

# HANDBOOK OF DEEP-SEA HYDROTHERMAL VENT FAUNA

Second completely revised edition

Editors:

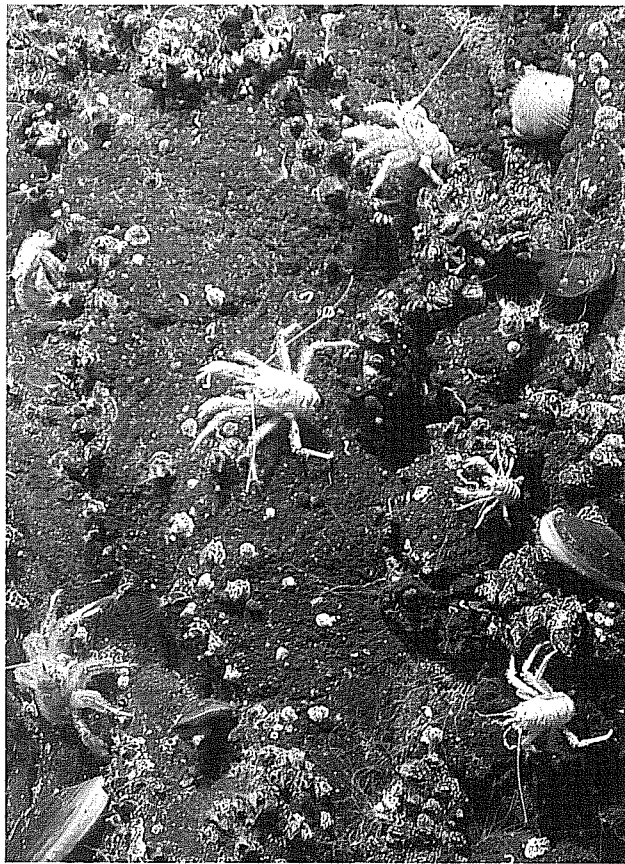
Daniel Desbruyères, Michel Segonzac & Monika Bright

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## Arthropoda: Decapoda, Anomura

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Worldwide, there are over 2500 species of anomuran crabs, which comprise ca 5% of all crustacean species. The Infraorder Anomura represents a paraphyletic group that includes the superfamilies Lomisoidea, Hippoidea, and the much more diverse Galatheoidea and Paguroidea. Species of these taxa are commonly found living from the intertidal zone to the abyssal plain >2000 m, including one terrestrial representative. Morphologically they have little in common, some are like crabs (e.g. Lithodidae) and others are like hermit crabs (e.g. Paguridae). They only share one character: the small fifth pereopod. Molecular studies have shown that Galatheoidea and Paguroidea are more related to each other than to Hippoidea, although more work is needed to completely resolve these relationships.



*Munidopsis* sp. (probably *M. lauensis*); cruise TUIM 07;  
by C.R. Fisher.

The vent fauna contains representatives of the superfamilies Galatheoidea and Paguroidea, including species of four families and a recent new family (Kiwaidae). Despite their ecological importance and high diversity, many aspects of their systematics and distribution are still poorly known.

The anomurans exhibit a considerable diversity of reproduction modes, life cycles and capacities for dispersal. The vast majority of species have relatively small pelagic eggs, with the exception of some representatives of the families Galatheidae and Chirostylidae, and a pelagic larval phase, which enhances their capacity for dispersal. There is evidence for prolonged brooding periods. Usually they produce only a few large eggs, probably related to an abbreviated or direct larval development. Most species are not restricted to hydrothermal vents and cold seeps. They usually occur in low densities, although there are some interesting exceptions (e.g. *Munidopsis lentigo*, *Shinkaia crosnieri*). The abundance of anomurans in vent and seep environments probably reflects the benefit derived from the organic matter produced by the chemosynthetic community inhabiting these zones. In general, their abundance increased in the vicinity of active hydrothermal sites. In the center of hydrothermal activity, however, abundance decreases.

Information on the geographic distribution and taxonomy of the different species is still limited and incomplete. Most species have a broad geographic distribution, as has been shown for a number of deep-sea taxa. There appears to be some interchange among the different communities separated by long distances, associated with high dispersal capabilities, although a high degree of local endemism can also exist. Unfortunately, mechanisms for colonization by vent organisms remain largely unknown for most of the mid-ocean ridge systems. Therefore, additional studies on molecular data and larval dispersal processes are desirable.

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### References:

- MARTIN J.W. & G.E. DAVIS (2001) Nat. Hist. Mus. Los Angeles Cty, Sci. Ser. **39**: 1-124.  
MARTIN J.W. & T.A. HANEY (2005) Zool. J. Linn. Soc. **145**: 445-522.  
MORRISON C.L., HARVEY A.W., LAVERY S., TIEU K., HUANG Y. & C.W. CUNNINGHAM (2002) Proc. R. Soc. Lond., B **269**: 345-350.  
PERÉZ-LOSADA M., JARA C.G., BOND-BUCKUP G., PORTER M.L. & K.A. CRANDALL (2002) J. Crustac. Biol. **22**: 661-669.

*Paragiopagurus ventilatus* LEMAITRE, 2004

**Size:** Shield length 5.8 mm max. (male); 4.9 mm max. (ovigerous female).

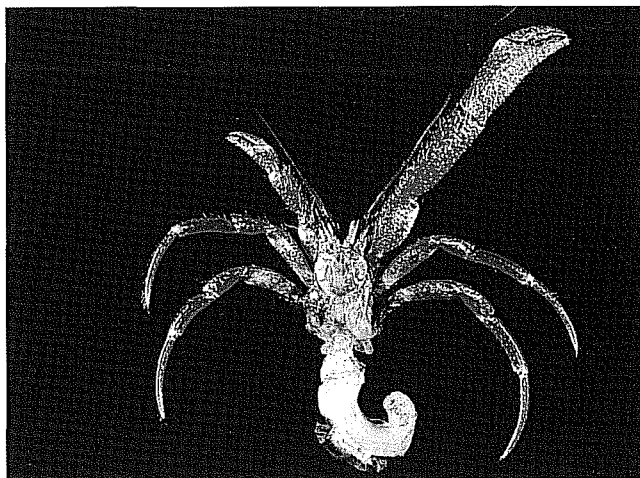
**Color:** In life, shield and cephalic appendages cream with some faded pink areas. Chelipeds and ambulatory legs red or pink.

**Morphology:** Gills biserial. Ocular acicles subtriangular, terminating in strong, simple spine (rarely bifid) with transverse striae. Outer faces of basis and ischium of third maxillipeds, chelipeds, and second and third pereopods, with plumose, bacteriophage setae. Chelipeds markedly dissimilar; proportions and armature of right strongly affected by size and sex, with that of males considerably longer and more elongate than in females. Dactyls of second and third pereopods with irregular rows of spines on ventromesial margins. Propodal rasp of fourth pereopod with one row of scales. Anterior lobe of sternite XII (third

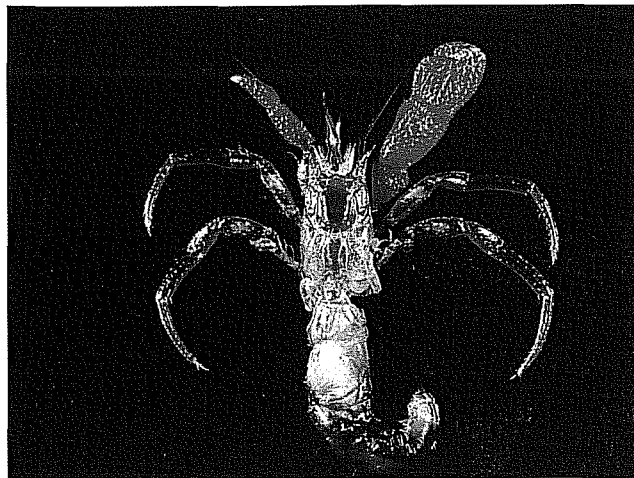
pereopods) with bifid spine. Telson asymmetrical; posterior margin separated by broad, shallow cleft, into rounded projections armed with few short, corneous spines often ventrally curved. Males lacking first pleopods; with unpaired rudimentary left pleopod.

**Biology:** Specimens collected by beam-trawl among other species newly described as mytilid and lucinid bivalves (BOUCHET & COSEL 2004), and numerous grapsid crabs (NG et al. 2000). At this area, diffuse gas seepage from the bottom. The specimens live in gastropod shells of the buccinid *Siphonalia*. Probably not part of the "obligate" vent fauna. Ovigerous females found in May 2001.

**Distribution:** Okinawa Arc: Northeastern Taiwan, Tashi fishing grounds.



1: Male in vivo; by courtesy of T. Yam Chan.



2: Female in vivo; by courtesy of T. Yam Chan.

**References:**

- BOUCHET P. & R. VON COSEL (2004) Zool. Stud. **43**: 704-711.  
LEMAITRE R. (2004) Cah. Biol. Mar. **45**: 325-334.  
NG N.K., HUANG J.F. & P.H. Ho (2000) Nat. Taiwan Mus., Spec. Publ. Ser. **10**: 191-199.

*Paralomis hirtella* DE SAINT LAURENT & MACPHERSON, 1997

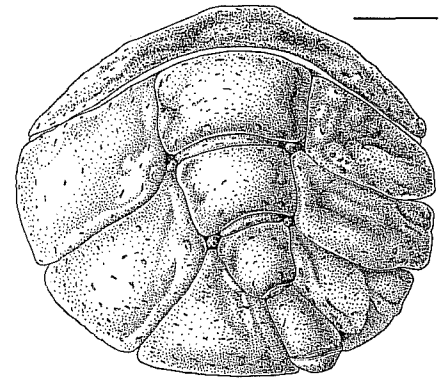
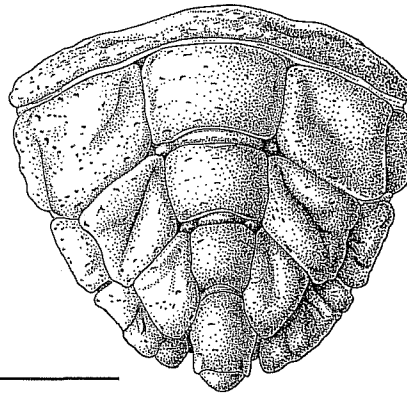
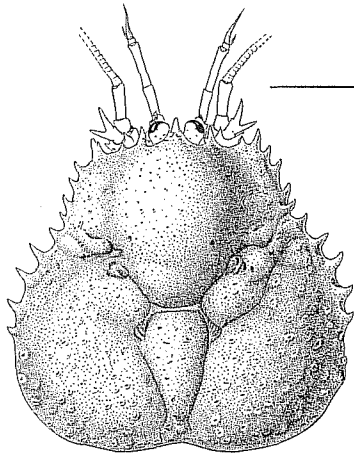
**Size:** Up to 59 mm carapace length.

**Morphology:** Carapace more or less hexagonal. Dorsal surface smooth, with few scattered small granules. Numerous tuft of setae of different length scattered on carapace surface. Rostrum with basal spine and two small dorsal spines. Chelipeds bearing thick spines and acute granules. Walking legs moderately long, with some thick spines on dorsal border of merus, carpus and propodus, dactylus slightly curved, with corneous spinelets

along ventral margin. Scattered tuft of setae on posterior surface, dorsal and ventral margins of articles.

