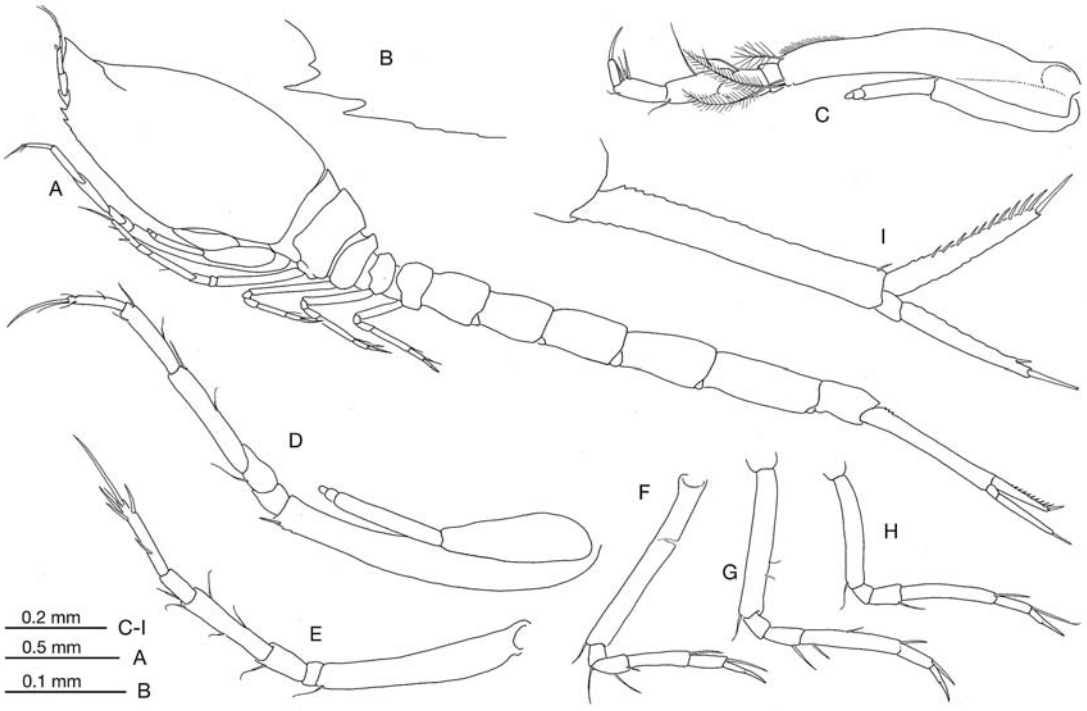
Morphology: Subfamily: Mandibles not broad at base. Exopods only on maxilliped 3 and pereopod 1 in female. Males usually with five pairs of pleopods (sometimes two or three) but they are absent in *Atlantocuma* that has been considered as an aberrant genus (JONES , 1984). Without free telson. Uropod endopod one- or two-articulated.

Female: Carapace smooth, about twice as long as high and slightly shorter than 1/3 of total length; pseudorostrum not very long, pointed; antennal notch shallow, anterolateral angle not prominent, marked by two teeth; eyelobe pointed at front, without lenses. Five thoracic segments visible. Pleon slightly longer than carapace and thoracic segments combined. Antenna 1 peduncle three-articulated; main flagellum two-articulated with two aesthetascs terminally, accessory flagellum rudimentary. Exopods on maxilliped 3 and pereopod 1. Maxilliped 3 basis slender, 1.5 as long as the rest of appendage. Pereopod 1 basis slightly longer than rest of appendage with a small simple seta on distal corner; carpus longer than propodus, which is 1.5 times as long as dactylus. Pereopod 2 basis shorter than the remaining articles together, ischium very short, carpus longer than dactylus. Pereopod 3 basis longer than rest of appendage, carpus about 1/3 of basis. Pereopod 4-5 basis shorter than the rest of appendage, carpus longer than half length of basis. Uropod peduncle longer than pleonite 5 and twice length of endopod; exopod article 2 with a simple seta on distal third of inner margin and a long simple seta terminally; endopod one-articulated, with 10 setae on inner margin and a longer one terminally.

Remark: Although the specimen described above agrees with the LEDOYER'S (1988) description in most of the features, it differs by a greater number of setae on the endopod of uropod.

Biology: Collected in a sediment trap (12 m above the bottom) located at East Pacific Rise: 13°N, 2 m north of the vent site Parigo.

Distribution: East Pacific Rise: 13°N, site Parigo. Previously known only from South-East of Glorieuses Islands, Mozambique Channel, at 3716 m depth (LEDOYER 1988).



1: Preadult female; A: Habitus; B: Anterolatereal angle of carapace; C: Maxilliped 3; D: Pereopod 1; E: Pereopod 2; F: Pereopod 3; G: Pereopod 4; H: Pereopod 5; I: Uropod; by J. Corbera.

References:

JONES N.S. (1984) Bull. Br. Mus. Nat. Hist. (Zool.) **46**(3): 207-289.
LEDOYER M. (1988) Mésogée **48**: 131-172.

