

This article was downloaded by: [University of Bath]

On: 13 February 2014, At: 16:37

Publisher: Taylor & Francis

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Journal of Natural History

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/tnah20>

A new North-East Atlantic species of *Bacescomysis* (Mysidacea, Crustacea) with original moth-like antennules

J.-P. Casanova^a & L. de Jong^a

^a ER Biodiversité & Environnement, Université de Provence, 3, Place Victor Hugo, 13331, Marseille cedex 3, France

^b ER Biodiversité & Environnement, Université de Provence, 3, Place Victor Hugo, 13331, Marseille cedex 3, France E-mail:

Published online: 21 Feb 2007.

To cite this article: J.-P. Casanova & L. de Jong (2005) A new North-East Atlantic species of *Bacescomysis* (Mysidacea, Crustacea) with original moth-like antennules, *Journal of Natural History*, 39:21, 1839-1849, DOI: [10.1080/00222930400023784](https://doi.org/10.1080/00222930400023784)

To link to this article: <http://dx.doi.org/10.1080/00222930400023784>

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the "Content") contained in the publications on our platform. However, Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Any opinions and views expressed in this publication are the opinions and views of the authors, and are not the views of or endorsed by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor and Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. Terms & Conditions of access and use can be found at <http://www.tandfonline.com/page/terms-and-conditions>

A new North-East Atlantic species of *Bacescomysis* (Mysidacea, Crustacea) with original moth-like antennules

J.-P. CASANOVA & L. DE JONG

ER Biodiversité & Environnement, Université de Provence, 3, Place Victor Hugo, 13331, Marseille cedex 3, France

(Accepted 11 November 2004)

Abstract

A new Mysidacea, *Bacescomysis papilio*, with a unique, supernumerary complement of sensilla on the antennules, is described from the Porcupine Abyssal Plain (4848 m) in the North-East Atlantic. Comparisons are made with the species of *Bacescomysis* and of the related genus *Hansenomysis*. Biological and biogeographical remarks on these two genera are provided, i.e. role of antennule, adaptations to deep water, and correlations between depth range of species and latitude.

Keywords: *Atlantic, Bacescomysis, biogeography, ecology, Mysidacea, Petalophthalmidae, taxonomy*

Introduction

Within the framework of the programme BENGAL, particle traps were moored on the Porcupine Abyssal Plain during the cruise Discovery 231 in March 1998, and recovered in September 1998 during the cruise Discovery 237. In one of them, deployed at a depth of 4848 m, 2.5 m above the bottom, a male specimen of Mysidacea was caught in a very good state of preservation. It is remarkable for its long and unusual plumose antennules, looking like those of a moth. A careful observation revealed it belongs to a new species of the deep-water genus *Bacescomysis* Murano and Krygier, 1985 (family Petalophthalmidae, suborder Mysida), described herein.

Bacescomysis papilio n. sp.
(Figures 1, 2, 3a, 4a–e, 5, 6)

Diagnosis

Length, measured from the eye notch of the carapace to the tip of the telson, 20.8 mm; outer flagellum of antennule shorter than inner flagellum but considerably thicker, with

Correspondence: L. de Jong, ER Biodiversité & Environnement, Université de Provence, 3, Place Victor Hugo, 13331, Marseille cedex 3, France. Email: bioplank@up.univ-mrs.fr

Published 29 April 2005.

ISSN 0022-2933 print/ISSN 1464-5262 online © 2005 Taylor & Francis Group Ltd
DOI: 10.1080/00222930400023784

tufts of sensilla on the inner side of each article; anterior part of cephalothorax, and more particularly mouth area, violet coloured; lateral margins of carapace deeply indented.

Material examined

Male holotype (North-East Atlantic, Porcupine Abyssal Plain, 48°55.02'N, 16°25.74'W, 4848 m depth), deposited at the Muséum national d'Histoire naturelle (Paris), reg. no. MNHN-My 492.

