Zoogeography and Biodiversity of the Isopoda (Crustacea: Peracarida) of the Galician Continental Slope

Zoogeographie und Biodiversität der Isopoda (Crustacea: Peracarida) des Galizischen Kontinentalabhanges

Dissertation

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"Die Früchte vom Baum der Erkenntnis sind es immer noch wert, dafür das Paradies zu verlieren."
– "The fruit from the Tree of Knowledge of Good and Evil are still worth losing paradise."

ERNST HAECKEL (1834-1919), Begründer der Biogenetischen Grundregel, Pionier der Evolutionsforschung

According to ICZN article 8.3 all names and nomenclatural acts in this thesis are disclaimed for nomenclatural purposes.

Table of content

1 Introduction

Deep-sea life was and is one of the greatest mysteries in animal biodiversity. It is well known among scientists – and vaguely in public – that our knowledge on the deep-sea fauna is generally poor. According to HOBOHM (2000), the extensively researched sea floor area of all world oceans together was about the size of a tennis court by the beginning of the second half of the 20^{th} Century, a tiny area compared to the world ocean's 362 mio. km^2 of sea floor, of which more than 83% ly deeper than 2000 m below the surface (DIETRICH *et al.* 1975).

One reason for this lack of knowledge can be found in the history of marine research. In earlier times, before the Enlightenment and Secularization, the sea and its inhabitants were often considered to be predominantly evil and dangerous (and certainly all offshore journeys were dangerous in those days). In the Renaissance the available literature on marine life was religiously motivated and still obscured by myths. Examples are OLAUS MAGNUS (1490 – 1557, Archbishop of Sweden, "Historia de gentibus septentrionalibus" 1567) and CONRAD GESNER (1516 – 1565 "Historia animalium" 1551 – 1558, initiation of taxonomy). At that time there was no record of deep-sea animals at all. With the industrial revolution, technological resources (like ocean vessels) improved rapidly and it is no wonder that many milestones of scientific exploration are found in the late 18^{th} and early 19^{th} century (e.g. journeys of ALEXANDER VON HUMBOLDT, ALFRED RUSSELL WALLACE, CHARLES ROBERT DARWIN). But in the middle of the 19^{th} Century it was still assumed that the deep sea was a completely lifeless desert, even by pioneers in marine research such as EDWARD FORBES who considered any life below 300 fathoms (about 550 m; 1 fathom = 6 ft., i.e. ca. 1.83 m) to be impossible (JAHN 2004). VON HUMBOLDT (1845) still complained about the generally low state of knowledge about the deep sea ("The depth of the ocean is unknown"). Technological requirements for deep-sea research are knowledge in oceanography (e.g. seafloor topography and water currents), reliable and large research vessels and the development of suitable sampling gear in combination with steel cable of several 1000 m length and motorized winches. Some of the first records of deep-sea life were provided by H.M.S. "*Challenger*" in 1872. It is obvious that no comprehensive studies on deep-water species were possible before these prerequisites were fulfilled. Since then, knowledge and technological resources have greatly improved, yet all deep-sea research is expensive and the samples of a single expedition can only cover a relatively small area.

There are several definitions of what actually is deep sea and what is not. GAGE & TYLER (1991) define deep sea topographically as all water below 200 m (up to 500 m in the Antarctic due to the weight of the ice crust), demarcated by the outer margin of the relatively flat continental shelf. On the continental slope, the sea floor is mostly rather steep in comparison to the shelf itself. In physical oceanography "deep sea" is defined as waters below the 10° C isotherm. This results in a latitudinal change of the upper border of the deep sea as it would be in about 800 – 1200 m depth near the equator but at the surface in polar regions (DIETRICH *et al.* 1975) and, as a consequence, the Mediterranean Sea would not include any deep sea at all – even though the eastern part has a maximum depth of 5102 m (HOFRICHTER 2002). In the Mediterranean Sea the temperature falls nowhere below 13° C (TÜRKAY 2002). Therefore, it is often better to use the terms sublittoral (0 – ca. 200 m), bathyal (ca. 200 – 2000 m), abyssal (ca. 2000 – 6000 m) and hadal zone (ca. 6000 m and below). The seafloor of the bathyal zone is especially represented by the continental slopes, the abyssal zone by the great abyssal plains and the hadal zone by the deep trenches. In this work, all regions below the transition between shelf and continental slope are regarded as "deep sea" and "deep water". Wherever the exact topography is unknown, this border is regarded to be at approximately 200 m depth.

1.1 Deep-sea biodiversity versus global biodiversity

Estimations of the global species richness range between 10 and 30 million contemporary species (WILSON E.O. 1985, MAY 1992, SAVAGE 1995, WUKETITS 1997) in contrast to about 1.8 million described species, with only between 180,000 and 255,000 being marine ones (GROOMBRIDGE 1992, HOBOHM 2000). Among the described species, a very low percentage (<1%) are deep-sea organisms, even though the sea floor below 2000 metres covers 59% of the planet’s surface. The large extension and ancient geological age of the oceans lead to the conclusion that the numerical relations between marine and terrestric species is distorted due to the better knowledge of terrestrial habitats. Earlier assumptions of the deep sea being poor in diversity and inanimate due to less accessible nutrition and extreme environmental conditions have been refuted (SANDERS *et al.* 1965, SANDERS & HESSLER 1969, WILSON 1980, GRASSLE & MACIOLEK 1992, POORE *et al.* 1994). On the contrary, for several higher taxa exceedingly high numbers of species have been recorded from the deep-sea benthos, often with a high percentage of unknown species (between 50 and 100%; e.g. WILSON 1980, POORE *et al.* 1994, PARK 1999, BRANDT *et al.* 2004). This is the case within the Isopoda (e.g. BRANDT *et al.* 2005, 2007). As hardly any information is available on the horizontal distribution of species due to the irregular distribution of sampling campaigns, currently no objective estimation of the real species count in the deep sea is possible. An exact comparative description of species numbers of geographic regions or of changes in species composition along geographical and bathymetric gradients (compare REX *et al.* 2000, CULVER & BUZAS 2000, GRAY 2001) cannot be done with adequate coverage yet.

1.2 The state of research of the European marine fauna

The European marine fauna has been recorded without coordination. The field guides and determination keys that are popular in institutes for marine sciences ("Faune de France", "Synopses of the British Fauna", "Fauna der Nord- und Ostsee", "Tierwelt Deutschlands" and more compact works like HAYWARD & RYLAND 1995, etc.) suggest a sufficiently solid record of the marine invertebrate fauna of the European coasts. However, this impression is deceiving as the knowledge on faunal communities of deeper waters is fragmentary especially in the northern Atlantic (e.g. REX *et al.* 2000, GAGE 2001).

Apart from the North Sea, the Baltic Sea and the British Isles, extensive or compact determination aids are nonexistent for the remaining coasts of Europe. Especially samples from greater depths (Spain: Continental shelf, 100 m and below; Mediterranean Sea: 200 m and below) have only been sporadically examined by taxonomists. Some taxa of the intertidal and upper sublittoral zone of the western Iberian coast have been faunistically examined (ARTECHE & RALLO 1985, CAMPOY 1982, FERNÁNDEZ *et al.* 1999, GARMENDIA *et al.* 1996, GONZÁLEZ GURRIARÁN & MÉNDEZ 1985, PARAPAR 1991) but catalogues of species for this region are at best fragmentary.

As for European seas, e.g. the benthos of Rockall Trough and Porcupine Bank have only been thoroughly studied concerning selected taxa and more intensively concerning fish (ALLAIN & KERGOAL 1997, CLARKE *et al.* 2002, GOODAY & HUGHES 2002, HARRISON 1988a, HOWELL *et al.* 2002, SUMIDA *et al.* 1998, WALLER *et al.* 2002).

This lack of precise taxonomic information and of corresponding determination keys together with the fragmentary knowledge on the geographical distribution of species is in fact an obstacle for the description of benthic communities in many European seas.

With the shipwreck of the oil tanker "Prestige" off the Galician coast (2002-11-19), the public interest focused on the marine ecosystems and the media requested information on the communities of animal life on the sea floor. However, this information could not be provided because no data on the fauna of the affected deep-sea floor existed. An estimation of the consequences of the "Prestige" oil spill for the benthic communities is only possible for the intertidal zone (URGORRI 2003). For communities from deeper waters no valid statements can be made as their undisturbed status is unknown. Even though the expedition "DIVA-Artabria 1" collected samples two months prior to the shipwreck, no long-term data has been recorded.

1.3 Hydrogeography of the Galician continental slope off Ría de Ferrol

The researched area of the campaign "DIVA-Artabria 1" is located in northern Spain (off the coast of northern Galicia, near A Coruña).