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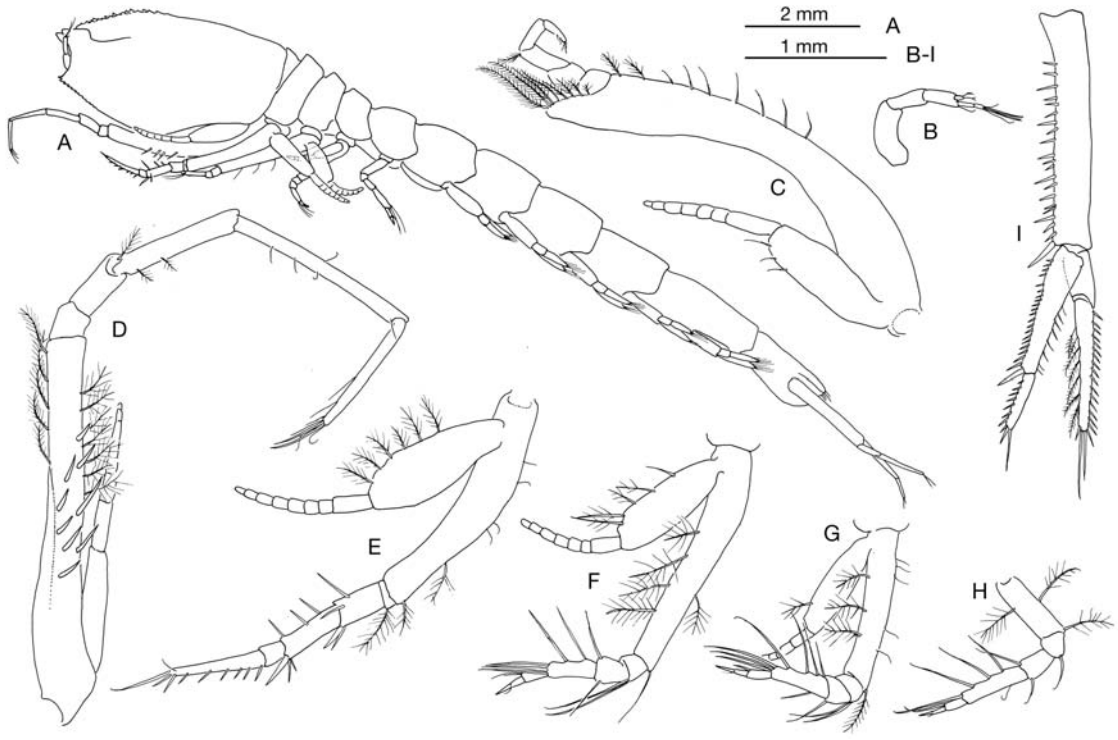
Bathycuma brevirostre (NORMAN, 1879)

Size: 15.5 mm.

Morphology: Subfamily (Vaunthompsoniinae): Mandibles not broad at base. Exopods on at least first three pairs of pereopods. Males usually with five pairs of pleopods (sometimes three). Without free telson. Uropod endopod one- or two-articulated. Species, adult male: Carapace with a mid-dorsal paired row of teeth on anterior half; anterolateral angle acute and lateral margin serrated. Antenna 1 peduncle three-articulated, article 1 slightly shorter than article 2 and 3 combined lengths; main flagellum two-articulated with 2 aesthetascs terminally, accessory flagellum rudimentary. Well developed exopods on maxilliped 3 and pereopods 1-4. Maxilliped 3 basis longer than rest of appendage, distal outer corner produced reaching merus. Pereopod 1 basis shorter than rest of appendage, with cuspidate setae on ventral face and pappose setae on distal half of outer and inner margins; carpus and dactylus of the same length. Pereopod 2 basis as long as rest of appendage, ischium very short. Pereopod 3 and 4 basis longer than rest of appendage, with pappose setae on margin. Pereopod 5 basis shorter than the three following articles combined lengths. Uropod peduncle longer than rami, with more than 20 setae on inner margin, being largest the distal one; exopod article 2 with simple setae on outer margin, plumose setae on the inner margin and two long simple setae terminally; endopod two-articulated, article 1 twice long as article 2 with more than 20 setae on inner margin; article 2 with eight setae on inner margin and 2 terminally.

Biology: Collected in a sediment trap (2.5 m above the bottom) located between two active vents at 1630 m depth.

Distribution: Previously known from south of Ireland (CALMAN 1905), Bay of Biscay (JONES 1985) and Mediterranean Sea (REYSS 1973) up to 5000 m depth. Mid-Atlantic Ridge: Lucky Strike.



1: Adult male; A: Habitus; B: Antenna 1; C: Maxilliped 3; D: First pereopod; E: Second pereopod; F: Third pereopod; G: Fourth pereopod; H: Fifth pereopod; I: Uropod; by J. Corbera.

References:

CALMAN W.T. (1905) Fish. Ireland, Sci. Invest.**1904**(1): 1-7.
JONES N.S. (1985) in LAUBIER L. & C. MONNIOT (Eds.) Peuplements Profonds du Golfe de Gascogne: 429-433.
NORMAN A.M. (1879) Ann. Mag. Nat. Hist. **3**(5): 54-73.
REYSS D. (1972) Deep-Sea Res. **20**: 1119-1123.

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Arthropoda, Crustacaea, Tanaidacea

In some deep-sea environments tanaids are the most diverse and abundant fauna but because of their small size (most are 2-5mm long) they are frequently overlooked. Their distribution in hydrothermal environments is virtually unknown. Up to now only two species (*Leptognathia ventralis* and *Typhlotanais* sp.) are known from Western Pacific Back-Arc Basins, seven species from the Mid-Atlantic Ridge, Lucky Strike (LARSEN et al., in press) and one (*Typhlotanais* sp.) from Rainbow (M. Segonzac, pers. obs.).

At Lucky Strike, the highest diversity and abundance of tanaids occurred in peripheral mussel clumps. Besides the two species, *Agathotanais ingolfi* and *Pseudotanais vulsella*, known from other deep-sea environments, *Mesotanais styxis* was found both inside and outside the vent field.

All species known from hydrothermal vents belong to previously known genera, even *Gordotanais* was found before although not yet described indicating that the fauna at Lucky Strike is not dramatically different from the surrounding deep-sea habitat. A similar observation was made in the study of tanaids from the Juan de Fuca vent system (LARSEN, in press).

Although the present handbook aims to present diagnostic information and illustration it is important to stress that the identification of tanaid species is often difficult and usually requires the dissection of the specimens.

1: *Armaturatanais atlanticus*; by K. Larsen, M. Blazewicz-Praszkowycz & M. R. Cuhna.

References:

LARSEN K. (in press) Zootaxa.

LARSEN K., BLAZEWICZ-PASZKOWYCZ M. & M.R. CUNHA (in press) Zootaxa.