**Biology:** Lives in few numbers around active chimneys and on mussel beds.

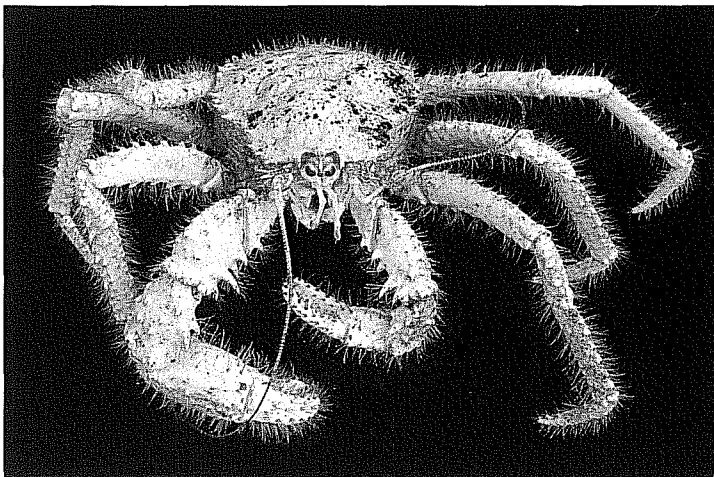
**Distribution:** North Fiji Back-Arc Basin: White Lady vent field; Lau Back-Arc Basin: Hine Hina vent field.



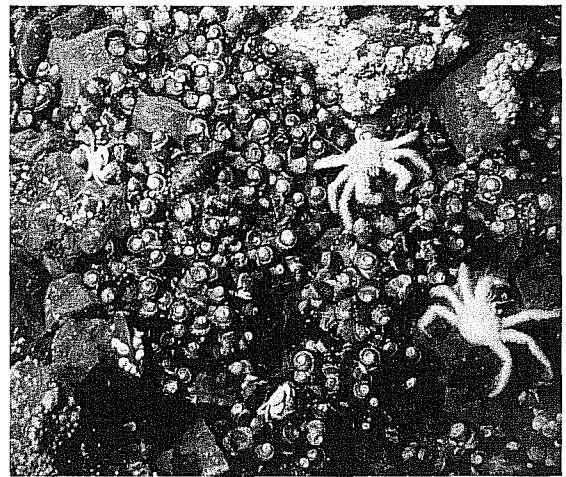
1: Holotype male, 32 x 35 mm, habitus, dorsal view; scale 10 mm; by M. de Saint Laurent & E. Macpherson.

2: Holotype, abdomen; scale bar 10 mm; by M. de Saint Laurent & E. Macpherson.

3: Other specimen 44 x 45 mm, abdomen of ovigerous female; scale bar 10 mm; by M. de Saint Laurent & E. Macpherson.



4: Specimen collected at Lau Back-Arc Basin: Hine Hina site; by P. Briand © Ifremer.



5: Two specimens in situ on gastropod bed of *Ifremeria nautilei* at North Fiji Back-Arc Basin: White Lady site; cruise Starmer 2 © Ifremer.

**References:**

DESBRUYÈRES D., ALAYSE-DANET A.-M. & S. OHTA (1994) *Mar. Geol.* **116**: 227-242.  
SAINT LAURENT M. DE & E. MACPHERSON (1997) *Zoosystema* **19**: 721-727.

*Paralomis verrilli* (BENEDICT, 1895)

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**Size:** Up to 110 mm carapace length.

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**Morphology:** Carapace more or less hexagonal, as long as wide. Dorsal carapace surface covered with small granules of various size. Granules usually with several setae. Regions well-defined. Gastric region rather more prominent than other regions, with a thick spine on apex. Cardiac region clearly less prominent than branchial regions, with four thick granules in square pattern. Each branchial region with one median spiniform granule and two smaller thick granules near intestinal region. Basal spine of rostrum more or less horizontal, slightly overreaching end of cornea, with spiniform tubercles on ventral side; two di-

vergent dorsal spines, upwardly directed, extending well past end of cornea. External orbital spine slightly shorter than eyes. Anterolateral spine slightly shorter than external orbital. Chelipeds bearing thick spines on mesial border of merus, carpus and hand. Walking legs moderately long, with well-developed spines along dorsal and ventral margins of meri and propodi, dactyli as long or longer than propodi.

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**Distribution:** North Pacific, from Japan, Bering Sea to California, 850-2379 m. Collected on vent sites of Juan de Fuca Ridge: Axial Seamount.

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1: Specimen among siboglinid tubeworms and microbial mats on side of sulphide edifice; from R/V Thomas G. Thompson, cruise TN149 (Zooarium vent field, Explorer Ridge; 31 July 2002) © NOAA.

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**References:**

- DAWSON E.W. (1989) N.Z.O.I Misc. Publ. **101**: 1-338.  
IKEDA H. (1998) The Deep-sea Crabs of Sagami Bay, Imamoto Printing: 1-180.  
MACPHERSON E. (2001) Zoosystema **23**: 797-805.  
ZAKLAN S.D. (2002) Alsk. Sea Grant Coll. Progr.: 751-845.

*Munida magniantennulata* BABA & TÜRKAY, 1992

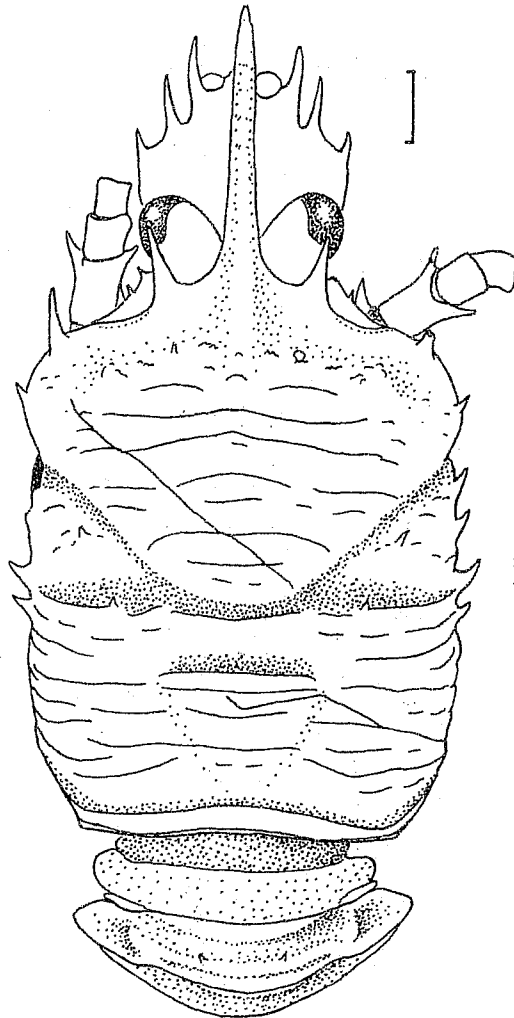
**Size:** Up to 12.8 mm carapace length.

**Morphology:** Dorsal carapace surface smooth, with epigastric spines. Lateral branchial margins with five small spines. First lateral spine of carapace near anterolateral angle, second spine clearly smaller than first. Second abdominal segment with transverse row of small spines, other segments unarmed. Corneae small, width equal to or less than distance between than distance between sinus formed by supraocular spines and rostrum. Basal segment of antennular peduncle unusually large.

Distomesial spine of first antennal article very small, never reaching midlength of second article. Merus of third maxilliped with only one spine on flexor margin. Chelipeds moderately massive, about three times carapace length. Walking legs slender.

**Biology:** No data. Collected by grab TV from an area close to active sites.

**Distribution:** Lau Back-Arc Basin: Hine Hina area.



1: Holotype male, carapace length 7.2 mm; dorsal view; scale bar 1 mm; from BABA & TÜRKAY (1992).

**References:**

- BABA K. (1994) Mem. Qld. Mus. **35**: 1-21.  
BABA K. (2005) Galathea Report **20**: 1-317.  
BABA K. & M. DE SAINT LAURENT (1992) Sci. Mar. **56**: 321-332.  
BABA K. & M. TÜRKAY (1992) Senckenb. Marit. **22**: 203-210.

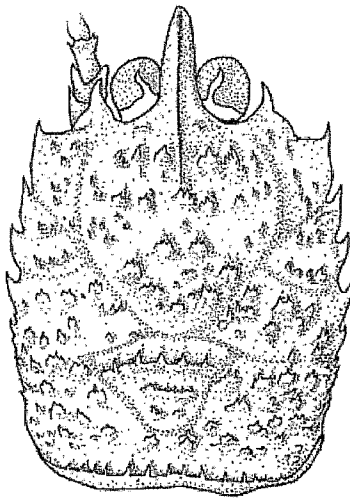
*Munidopsis acutispina* BENEDICT, 1902

**Size:** Up to 8.0 mm carapace length.

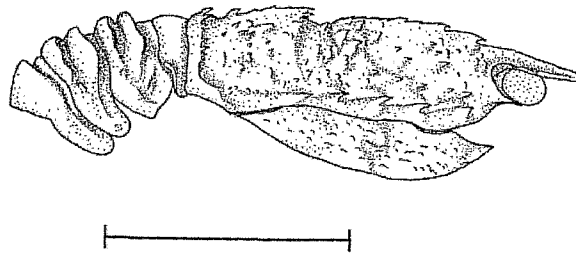
**Morphology:** Carapace with numerous pointed tubercles. Rostrum narrow triangular, horizontal and dorsally carinated. Front margin convex, antennal spine small. Abdomen unarmed. Cornea well exposed, visible in dorsal view, eye spine mesial and small. Fixed finger of chelipeds without denticulate carina on distolateral margin. Walking legs not reaching end of chelipeds. Propodi of walking legs of uniform width, with distinct spines. Epipods absent from pereopods.

**Biology:** Occurs in both hydrothermal and cold seep areas.

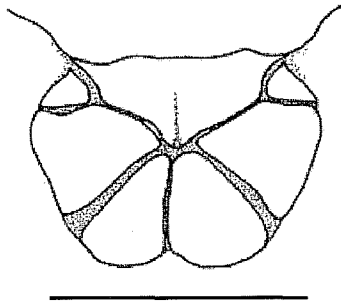
**Distribution:** Mid-Atlantic Ridge: Lost City vent field, and Eastern Mediterranean Sea, Kazan mud volcano, cold seep, 2030 m. Known as well off Western North Africa and the Azores Islands, between 698 and 845 m, and from the Mediterranean Sea (W Tyrrhenian Sea, Sardinia) between 374 and 1036 m.



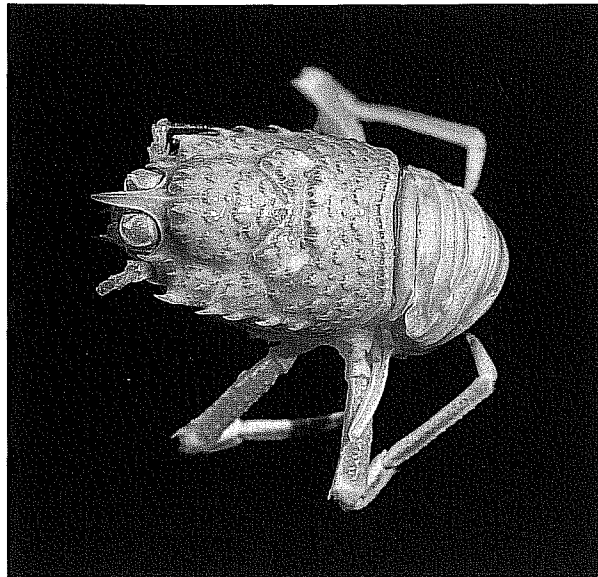
1: Carapace, dorsal view; male, carapace length 8.0 mm; from FROGLIA et al. (2002).



2: Carapace and abdomen, lateral view; scale bar 5 mm; male; from FROGLIA et al. (2002).



3: Telson; scale bar 5 mm; from FROGLIA et al. (2002).



4: Specimen from Lost City; cruise Exomar; by P. Briand © Ifremer.