The western European continental shelf is an obstacle for the eastward expansion of the *Gulf Current* (or *North Atlantic Current* in the East Atlantic). West of the British shelf it is divided into two main currents: The northern part, the *Norwegian Current*, passes the northernmost British shelf between Scotland and the Faroes and leads along the Norwegian Coast into the Barents Sea and towards the western coast of Spitsbergen. The southern part is deflected southward, partially directly towards the western coast of the Iberian Peninsula, partially along the western coast of France, then into the Bay of Biscay and westward along the northern coast of Spain (Fig. 1). Both parts are meeting off Galicia, forming the *Portugal Current*, which flows southward along the western coast of the Iberian Peninsula towards the Canary Islands.

Below the surface, on a level with the *upper North Atlantic Deep Water* (*uNADW*, ca. 800 – 1400 m depth, DIETRICH *et. al.* 1975), a current in the opposite direction exists: It leads from the Ibero-Moroccan Gulf northward along the western coast of Portugal and passes the north western tip of Galicia to further reach eastward into the Biscayan Sea. This water mass is an outflow of the Mediterranean Sea and consists of *Levantinian Central Water* (originating from the eastern Mediterranean Sea, MCCARTNEY & MAURITZEN 2001). West of Gibraltar the Mediterranean water reaches the much less saline water of the Atlantic. Both water masses hardly mingle with each other but due to its higher density and specific weight the *Levantinian Central Water* sinks down to a level of 800 to 1400 m, where it is directed northward along the western Iberian coast by the Coriolis force (DIETRICH *et al.* 1975). Off Galicia, it still has a maximum salinity of 36‰ (i.e. 36 psu) in depths of about 1000 m. On the other hand the surface water can be mixed with fresh water, due to local outflow from the Rías, regionally by the particularly frequent winter rainfall in the north western Iberian peninsula (DIETRICH *et al.* 1975).

The deflection of the *Portugal Current* (Fig. 1) by the Coriolis force causes an upwelling system at the western coasts of Portugal and Spain. The upwelling water comes from depths of up to 200 m and is colder and has more nutrient content than the surface water (TORRES *et al.* 2003). The overall nutrient content of the Galician coast is influenced by the upwelling system nearly throughout all the year (e.g. LÓPEZ-JAMAR *et al.* 1992, CASAS *et al.* 1997). In the Artabrian Gulf, the upwelling promotes seasonal mass production of phytoplancton which leads to a strong enrichment of nutrient content on the sea floor (BODE *et al.* 1998).

Despite the outflow of Mediterranean water, the dispersal of bathyal benthic species of the European Mediterranean Sea into the north east Atlantic is limited because the Gibraltar Sill (280 m depth) is an obstacle for the spreading of stenobathic species, as shown by GRASSHOFF (1989) for Anthozoa.

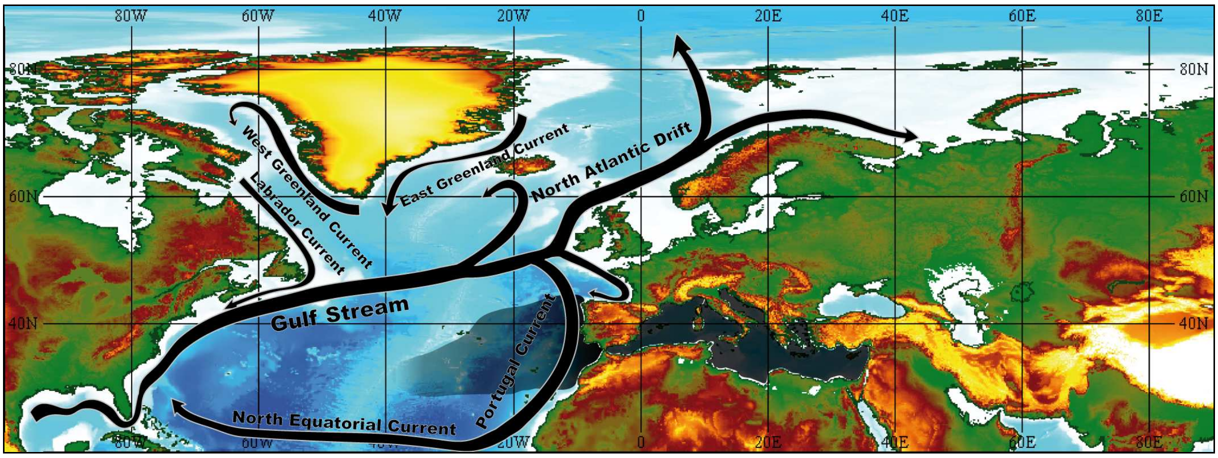

Fig. 1: The Gulf Stream is parted in the North East Atlantic into the North Atlantic Drift, directing north eastward and the Portugal Current, directing south- and slightly westward near the surface. It causes the upwelling effect in this region. Levantinian Central Water (i.e. upper North Atlantic Deep Water, *uNADW*, schematically) in grey shade. Bathymetric chart: GEBCO, water currents simplified after DIETRICH *et al.* (1975), *uNADW* after BEARMAN (2001).

Besides, the Galician coast is strongly cleft by 18 estuaries ("Rías"). In contrast to the fjords of the Norwegian coast which were formed by glacial erosion, the otherwise similar Rías were fluvial valleys during the Pleistocene (where the sea level was at least 100 m lower than today) and later drowned by eustatic rise of the sea level (transgression, VILAS 2002). Tidal currents and rivers flowing into the Rías often caused hard substrates to be covered with sediment (NONN 1966, ASENSIO-AMOR & GRAJAL-BLANCO 1981, 1982, SÁNCHEZ-MATA 1995). Due to detritus outflow from the Rías these soils have an enriched percentage of organic matter from 2 to 4%

P.O.C. (short for ParticularOrganicCarbon; LOPEZ-JAMAR *et al.* 1992) and can therefore be regarded as eutrophic.

The enrichment of organic matter in the examined area is therefore strongly increased by upwelling and an exchange of water masses between the Rías and the adjacent continental shelf induced by tidal and wind effect (DECASTRO *et al.* 2003).

Regarding the correlation of nutrient content and benthic biomass, the macrobenthic biomass significantly decreases from the continental shelf to the Iberian Abyssal plain as shown by a transect in western Galicia including the Galicia Bank off Cabo Fisterra (FLACH *et al.* 2002). However, there are only fragmentary data on changes in diversity at species level. There are mainly documentations of increased abundances caused by upwelling, as shown for Decapoda (FARINA *et al.* 1997).

1.4 Marine Isopoda

The Isopoda LATREILLE, 1817 are among the richest marine taxa in species and individuals (next to Nematoda, Polychaeta and Copepoda). This is especially so for the bathyal and abyssal macrozoobenthos (HESSLER *et al.* 1979; BRANDT *et al.* 1997). Currently (December 2008), 10643 extant isopod species are recognized (World List of Isopods: SCHOTTE *et al.* 1995 onwards). They inhabit all marine environments (except for the terrestrial Oniscidea), from the intertidal zone to the deep sea. As a specific faunal element of the deep sea they are of major importance for questions regarding its colonization and the distribution of deep-sea species (HESSLER 1970, HESSLER *et al.* 1979, GAGE 1979, WILSON 1980, HARRISON 1987, GAGE & TYLER 1991, PATERSON & LAMBSHEAD 1995, HOWELL *et al.* 2002).

Marine Isopoda are much less uniform than one would expect if only the terrestrial Oniscidea were regarded. For example, the Valvifera SARS, 1882 are characterized by their uropods ventrally covering the pleopodal chamber, with the predominantly intertidal Idoteidae SAMOUELLE, 1819 and the hemisessile, suspension feeing Arcturidae BATE & WESTWOOD, 1869. There are elongated, vermiform burrowers as the Anthuridea MONOD, 1922, that are carnivorous and have sucking mouthparts and a peculiarly shaped tail fan with dorsally inserting uropodal exopods (WÄGELE 1981). More compact or even flattened species are found within the Sphaeromatidea WÄGELE, 1989. There are temporary haematophagous ectoparasites as the Gnathiidae Leach, 1814 with parasitic larval stages and highly sexually dimorphic adults that do not feed anymore. In Bopyridae RAFINESQUE-SCHMALTZ, 1815, the adult stages are parasitic with protandric hermaphroditism, the sessile adult females are found inside of the carapace of their hosts (Malacostraca), whereas the Cryptoniscium larvae are freely living (WÄGELE 1989). A brief overview of higher taxa (suborders and families) that concern the described species will be given in the taxonomic part.

Based on a fragmentary fossil record, the stratigraphic documentation of the Isopoda begins in the late Carboniferous (Pennsylvanian in North American literature; SCHRAM 1970), over 300 million years ago. All suborders supposedly exist at the latest from the Jurassic onward (WÄGELE 1989, BRANDT *et al.* 1999), 200 to 146 million years ago, long before the Atlantic Ocean opened. However, most fossil specimens hardly allow any further classification as the most important diagnostic characters are normally not preserved (WÄGELE 1989). Few exceptions come from conserving Lagerstätten as e.g. the Solnhofen limestone (*Schweglerella strobli* POLZ, 1998 [Sphaeromatidea], compare BRANDT *et al.* 1999, FRICKHINGER 1999). The baltic and dominican amber contains only terrestrial isopods and is of Eocene and Oligocene age (WEITSCHAT & WICHART 2002, POINAR & POINAR 1999), too young to bring light into the evolution of higher isopod taxa.