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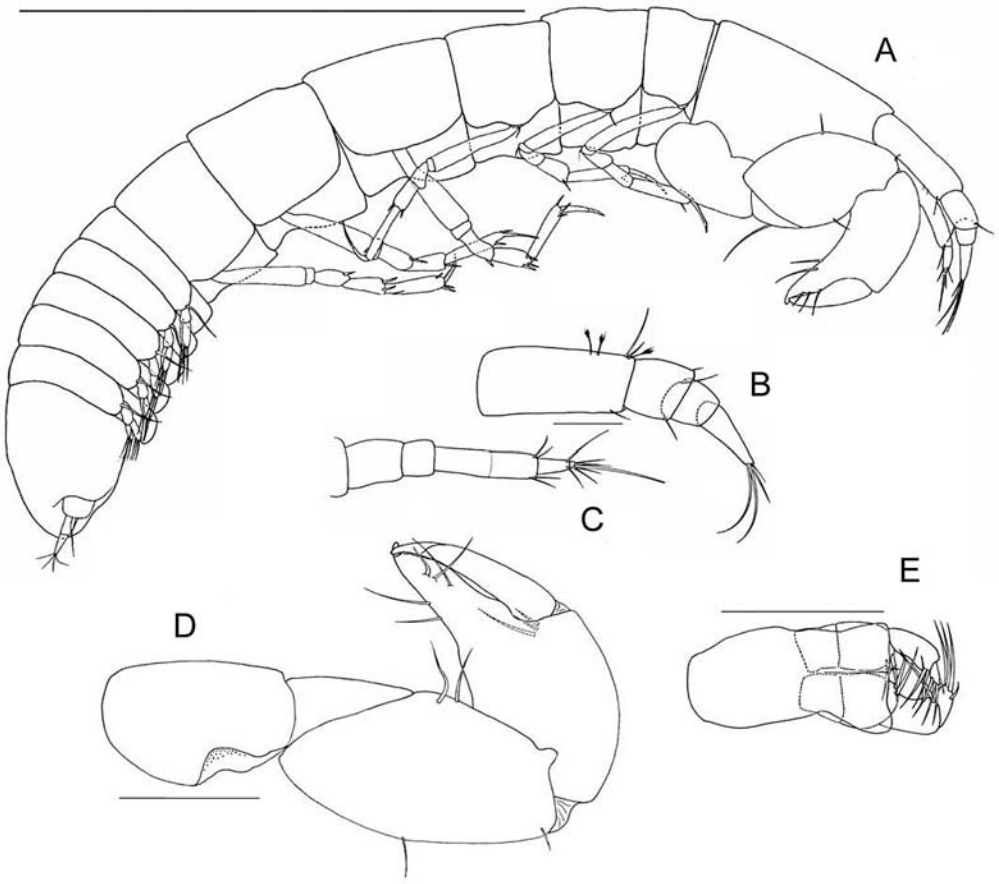
Armaturatanais atlanticus Larsen, Blazewicz-Paszkowycz & Cunha, in press

Size: 2.0 mm.

Morphology: (Genus, female) Body slightly dorso-ventrally flattened. Cuticle heavily calcified. Pleotelson acorn-shaped in lateral view. Antennula with four articles. Antenna with six articles and fusion line on article 4. Mandibles small; molar fairly broad with flat distal crushing area surrounded by small denticles. Maxilliped endites without denticles, processes or flat setae. Pereopods I-III merus and carpus without spiniform setae. Pereopods and pleopods attached on the inner side of the lateral shield. Pereopods with coxa; dactylus and unguis not fused to a claw; pereopods I-III unguis longer than dactylus; pereopods IV-VI dactylus longer than unguis. Pleopods present in female, with simple or plumose setae. Uropods biramous, endopod with two articles; exopod with one article. (Genus, male) Pleon marginally longer than in female. Antennular article 3 shorter than in female and without fusion line. Functional mouthparts retained. All pleonites bearing pleopods with plumose setae, pleopods larger than in female. (Species, female) Antennula article 3 more than half as long as article 2. Right mandibular incisors smooth; left mandibular/lacinia mobilis with few dorsal denticles. Chelipedal dactylus naked. Pereopods longer than pleon. Pereopods IV-VI dactylus naked; unguis of same with simple apex.

Biology: Collected from samples of volcanic rocks (hyaloclastic) and hydrothermal slab in the proximity of active vents.

Distribution: Mid-Atlantic Ridge: Lucky Strike.



1: Female; A: Habitus, lateral view; B: Antennula; C: Antenna; D: Cheliped; E: Maxilliped; scale bars 1 mm (A), 0.1 mm (others); from Larsen et al. (in press).

Reference:

Larsen K., Blazewicz-Paszkowycz M. & M.R. Cunha (in press) Zootaxa.

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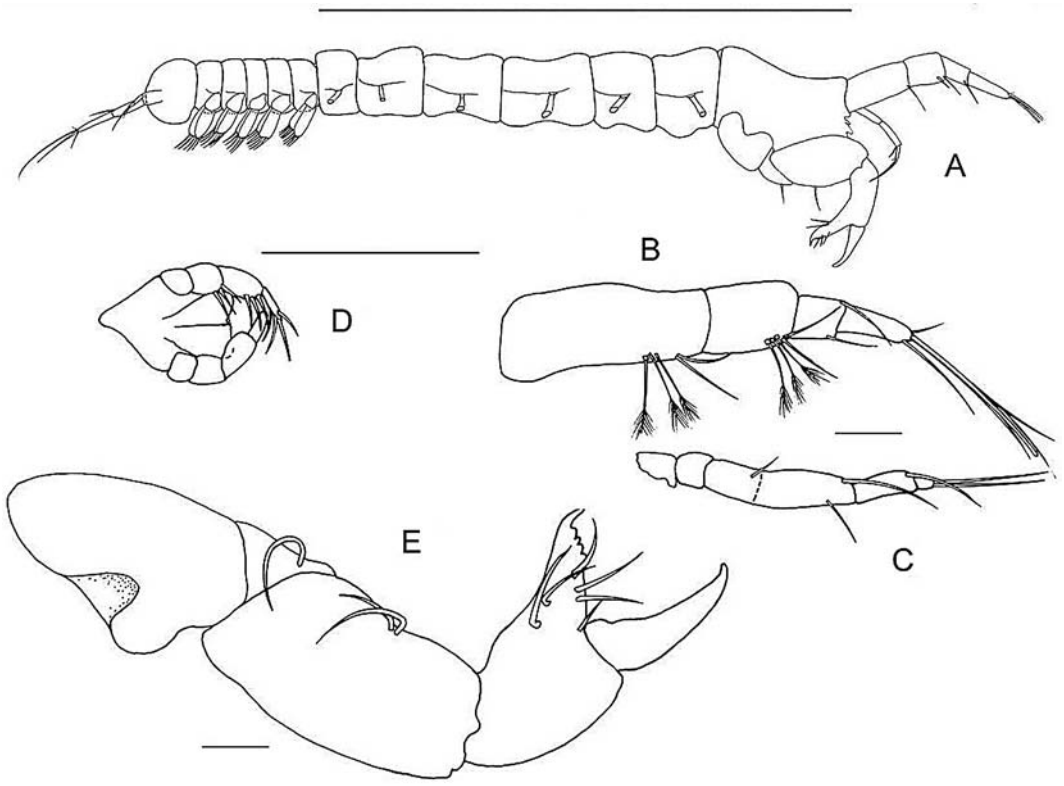
Leptognathiella fragilis Larsen, Blazewicz-Paszkowycz & Cunha, in press