**References:**

- FROGLIA C., MURA, M. & A. BONFITTO (2002) *Crustac. Int. J. Crustac. Res.* **75**: 375-382.  
GEBRUK A.V., GALKIN S.V., KRYLOVA E.M., VERESHCHAKA A.L. & G.M. VINOGRADOV (2002) *InterRidge News* **11**(2): 18-19.  
MACPHERSON E. & M. SEGONZAC (2005) *Zootaxa* **1095**: 1-60.  
OLU-LE ROY K., SIBUET M., FIALA-MÉDIIONI A., GOFAS S., SALAS C., MARIOTTI A., FOUCHER J.-P. & J. WOODSIDE (2004) *Deep-Sea Res.* **51**: 1915-1936.

*Munidopsis alvisca* WILLIAMS, 1988

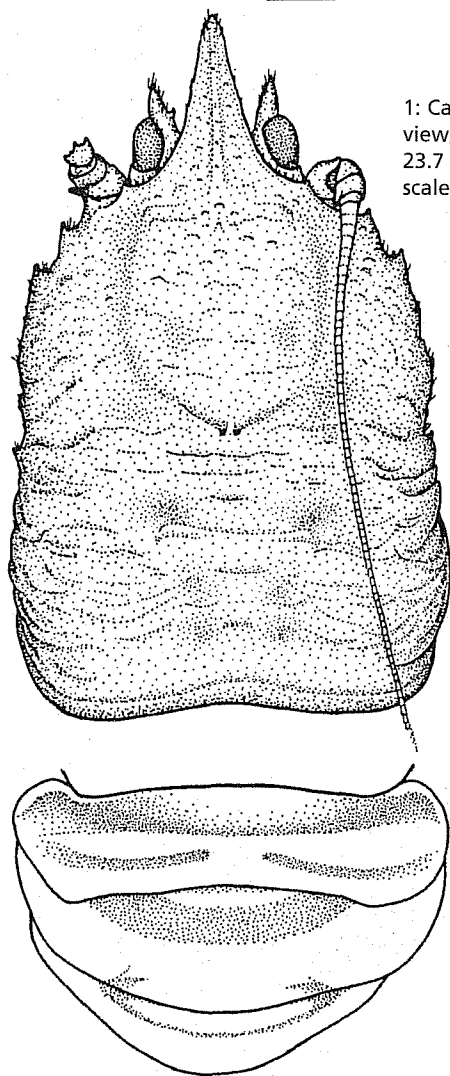
**Size:** Up to 27.9 mm carapace length.

**Morphology:** Dorsal carapace surface without spines, covered by scale-like rugosities. Rostrum unarmed, broad at base, distally narrowed and upturned, weakly carinated dorsally. Front margin oblique, small antennal spine present. Abdomen unarmed. Eyes not movable, eyespine well developed, cornea relatively large, clearly wider than eyespine. Chelipeds with several spines on merus and carpus, palm spineless, fixed finger of chelipeds without denticulate carina on distolateral margin.

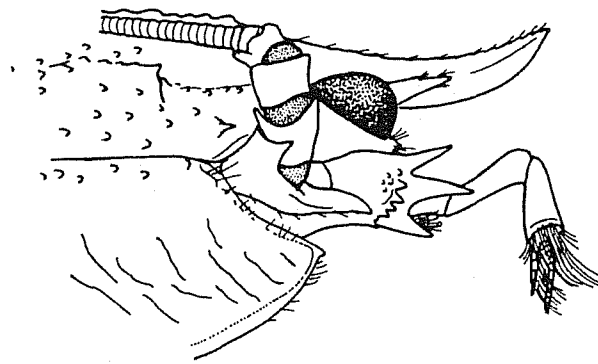
First walking leg reaching nearly tip of cheliped, dorsal crest of merus and carpus with row of spines along dorsal border; dactylus smoothly narrowed distally, flexor margin slightly curving, bearing low spines. Epipods absent from pereopods.

**Biology:** Living around hydrothermal vent sites.

**Distribution:** Explorer Ridge: Magic Mountain; Juan de Fuca Ridge; Guaymas Basin.



1: Carapace and abdomen, dorsal view; holotype carapace length 23.7 mm (including rostrum); scale bar 5 mm; by A.B. Williams.



2: Carapace, lateral view; scale bar 5 mm; by A.B. Williams.

**References:**

- BABA K. (2005) Galathea Report **20**: 1-317.  
KHODKINA I.V. (1991) Zool. Zh. **70**: 71-76.  
WILLIAMS A.B. (1988) Fish. Bull. **86**: 263-287.



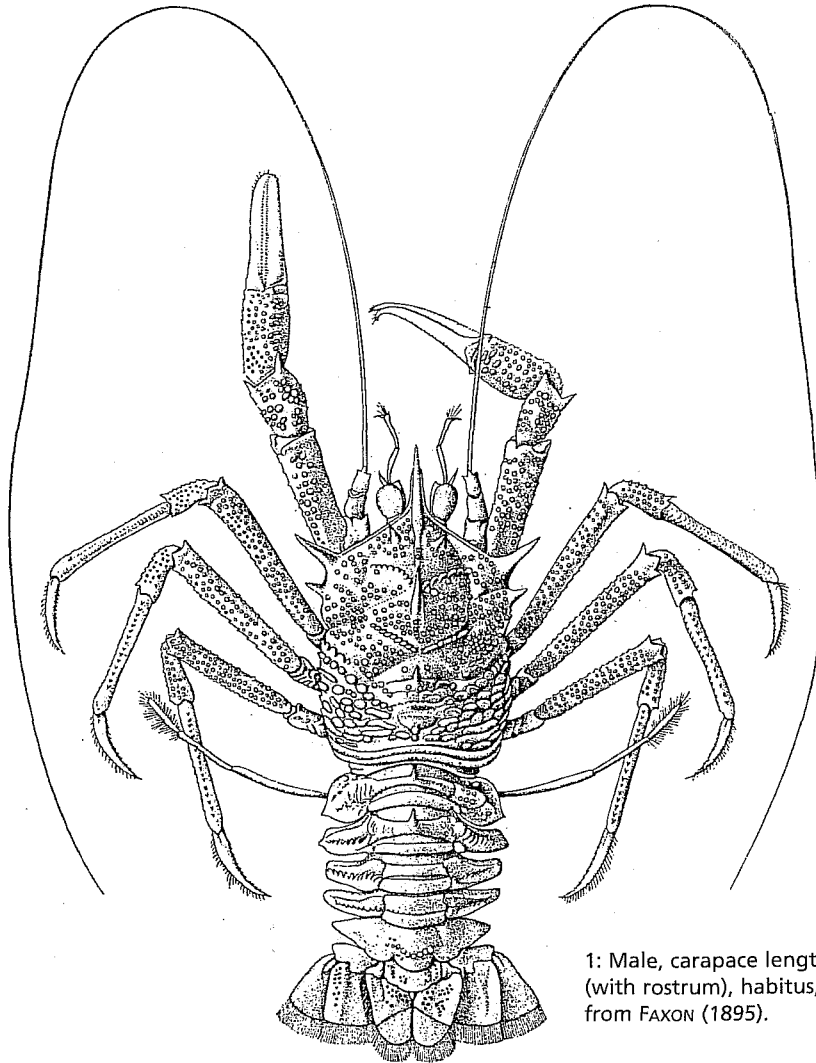
*Munidopsis diomedea* (FAXON, 1893)

**Size:** Up to 30 mm (with rostrum).

**Morphology:** Carapace covered with tubercles, dorsally armed with two well-developed epigastric, one extremely strong laterally compressed mesogastric, and one moderately large cardiac spine, with two lateral spines. Dorsal carapace surface smooth, without spines. Rostral spine upturned distally. Second to fourth abdominal tergites each with prominent median spine. Eyes movable and spineless, corneae subglobular. Chelipeds covered with granules, nearly spineless. Walking legs long,

slender, with numerous granules, subcylindrical. First walking leg overreaching chelipeds. Dactyli compressed laterally, flexor border moderately curving, bearing proximally diminishing low spines. Epipods present on chelipeds and first and second walking legs.

**Distribution:** East Pacific Rise. The species has been sampled in Eastern Pacific, from the Gulf of California to Chile, between 768 and 2026 m.



1: Male, carapace length ca. 30 mm (with rostrum), habitus, dorsal view; from FAXON (1895).

**References:**

- BABA K. (2005) Galathea Report **20**: 1-317.  
FAXON W. (1895) Mem. Mus. Comp. Zool. Harvard Coll. **18**: 1-292.  
HAIG J. & M. WICKSTEN (1975) Bull. South Calif. Acad. Sci. **74**: 100-105.  
KHODKINA I.V. (1991) Zool. Zh. **70**: 71-76.

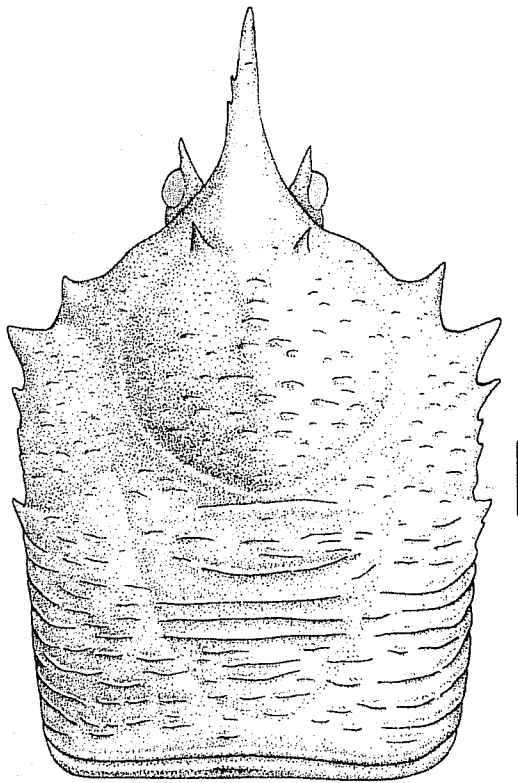
*Munidopsis exuta* MACPHERSON & SEGONZAC, 2005

**Size:** Up to 39.5 mm carapace length.

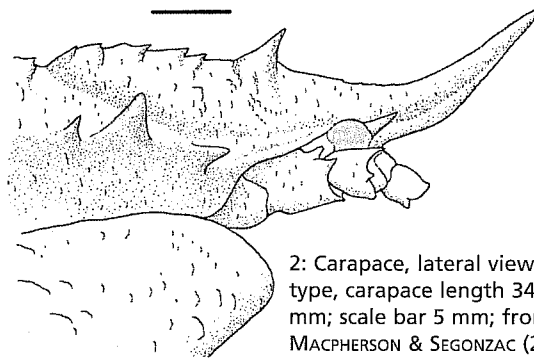
**Morphology:** Carapace with pair of epigastric spines, sometimes 2-3 additional small spines, covered by scale-like rugosities. Rostrum broad at base, distally narrowed and upturned, weakly carinated dorsally. Front margin oblique, antennal spine absent. Abdomen unarmed. Eyes not movable, cornea relatively large, clearly wider than eyespine. Chelipeds with several spines on merus and carpus, palm spineless, fixed finger moderately ridged along distal third of lateral margin. First walking leg slightly exceeding cheliped, dorsal crest of merus and carpus with row of spines along dorsal border; dactylus smoothly narrowed distally, flexor margin slightly curving, bearing low spines. Epipods on chelipeds, not on walking legs. The species was identified as *M. subsquamosa* by SAINT LAURENT (1985) and *M. crassa* by SEGONZAC (1992).