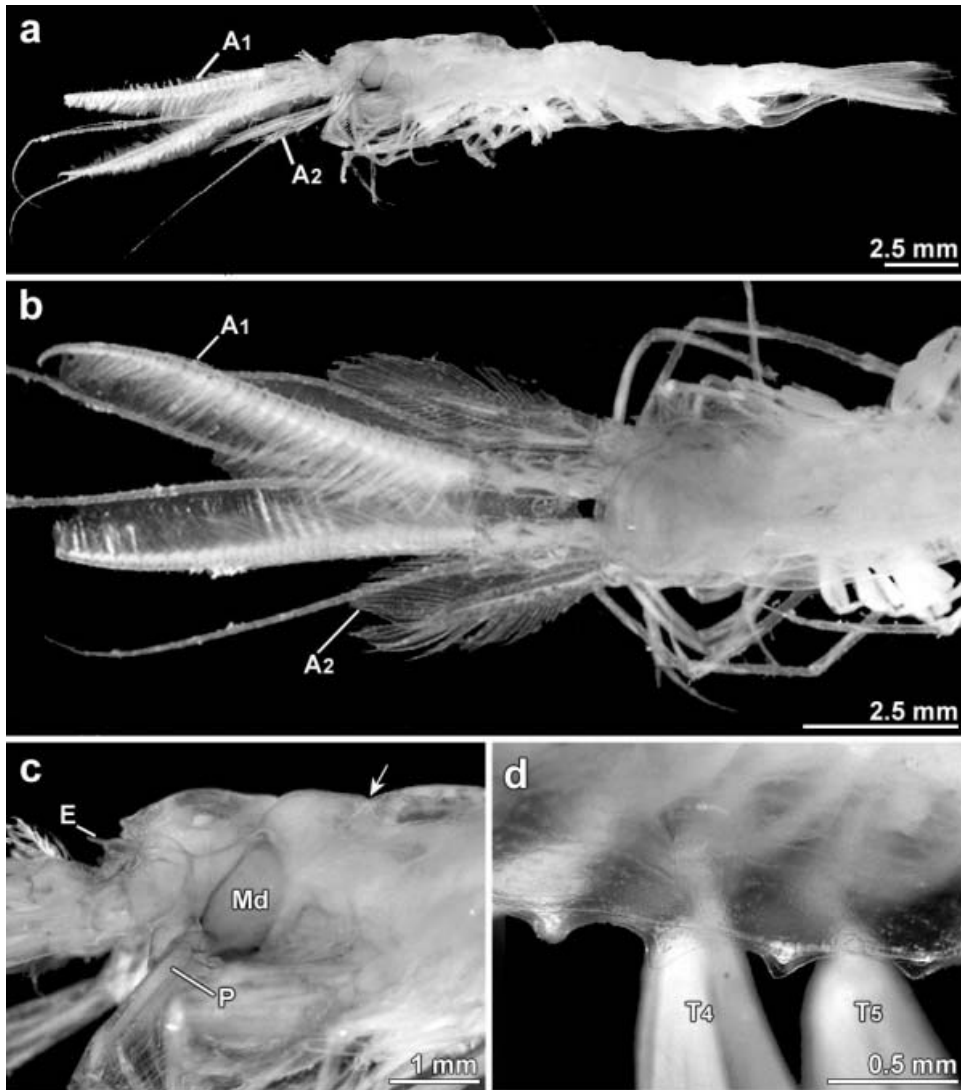


Figure 1. *Bacescomysis papilio* n. sp. (a) Left lateral view; (b) dorsal anterior view; (c) lateral anterior view showing the mandible (Md) with its palp (P) and the cervical sulcus (arrow) of the carapace; (d) postero-lateral view of the carapace showing its indented margin. Note in (a–c) that the anterior violet-coloured area is darker than the rest of the body. A₁, antennule; A₂, antenna; E eyeplate; T₄ and T₅, thoracopods 4 and 5.

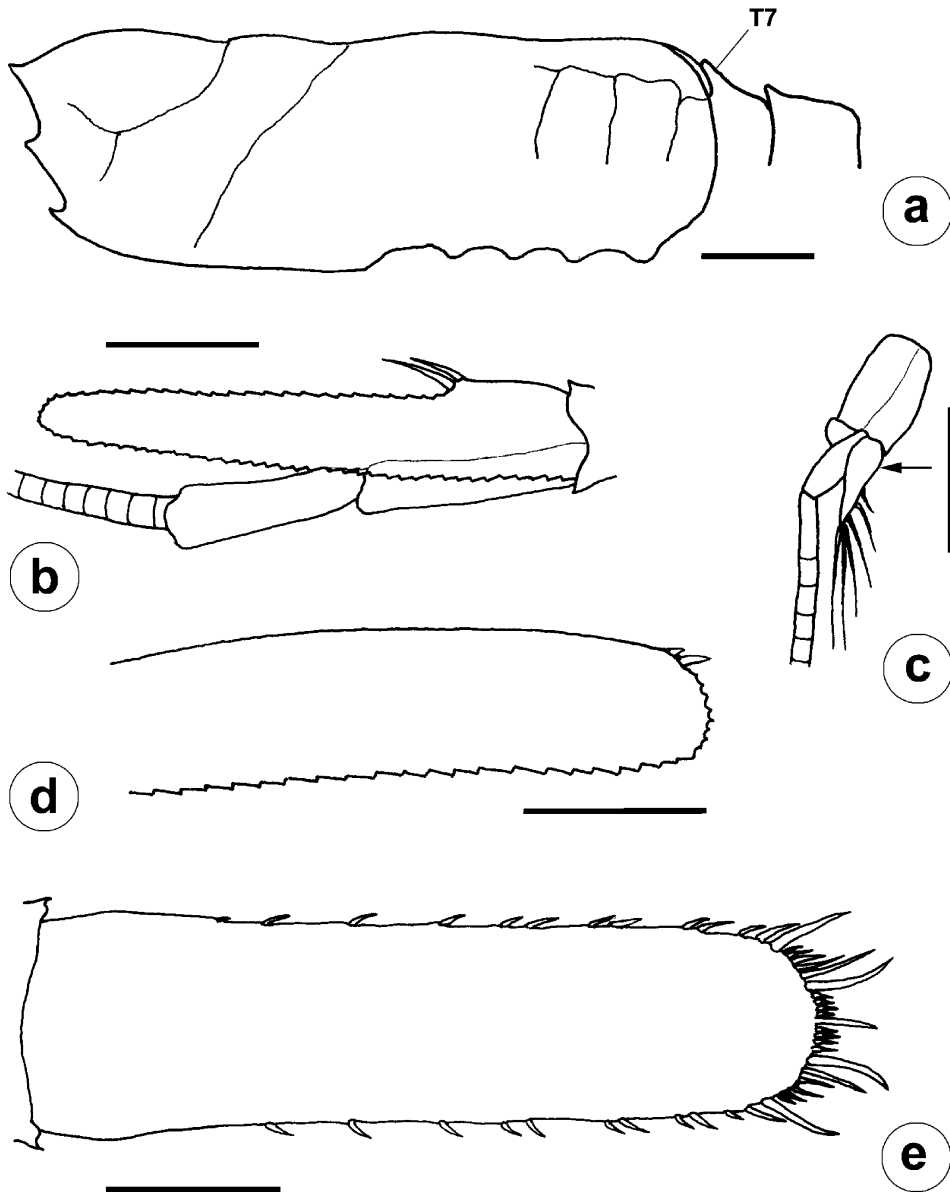


Figure 2. *Bacescomysis papilio* n. sp. (a) Left lateral view of the carapace and dorsal part of the posterior thoracic somites (T_7 =seventh); (b) right antenna; (c) first pleopods showing the short endopod (arrow); (d) posterior two-thirds of the exopod of the right uropod; (e) dorsal view of the telson. Scale bars: 1 mm.