Size: 1.3 mm.

Morphology: (Family and Genus) Body cylindrical, relatively small (rarely over 2 mm in length). Pleon and pleotelson short (never longer than combined length of three last pereonites). Antennule with four or five articles; article 2 frequently with dorsal projection overlapping basal part of article 3. Antenna with five or six articles. Mouthparts well developed and functional in both sexes. Molar process thin with few terminal spines. Maxillule with seven or eight terminal spiniform setae. Maxilliped endite not fused, distal edge often with medial, frequently triangular, process. Chelipeds attached via sclerite. Pereopods I-III often stout, with or without coxa. Pereopods IV-VI without coxa and not stouter than pereopods I-III; dactylus and unguis not fused. Pleopods absent or present with simple setae only. Uropods biramous; rami with one or two articles. (Species, female) Body fairly elongated (length/width ca. 9.5). Cephalothorax as long as combined length of first two pereonites. Pereopods I-III carpus and propodus without small ventral spines. Uropods twice as long as pleotelson but shorter than combined pleon; basal article shorter than pleotelson and biarticulated exopod half as long as first endopod article.

Biology: Collected from samples of hydrothermal slabs in the vicinity of active venting.

Distribution: Mid-Atlantic Ridge: Lucky Strike.



1: Female; A: Habitus lateral view; B: Antennula; C: Antenna; D: Maxilliped; E: Cheliped; scale bars 1 mm (A), 0.1 mm (others); from Larsen et al. (in press).

Reference:

Larsen K., Blazewicz-Paszkowycz M. & M.R. Cunha (in press) Zootaxa.

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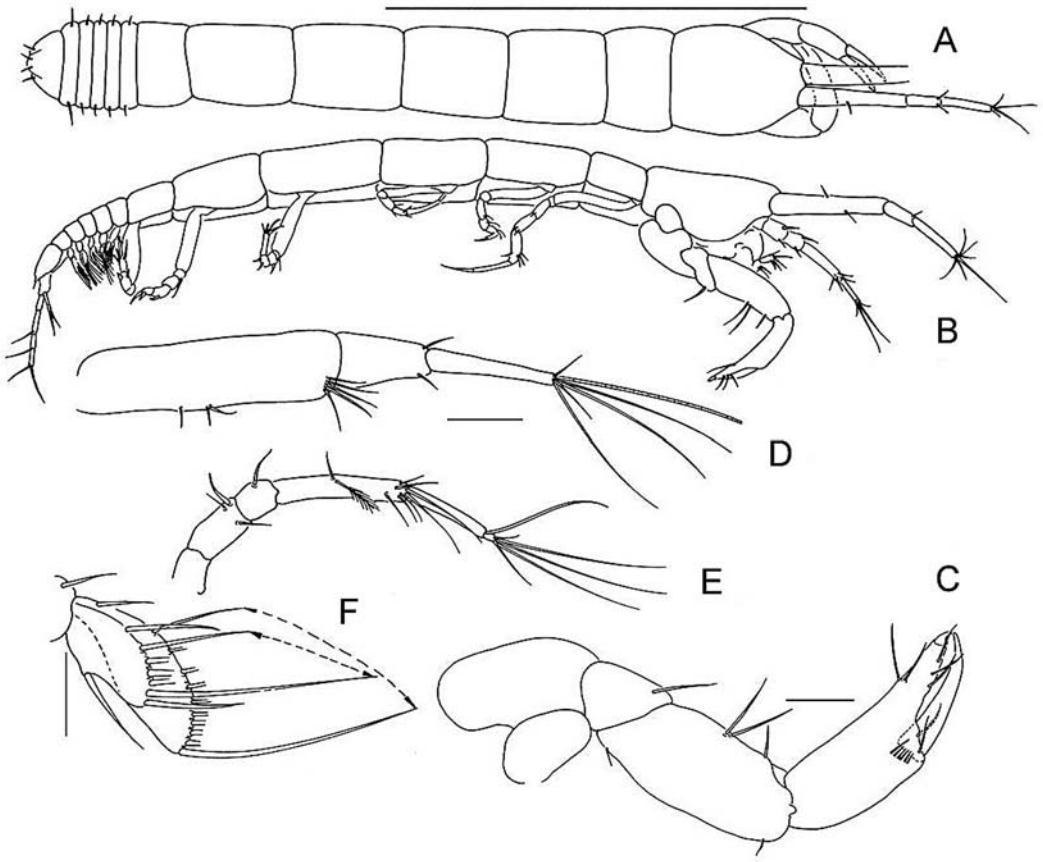
Mesotanais styxis Larsen, Blazewicz-Paszkowycz & Cunha, in press

Size: 1.9 mm.