**Biology:** This species occurs in both abyssal (Gulf of Biscay, 2860 m) and hydrothermal vent environments (Mid-Atlantic Ridge: Snake Pit, Elan). It has been collected by baited trap together with a nephropid lobster *Thymopides laurentae* SEGONZAC & MACPHERSON, and a macrurid fish *Coryphaenoides amatus* (HECTOR), at the base of the active edifice, on sulphide rocks, among scattered sea anemones, chaetopterid tubeworms and alvinocaridid shrimps. The species has also been collected at the base of inactive chimney complex, among dead mytilid bivalves. An additional specimen (unfortunately lost) was collected during the cruise BRIDGE 1993 at the Mid-Atlantic Ridge hydrothermal vent site Broken Spur site (dive Alvin 2625, 27.06.1993, E. Southward, personal communication).

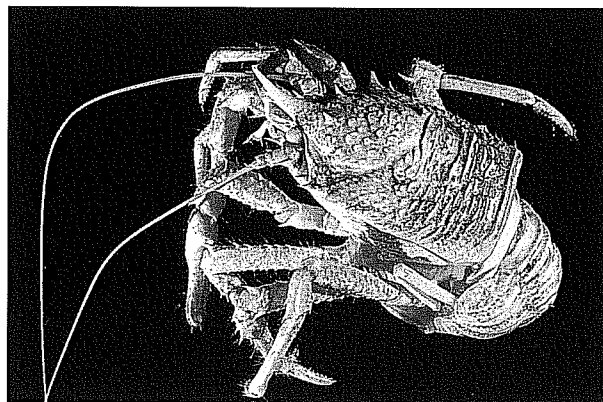
**Distribution:** Mid-Atlantic Ridge: Snake Pit, TAG, probably Broken Spur, and Logatchev; Gulf of Biscay.



1: Carapace, dorsal view; holotype, carapace length 34.7 mm; scale bar 5 mm; from MACPHERSON & SEGONZAC (2005).



2: Carapace, lateral view; holotype, carapace length 34.7 mm; scale bar 5 mm; from MACPHERSON & SEGONZAC (2005).



3: Specimen from Snake Pit; cruise Hydrosnake; by P. Briand © Ifremer.

**References:**

- MACPHERSON E. & M. SEGONZAC (2005) Zootaxa **1095**: 1-60.  
 SAINT LAURENT M. DE (1985) in Ifremer Brest (Ed.) Peuplements Profonds du Golfe de Gascogne: 469-478.  
 SEGONZAC M. (1992) C. R. Acad. Sci. Paris III **314**: 593-600.

*Munidopsis lauensis* BABA & DE SAINT LAURENT, 1992

**Size:** Up to 12.4 mm carapace length.

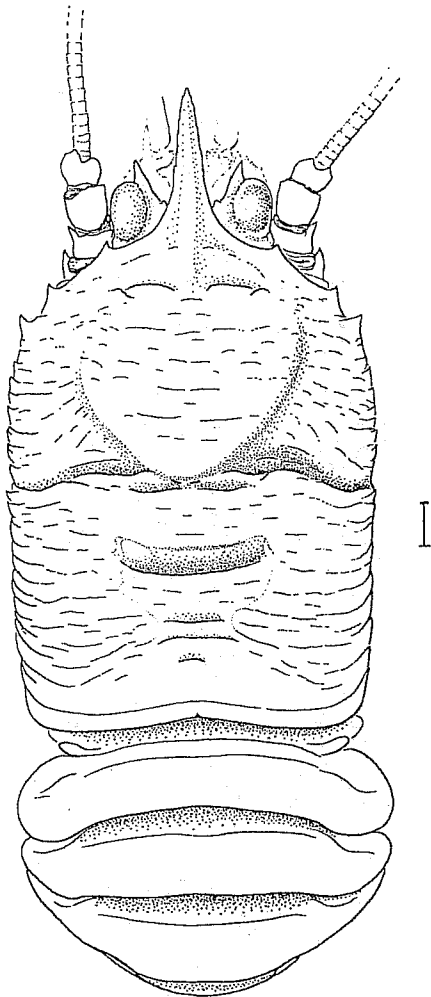
**Color:** Generally white, but some rare specimens are blackish, due to a manganese deposit.

**Morphology:** Carapace without dorsal spines or tubercles. Rostrum spiniform, horizontal and unarmed. Eye with small mesial spine, cornea large. Abdomen unarmed. Sixth abdominal segment having posteromedian margin transverse, exceeded by lateral lobes. Epipods absent from pereopods. First walking legs

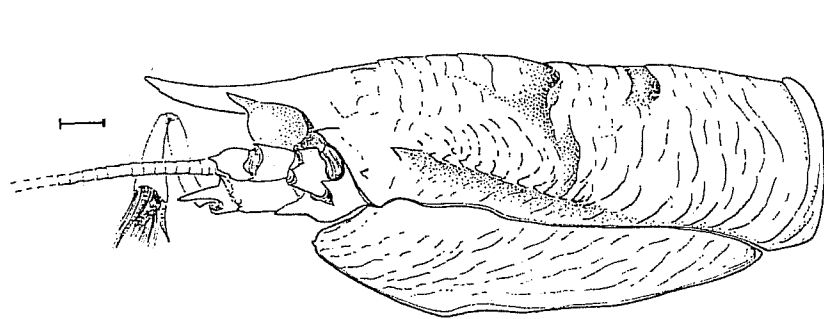
overreaching chelipeds. Fixed finger of chelipeds without denticulate carina on distolateral margin. Chelipeds and walking legs, with few small spines. Dactylus of walking legs with spines along entire flexor border.

**Biology:** On active hydrothermal sites, often in high density.

**Distribution:** North Fiji Back-Arc Basin: White Lady vent field; Lau Back-Arc Basin: Valu Fa Ridge, Hine Hina vent fields.



1: Carapace and abdomen, dorsal view; holotype male, carapace length 10.8 mm; scale bar 1 mm; by K. Baba & M. de Saint Laurent.



2: Carapace, lateral view; holotype male, carapace length 10.8 mm; scale bar 1 mm; by K. Baba & M. de Saint Laurent.



3: *Munidopsis* sp. (probably *M. lauensis*); cruise TUIM 07; by courtesy of C.R. Fisher.

**References:**

- BABA K. (2005) Galathea Report **20**: 1-317.  
BABA K. & M. DE SAINT LAURENT (1992) Sci. Mar. **56**: 321-332.  
DESBRUYÈRES D., ALAYSE-DANET A.-M. & S. OHTA (1994) Mar. Geol. **116**: 227-242.

*Munidopsis lentigo* WILLIAMS & VAN DOVER, 1983

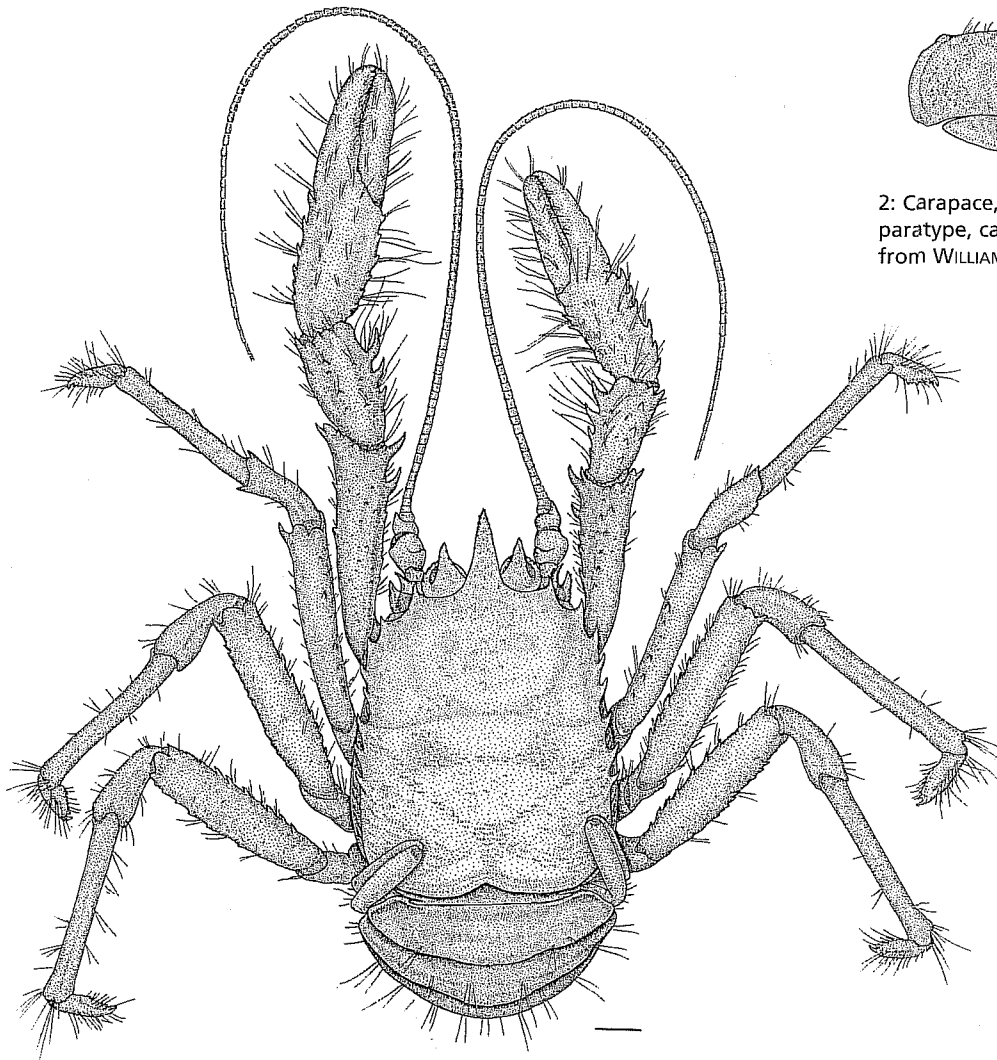
**Size:** Up to 12.8 mm carapace length.

**Morphology:** Dorsal carapace surface smooth, without spines. Rostrum unarmed, broad triangular and horizontal, not carinated dorsally. Front margin transverse, antennal spine present. Abdomen unarmed. Flattened eyes, depressed cornea, large median eyespine present. Chelipeds with several spines on merus and carpus, and palm, fixed finger of chelipeds without denticulate carina on distolateral margin. Lenticular-shaped, flat-

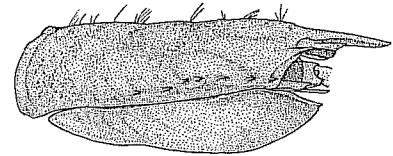
tened light brown spot on ventral surface of chela. First walking leg reaching nearly tip of cheliped, dorsal crest of merus with row of small spines; dactylus short, flexor margin bearing low spines. Epipods absent from pereopods.

**Biology:** Lives around the hydrothermal vents.

**Distribution:** East Pacific Rise: 21°N; south of Baja California.



1: Habitus, dorsal view; scale bar 1 mm; female paratype, carapace length 11.9 mm; from WILLIAMS & VAN DOVER (1983).



2: Carapace, lateral view; female paratype, carapace length 11.9 mm; from WILLIAMS & VAN DOVER (1983).

**References:**

- BABA K. (2005) Galathea Report **20**: 1-317.  
WILLIAMS A.B. & C. VAN DOVER (1983) Proc. Biol. Soc. Wash. **96**: 481-488.