Description

Bacescomysis papilio is a medium-sized species (20.8 mm). The carapace is short (length 5.8 mm), leaving the last two thoracomeres uncovered (Figures 1a, 2a). It is soft, membranous and transparent, so that the mandibles are clearly visible laterally (Figure 1c). Two well-marked grooves run across the dorso-lateral area, before and behind the mandibles, the posterior one probably corresponding to the cervical sulcus since it

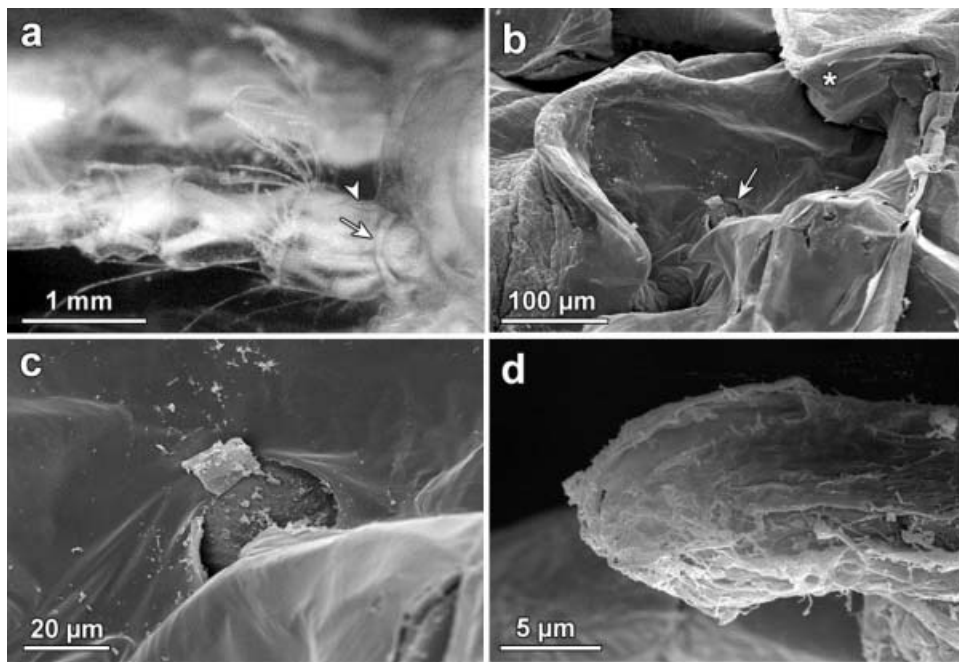


Figure 3. (a) *Bacescomysis papilio* n. sp. Dorsal view of the left antennular peduncle area showing the Tattersall organ (arrow) and the horn-like projection (arrowhead) of the eyeplate. (b–d) *Bacescomysis abyssalis* (SEM micrographs). (b) Tattersall organ constituted by a pit-like depression with a bottom aperture (arrow), overlapped by a flap (asterisk); (c) enlargement of the bottom aperture; (d) detail of the horn-like projection (=eye remnant) of the eyeplate.

indicates the limit between the head and the thorax. Frontal margin gently rounded, with slightly upturned rim. Eye notch present. Antero-lateral corners acutely produced. Postero-lateral half margin deeply indented with four notches (Figures 1d, 2a). Postero-dorsal margin emarginate, fitting with the antero-dorsal part of the seventh thoracic somite, shaped like the pommel of a saddle (Figure 2a).

Eyeplate well evident, sticking out from beneath the carapace, flanked by two anterior horn-like projections considered to represent the reduced eyes (Figures 1c, 3a). Only the appendages having a taxonomical and/or a biological importance in the genus will be described. Antennules long, 11 mm, and stout (Figure 1a, b). Peduncles robust, with the Tattersall organ situated proximally on the dorsal proximal side of the first segment (Figure 3a) as a pit-like depression partially overlapped by a rounded flap projecting forward. Outer flagellum considerably thicker than the inner one all along (Figure 1a, b). The proximal 33 segments are swollen and provided on inner edges with two transverse clusters of long and densely set sensilla (Figures 1b, 4a, b). The six distal segments are normally sized and devoid of sensilla. Each sensillum is made of two parts: a very short basal portion, rounded in cross-section, and an elongated distal, strap-like part (Figure 4b–e). A nerve is visible in the sensilla core when broken (Figure 4c, e). Antennal peduncles shorter and more slender than those of the antennules (Figure 1a–c). Antennal scale lanceolate, setose all along its inner margin and along the distal four-fifths of its outer margin (Figure 2b). Two spines separate the naked and setose parts of the outer margin. First segment of the flagellum longer than the second; all the others considerably shorter.