On major areas of the coasts of Europe one can expect the existance of undescribed isopod species from depths of 100 m and below. The deeper benthos, especially the smaller invertebrates, is – with few exceptions – taxonomically poorly treated. In recent years, there have even been several descriptions of new isopod species from shallow waters (REBOREDA & WÄGELE 1992, REBOREDA *et al.* 1994; CASTELLÓ & POORE; 1998, NOLTING *et al.* 1998, SANCHEZ & JUNOY 2002) which could be endemic for the Iberian coast. However, since almost no data exists for the north African coast, such statements are not well founded. A rare exception to the fact that most records are from shallow waters is the catalogue of Isopoda from the spanish Fauna I project (southern Iberian peninsula, RODRÍGUEZ-SÁNCHEZ *et al.* 2001) that also contained bathyal samples. A catalogue of Iberian Isopoda has been compiled from the literature by JUNOY & CASTELLÓ (2003). It demonstrates our poor knowledge on Iberian isopods as it contains only a few records of deep-water species.

The reconstruction of the history of isopod zoogeography is important for our understanding of the present geographical distribution of species. There are two contrary hypotheses on the migration of isopods into the deep sea of the Atlantic. One supposes migration from the polar shelf, especially from the Antarctic region into the deep sea (KUSSAKIN 1973, GEORGE & MENZIES 1968; MENZIES *et al.* 1973). The other hypothesis presumes tha isopods have mainly evolved in the deep sea and the polar shelf was colonized later (HESSLER & THISTLE 1975, WÄGELE 1989). According to RAUPACH *et al.* (2004), several isopod lineages evolved independently in the deep sea In any of both cases the deep-water currents and submarine elevations that are present in the Atlantic today will have an influence on the ability of the species to disperse, regardless if they originated in the deep sea, in shallow waters or from the Antarctic region.

Although most isopods have benthic larval stages and are normally less vagile than nectonic arthropods, their migration along homogenous water masses is very likely, e.g. by drifting with water currents near the sea floor. Their geologically early colonization of the deep sea of the Atlantic by migration from adjacent oceans, either from shallow waters or via deep connections, are hypothetical explanations for today's presence of the Isopoda in the Atlantic (BRENKE 2005b).

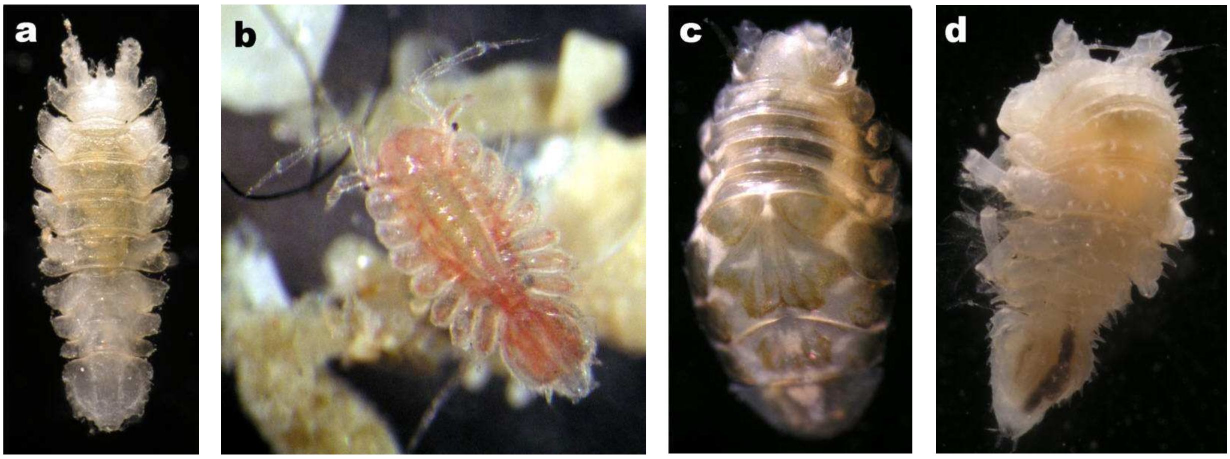

Fig. 2: Examples of asellote Isopoda sampled during the Expedition "DIVA-Artabria 1": a) *Janirella hessleri* CHARDY, 1975 (Janirellidae), b) *Metamunna typica* TATTERSALL, 1905 (Paramunnidae, living specimen), c) *Disconectes latirostris* (SARS, 1882) (Munnopsidae: Eurycopinae), d) *Bathybadistes penthesilea* n. sp. (Munnopsidae: Ilyarachninae). A. MURSCH phot.

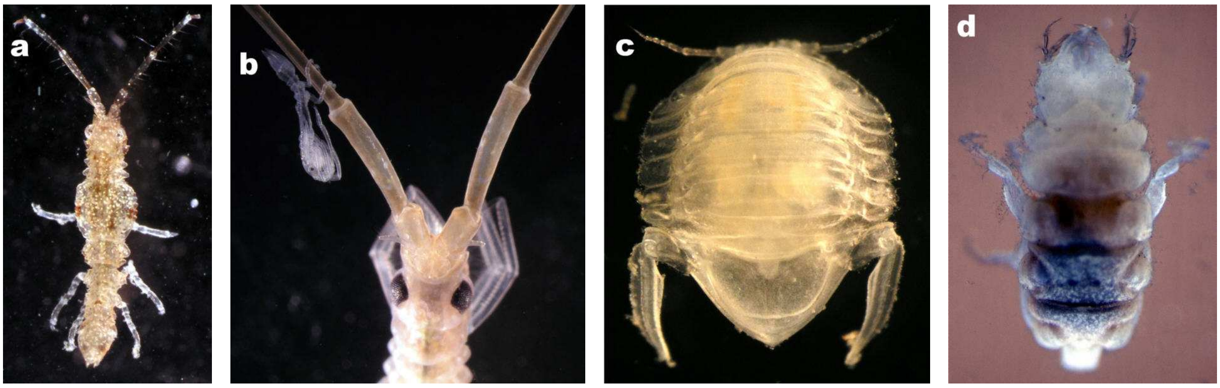

Fig. 3: Examples of non-asellote Isopoda sampled during the Expedition "DIVA-Artabria 1": a) *Arcturella dilatata* SARS, 1882 (Valvifera: Arcturidae, juvenile female), b) *Astacilla longicornis* (SOWERBY, 1806) (Valvifera: Arcturidae, female with manca on antenna 2), c) *Bathycopea typhlops* TATTERSALL, 1905 (Sphaeromatidea: Ancinidae), d) *Gnathia albescens* HANSEN, 1916. (Gnathiidae); a, d: A. MURSCH phot.; b, c: V. URGORRI phot.

In greater depths mostly Asellota predominate among the Isopoda, many families have their diversity maximum in the deep sea (KUSSAKIN 1973). So far, of the 2147 currently described species of Asellota, 222 species (10.3%) were published after the year 2000 (SCHOTTE *et al.* 1995 ff., December 2008) and it is expected that this percentage will greatly increase in the near future because not all of the new species from recent deep-sea expeditions (e.g. Diva 1 2000: Angola Basin; Diva 2 2005: Guinea Basin) have been published yet. In arctic and subarctic regions of the northern Atlantic, SVAVARSSON *et al.* (1993) showed a percentage of more than 60% endemic species below depths of 750 m. WILSON (1999) considers the Asellota to be very old due to their number of species and supposes their colonization of the deep sea as early as in the Palaeozoic. This was supported by more recent molecular analyses (RAUPACH *et al.* 2004). In contrast to the Asellota, the phylogenetically younger Scutocoxifera DREYER & WÄGELE, 2002 become less diverse from the shore to the deep sea and from South to North (NEGOESCU & SVAVARSSON 1997, WILSON 1998).

1.5 Aims and scope

The spanish research project "Diversidad latitudinal en los fondos profundos del Océano Atlántico (DIVA-Artabria): Biodiversidad y distribución batimétrica (100 – 2000 m) en el NW de las costas de Galicia" (Latitudinal diversity in the deep sea of the Atlantic Ocean: Biodiversity and bathymetric distribution in the north western Galician coasts) is dedicated to the enhancement of the knowledge on the European marine fauna, i.e. to acquire information about the composition and geographical and bathymetric distribution of species on the lower continental shelf and on the continental slope of the western Iberian coast. Samples taken within this project have been used to analyze the isopod fauna. The insufficiently known *status quo* of the composition of benthic communities is analyzed to make the recognition of future changes possible. As bathyal isopods are generally rarely sampled (littoral species are well known, abyssal sampling is currently done at a global scale united by CeDaMar, http://www.cedamar.org), any bathyal material contributes to a better understanding of the fauna of these depths. New and poorly known species and their known geographic distribution are described in this work.