Morphology: (Family and Genus) Body cylindrical. Eye lobes present but without visual pigment. Antennula with three articles. Antenna with six articles; article 2 and 3 with spiniform dorsal setae. Mandibles well developed with broad molar. Labium with two pairs of lobes. Maxillule with nine spiniform terminal setae. Maxilliped basis and endites not fused; endites with two or three short, flat, unequal-sized setae and none or one simple seta; basis with one or two long simple setae near palp insertion. Mouthparts reduced in males. Chelipeds attached via sclerite. Pereopod I almost twice as long as following pereopods; dactylus/unguis longer than propodus. On other pereopods dactylus/unguis shorter than propodus. Pereopods I-III with coxa; dactylus/unguis not fused. Pereopods IV-VI without coxa; basis thicker than pereopods I-III dactylus/unguis incompletely fused to an elongated claw. Pleopods present and well developed, with plumose setae. Uropods biramous; exopod biarticulated; endopod with three or more articles. (Species, female) Antennula without long (almost as long as antennule) setae. Maxilliped basis with only one distal setae. Uropodal endopod with four articles.

Biology: Collected from samples of hydrothermal slabs in the proximity of active chimneys but also on volcanic rocks outside the vent field (Lucky Strike segment).

Distribution: Mid-Atlantic Ridge: Lucky Strike.



1: Female; A: Habitus, dorsal view; B: Habitus, lateral view; C: Antennula; D: Antenna; E: Cheliped; F: Pleopod; scale bars 1 mm (A, B), 0.1 mm (others); from Larsen et al. (in press).

Reference:

Larsen K., Blazewicz-Paszkowycz M. & M.R. Cunha (in press) Zootaxa.

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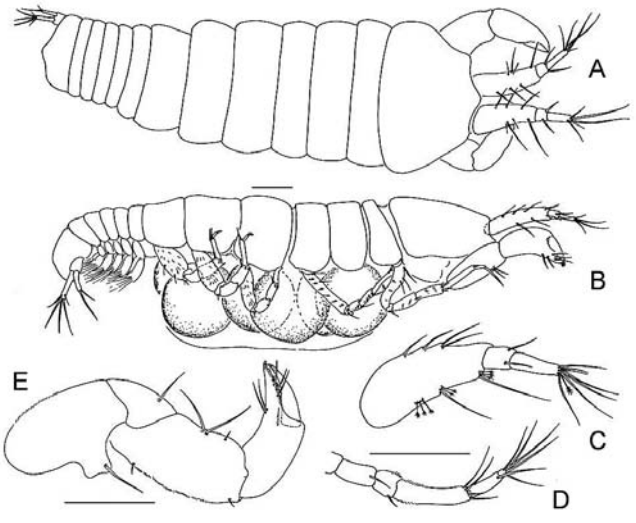
Obesutanais sigridi Larsen, Blazewicz-Paszkowycz & Cunha, in press

Size: 1.2 mm.

Morphology: (Family and Genus, female) Body habitus short and stout (almost pseudotanais-like) with a wide head. Body tapering off in posterior direction. Antennula with long setae on article 1. Mandibular molar with few distal spines. Maxilliped endites with one distal tubercule. Mouthparts reduced in males. Cheliped merus and carpus with long seta (longer than fixed finger). Pereopods II and III merus with one seta as long as or longer than carpus; carpus with a long seta (almost as long as propodus). Pereopod IV-VI without process with microspines (clinging apparatus). Pleopods setation, except for endopod proximal seta, restricted to the distal end; large gap between endopod proximal seta and other setae, long (more than half the length of endopod). Uropod endopod is incompletely fused to one article; endo- and exopod with thick specialized terminal setae; exopod unarticulated, almost as long as endopod. (Species, female) Pereopods long (longer than pleon). Pereopods IV-VI dactylus and unguis partly fused but not into a claw. Uropods longer than pleotelson; endopod with pseudoarticulation; exopod with one article, almost as long as endopod.

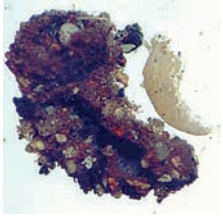
Biology: Collected from samples of volcanic rocks (hyaloclastic) and sulphide chimneys active and inactive. Often found inside tubes built with small particles of sediment.

Distribution: Mid-Atlantic Ridge: Lucky Strike.



1: Female; A: Habitus, dorsal view; B: Habitus, lateral view; C: Antennula; D: Antenna; E: Cheliped; scale bars 0.1 mm; from Larsen et al. (in press).

2: Tubes on a piece of sulphide (Lucky Strike), cruise Seahma 1 © FCIJL; by P. Briand © Ifremer.



3: Specimen removed from tube; by M. Cunha.

Reference:

Larsen K., Blazewicz-Paszkowycz M. & M.R. Cunha (in press) Zootaxa.

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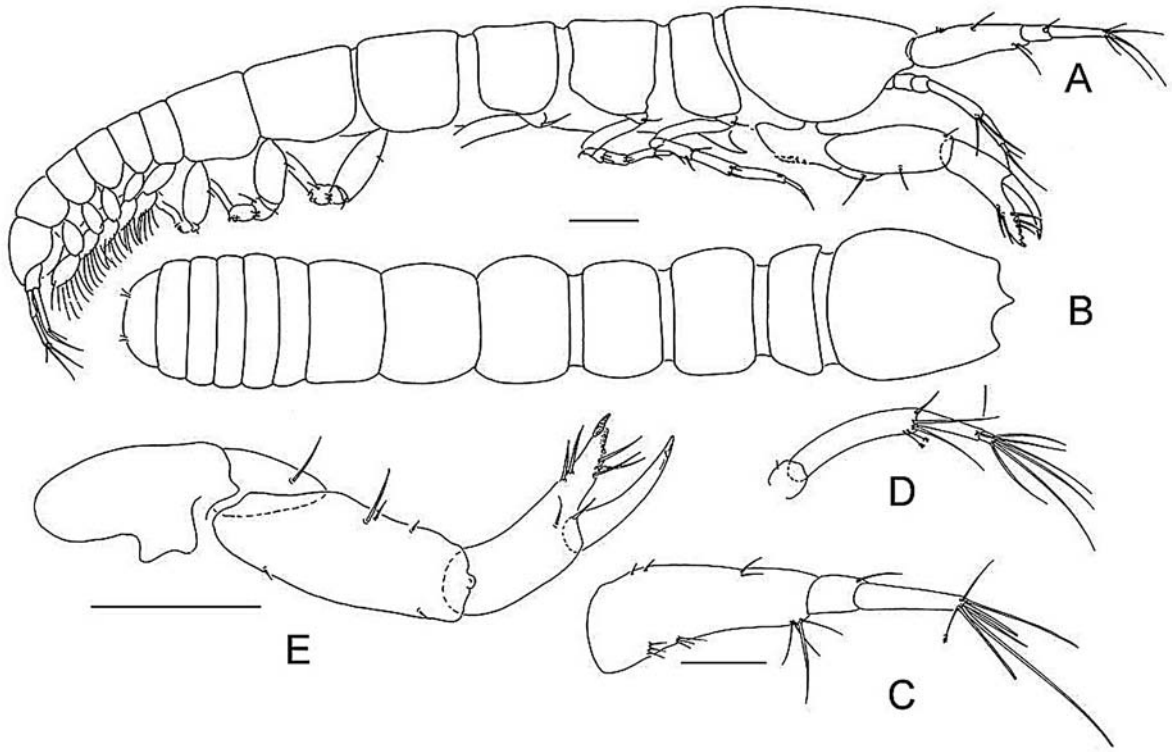
Typhlotanais incognitus Larsen, Blazewicz-Paszkowycz & Cunha, in press