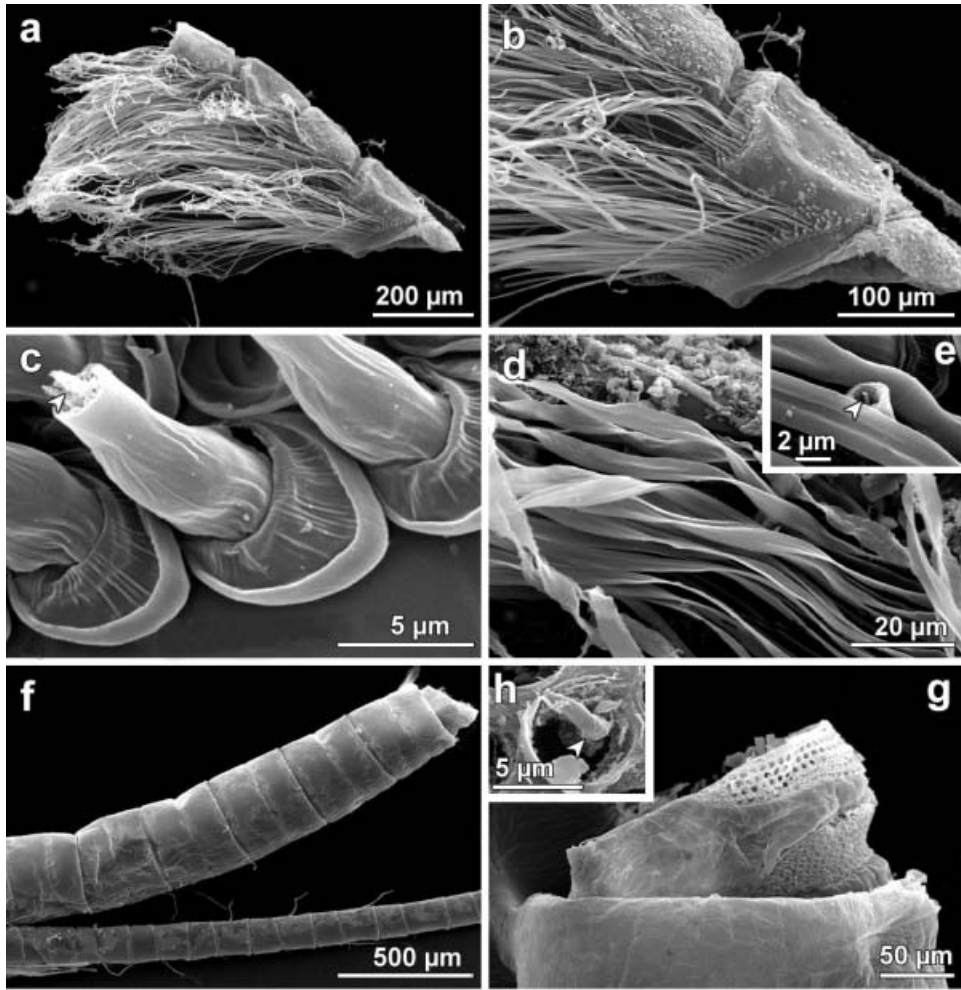


Figure 4. SEM micrographs of the antennule of *Bacescomysis papilio* n. sp. (a–e) and *B. abyssalis* (f–h). (a) Four enlarged articles showing numerous long sensilla; (b) detailed view of one article; (c–e) details of the sensilla; (f) enlarged articles devoid of sensilla; (g) article following the enlarged ones provided with two areas of insertion of sensilla; (h) detail of the inserting hole of a sensillum. Arrowheads indicate the nerves in (c, e, h).

Mandibles with a small blunt, feebly sclerotized pars incisiva; mandibular palp long and rather slender (Figure 1c), with numerous long setae.

Endopod of the first pair of thoracic limbs enlarged and violet as the rest of the mouth area (Figure 5a). Endopod of the third to the fifth thoracic limbs subchelate, whilst those of the last three pairs with a slender claw. Eighth thoracic limbs with, at their base, an ampulla-like genital protuberance in postero-internal position (Figure 5b).

Pleopods biramous. The endopods of the first pair are reduced to a single segment ornamented with setae (Figure 2c). Those of the fifth pair are about twice as long as the exopods (Figure 6a, b) and bear a few setae distally, at the level of the very short terminal tongue-shaped segment; no other trace of segmentation is seen on their length. Exopods of the second pair bearing one long serrulated dagger-like seta on the inner distal part of the basal segment (Figure 5c–e). Uropods shorter than the telson (Figure 6b). Exopods lacking