*Munidopsis marianica* WILLIAMS & BABA, 1989

**Size:** Up to 38.0 mm carapace length.

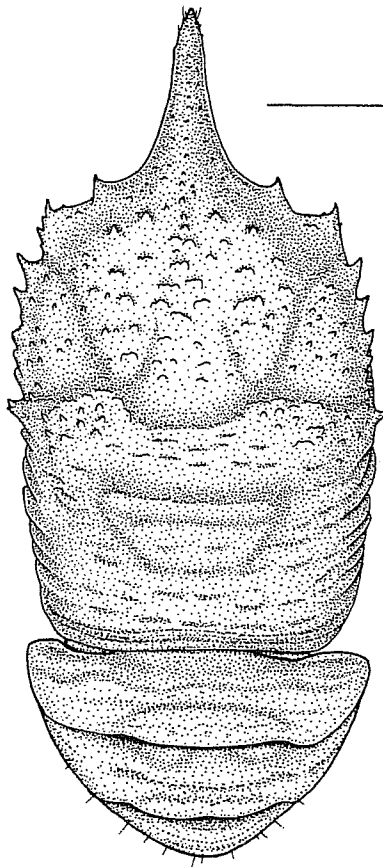
**Morphology:** Dorsal carapace surface without spines, covered by scale-like rugosities. Rostrum unarmed, broad triangular and horizontal, weakly carinated dorsally. Front margin oblique, small antennal spine present. Abdomen unarmed. Eyes movable, large mesial eyespine small lateral eyespine, cornea relatively large, wider than mesial eyespine. Chelipeds with several spines on merus and carpus, palm spineless, fixed finger of

chelipeds without denticulate carina on distolateral margin. First walking leg reaching nearly tip of cheliped, dorsal crest of merus and carpus with row of spines along dorsal border; dactylus smoothly narrowed distally, flexor margin nearly stright, bearing low spines. Epipods present on chelipeds.

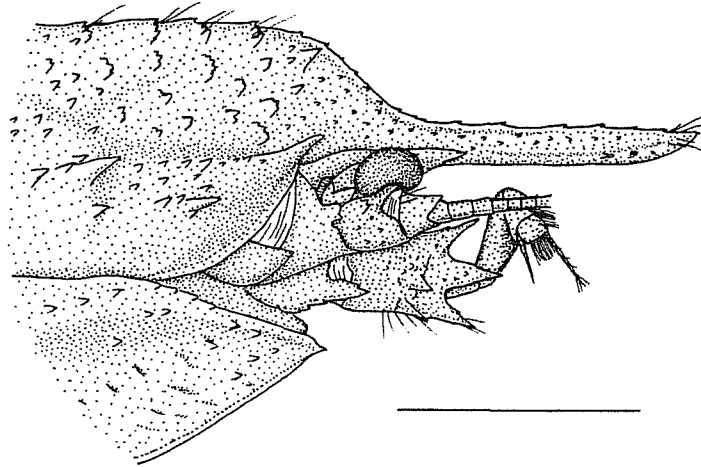
**Biology:** Lives at both vent and non vent areas.

**Distribution:** Western Pacific Ocean, Mariana Back-Arc Basin.

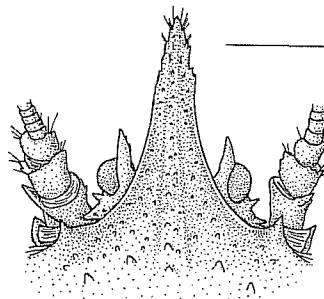
1-4: Female holotype, carapace length 38.0 mm; scale bar 10 mm; by A.B. Williams & K. Baba.



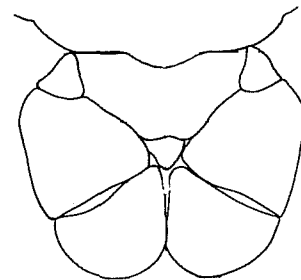
1: Carapace and abdomen, dorsal view.



3: Anterior part of carapace, lateral view.



2: Rostrum and anterior part of carapace, dorsal view.



4: Telson, no scale.

**References:**

- BABA K. (2005) Galathea Report **20**: 1-317.  
WILLIAMS A.B. & K. BABA (1989) Fish. Bull. **87**: 899-910.

*Munidopsis sonne* BABA, 1995

**Size:** Up to 12.8 mm carapace length.

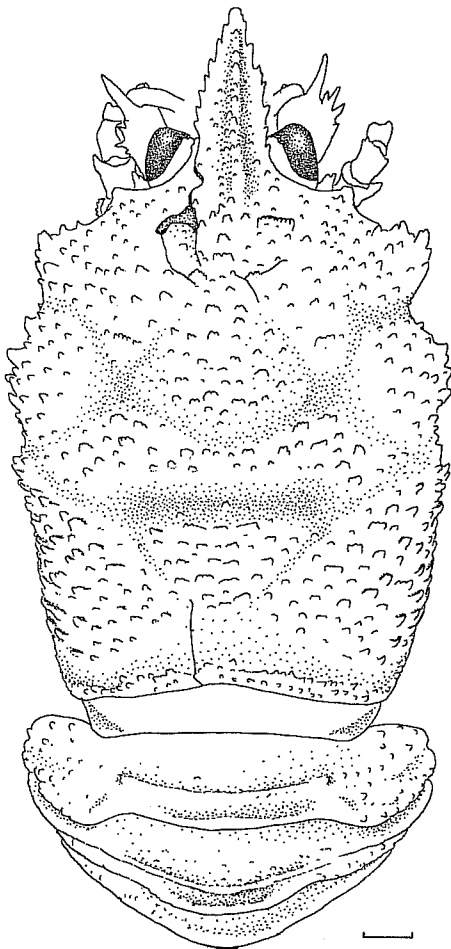
**Morphology:** Dorsal carapace surface covered with numerous tubercle-like setiferous processes, gastric region with pair of epigastric processes. Rostrum nearly triangular, nearly horizontal, lateral margins serrate. Front margin with antennal acute process. Anterolateral angle produced. Abdomen unarmed; sixth abdominal segment with weak posterolateral lobe, posterior margin not produced. Eyes immovable, cornea narrowed distally. Antennular basal segment cristate dorsolaterally, with row of several spines. Chelipeds subcylindrical, covered with

tubercular processes and blunt short spines, longer than second walking legs; fixed finger without denticulate carina on distolateral margin. Walking legs diminishing in length posteriorly; dactyli rather straight in first and second legs, more curving on third; setae along distal two-thirds of flexor border. Epipods present on chelipeds, first and second walking legs.

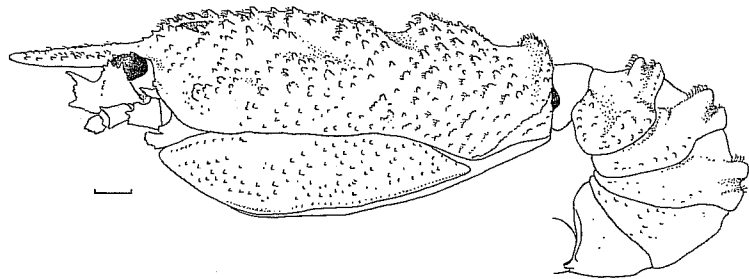
**Biology:** Lives around hydrothermal vents.

**Distribution:** North Fiji Back-Arc Basin.

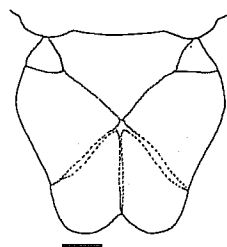
1-3: Ovigerous female holotype, carapace length 10.5 mm; scale bar 1 mm; by K. Baba.



1: Carapace and abdomen, dorsal view.



2: Carapace and abdomen, lateral view.



3: Telson.

**References:**

- BABA K. (1995) *Crustac. Res.* **24**: 188-193.  
BABA K. (2005) *Galathea Report* **20**: 1-317.

*Munidopsis starmer* BABA & DE SAINT LAURENT, 1992

**Size:** Up to 33.4 mm carapace length.

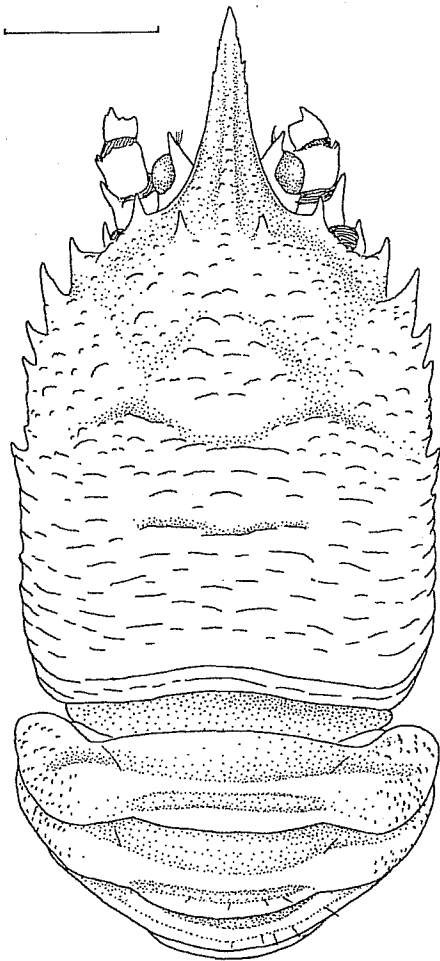
**Morphology:** Carapace with two epigastric spines, dorsal surface smooth. Rostrum spiniform, upwards directed, unarmed. Eye with small mesial spine, cornea large. Abdomen unarmed. Sixth abdominal segment having posteromedian margin transverse, exceeded by lateral lobes. Epipods absent from pereopods. First walking legs overreaching chelipeds. Fixed finger of

chelipeds without denticulate carina on distolateral margin. Chelipeds and walking legs, with few small spines. Dactylus of walking legs with spines along entire flexor border.

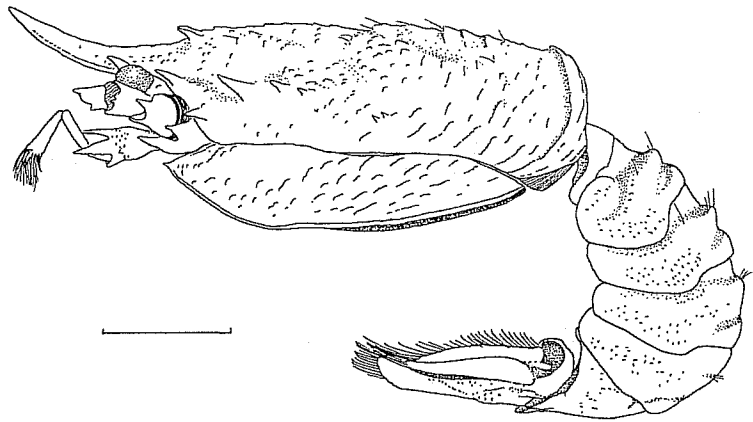
**Biology:** Lives on active hydrothermal vents.

**Distribution:** North Fiji Back-Arc Basin: site White Lady.

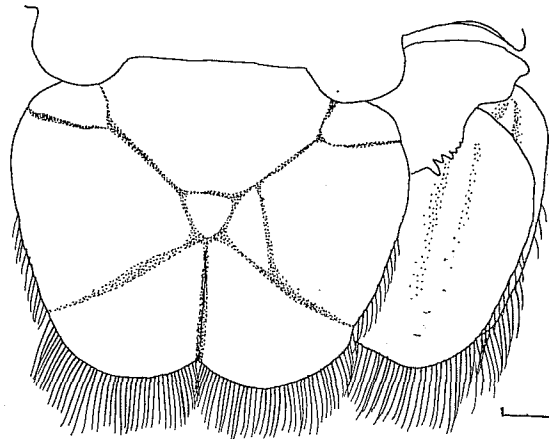
1-3: Female holotype, carapace length 31.4 mm; by K. Baba & M. de Saint Laurent.