Regarding the local water currents and mediterranean origin of *uNADW*, it is assumed *a priori* that the continental slope of northern Galicia contains faunal elements of which some also occur in the Mediterranean Sea and off northern Africa, others also around England and the Biscayan Sea.

Furthermore, there are some questions on the species composition of the local fauna and on the geographical and bathymetric distribution that shall be answered in the present thesis:

- How does species richness and species composition change with depth?
- Which isopod taxa are specialized to a restricted depth range? From what depth on do specialized deep-sea species appear? What is the bathymetric range of isopod species? Does the bathymetric range change with geographical latitude?
- Are endemic species present and which fraction of the fauna is endemic?
- What is the world wide geographical distribution of each isopod species occurring along the western Iberian coast? What is the proportion of North East Atlantic, North African and/or Mediterranean species in the present fauna?
- How many species are unknown? Is their proportion comparable to that of samples from abyssal depths (often more than 50%, BRANDT *et al.* 2007 a, b)?

2 Material and methods

2.1 Sampling

The expedition series "DIVA-Artabria 1" with the Spanish oceanographic research ship B.O. "*Mytilus*" from the University of Vigo, Spain, took place in two consecutive years (September 2002 and September 2003) off the coast of northern Galicia. The aim was a faunistic analysis of the sublittoral and bathyal benthos along a bathymetric gradient.

The employed sampling gear consisted of an Agassiz Trawl (Fig. 5), a small Naturalist Dredge (Fig. 7) and an epibenthic sledge after BRENKE (2005) in a resized "1:2 scale" version (Fig. 9) to fit the smaller dimensions of the research vessel. It was remarkable to find samples from depths of 1000 m to be significantly contaminated with heavy oil, supposedly from the "Prestige" impact.

Along a transect of about 60 km length stations of the lower margin of the shelf and of the continental slope were examined at depths of ca. 100 up to 1000 m (sampled areas are given for each sampling gear in figs. 4, 6, 8, for station coordinates see appendix). Sampling was done from 2002-09-08 to 2002-09-14 and from 2003-09-11 to 2003-09-19 starting from the Ría de Ferrol (Estación de Bioloxía Mariña da Graña, Ferrol – near A Coruña). As most of the sampled areas consisted of rocky substrates and rubble a quantitative sampling with e.g. box corers would not have been efficient. Therefore, the sampling focussed on taxonomical registration with dragging gear. Samples were taken from more stations in the campaign of 2003 (25 compared to 19 in 2002) due to the greater staff of scientists and exceptionally good weather conditions (especially the sampling at greater depths of the transect with the epibenthic sledge were not possible due to bad weather in 2002).

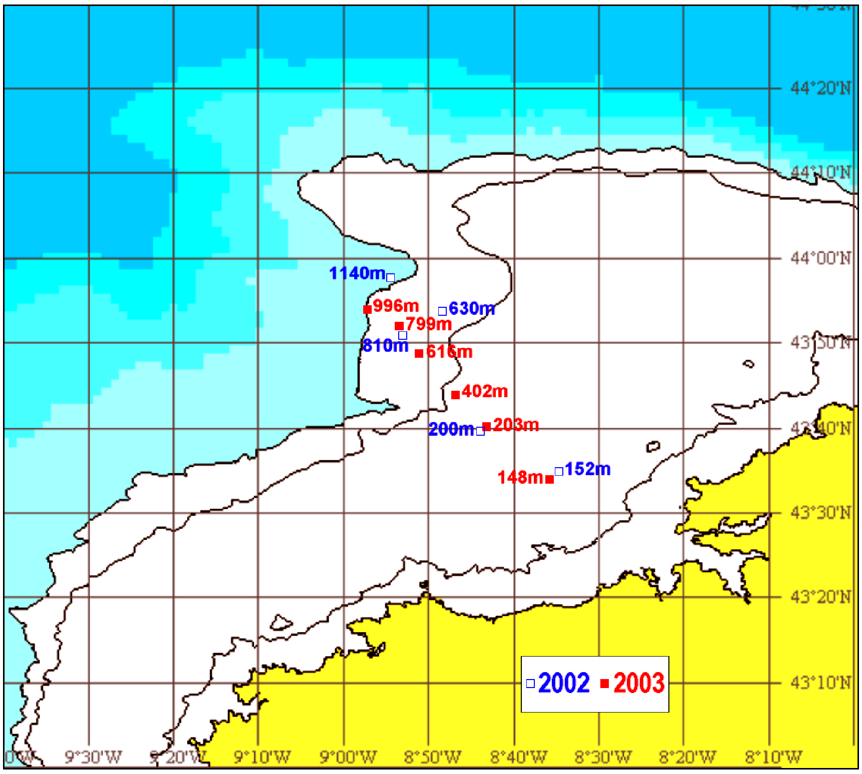

Fig. 4: Sampled areas with an Agassiz Trawl (AT) during the expedition "DIVA-Artabria 1" in 2002 (blue, hollow squares) and 2003 (red, full squares) along a vertical transect. Bathymetric chart: GEBCO, with 100, 500 and 1000 m isobaths (dark lines).

Fig. 5: The Agassiz Trawl employed during the expedition "DIVA-Artabria 1" on board of B.O. "*Mytilus*", F.J. CRISTÓBO phot.

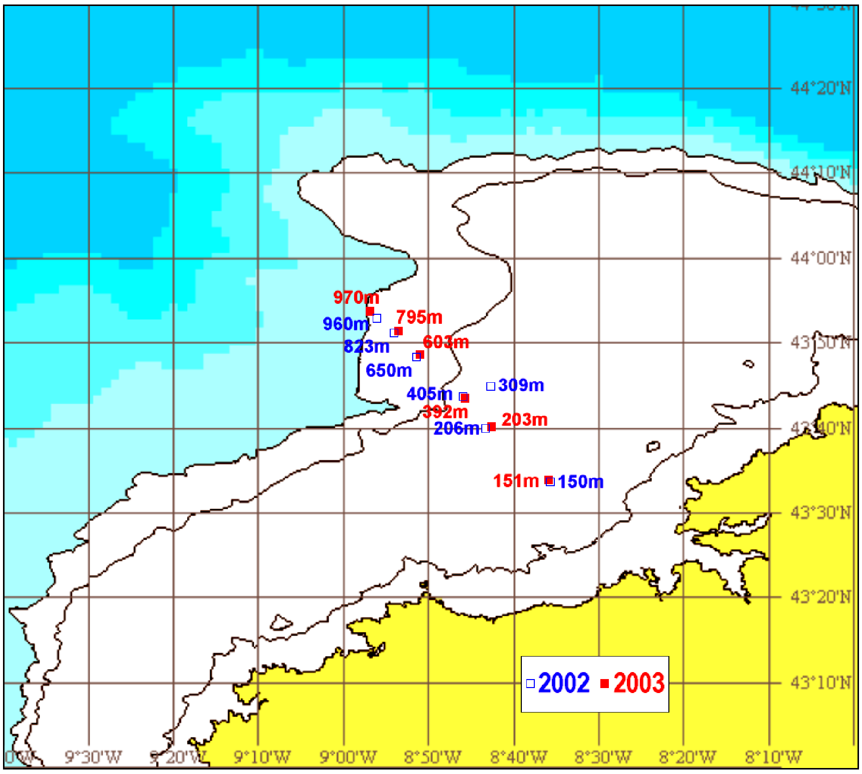

Fig. 6: Sampled areas with a Naturalist Dredge (DRN) during the expedition "DIVA-Artabria 1" in 2002 (blue, hollow squares) and 2003 (red, full squares) along a vertical transect. Bathymetric chart: GEBCO, with 100, 500 and 1000 m isobaths (dark lines).

Fig 7: The Naturalist Dredge employed during the expedition "DIVA-Artabria 1" on board of B.O. "*Mytilus*", P. RIOS-LÓPEZ phot.