Size: 1.5 mm.

Morphology: (Family and Genus, female) Body almost completely cylindrical. Cephalothorax wider than pereon. Antennula with three articles. Antenna with five or six articles. Molar process broad with several terminal denticles. Maxillula with seven or eight terminal spiniform setae. Maxilliped basis partially fused, endites not fused; distal edge with lateral process. Chelipeds ventrally attached via sclerite. Pereopods I-III with coxae; merus and carpus with simple setae only. Pereopods IV-VI with or without coxae; basis stouter or not stouter than pereopods I-III; merus and carpus with at least one spiniform seta, usually with clinging apparatus; dactylus and unguis fused. Pleopods present, with simple or plumose setae. Uropods biramous; endopod with two articles; exopod with one or two articles. (Species, female) Pereopods long (longer than pleon). Pereopods IV-VI not stouter than Pereopods I-III; dactylus and unguis fused but not into a claw. Uropods longer than pleotelson; endopod with two articles; exopod with one article, almost as long as endopod.

Biology: Collected from samples of hydrothermal slab in the proximity of active vents.

Distribution: Mid-Atlantic Ridge: Lucky Strike.



1: Female; A: Habitus, lateral view; B: Habitus, dorsal view; C: Antennula; D: Antenna; E: Cheliped; scale bars 0.1 mm; from Larsen et al. (in press).

Reference:

Larsen K., Blazewicz-Paszkowycz M. & M.C.R Cunha (in press) Zootaxa.

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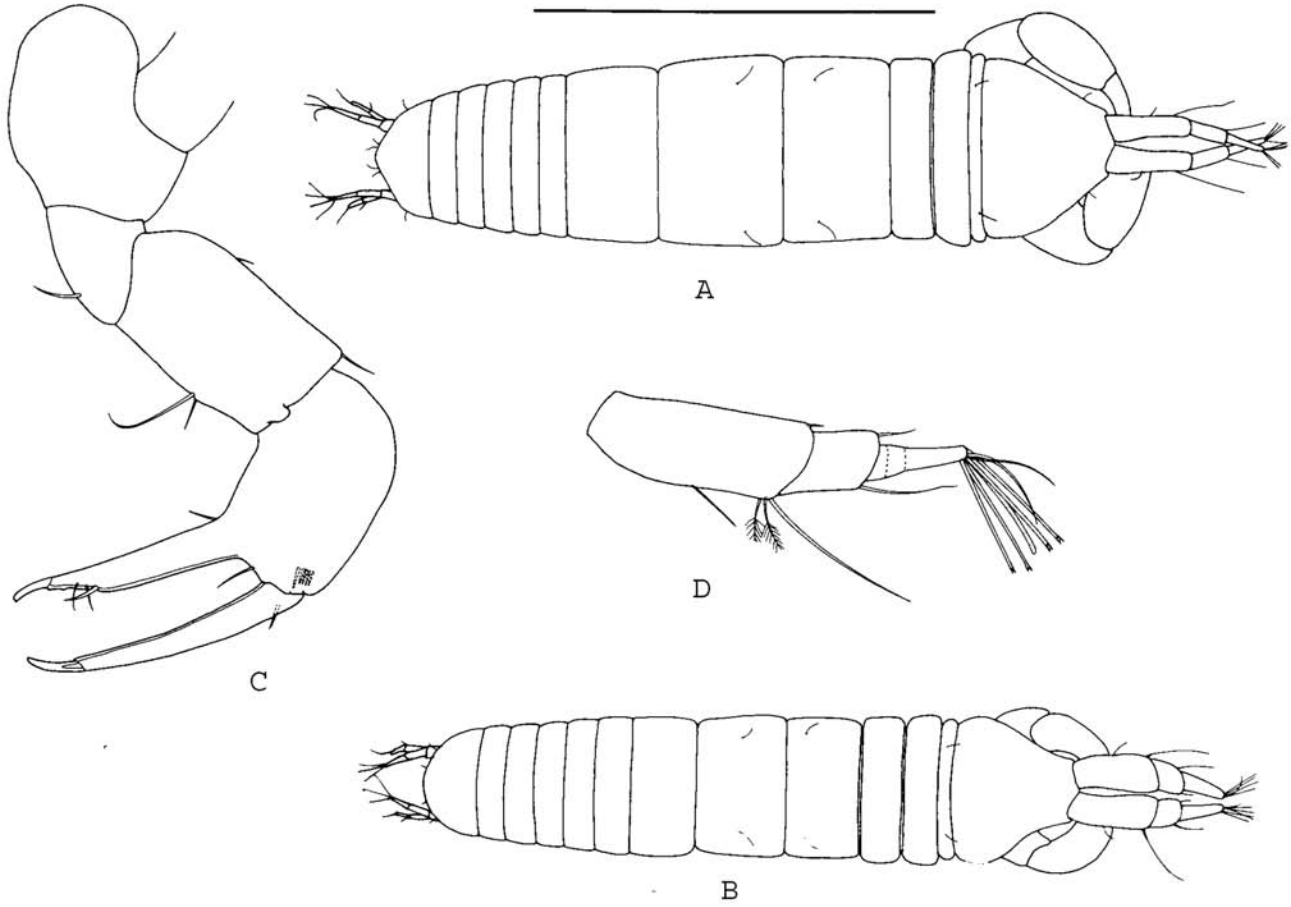
Pseudotanais vulsella Bird & Holdich, 1989

Size: 2.3 mm.