1: Carapace and abdomen, dorsal view; scale bar 10 mm.



2: Carapace and abdomen, lateral view; scale bar 10 mm.



3: Telson; scale bar 1 mm.

**References:**

BABA K. (2005) Galathea Report **20**: 1-317.

BABA K. & M. DE SAINT LAURENT (1992) Sci. Mar. **56**: 321-332.

DESBRUYÈRES D., ALAYSE-DANET A.M., OHTA S. & the Scientific Parties of Biolau and Starmer Cruises (1994) Mar. Geol. **116**: 227-242.

*Munidopsis* WHITEAVES, 1874

**Size:** Up to 45 mm carapace length.

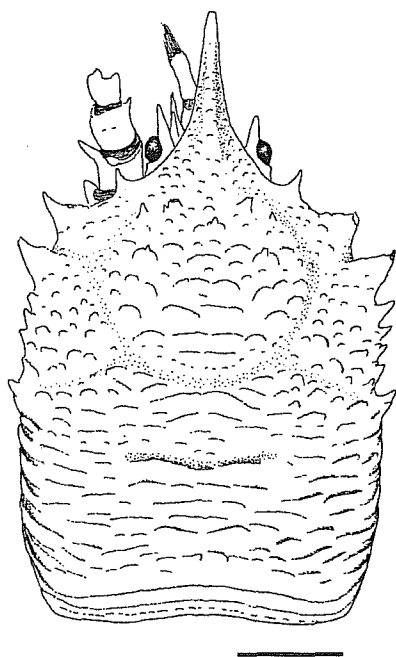
**Morphology:** Carapace with gastric region having group of spines including two epigastric spines and some additional small spines or tubercular spines on scale-like ridges. Lateral margin having first spine (anterolateral) distinctly larger than antennal spine, directed anterolateral, second spine stronger than first. Rostrum subtriangular in proximal half, distally narrowed, slightly upcurved, dorsally carinated. Front margin oblique, antennal spine small. Abdominal segments unarmed, sixth segment having posteromedian margin slightly convex, not produced. Telson composed of 10 plates, midlateral plate produced on anterolateral margin. Ocular peduncles broad at base, distomesially with eye-spine distinctly longer than cornea; cornea relatively small, as broad as eye-spine. Fixed finger of chelipeds without denticulate carina on distolateral margin. First walking leg exceeding chelipeds; palm shorter than

fixed finger, bearing a few spines along mesial margin; fingers spooned at tip. Dactyli of walking legs smoothly narrowed distally, flexor margin bearing ultimate denticle equidistant between penultimate denticle and end of article. Epipods present on chelipeds.

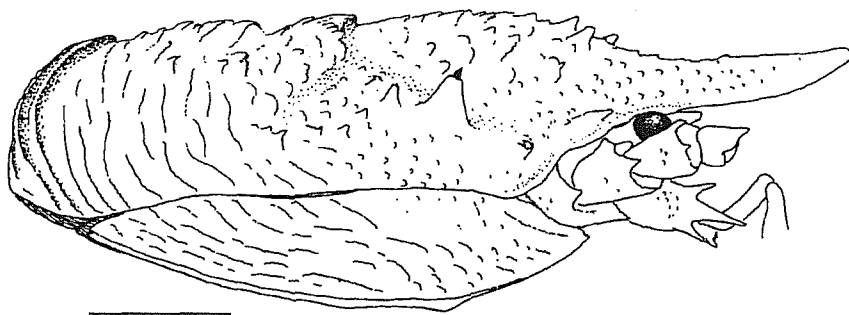
**Remarks.** This species has been reported from the hydrothermal vents of the Galapagos Spreading Center under the name of *M. subsquamosa* HENDERSON, 1885, but it belongs to a different species, probably undescribed. A more careful examination, including molecular analyses, of the specimens from different localities will clarify the systematic status of this species.

**Biology:** Occurrences around the hydrothermal vents may be revised.

**Distribution:** Galapagos Spreading Center, East Pacific Rise.



1: Carapace, dorsal view; scale bar 5 mm; from BABA (2005).



2: Right, carapace, lateral view; bar 5 mm; from BABA (2005).

**Reference:**

BABA K. (2005) Galathea Report 20: 1-317.

E. MACPHERSON & K. BABA

Denisia 18 (2006): 448



*Shinkaia crosnieri* BABA & WILLIAMS, 1998

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**Size:** Up to 43.7 mm carapace length (Taiwanese specimen 45 mm, 58.9 mm with rostrum).

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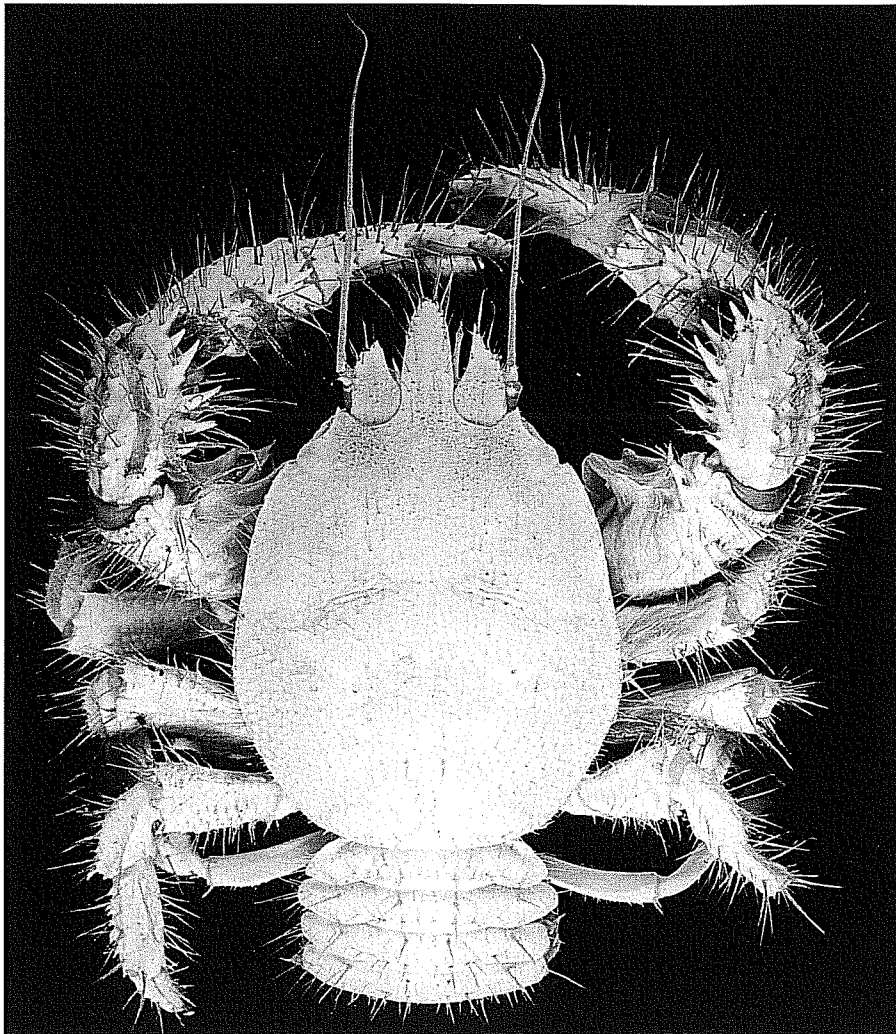
**Morphology:** Dorsal carapace surface smooth, lateral margins bearing many small spines. Rostrum prominent, flattened dorsally, triangular, not carinated dorsally. Orbital margin concave, antennal spine present. Pterygostomial flap anteriorly produced, covering greater part of antennal peduncle. Dense long plumose setae on sternum, pterygostomial flap and ventral surface of pereopods. Abdomen unarmed. Flattened eyes, with

dorsally flattened projection. Chelipeds strong, broad, depressed, with numerous short spines. Walking legs stout and moderately flattened. Epipods present on chelipeds, first and second walking legs.

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**Distribution:** Western Pacific: Edison Seamount; Okinawa Trough, Iheya Ridge, North Iheya Knoll; off NE Taiwan, 1200-1500 m.

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1: Male carapace length 45 mm, dorsal view; by T.-Y. Chan.

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**References:**

- BABA K. (2005) Galathea Report **20**: 1-317.  
BABA K. & A.W. WILLIAMS (1998) Zoosystema **20**: 143-156.  
CHAN T.-Y., LEE D.-A. & C.S. LEE (2000) Bull. Mar. Sci. **67**(2): 799-804.  
FUJIKURA K. & T. OKUTANI (2002) Benthos Research **57**: 21-30.  
WATABE H. (2000) JAMSTEC J. Deep-Sea Res. **17**: 29-34.

*Kiwa hirsuta* MACPHERSON, JONES & SEGONZAC, 2005 "yeti crab"

**Size:** Carapace length 51.5 mm (58.6 mm with rostrum), total length 88.4 mm.

**Color:** Uniformly white, with yellow corneous tip at the extremity of the chelipeds 1.

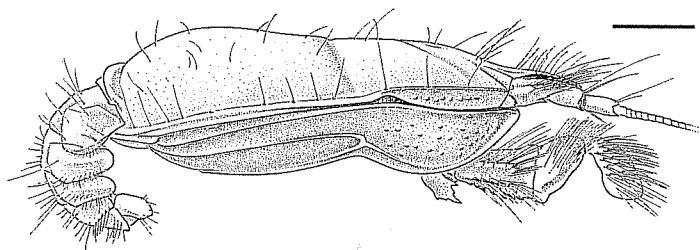
**Morphology:** Carapace, excluding rostrum, 1.3 times longer than broad, dorsal surface smooth. Front margin slightly oblique, with small tooth near rostrum; anterolateral angle rounded. Rostrum broadly triangular, horizontal, slightly concave dorsally, lateral borders granulated, with long uniramous setae; ventral side slightly carinated. Insertion of fifth pereopod not visible and situated below sternal plastron. Eyes strongly reduced, membranous remains, without pigment. Antennal scale absent. Antennal peduncle without scaphocerite. Flagellum as long as carapace without rostrum. Chelipeds and walking legs with dense mat of setae. Telson as wide as long, median transverse suture separating anterior and posterior portions. Chelipeds and walking legs with numerous rows of spines, each spine with yellow corneal tip and tuft of long and dense plumose setae, only absent in cheliped fingers, setae denser and longer in mesial and ventral sides than in lateral and dorsal sides. Chelipeds nearly symmetric, slightly more than twice as long as carapace including rostrum. Fingers somewhat triangular, without setae, having numerous spines decreasing in size distally, distal areas of fingers unarmed; slightly gapping, and

distally spoon-shaped; movable finger with proximal large denticulate tooth followed by cutting margin bordered with smooth, low, corneous scales, ending in acute corneous point; fixed finger with some proximal small teeth, followed by cutting edge similar to movable finger and ending in acute corneous point, additional row of mesial granules ending in acute corneous point; fingers distally crossing, corneous tip of movable finger crossing between two corneous tips of fixed finger. Paired pleopods present.