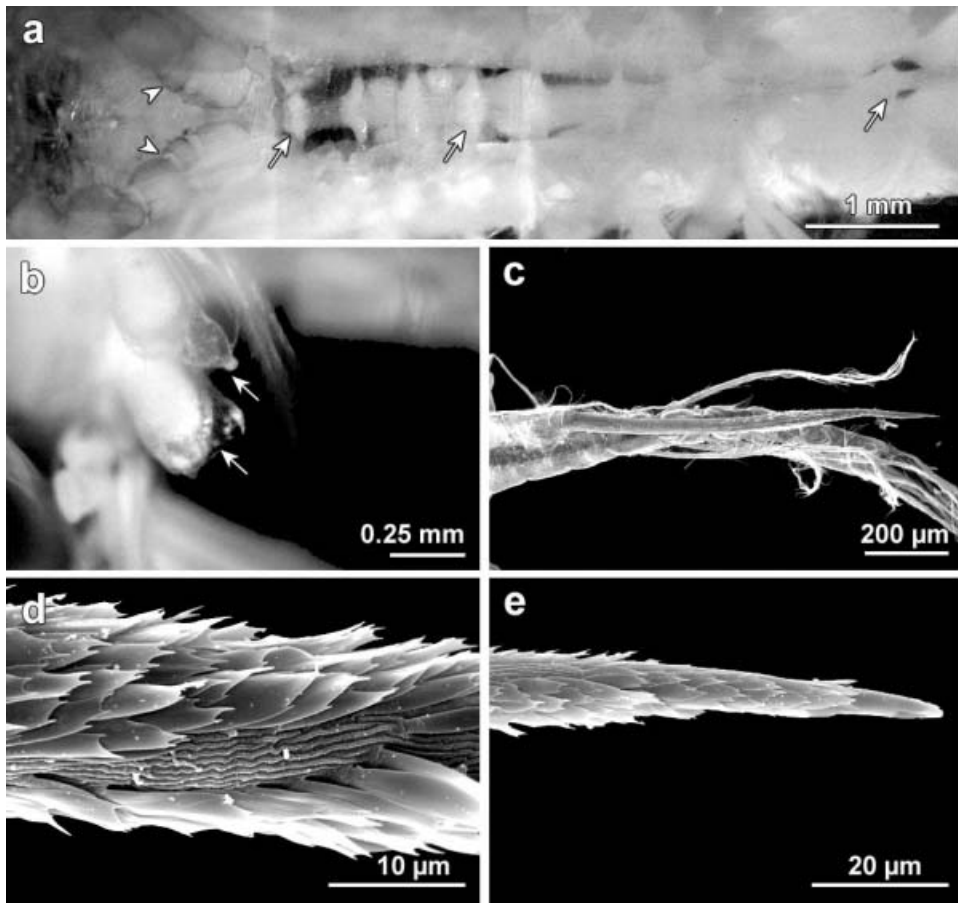


Figure 5. *Bacescomysis papilio* n. sp., photomicrographs (a, b) and SEM micrographs (c–e). (a) Ventral part of the body showing the coloured mouth area along with the maxillipeds (arrowheads) and the ventral nerve cord with ganglia (arrows); (b) basal genital protuberances (arrows) on the eighth thoracic limbs; (c) dagger-like seta on the basal segment of the exopod of the second pleopod; (d, e) details of this seta.

distal articulation; their outer margin naked, with two small spines distally (Figure 2d); apex and inner margin ornamented with setae. Endopods almost as long as the exopods, but half their width, totally fringed with setae. Telson elongated, bearing spines of different size along its parallel margins and rounded apex (Figures 2e, 6c): three or four isolated spines, then three sets of two, one set of three and one of six spines (in each set, spine length increases distally); the two longest are the subterminal pair which flank eight small spines separated by a large median one. Ventral integument particularly thin and translucent allowing clear observation of the nerve cord and the thoracic and abdominal ganglia between the muscular masses (Figure 5a).

Etymology

The name of the species refers to the aspect of the antennules which recall the antennae of a moth.

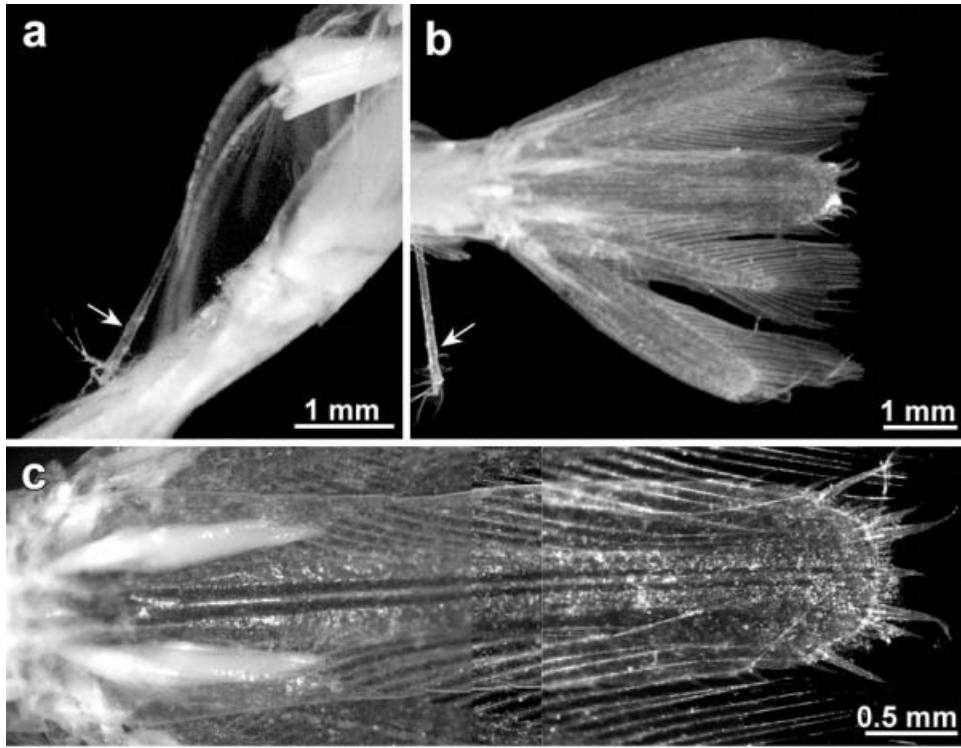


Figure 6. *Bacescomysis papilio* n. sp. (a) Lateral view of the posterior abdomen showing the long endopod of the fifth pleopods (arrow); (b) tail-fan in ventral view showing the telson longer than the uropods, and also the endopod of the fifth pleopod (arrow); (c) details of the telson.