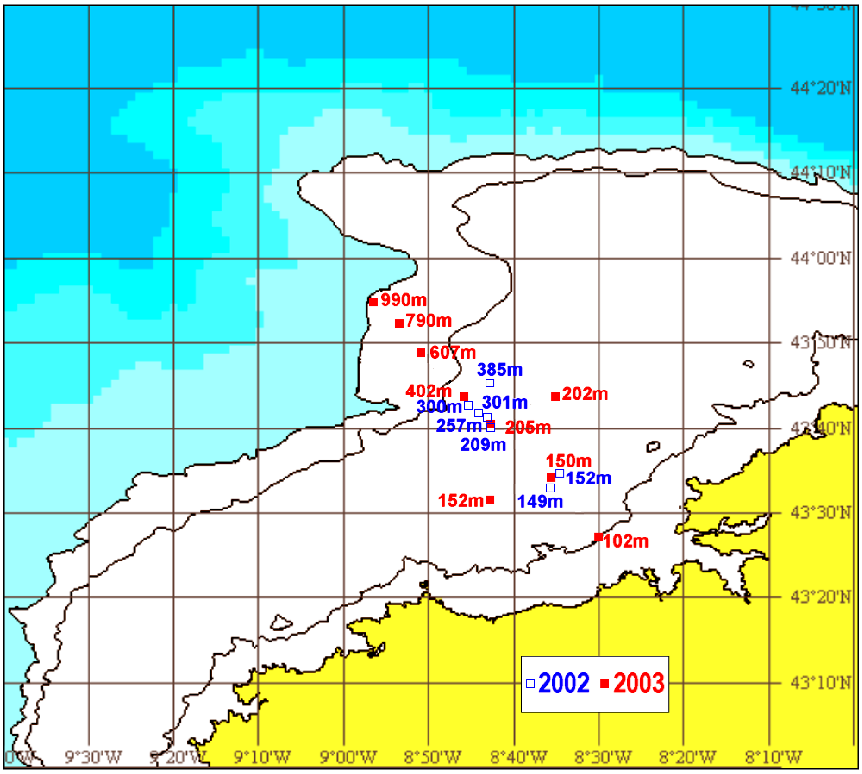

Fig. 8: Sampled areas with an Epibenthic sledge (EBS) during the expedition "DIVA-Artabria 1" in 2002 (blue, hollow squares) and 2003 (red, full squares) along a vertical transect. Bathymetric chart: GEBCO, with 100, 500 and 1000 m isobaths (dark lines).

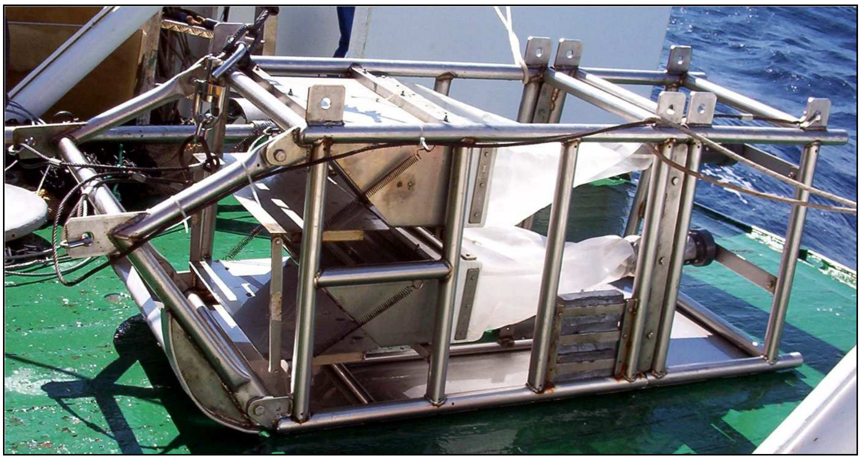

Fig. 9: Downscaled version of the epibenthic sledge after BRENKE (2005) during the expedition DIVA-Artabria 1 (2003) on board of B.O. "*Mytilus*". A. MURSCH phot.

2.2 Treatment of samples, taxonomic work

All isopod material collected during the expedition "DIVA-Artabria 1" was presorted in the Estación de Bioloxía Mariña da Graña, Ferrol, Spain. Further sorting and the taxonomic work was done in the Department of Evolutionary Ecology and Animal Biodiversity, University of Bochum, and in the German Centre for Marine Biodiversity Research (DZMB), Wilhemshaven, Germany. For identification of species, determination keys were used (where present) in combination with the taxonomic catalogue of Prof. Dr. J.–W. WÄGELE in the Zoological Research Museum Alexander Koenig, Bonn, Germany.

The samples were examined with an Olympus BX 40 stereo microscope and a Leica MZ 12_5 binocular microscope. Measurements were taken following WILSON & HESSLER (1980) using an object micrometer. Photographs of selected specimens were taken with a Leica MZ 12_5 binocular microscope equipped with a Leica DC 300 digital camera and an Olympus BX 40 stereo microscope with an ALTRA 20 digital camera. In cases of larger specimens (*Ianthopsis maximi* n. sp.), body appendages were placed in a staining block with 70% Ethanol, glycerine and KOH (in pellets) in order to macerate muscular tissue. Specimens with a cuticula strongly incrusted with $CaCO_3$ (e.g. Ischnomesidae) were decalcified by a few grains of crystalline citric acid. In one case body appendages were stained with "Lignin Pink" (=azophloxine, $C_{18}H_{13}N_3Na_2O_8S_2$, Fluka Chemika) to improve the contrast of cuticular structures (COLEMAN 2006). This treatment was dismissed later because the azophloxine dissolves in the glycerine gelatine. All drawings were made using a digital method ("digital inking", COLEMAN 2003, 2006): Instead of the conventional pencil drawings made using a *camera lucida*, the habitus and all separated body parts were digitally photographed in several focus levels (up to 37 images for complex three-dimensional objects as e.g. mandibles) so that for all external features of the cuticle including the upper and lower side sharp images were available.

To prepare drawings, these photographs were placed as a stack of separate layers in Adobe® Illustrator® (Version CS2) to facilitate a movement through different focus levels whithin the drawing program. The vector based (and therefore infinitely scaleable) line drawings were made in an additional layer above the photographs using a digitizer board (Intuos® 3 A4 wide, Wacom® inc.). The disadvantage of a large number of photographs having to be made prior to drawing (in some cases more than 700 for a single specimen) is compensated by a more efficient and convenient drawing method in contrast to the indirect method of making pencil drawings with a *camera lucida* that later have to be transferred to ink drawings.

Dissection was done with tungsten needles and minute insect pins (V2A stainless steel, 0.15 mm diameter) fixed in preparation needle handles (SCHULTZ 1969, MURSCH *et al.* 2008). In some taxa – especially in Munnopsidae – antenna 1 and 2 of one side of the body were separated to facilitate lateral drawings of the frons, clypeus and labrum (WILSON 1989). Separated body parts were embedded with MERCK® glycerine gelatine dyed with light green.

As a further optimization of this method (COLEMAN 2003, 2006), the many different types of setae were predefined as brush tools in Adobe Illustrator. Initially; an idealized symmetrical line drawing was done for each type of seta. This drawing was marked and defined as new paintbrush object. It is necessary to switch on the control box "proportional" in the properties panel of the paintbrush to guarantee that the width : length ratio of any drawn seta of this type will stay the same. So any drawing can later be rescaled as desired without having to redraw the setae. This technique is mostly suitable for simple setae, spine-like setae etc. and is less useful for e.g. the serrated spine-like setae on the exopod of maxilla 1 or in the spine row of the mandible. This technique allows a more efficient drawing and setae can be figured at any shape and curvature far more realistic than by joint line segments. As it is assumed that future taxonomic work will rely more intensely on digital drawing methods, the brush tool library that was prepared for the setae in this work is available for taxonomists (URL: http://homepage.rub.de/andre.mursch/setae.ai).