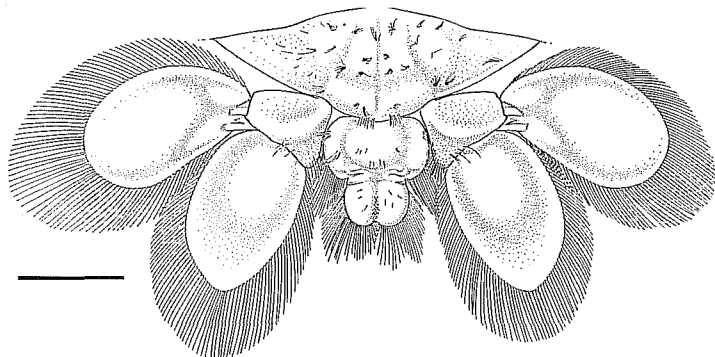
**Setae:** the pereopods, and in particular the chelipeds, are densely covered with flexible setae (ca. 15 mm) having clusters of filamentous bacteria, mainly at distal part. Other rigid chitinous setae (ca. 13 mm) are barbed in the distal part, ending in a rigid spine, and they are regularly inserted in pairs mainly on the merus of the chelipeds. They are deprived of bacteria.

**Biology:** Occurs at densities of one to two individuals per 10 m<sup>2</sup>, more or less regularly spaced on the zone of pillow basalt surrounding active hydrothermal vents, and at the base of chimneys among vent mussels *Bathymodiolus* sp., crabs bythograeid spp. and ophidiid fish. Omnivorous.

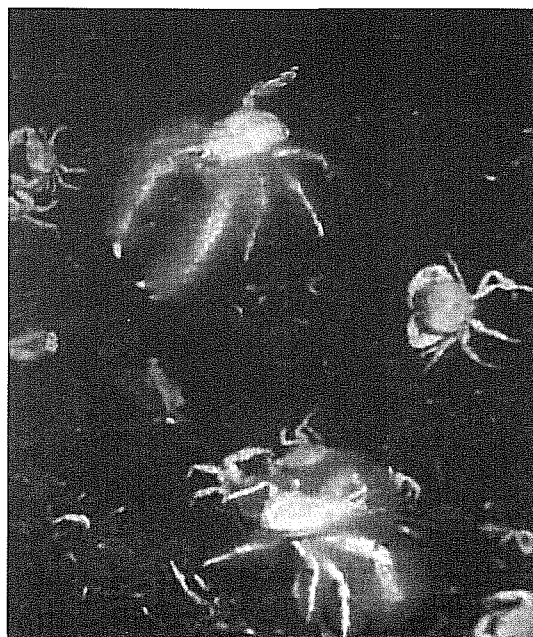
**Distribution:** Pacific-Antarctic Rise: German Flats, 38°S. This animal was first observed (and noted as "type Shinkaiinae", but not collected), in 2001 by the German cruise Sonne SO-157 (STECHEER et al. 2002).



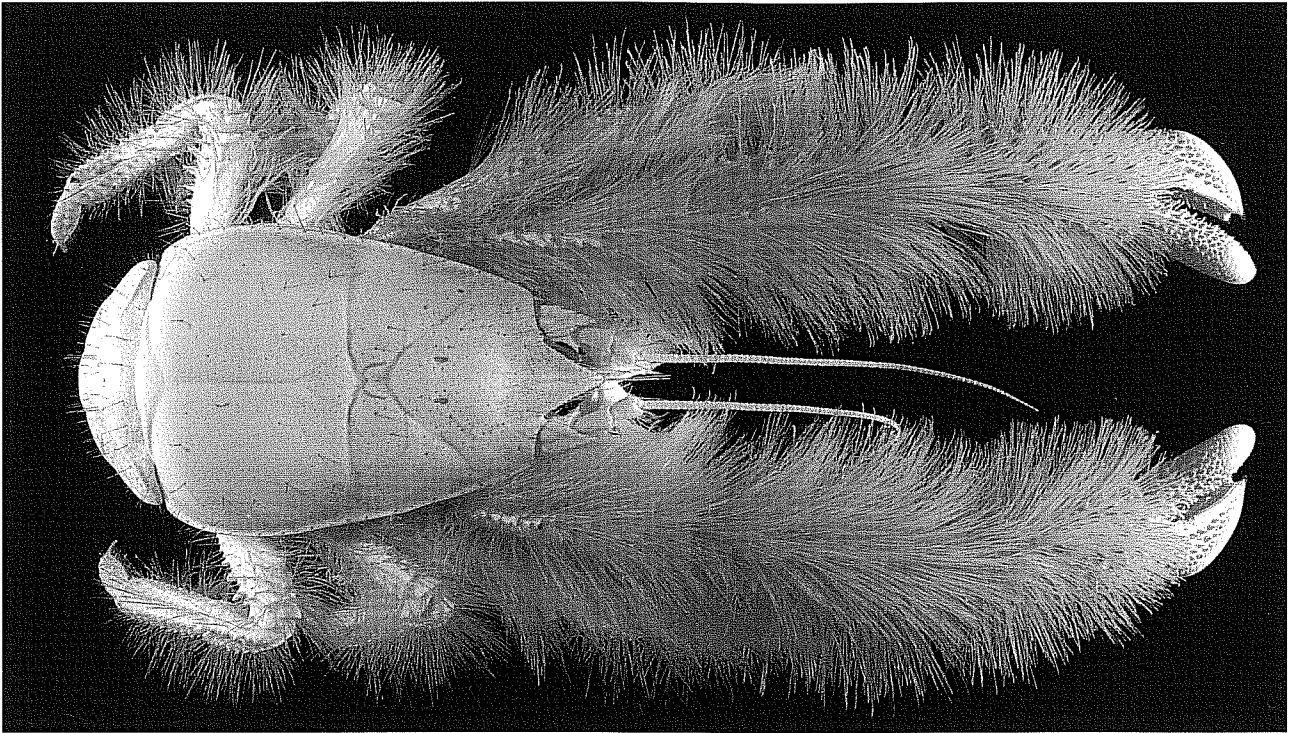
1: Carapace and abdomen, lateral view; scale bar 10 mm; by J.-F. Dejouannet © IRD.



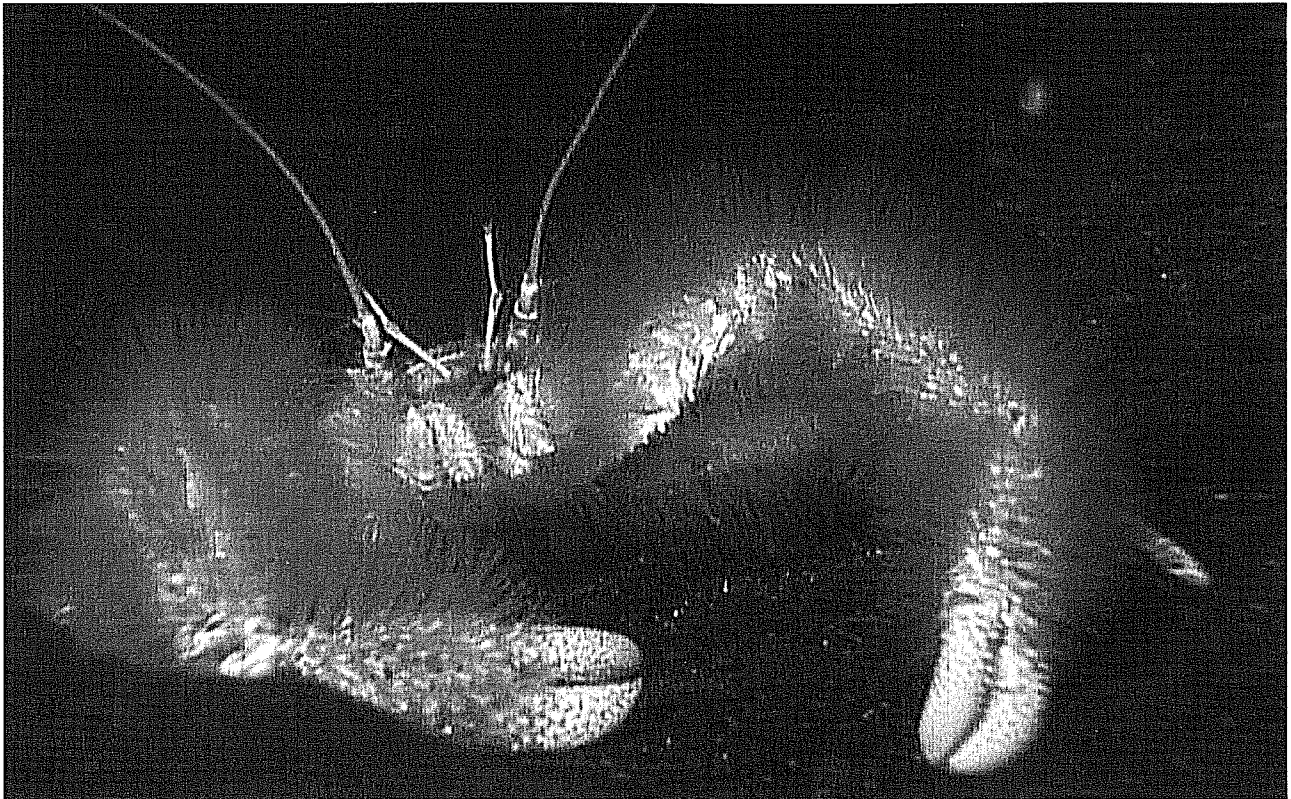
2: Sixth segment of abdomen, telson and uropods, dorsal view; scale bar 5 mm; by J.-F. Dejouannet © IRD.



3: Two specimens on mussel bed, among bythograeid crabs on vent site Annie's Anthill (Southern East Pacific Rise); cruise PAR 5; by courtesy of R. Vrijenhoek © MBARI.



4: Male holotype, dorsal view; by A. Fifis © Ifremer.



5: One specimen on pillow lava, taken on the site Pâle Etoile (Southern East Pacific Rise); cruise, PAR 5; by courtesy of R. Vrijenhoek © MBARI.

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#### References:

- MACPHERSON E., JONES W.J. & M. SEGONZAC (2005) *Zoosystema* **27**(4): 709-723.  
STECHER J., TÜRKAY M. & C. BOROWSKI (2002) *Cah. Biol. Mar.* **43**: 271-274.

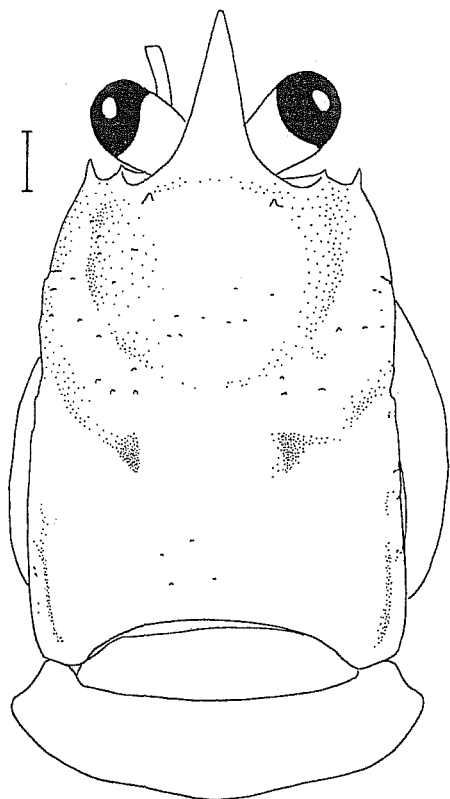
*Uroptychus bicavus* BABA & DE SAINT LAURENT, 1992

**Size:** Up to 7.5 mm carapace length.

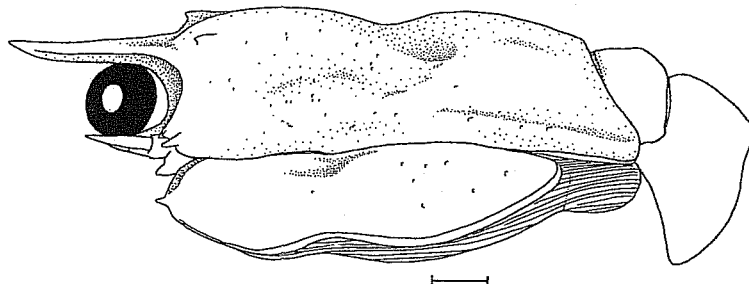
**Morphology:** Carapace smooth, lateral margin without distinct spine other than anterolateral spine. Epigastric spines on dorsal surface. Rostrum moderately broad triangular, slightly upturned apically. Fourth sternite rounded on anterolateral corner. Antennal scale barely reaching midlength of fifth antennal article. Propodus of first walking legs slightly longer than carpus. Dactylus of walking legs with flexor marginal spines not contiguous to flexor margin.