Comparison with other species

The genus *Bacescomysis* has been separated from *Hansenomysis* Stebbing, 1893 by Murano and Krygier (1985). It differs from the latter in four main characteristics: (1) exopods of the uropods unsegmented; (2) vivid violet coloration of the anterior portion of the cephalothorax; (3) bi-horned anterior margin of the eyeplate; and (4) exopods of the second pleopods of males with three or four long, thick and denticulate setae. Nevertheless, these authors questioned the validity of the last characteristic since *Hansenomysis rostrata* Birstein and Tchindonova, 1970 displays such modified setae. The validity of the third character must also be questioned; indeed, *H. tropicalis* Bacescu, 1967 and *H. pseudofyllae* Lagardère, 1983 have two well-defined prominences (the former), and horn-like projections (the latter), on the eyeplate.

A fifth characteristic to separate the two genera is the lateral ornamentation of the telson. In *Bacescomysis*, there are only one or two long spines near the tip of the telson; the lateral edges of the telson are provided along most of their length with more or less small-sized spines. In *Hansenomysis*, there are three to six long spines flanking short series of smaller spines; in each series, the length of the spines slightly increases distally.

Thus, except for the colour, which often disappears after a long period of preservation, the ornamentation of the telson and the unjointed or two-segmented condition of the exopod of the uropods are the best characters to distinguish the two genera. The presence of a joint in this appendage would be a primitive feature, according to Burkenroad (1981).

Its presence in only one species of Euphausiacea, *Bentheuphausia amblyops* G. O. Sars, 1885, considered to be the most primitive representative of this order of pelagic crustaceans (Casanova 1984), argues for Burkenroad's hypothesis. On the other hand, its variability in the Mysidacea weakens this view. Indeed, it exists in three genera of the primitive suborder Lophogastrida (*Gnathophausia* W.-Suhm, 1873, *Eucopia* Dana, 1852, *Paralophogaster* Hansen, 1910), but not in the three others (*Lophogaster* M. Sars, 1857 and the two monospecific genera *Chalaraspidium* W.-Suhm, 1895 and *Ceratolepis* G. O. Sars, 1883). In the evolved suborder Mysida, it is present in the family Lepidomysidae but not in the Stygiomysidae (although it seems to be partially expressed in *Stygiomysis aemete* Wagner, 1992), both being monogeneric, and in the three other genera (*Petalophthalmus* W.-Suhm, 1874, *Pseudopetalophthalmus* Bravo and Murano, 1997 and *Ceratomysis* Faxon, 1893) of the family Petalophthalmidae, to which *Bacescomysis* and *Hansenomysis* belong. In the last and largest family, Mysidae, considered to be the most evolved, it is only observed in the small subfamily Siriellinae, although this articulation line is incomplete according to W. M. Tattersall and O. S. Tattersall (1951), and in the monogeneric subfamily Rhopalophthalmidae where both rami of the uropods are segmented. Thus, the presence of such an articulation in *Hansenomysis* or its absence in the related genus *Bacescomysis* seem to have neither a phylogenetical nor an ecological significance.

Bacescu (1971) said that the seven species of *Hansenomysis* he studied in the Peru–Chile Trench split into “two different groups”. One of them was later considered to represent a new genus, after the discovery of *Bacescomysis pacifica* Murano and Krygier, 1985, as noted above. It comprises now three species described by Bacescu (1971), i.e. *B. birsteini*, *B. peruvianus* and *B. tattersallae*, two species described by Lagardère (1983) in the Bay of Biscay, namely *B. abyssalis* and *B. atlantica*, *B. pacifica* off the Oregon coast, and *B. papilio* n. sp.

Bacescomysis papilio n. sp. is immediately recognizable by its laterally indented carapace, and the high number of enlarged articles on the outer flagellum of the antennules, 33, that is to say about twice that of the species of *Bacescomysis* and *Hansenomysis*, 13–18. Moreover, these articles are provided with numerous sensilla that have never been reported in the other species of the two genera. This is well evident in a male of *B. abyssalis* (Figure 4f–h) which exhibits these swollen articles devoid of sensilla, while the narrower one following this series (the appendage is broken at this level) is provided with two inner areas where probable sensilla-like structures were inserted, as indicated by the nerve arising from the regular perforations in the tegument. Lastly, the presence of only one modified stout seta on the endopod of the second pleopod of the male contrasts with three or four displayed by the rest of the species of *Bacescomysis*, and their absence in those of *Hansenomysis*, when this character has been looked for. So, it would not be surprising if further information on *B. papilio*, such as molecular data from adequately preserved specimens that might be caught in the future, lead it to be raised to generic level.

Sensitive role of antennule

Male-specific tufts of hair-like sensilla, looking like those of *Bacescomysis papilio*, are known on the antennule of mysids. They are situated on the third peduncular segment in *Boreomysis arctica* (Krøyer, 1861) and *B. megalops* G. O. Sars, 1872, and on the appendix masculina situated ventrally at the distal end of the same segment in *Neomysis integer* (Leach, 1814) and *Praunus flexuosus* (Müller, 1776) (Johansson and Hallberg 1992). They would have an olfactory role as chemoreceptors of sexual pheromones, as demonstrated by

Guse (1983). Why does the male of *Bacescomysis papilio* possess so numerous sensilla on almost every article of the antennules? The absence of a terminal pore indicates they cannot be contact chemoreceptors (taste) (see Johansson and Hallberg 1992 for review). Therefore, they are not involved in food detection. Moreover, the diet of these animals probably does not require particular detection skills. Indeed, Bacescu (1971) suggested these benthic mysids feed on substratum detritus because of the great number of setae on their peri-oral appendages. SEM observations of the molar process of the mandibles of *Bacescomysis abyssalis*, totally smooth and concave by comparison with those of phytophagous and carnivorous species, have confirmed this hypothesis (De Jong-Moreau et al. 2001). The other species of *Bacescomysis* and *Hansenomysis* that live in the same habitat are not provided with so numerous antennular sensilla. Their role remains unknown in *Bacescomysis papilio*, unless this species is considered as very rare (it is absent in the numerous samples of Lagardère from the Bay of Biscay), implying thus the need for high-performance sensorial equipment to enable individuals to find one another.