Morphology: (Family and Genus) Body habitus short and robust. Eyes absent. Pereonites 1-2 reduced. Antennula with three articles, distal article bearing setae with complex tips. Maxilliped endites fused. Cheliped attachment via sidepiece. Pereopods I-III coxae absent. Pereopod I different from II-III. Pereopods II-VI carpus antero-inferior spine flattened, "blade-like". Uropod endopod with two articles; exopod with two articles. One pair of oostegites only on pereopods IV. (Species) pereonites 1-3 combined shorter than pereonite 4. Cheliped of forcipate type. Pereopod I slender, basis about 12 times longer than broad. Pereopods II-III similar, basis 6 times longer than broad. Pereopods II-VI carpal blade-like spine long. Pereopods IV-VI similar dactylus and unguis fused. Pleopods well developed.

Biology: On Lucky Strike area, this species was frequently collected from samples of volcanic rocks (hyaloclastic and lava) and sulphide rubble but also in areas of diffuse venting and near active chimneys active.

Distribution: North Atlantic: North Feni Ridge, Rockall Trough, Hebridian slope, Porcupine Seabight and Celtic Slope, 1028-1640 m; Mid-Atlantic Ridge: Lucky Strike.



1: A: Female habitus, dorsal view; B: Male habitus, dorsal view; C: Right cheliped, female; D: Antenulla, male; scale bar 1 mm; from Bird & Holdich (1989).

References:

Bird G.J. & D.M. Holdich (1989) Zool. J. Linnean Soc. **97**: 233-298.
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Arthropoda, Crustacaea, Isopoda

Recent expeditions to the Lucky Strike vent field at the Mid-Atlantic Ridge provided an uncommon collection of peracarid crustaceans (CUNHA et al. 2001, CUNHA & WILSON 2003, in press) that accounted for about 50% of the species richness in the samples and included about 20 isopod species. Among these four asellotes are new species: the two *Heteromesus* presented herein, one undescribed Katianiridae and one undescribed Munnopsidae. These species were collected in areas of diffuse low venting, in peripheral mussel (*Bathymodiolus azoricus*) aggregations and in a zone of filter feeding organisms. Nevertheless, we cannot infer that these isopods are vent endemic because they do not show special adaptations to the environment and our knowledge of their distribution is minimal.

The Lucky Strike isopod fauna also includes a number of known deep-sea asellotes (mostly Haplomunnidae, Haplonisciidae, and Munnopsidae) and a few species of other isopods (Anthurida, Cirolanidae, and Gnathiidae, unpublished data). Some of these were already cited in the previous version of the Handbook (DESBRUYÈRES & SEGONZAC 1997) together with the epicarid *Thermaloniscus cotylophorus* from East Pacific Rise: 13ºN.

Isopods are among the most abundant and diverse taxa in the deep sea (HESSLER & SANDERS 1967, HESSLER et al. 1979; RAUPACH et al. 2004), but there are only very few records of these crustaceans in hydrothermal communities. The reasons for this are unclear because isopods, especially asellotes, are known for their adaptative potential (HESSLER & THISTLE 1975) and at least in relatively shallow (<2000 m) hydrothermal vent fields, such as in Lucky Strike, the less toxic environment likely facilitates the immigration of background species (VAN DOVER 1995).

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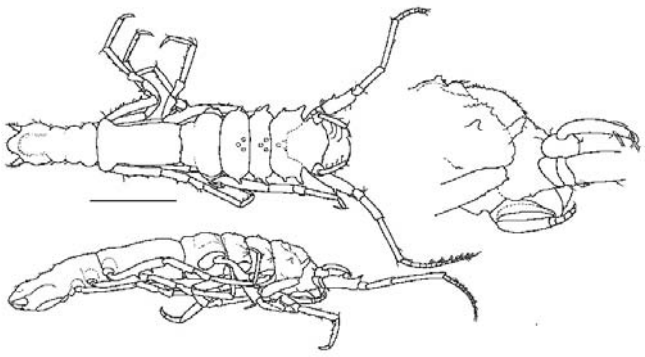
Heteromesus calcar CUNHA & WILSON, in press

Size: 4 mm.

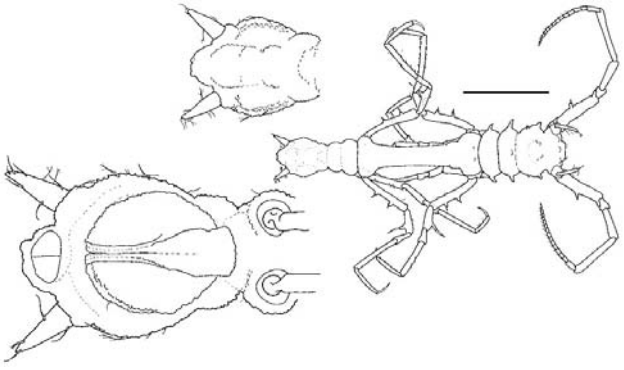
Morphology: (Family) Body elongate, subcylindrical and narrow. Pereonites 4-5 elongate, pereonite 5 longest, pereonite 4 widest anteriorly, 5 widest posteriorly. Head fused and embedded in pereonite 1. Pereonites 1 (posterior margin) to 4 free and articulating. Anus separated from branchial chamber. Eyes absent. Antennula terminating with simple seta, article 1 squat and globular, article 2 elongate, at least twice as long as article 1. Antenna length more than half body length, without squama. Maxilla inferior margin with two medial pectinate setae. Pereopod I robust strongly subchelate; pereopods II-VII ambulatory. Uropod uniramous terminal. (Genus) Pereonite 5 freely articulated with pereonite 6, articulations not expressed between pereonite 6, pereonite 7, pleonite 1 and pleotelson. Pereonite 4 produced posteriorly but always broader than long. Antennula article 1 globular, article 2 inserting dorsally; article 2 strongly curved anteriorly at proximal insertion; articles distal to article 2 reduced to 1-3 articles, distal articles altogether tiny, length less than 0.3 times of article 2 length. Pereopod I carpus distally expanded, widest point distal to midpoint of carpus, with one elongate robust seta and a proximal shorter robust seta. Pleopod II female operculum with narrow proximal neck, almost circular posteriorly, with plumose setae. Pleopod III exopod with plumose setae and fringe of fine setae. Pleopod V absent. Uropod with single article, conical, tapering distally; extending beyond posterior margin of pleotelson. (Species) Pereonites 1-3 with anterolateral spines. Pereonite 2 in female with no paired dorsal spines or tubercles. Pereonite 5 in female length 2.0 times the width. Antennula with 3 articles altogether. Pereopods IV-V bases with pedestal spines; ischia with elongate pedestal spines.