**Biology:** Living in low number among vent community.

**Distribution:** North Fiji Back-Arc Basin: site Mussel Valley.



1: Habitus, dorsal view; holotype male, carapace length 7.5 mm; scale bar 1 mm; by K. Baba & M. de Saint Laurent.



2: Habitus, lateral view; holotype male, carapace length 7.5 mm; scale bar 1 mm; by K. Baba & M. de Saint Laurent.

**References:**

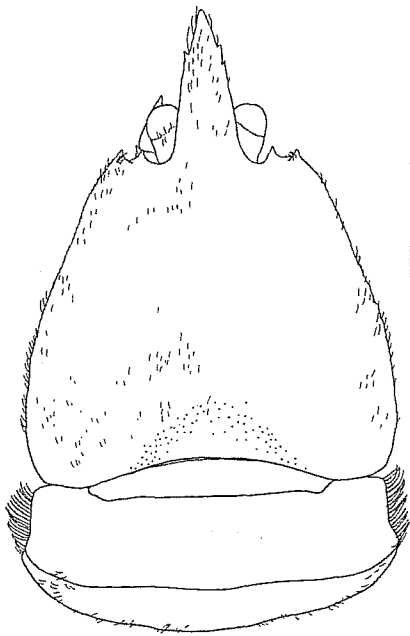
- BABA K. (2005) Galathea Report **20**: 1-317.  
BABA K. & M. DE SAINT LAURENT (1992) Sci. Mar. **56**: 321-332.  
DESBRUYÈRES D., ALAYSE-DANET A.-M. & S. OHTA (1994) Mar. Geol. **116**: 227-242.

*Uroptychus edisonicus* BABA & WILLIAMS, 1998

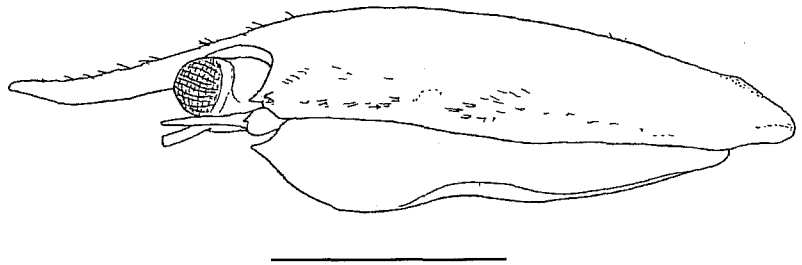
**Size:** Up to 8.4 mm carapace length.

**Morphology:** Carapace smooth, lateral margin without distinct spine other than anterolateral spine, not laterally serrate. Epigastric spines absent. Rostrum narrow triangular, weakly curving dorsad distally. Fourth sternite relatively narrow on anterolateral corner. Antennal scale overreaching end of penultimate segment. Propodus of walking legs unarmed on dorsal crest, with spines on distal portion of flexor margin, distal-most remotely separated from distal second, and situated near juncture with dactylus; propodus with convex flexor distal margin. Dactylus of second walking leg with two distal spines remotely separated from proximal group of spines.

**Distribution:** Western Pacific: Bismarck Archipelago, Edison Seamount, near Lihi Island.



1: Ovigerous female holotype, carapace length 6.2 mm; dorsal view; scale bar 3 mm; by K. Baba & A.B. Williams.



2: Ovigerous female holotype, carapace length 6.2 mm; lateral view; scale bar 3 mm; by K. Baba & A.B. Williams.

**References:**

- BABA K. (2005) Galathea Report **20**: 1-317.  
BABA K. & A.B. WILLIAMS (1998) Zoosystema **20**: 143-156.

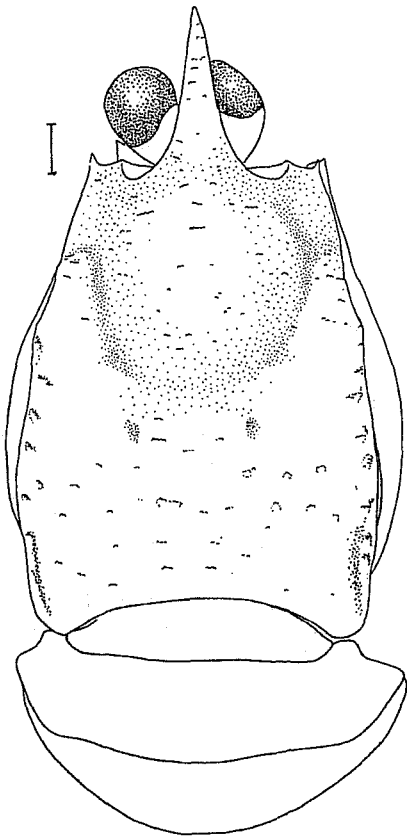
*Uroptychus thermalis* BABA & DE SAINT LAURENT, 1992

**Size:** Up to 8.4 mm carapace length.

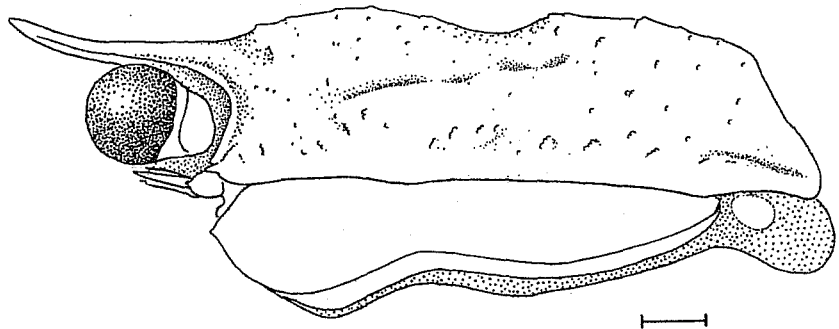
**Morphology:** Carapace smooth, lateral margin without distinct spine other than anterolateral spine. Epigastric spines absent. Rostrum narrow triangular, weakly curving dorsad distally. Fourth sternite relatively narrow on anterolateral corner. Antennal scale overreaching end of penultimate segment. Propodus of walking legs with spines on distal portion of flexor margin, distal-most remotely separated from distal second, and situated near juncture with dactylus; propodus without convex flexor distal margin. Dactylus of second walking leg with two distal spines remotely separated from proximal group of spines.

**Biology:** Living in few number among vent community.

**Distribution:** North Fiji Back-Arc Basin: White Lady. Known also from Queensland, at 1497 m.



1: Habitus, dorsal view; male holotype, carapace length 8.4 mm; scale bar 1 mm; from BABA & SAINT LAURENT (1992).



2: Habitus, lateral view; male holotype, carapace length 8.4 mm; scale bar 1 mm; from BABA & SAINT LAURENT (1992).

**References:**

- AHYONG S. & G.C.B. POORE (2004) Zootaxa **436**: 1-88.  
BABA K. (2005) Galathea Report **20**: 1-317.  
BABA K. & M. DE SAINT LAURENT (1992) Sci. Mar. **56**: 321-332.

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## Crustacea, Brachyura

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Very few representatives of brachyuran crabs have colonized the deep oceans: the families Geryonidae (maximal depth 1500 m) and Ethusidae GUINOT, 1977 (maximal depth 5500 m). Therefore it was surprising to find a brachyuran group living in high density at the hydrothermal vents of the mid-oceanic ridges and back-arc basins between 2500 and 4000 m depths.

Twelve species of hydrothermal brachyuran crabs are presently described. All species restricted to hydrothermal vents belong to a single family, the Bythograeidae, including four genera: *Bythograea* (five species from the East Pacific Rise), *Allograea* (one species from the East Pacific Rise), *Cyanograea* (one species from the East Pacific Rise), *Austinograea* (four species, three from back-arc basins, and one from the Central Indian Ridge), and *Segonzacia* (one species from the Mid-Atlantic Ridge). A possibly new species of *Austinograea* from the Lau Back-Arc Basin is currently under description. In addition, some opportunistic species such as *Chaceon affinis* (Geryonidae) from Menez Gwen, Mid-Atlantic Ridge and *Xenograpsus testudinatus* (Varunidae) from the shallow waters of the Okinawa Arc are also present in active vent sites.

A joint work between morphologists and molecular taxonomists allowed for the confirmation of new species of *Bythograea* (with the sister species *Bythograea thermydron*/*B. galapagensis*; and *B. laubieri*/*B. vrijenhoeki*). The phylogeny of all bythograeid genera, joining morphological and molecular data, is in preparation (HURTADO et al., pers. comm.). Based on spermatozoal ultrastructure of three bythograeid species *Bythograea thermydron*, *Austinograea alayseae* and *Segonzacia mesatlantica*, TUDGE et al. (1998) suggest that the bythograeids derive from the Xanthidae MACLEAY, 1838 sensu lato, and in particular of an ancestor of *Calocarcinus* CALMAN, 1909 (Trapeziidae MIERS, 1886), a crab of deep-sea coral reefs, which colonized the hydrothermal systems in or after the Eocene. Preliminary molecular studies (unpublished) support affinities of several vent crab families of Xanthoidea; nevertheless other studies are still necessary to corroborate this hypothesis.

The bythograeids are widely distributed on the western Pacific back-arc basins, the mid-oceanic ridges of the Pacific with

clear northern limit at 21°N, and the North Atlantic and Central Indian Oceans. It is noted that in spite of the distance, which separates these populations, the Central Indian Ridge populations are more closely related to those of the back-arc basins than those from the North Atlantic. Southern Mid-Atlantic Ridge and Indian Ridge, however, have not been visited often and are insufficiently explored.

Only a few studies were made on vent crab fecundity. *B. thermydron* produces a considerable quantity of eggs (up to 30 000, VAN DOVER 1985), which develop to zoea larvae. These larvae are rarely found in vent areas, but the larger megalope stage, especially of *B. thermydron* and *B. microps*, is often found in large quantities in tubeworm and mussel aggregations. Megalopes of *Cyanograea praedator* were collected, but juvenile and sub-adult stages have yet to be found.

It is important to note that several bythograeid species have reduced eyestalks and are even blind when adult. In other species (*C. praedator*), the eyes and their peduncles are unmovable and covered by vent mineral deposits.

Crabs have a relatively hard carapace and special care should be taken of the legs. For descriptions, the specimens must be as intact as possible; damaged specimens may be too easily misidentified. In general, males with their sexual gonopods are necessary to identify the species with certainty. Crabs have to be first fixed in 10% buffered formaldehyde, but then preserved in 75% ethyl or isopropyl alcohol. Prior to fixation, a leg (P3 or P4) has to be preserved in 80% ethanol for molecular analyses.

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### References:

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- MARTIN J.W. & T. HANEY (2005) Zool. J. Linn. Soc. **145**: 445-522.  
TUDGE C.C., JAMIESON B.G.M., SEGONZAC M. & D. GUINOT (1998) Invertebr. Reprod. Dev. **34**: 13-23.  
VAN DOVER C.L., FACTOR J.R., WILLIAMS A.B. & C.J. JR BERG (1985) Biol. Soc. Wash. Bull. **6**: 223-227.