The role of the Tattersall organs is more enigmatic yet. They are found in all the species of *Bacescomysis* and *Hansenomysis* of both sexes. They were not mentioned by Birstein and Tchindonova (1958, 1970) in *H. armata* Birstein and Tchindonova, 1958 and *H. rostrata* Birstein and Tchindonova, 1970, but Tattersall (1961), who wrote to the latter, reported that Tchindonova confirmed they existed. Tattersall described these “pit-like” organs, and concluded they “have some kind of sensory function”, recalling that she previously (Tattersall 1955) suggested their chemoreceptor role. Later, Bacescu (1971) agreed with her; he suggested they were sensory organs “of a primitive type”, and proposed the name of Tattersall organs. SEM observations of these organs have been made to try to elucidate their role. As there was a risk of damage to the holotype, specimens of *Bacescomysis abyssalis* were used for this purpose. The results are not conclusive. It appears (Figure 3b, c) that in the bottom of the horseshoe-shaped, pit-like depression there is a small circular aperture through which a rounded mass is seen. To our knowledge, they do not resemble sensorial organs already known in the Crustacea. Unfortunately, the internal tissues of these specimens are too damaged to allow histological sections for TEM observation. A chemoreceptor role seems probable.

Adaptations to deep water

Since the eyeplate is situated just above the Tattersall organs, it was interesting to observe the horn-like projections, considered to be remnants of the eyes. No trace of ommatidia are visible (Figure 3d), even degenerated as those of the common deep planktonic Lophogastrid *Eucopeia unguiculata* (W.-Suhm, 1875), which nevertheless lives less deeply, i.e. below 500–600 m in the world ocean (Fage 1942). According to W. M. Tattersall and O. S. Tattersall (1951), these projections “probably serve a sensory function”; this hypothesis is not evidenced since no sensory organs (aesthetasc sensilla, setae...) are observed. Besides the loss of the eyes, another adaptation to abyssal life in *B. papilio* is the reduction of the locomotory musculature, evidenced by the clear observation of almost the entire course of the nerve cord, and the ganglia, in ventral view through the thin integument (Figure 5a). This is difficult, indeed impossible, to be seen in individuals of *Boreomysis artica* Krøyer, 1861 and *Praunus flexuosus* Müller, 1776 of the same size, living respectively at mid-depths and in neritic waters, since their longitudinal muscular masses are contiguous. A comparable adaptation has already been reported for deep-water decapod crustaceans such as *Sergestes (Sergia) japonicus* Bate, 1881 (described as *S. “mollis”* by

Smith 1884 since “the whole integument is very soft and all parts of the animal exceedingly fragile”), and numerous deep-sea fish families (Denton and Marshall 1958); this would be an adaptation to the scarcity of food resources in the abyssal waters.

Biogeographical remarks on the related genera Bacescomysis and Hansenomysis

Five species of *Hansenomysis* were known when Bacescu (1967, 1971) described four species of this genus and three others of *Bacescomysis*. These seven new species plus *H. falklandica* O. S. Tattersall, 1955 (only represented by 12 individuals) were caught between 1238 and 4450 m deep on the sea-floor off Peru. Later, Lagardère (1983) described four new species (two in each genus) in the Bay of Biscay, and remarked the astonishing variety and the vigorous evolution of *Hansenomysis* (the two genera were not still separated) in the abyssal realm. The discovery of *Bacescomysis papilio*, the fifth species belonging to these related genera in the same area, strengthens Lagardère's remarks.

These mysids are more or less linked with the bottom, since most of them have been caught among the epibenthic fauna. The specific variety of the deep benthoplanktonic fauna has already been shown for the copepods (Grice and Hulsemann 1970; Grice 1972), the ostracods (Angel and de Baker 1982), and the chaetognaths, which are also more diversified in the tropical regions than in the Antarctic (Casanova 1986). The latter trend in biodiversity is also noticeable for the species of *Bacescomysis* and *Hansenomysis*. Indeed, only six species are known at high latitudes: *Hansenomysis fyllae* (Hansen, 1887) between Greenland, New England and the British Isles; *H. antarctica* Holt and Tattersall, 1906 and *H. angusticauda* O. S. Tattersall, 1961 from the Ross Sea; *H. falklandica* off the southern South America; and *H. armata* Birstein and Tchindonova, 1958 and *H. rostrata* from the Kuril-Kamchatka Trench. They also live at shallow depths in these areas: from 100 m downwards in the Ross Sea, 185 m in the Magellan Strait, as compared to 650 m off New England, 950–1000 m in the New Caledonia area (Casanova 1993), 1280 m off Peru, and more than 1900 m in the Bay of Biscay for the species caught in these areas. Moreover, it appears that the species of *Bacescomysis* live deeper than those of *Hansenomysis*. Indeed, all have been observed at depths ≥ 2000 m, and mostly > 4000 m, while the latter are found at depths ≤ 2000 m, except for two records of *H. pseudofyllae* at 3000 and 4800 m (Lagardère 1983).