Biology: Collected in the vicinity of active venting sites on sulphide deposits, sulphide rubble and volcanic rocks.

Distribution: Mid-Atlantic Ridge: Lucky Strike.



1: Female (left) head, lateral view and habitus, dorsal and lateral views; scale bar 1 mm; by M. Cunha.



2: Male (right) habitus, dorsal view, and pleotelson, dorsal and ventral views; scale bar 1 mm; by M. Cunha.

Reference:

CUNHA M.R. & G.D.F. WILSON (in press) Zootaxa.

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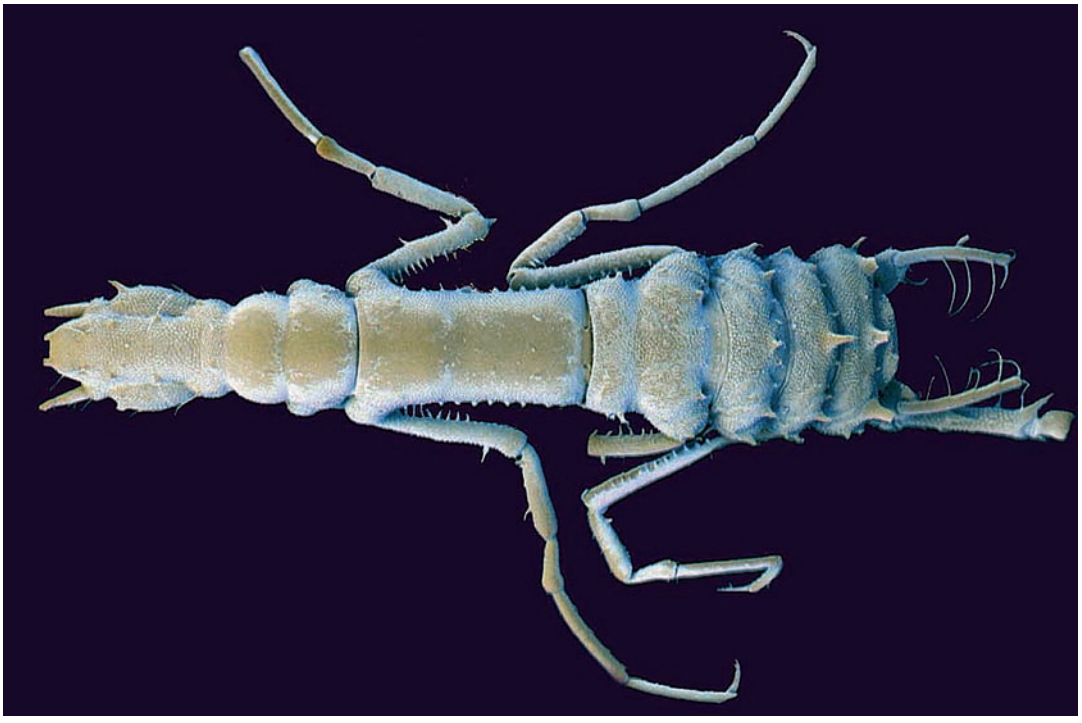
Heteromesus ctenobasius Cunha & Wilson, in press

Size: 4 mm.

Morphology: (Family) Body elongate, sub-cylindrical and narrow. Pereonites 4-5 elongate, pereonite 5 longest, pereonite 4 widest anteriorly, 5 widest posteriorly. Head fused and embedded in pereonite 1. Pereonites 1 (posterior margin) to 4 free and articulating. Anus separated from branchial chamber. Eyes absent. Antennula terminating with simple seta, article 1 squat and globular, article 2 elongate, at least twice as long as article 1. Antenna length more than half body length, without squama. Maxilla inferior margin with two medial pectinate setae. Pereopod I robust strongly subchelate; pereopods II-VII ambulatory. Uropod uniramous terminal. (Genus) Pereonite 5 freely articulated with pereonite 6, articulations not expressed between pereonite 6, pereonite 7, pleonite 1 and pleotelson. Pereonite 4 produced posteriorly but always broader than long. Antennula article 1 globular, article 2 inserting dorsally; article 2 strongly curved anteriorly at proximal insertion; articles distal to article 2 reduced to 1-3 articles, distal articles altogether tiny, length less than 0.3 times of article 2 length. Pereopod I carpus distally expanded, widest point distal to midpoint of carpus, with one elongate robust seta and a proximal shorter robust seta. Pleopod II female operculum with narrow proximal neck, almost circular posteriorly, with plumose setae. Pleopod III exopod with plumose setae and fringe of fine setae. Pleopod V absent. Uropod with single article, conical, tapering distally; extending beyond posterior margin of pleotelson. (Species) Pereonite 1-3 median pedestal spines. Pereonites 4-5 in female with lateral pedestal spines. Pleotelson terminal margin with pedestal spines. Antennula with five articles altogether. Pereopod II-VII bases and ischia with pedestal spines.

Biology: Collected in the vicinity of active venting sites on volcanic rocks.

Distribution: Mid-Atlantic Ridge: Lucky Strike.



1: Female habitus, dorsal view; the color picture is a false color composite of three different SEM images, by G.D.F. Wilson & S. Lindsay © Australian Museum.

Reference:

Cunha M.R. & G.D.F. Wilson (in press) Zootaxa.

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