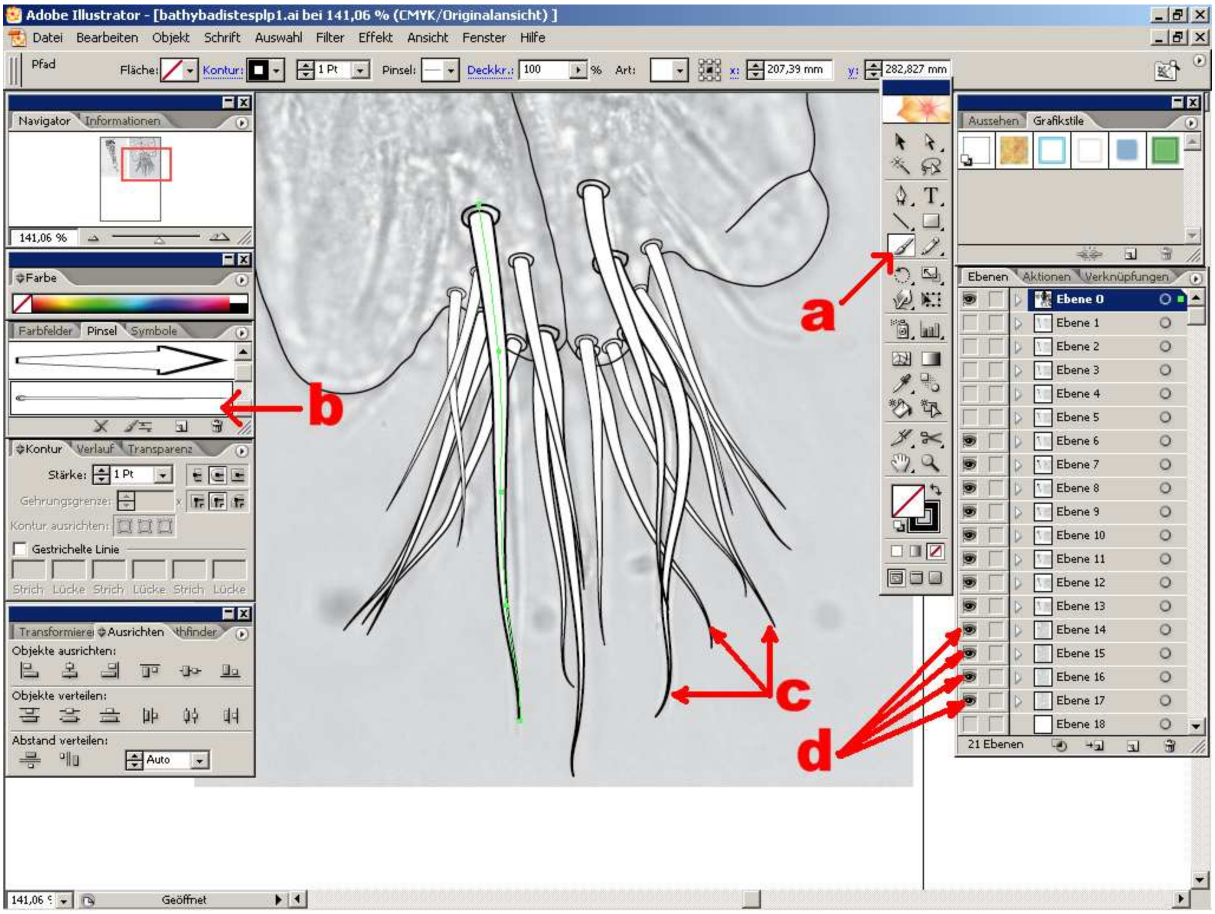

Fig. 10: Screenshot during the drawing process with Adobe Illustrator: apex of pleopod 1 of *Bathybadistes penthesilea* n. sp. (compare Plate XXXVIII a): a) brush tool in the toolbar; b) brush tool library, the chosen seta type is framed; c) different setae drawn freehand using the same seta type, the drawing of setae always starts with the undermost one; d) layer panel, the drawing is exclusively done in the uppermost layer, the following layers 1 – 17 contain the photographs from the microscopic slide in different levels of focus. The eye symbol of each layer can be switched on or off separately so that it is possible to toggle through different focus levels on screen.

Body lengths in this work are defined following WILSON & HESSLER (1980) as length between apex of rostrum (if present, in species lacking a rostrum the anterior margin of the frons is used) and caudal tip of pleotelson and are measured in lateral view as dorsal views are mostly insuitable for a correct measurement due to at least partial dorsoventral enrollment of the body. Body appendages such as antennae, uropods and labrum are excluded from body lengths. Lengths of pereopods and other multi-articled body appendages are given as if fully stretched out (which is not always possible in reality), i.e. the combined lenghts of all articles along their longitudinal axis (disregarding distal lobes projecting over joints).

For the external morphology of Gnathiidae the terminology of COHEN & POORE (1994) was followed. The terminology of the isopod setae refers mostly to HESSLER (1970), WILSON (1989) and WATLING (1989), although no uniform concept exists at present. "Swimming setae" is exclusively used for plumose setae on the carpi and propodi of natatory pereopods with specialized insertion (only existent in Munnopsidae and Desmosomatidae). As the term implies the function of these setae, it is only used where this function has been observed (HESSLER & STRÖMBERG 1989). "Fan setae" are flattened, more or less broadened, spine-like setae with jagged margin found on the distal end of the maxilliped's endite. "Pappose setae" describes setae on medial margins of maxilliped palp articles 2 and 3 with dense setulation in the distal half but without setulation in the proximal half, both halves demarcated by an annulus. For Cirolanidae, additional terms follow BRUSCA *et al.* (1995; e.g. "circumplumose, spine-like seta" for spine-like setae on the endopod of maxilla 1). The commonly used diminutive terms "antennula" for antenna 1 and "maxillula" for maxilla 1 are dismissed due to the term implying both appendices to be of smaller size than their counterparts (antenna 2 and maxilla 2, respectively) which is often not the case. In most cases maxilla 1 (especially the rami) is considerably larger than maxilla 2. Abbreviations were avoided whenever possible.

Prior to publication, type material of all described new species of this work will be deposited in the Zoologisches Museum Hamburg (ZMH), Germany.

2.3 Zoogeography

As deep-sea samples usually are scattered and taken without international coordination, the data on the geographical distribution of a single species have to be compiled from previous records in the literature. To give a better overview of the collected data, geographical maps showing the distribution of individual species were created using bathymetric charts provided by GEBCO (=General Bathymetric Chart of the Oceans).

2.4 Comparison with other faunas

For a better understanding of the characteristics of the regional faunal of the Galician Continental slope, the fauna was compared with isopods collected from the Great Meteor Seamount (cruise M42-3 with RV "Meteor", ca. 700 specimens) and from the Mediterranean Sea (cruise M71 with RV "Meteor", LEVAR expedition, 55 specimens). Additional material from the Mediterranean Sea (cruise M25 with RV "Meteor", 946 specimens; cruise M40 with RV "Meteor", 109 specimens) was loaned from the Senckenberg Research Institute, Frankfurt am Main, Germany.

3 Results

The two consecutive expeditions of "DIVA-Artabria 1" yielded 690 isopod specimens belonging to at least 36 species (Table 1). Specimens were collected from all sampled depths of the campaign and were present in all samples where the epibenthic sledge was employed.

16 specimens of Gnathiidae were found as isolated females or Praniza larvae and were indeterminable to species level. One specimen of Cirolanidae (not conspecific with the other cirolanid material) from 1140 m and one specimen of "Janiridae" (not conspecific with *Austrofilius teiresias* n. sp.) from 630 m depth consisted of indeterminable fragments. The Bopyridae were represented by five indeterminable Cryptoniscium larvae from 607 – 970 m depth.

The remaining 33 species could be identified. Of these, 24 species were already known to science (Table 1), nine were unknown and are described in the taxonomic part. The new species are:
Munna heikeae n. sp. (Asellota: Munnidae)
Notoxenoides nudicollis n. sp. (Asellota: Paramunnidae)
Austrofilius teiresias n. sp. (Asellota: "Janiridae")
Ianthopsis maximi n. sp. (Asellota: Acanthaspidiidae)
Lipomera (Lipomera) celtica n. sp. (Asellota: Munnopsidae: Lipomerinae)
Bathybadistes penthesilea n. sp. (Asellota: Munnopsidae: Ilyarachninae)
Ischnomesus brenkei n. sp. (Asellota: Ischnomesidae)
Arcturopsis mammifer n.sp. (Valvifera: Arcturidae)
Caecognathia ovalifrons n. sp. (Cymothoidea: Gnathiidae)

Additionally, five previously insufficiently documented species are rediscribed. These are:
Pseudarachna hirsuta (SARS, 1864) (Asellota: Munnopsidae: Ilyarachninae)
Munnopsoides eximius HANSEN, 1916 (Asellota: Munnopsidae: Munnopsinae)
Macrostylis longiremis (MEINERT, 1890) (Asellota: Macrostylidae)
Metacirolana hanseni (BONNIER, 1896) (Cymothoidea: Cirolanidae)
Gnathia dentata (SARS, 1872) (Cymothoidea: Gnathiidae)

The horizontal distribution of the previously known species is shown in the zoogeographical part (Fig. 11 – 33, Table 3).

Table 1: Species station matrix of the Isopoda with the number of specimens sampled in the expedition "DIVA-Artabria 1" in 2002 and 2003. Areas sampled with epibenthic sledge in grey shade. New species in light grey shade. Species that were examined in detail are underlined.