The species of the two genera also seem to be strictly localized: around the Falkland Islands and the Magellan Strait for *H. falklandica* in the “Discovery II” collections from the southern Atlantic and the Antarctic Oceans (Tattersall 1955); eight species (among which one individual of *H. falklandica*) “in only a few localities ... despite the amount of sampling” in the Peru–Chile Trench according to Bacescu (1971). This is perhaps an explanation for the display of numerous chemoreceptors if *Bacescomysis papilio* is one of the rarest species of this interesting group of mysids.

Acknowledgements

We are grateful to Joëlle Galéron (Ifremer, Brest) for the loan of material, and to the chief scientist Myriam Sibuet (Ifremer, Brest) and participants of the Discovery 231 and 237 cruises. Those cruises were part of the European BENGAL programme [contract no. MAS3-CT95-0018 (DG 12-ESCY)]. We also thank Dr Jean-Paul Lagardère, who gave us specimens of its new species.

References

- Angel MV, de Baker AdeC. 1982. Vertical distribution of the standing crop of plankton and micronekton at three stations in the Northeast Atlantic. *Biological Oceanography* 2(1):1–30.
- Bacescu M. 1967. Further Mysids from the Pacific Ocean collected during the XIth Cruise of R/V “Anton Bruun”, 1965. *Revue Roumaine de Biologie et Zoologie* 12(3):147–159.
- Bacescu M. 1971. Scientific results of the Southeast Pacific Expedition. Contributions to the Mysid Crustacea from the Peru–Chile Trench (Pacific Ocean). *Anton Bruun Report* 7:1–24.
- Birstein JA, Tchindonova JG. 1958. Glubocovodniie Mysidii severo zapadnoi ciasti Tihogo Okeana. *Trudy Instituta Okeanologii* 27:258–355.
- Birstein JA, Tchindonova JG. 1970. New mysids (Crustacea, Mysidacea) from the Kurile-Kamchatka Trench. *Trudy Instituta Okeanologii* 86:277–291.
- Burkenroad MD. 1981. The higher taxonomy and evolution of Decapoda (Crustacea). *Transactions of the San Diego Society of Natural History* 19(17):251–268.
- Casanova B. 1984. Phylogénie des Euphausiacés (Crustacés Eucarides). *Bulletin du Muséum National d’Histoire Naturelle, Paris, Série 4* 6A(4):1077–1089.
- Casanova J-P. 1986. Quatre nouveaux chaetognathes atlantiques abyssaux (genre *Heterokrohnia*): description, remarques éthologiques et biogéographiques. *Oceanologica Acta* 9(4):469–477.
- Casanova J-P. 1993. Crustacea Mysidacea: les Mysidacés Lophogastrida et Mysida (Petalophthalmidae) de la région néo-calédonienne. In: Crosnier A, editor. *Résultats des Campagnes MUSORSTOM. Volume 10. Mémoires du Muséum National d’Histoire Naturelle* 156:33–53.
- De Jong-Moreau L, Casanova B, Casanova J-P. 2001. Detailed comparative morphology of the peri-oral structures of the Mysidacea and Euphausiacea (Crustacea): an indication for the food preference. *Journal of the Marine Biological Association of the United Kingdom* 81:235–241.
- Denton EJ, Marshall NB. 1958. The buoyancy of bathypelagic fishes without a gas-filled swim bladder. *Journal of the Marine Biological Association of the United Kingdom* 37:753–767.
- Fage L. 1942. Mysidacea Lophogastrida-II. *Dana-Report* 23:1–67.
- Grice GD. 1972. The existence of a bottom-living Calanoid Copepod fauna in deep water with descriptions of five new species. *Crustaceana* 23:219–242.
- Grice GD, Hulsemann K. 1970. New species of bottom-living Calanoid Copepods collected in deep water by the DSRV “Alvin”. *Bulletin of the Museum of Comparative Zoology* 139:185–227.
- Guse GW. 1983. Die Sensillen des Lobus masculinus von Mysidaceen (Crustacea): Ihre Ultrastruktur und mögliche Bedeutung als Pheromonrezeptoren. *Verhandlungen der Deutschen Zoologischen Gesellschaft* 76:189.
- Johansson KUI, Hallberg E. 1992. Male-specific structures in the olfactory system of mysids (Mysidacea; Crustacea). *Cell and Tissue Research* 268:359–368.
- Lagardère J-P. 1983. Les Mysidacés de la plaine abyssale du golfe de Gascogne. I. Familles des Lophogastridae, Eucopiidae et Petalophthalmidae *Bulletin du Muséum National d’Histoire Naturelle, Paris, Série 4* 5A(3):809–843.
- Murano M, Krygier EE. 1985. Bathypelagic mysids from the northeastern Pacific. *Journal of Crustacean Biology* 5(4):686–706.
- Smith SI. 1884. Report on the Decapod Crustacea of the “Albatross” dredgings off the east coast of the United States in 1883. *Reports of the United States Fish Commission* 10:345–426.
- Tattersall OS. 1955. Mysidacea. *Discovery Reports* 28:1–190.
- Tattersall OS. 1961. Report on some Mysidacea from the deeper waters of the Ross Sea. *Proceedings of the Zoological Society of London* 137:553–571.
- Tattersall WM, Tattersall OS. 1951. *The British Mysidacea*. The Ray Society, London, 136:460.