Sub-order	Familiy	Species	102 m (EBS 100-03)	103 m (DRN 100-03)	148 m (AT 150-03)	149 m (EBS 150 B-02)	150 m (DRN 150-02)	150 m (EBS 150-03)	151 m (DRN 150-03)	152 m (AT 150-02)	152 m (EBS 150-02)	152 m (EBS 150 W-03)	200 m (AT 200-02)	202 m (DRN 200-03)	202 m (EBS 200 E-03)	203 m (AT 200-03)	203 m (DRN 200 B-03)	205 m (EBS 200-03)	206 m (DRN 200-02)	209 m (EBS 200-02)	257 m (EBS 250-02)	300 m (EBS 350-02)	301 m (EBS 300-02)	301 m (EBS 300-03)	309 m (DRN 300-02)	350 m (EBS 350-03)	385 m (EBS 400-02)	392 m (DRN 400-03)	402 m (AT 400-03)	402 m (EBS 400-03)	405 m (DRN 400-02)	603 m (DRN 600-03)	607 m (EBS 600-03)	616 m (AT 600-03)	630 m (AT 600-02)	650 m (DRN 600-02)	790 m (EBS 800-03)	795 m (DRN 800-03)	799 m (AT 800-03)	810 m (AT 800-02)	823 m (DRN 800-02)	960 m (DRN 1000-02)	970 m (DRN 1000-03)	990 m (EBS 1000-03)	996 m (AT 1000-03)	1140 m (AT 1000-02)
Asellota	Munnidae	*Munna heikeae* n. sp. [n=41]																															33		2					3					1	2
Asellota	Para-munnidae	*Metamunna typica* [n=102]	71					1			14		2					3		8	1						2																			
Asellota	Para-munnidae	*Notoxenoides nudicollis* n. sp. [n=1]																															1													
Asellota	Para-munnidae	*Paramunna bilobata* [n=14]									7							5		2																										
Asellota	"Janiridae"	*Austrofilius teiresias* n. sp. [n=13]																																	3					10						
Asellota	"Janiridae"	"Janiridae" gen. sp. [n=1]																																	1											
Asellota	Acanthaspi-diidae	*Ianthopsis maximi* n. sp. [n=16]																															10				2						4			
Asellota	Janirellidae	*Janirella hessleri* [n=21]																																									15		3	3
Asellota	Munnopsidae	*Disconectes latirostris* [n=70]																11					1				5			21			32													
Asellota	Munnopsidae	*Eurycope cornuta* [n=7]																															6				1									
Asellota	Munnopsidae	*Lipomera (Lipomera) celtica* n. sp. [n=6]																												6																
Asellota	Munnopsidae	*Ilyarachna longicornis* [n=22]																									5			4			11													2
Asellota	Munnopsidae	*Bathybadistes penthesilea* n. sp. [n=50]																									1						48				1									
Asellota	Munnopsidae	*Pseudarachna hirsuta* [n=5]																				5																								
Asellota	Munnopsidae	*Munnopsoides eximius* [n=2]																															2													
Asellota	Desmosoma-tidae	*Eugerda tenuimana* [n=46]																			21	5	6				6			6			2													
Asellota	Desmosoma-tidae	*Prochelator lateralis* [n=7]																3					1							1			2													
Asellota	Macro-stylidae	*Macrostylis longiremis* [n=1]																																			1									
Asellota	Ischnome-sidae	*Ischnomesus brenkei* n. sp. [n=6]																															6													
Valvifera	Arcturidae	*Arcturella dilatata* [n=2]						2																																						
Valvifera	Arcturidae	*Arcturopsis mammifer* n. sp. [n=109]																								1	1						77		1		7			1	7		9		1	4
Valvifera	Arcturidae	*Astacilla longicornis* [n=10]																															10													
Anthu-ridea	Hyssuridae	*Hyssura cf. producta* [n=2]																																	1										1	
Anthu-ridea	Paranthu-ridae	*Calathura brachiata* [n=2]																																												2
Anthu-ridea	Paranthu-ridae	*Leptanthura tenuis* [n=1]																															1													
Cymo-thoidea	Cirolanidae	*Eurydice truncata* [n=7]																		1													3							3						
Cymo-thoidea	Cirolanidae	*Eurydice pulchra* [n=1]																																			1									
Cymo-thoidea	Cirolanidae	*Metacirolana hanseni* [n=69]																																									54		2	13
Cymo-thoidea	Cirolanidae	*Natatolana borealis* [n=1]																															1													
Cymo-thoidea	Cirolanidae	*Natatolana gallica* [n=3]																														3														
Cymo-thoidea	Cirolanidae	Cirolanidae gen. sp. [n=1]																																												1
Cymo-thoidea	Gnathiidae	*Caecognathia ovalifrons* n. sp. [n=6]																																						4						2
Cymo-thoidea	Gnathiidae	*Gnathia albescens* [n=4]																																									3			1
Cymo-thoidea	Gnathiidae	*Gnathia dentata* [n=8]																																	7					1						
Cymo-thoidea	Gnathiidae	Gnathiidae gen. sp. indet. [n=16]	1															1															2		3		2			3			2			2
Sphaero-matidea	Ancinidae	*Bathycopea typhlops* [n=12]																															6				6									
Epicaridea	Bopyridae	Bopyridae gen. sp. indet. [n=5]																															2							2			1			

3.1 Taxonomic results

Suborder Asellota LATREILLE, 1803

The Asellota are characterized by the fusion of the pleotelson with at least pleonites 3 – 5. Pleopod 1 is always missing in female Asellota, in males it is lacking the endopod. The endopod of the male pleopod 2 is elongated to a stylet with dorsal sperm duct. In females, pleopod 2 is uniramous, without endopod. In addition to the 2 terminal claws the dactylus has an additional, smaller third claw. Asellota have a worldwide geographical distribution, they occur both in marine and limnic habitats, their bathymetric distribution is from the surface to hadal depths. It is an extremely diverse group and consists of more than 2000 described species (2146 as of December 2008: SCHOTTE *et al.* 1995 ff.). Asellota are predominantly benthic, the tail fan is reduced and the number of plumose setae on the pleopods is reduced. However, some janiroid families evolved new mechanisms for swimming (Munnopsidae and Desmosomatidae).

Superfamily Janiroidea SARS, 1897

In Janiroidea the male pleopods 1 of both sides are medially fused. The suture forms a part of the sperm duct. The male pleopod 2 has a stylet-shaped endopod with a sperm groove that is closed to a tube that is open at both ends. The carpus of pereopod 1 is elongated (and not short and triangular) and contributes to a subchela. Janiroidea are especially known for their species richness and diversity in deepwater habitats, the variation in general body shape is immense and there are many bizarre looking deepwater species that show spines and other processes on their head, pereonites and pleotelson. The phylogeny of the Janiroidea has not yet been fully resolved, but it is one of the major fields of work within isopod research (e.g. RAUPACH *et al.* 2005).

3.1.1 Family Munnidae SARS, 1899

The Munnidae are more or less dorsoventrally flattened, but usually dorsally convex, especially at the pleotelson. There are 109 previously recorded species (December 2008, SCHOTTE *et al.* 1995 ff.). WÄGELE (1989) defines the "munnoid habitus" with an oval body outline in dorsal view due to the anterior and posterior pereonites being narrower than those at mid-length. Pereonites 5 – 7 are not only narrower but also considerably shorter than the preceding pereonites. The head is wider than long with laterally pointing, stalked eyes. The pleotelson is dorsally convex and mostly elliptical in cross-section. In Munnidae, the pereopods are often much longer than the body, except for the subchelate pereopod 1. The usually very small uropods are not inserting posteroventrally, but posterolaterally, if not even shifted to the dorsum of the pleotelson. The anus is freely visible and not covered by the pleopods in ventral view.

Genus *Munna* KRØYER, 1839

Type species: *Munna boeckii* KRØYER, 1839

Species included: *M. acanthifera* HANSEN, 1916; *M. aculeata* SIVERTSEN & HOLTHUIS, 1980; *M. affinis* NORDENSTAM, 1933; *M. amphoricauda* TEODORCYZK & WÄGELE, 1994; *M. antarctica* (PFEFFER, 1887); *M. arcacauda* TEODORCYZK & WÄGELE, 1994; *M. argentinae* MENZIES, 1962; *M. armoricana* CARTON, 1962; *M. arnholdi* GURJANOVA, 1933; *M. avatshensis* GURJANOVA, 1936; *M. bispina* SHIMOMURA & MAWATARI, 2001; *M. bituberculata* NORDENSTAM, 1933; *M. boeckii* KRØYER, 1839; *M. caprinsula* KENSLEY & SCHOTTE, 1994; *M. chilensis* MENZIES, 1962; *M. chromatocephala* MENZIES, 1952; *M. chromatocephala orientalis* KUSSAKIN, 1962; *M. coeca* GURJANOVA, 1930; *M. concavifrons* (BARNARD, 1920); *M. coxalis* KUSSAKIN, 1972; *M. crinata* KUSSAKIN, 1972; *M. crozetensis inornata* KUSSAKIN, 1962; *M. crozetensis* KUSSAKIN & VASINA, 1982; *M. crozetensis orientalis* KUSSAKIN, 1974; *M. cryophila* VANHOEFFEN, 1914; *M. dentata* VANHOEFFEN, 1914; *M. fabricii* KRØYER, 1846; *M. fernaldi* GEORGE & STRÖMBERG, 1968; *M. gallardoi* WINKLER, 1992; *M. globicauda* VANHOEFFEN, 1914; *M. groenlandica* HANSEN, 1916; *M. halei* MENZIES, 1952; *M. hanseni* STAPPERS, 1911; *M. heikeae* n. sp.; *M. hentyi* POORE, 1984; *M. hirsuta* KUSSAKIN, 1962; *M. hovelli* POORE, 1984; *M. instructa* CLÉRET, 1971; *M. japonica* SHIMOMURA & MAWATARI, 2001; *M. jazdzewskii* TEODORCYZK & WÄGELE, 1994; *M. kerguelensis* KUSSAKIN & VASINA, 1982; *M. kroeyeri* GOODSIR, 1842; *M. kurilensis* KUSSAKIN, 1974; *M. limicola* SARS, 1866; *M. lobata* KUSSAKIN, 1962; *M. longipoda* TEODORCYZK & WÄGELE, 1994; *M. lukini* KUSSAKIN & MEZHOV, 1979; *M. lundae* MENZIES, 1962; *M. macquariensis* HALE, 1937; *M. maculata* BEDDARD, 1886; *M. magnifica* SCHULTZ, 1964D; *M. makarovi* ROSTOMOV, 1987; *M. minuta* HANSEN, 1916; *M. modesta* KUSSAKIN, 1962; *M. nasuta* KUSSAKIN & MEZHOV, 1979; *M. neglecta* MONOD, 1931; *M. neozelanica* CHILTON, 1892; *M. ornata* KUSSAKIN, 1962B; *M. pallida* BEDDARD, 1886; *M. palmata* LILLJEBORG, 1851; *M. parvituberculata* KUSSAKIN, 1962; *M. pellucida* GURJANOVA, 1930; *M. petronastes* KENSLEY, 1984; *M. psychrophila* VANHOEFFEN, 1914; *M. roemeri* GURJANOVA, 1930; *M. serrata* KUSSAKIN, 1962; *M. setosa* KUSSAKIN, 1962; *M. (Metamunna) similis* FRESI & MAZZELLA, 1971; *M. spicata* TEODORCZYK & WÄGELE, 1994; *M. spinifera* ROBINSON & MENZIES, 1961; *M. spinifrons* MENZIES & BARNARD, 1959; *M. spitzbergensis* GURJANOVA, 1930; *M. stephenseni* GURJANOVA, 1933; *M. studeri* HILGENDORF, 1893; *M. subneglecta* GURJANOVA, 1936; *M. temae* MÜLLER, 1990; *M. tenuipes* KUSSAKIN, 1962; *M. truncata* RICHARDSON, 1908; *M. unicincta* KUSSAKIN & MEZHOV, 1979; *M. uripica* KUSSAKIN, 1972; *M. varians* SIVERTSEN & HOLTHUIS, 1980; *M. vittata* KUSSAKIN & MEZHOV, 1979; *M. wolffi* FRESI & MAZZELLA, 1974

Diagnosis

The diagnosis of POORE (1984) is followed here.

3.1.1.1 *Munna heikeae* n. sp.

Material examined: **Holotype** male (2.29 mm), Continental slope off Ría de Ferrol, Galicia, Spain, 43º48.587' N, 08º51.402' W – 43º49.545' N, 08º51,197' W, 607 m, station: "EBS 600-03", **Paratypes**, female (2.16 mm), juvenile male (1.36 mm), juvenile female (1.28 mm), same locality as holotype, station: "EBS 600-03".

Additional material: 5 paratypes, same locality as examined material.

Type material will be deposited in the Zoologisches Museum Hamburg (ZMH), Germany.

Distribution

Known only from *locus typicus*: Continental slope off northern Galicia, Spain. Stations: "EBS 600-03", "AT 600-02", "AT 800-02", "AT 1000-03", "AT 1000-02" at 607 – 1140 m depth.
Etymology: Dedicated to the author's beloved life companion Heike Lünenstraß.

Diagnosis

Munna with body about 2.2 – 2.3 times longer than wide. Pleotelson more than a third of body length, with shallow notch at uropod insertion, ventrodistal margin serrated with 5 – 6 denticles. Uropod biramous with inconspicuous exopod 0.3 times endopod length, hardly visible *in situ*. Uropodal endopod without denticles, distally tapering. Male pleopod 1 narrowest at apex, distolateral lobes not pointing laterally.

Description of male holotype

Body (Plate I a) 2.29 mm long, elongatedly oval, length : width = 2.29, dorsoventrally slightly flattened width : depth about 1.5, sparsely setose. Width of head > pereonite 1 < pereonite 2 < pereonite 3 = pereonite 4 > pereonite 5 > pereonite 6 > pereonite 7 < pleotelson. Head transverse, length : width = 0.43. Eyes well developed, on short stalks, rounded, with approximately 40 ocelli. Anterior margin of clypeus with irregular row of simple setae. Pereonites tightly packed, pereonites 1 – 6 with rounded lateral margin with dorsolateral supracoxal bulge, inconspicuous at pereonite 7. Supracoxal bulges of pereonites 1 – 3 pointing anteriolaterally, pointing laterally at pereonite 4, caudolaterally at 5 – 7. Pereonite 7 with acute caudolateral angle.

Pleotelson elongatedly cordiform, length : body length = 0.36, length : width = 1.35, widest at proximal third, apex rounded, distolateral margin bulged at uropod insertion, ventrolateral margin between insertion of uropod and apex serrated, serration consisting of 5 – 6 cusps. Laterally at proximal third 2 inconspicuous spine-like setae.

Pleopod 1 (Plate VII a) 3.7 times longer than wide, ventrally setose, distal third devoid of setae, distally evenly tapering, narrowest at apex. Apices with 8 simple setae and small distolateral lobe pointing caudally.

Pleopod 2 (Plate VII b) sympod 3.5 times as long as wide, ventrally with evnly distributed simple setae. Exopod short, bulbous, hardly projecting beyond mesial margin of sympod: Endopod with acute stylet of 0.6 times sympod length, distally not projecting beyond apex of sympod.

Description of female paratype

Length 2.16 mm, body as in male holotype. Antenna 1 (Plate I b) 0.34 times body length, 3 cylindrical peduncular articles. Article 1 length : width = 1.5, distally with 1 broom seta and 2 simple setae. Article 2 length : article 1 length = 1.3, length : width = 2.5, 3 broom seta at midlength, distally with 1 broom seta. Article 3 length : article 2 length = 0.4, length : width = 1.5, distally with 1 simple seta. Flagellum with 5 articles, length of article 1 < 2 > 3 = 4 >> 5. Article 1 distally with 1 simple and 1 broom seta, article 2 with 2 simple setae at midlength, distally with 1 simple seta. Article 3 distally with 1 simple setae. Article 4 distally with 1 simple seta and 1 aesthetasc. Article 5 very short, distally with 2 simple setae and 1 aesthetasc.

Antenna 2 (Plate I c) basalmost 4 peduncular articles preserved, cylindrical, length of article 1 = 2 < 3 > 4. Article 1 distolaterally with 2 simple setae. Article 3 distomedially with 6, distolaterally with 5 simple setae. Scale of article 3 fused with article, consisting of a small distolateral bulge.

Labrum (Plate II a) width : cephalic width = 0.26, semi-circular with shallow anteromedial depression, anteromedial margin with fringe of simple setae.

Mandibles (Plate II b, c) slender, incisor part of left mandible with 4, of right mandible with 5 cusps. *Lacinia mobilis* with 4 cusps. Spine row of left mandible with 3, of right mandible with 5 denticulate spine-like setae, progressively increasing in length and number of denticles from distal to proximal end of spine row. Distalmost denticulate spine-like seta of right mandible similar to *lacinia mobilis*. Molar part cylindrical, triturating surface weakly excavated. Molar part of left mandible distoventrally with several scale setae, triturating surface with 5 sensory cavities. Molar part of right mandible dorsal margin of triturating surface with row of irregular cusps and 4 hemiplumose setae. Condyle inconspicuous, shorter than molar part. Palp length : mandible body length = 0.97. Articles cylindrical, straight, progressively narrower from article 1 to article 3. Article 1 with scattered scale setae and 2 simple setae, distoventrally with 1 spine-like seta. Article 2 length : article 1 length = 1.35, distal half laterally densely covered with scale setae, 2 distolateral plumose, spine-like setae. Article 3 as long as article 1, laterally densely covered with scale setae, distally with 3 hemiplumose, spine-like setae.

Maxilla 1 (Plate III a) exopod 3.6 times as long as wide. Medial margin with 6 transverse rows of 3 to 5 simple setae, distomedially with 6 simple setae. Apex obliquely truncate, with 6 simple, spine-like setae and 6 denticulate, spine-like setae. Endopod 0.7 times as long as exopod, length : width = 4.3, apex mesially curved. Lateral margin with a row of 7 long, simple setae. Apex with 1 simple, spine-like seta and 3 hemiplumose, spine-like setae.

Maxilla 2 (Plate III b) both parts about 5.5 times as long as wide, lateral part a fourth longer than mesial part, distally surpassing endopod, mesial part shorter than endopod. Apex of lateral part with 1 hemiplumose, spine-like seta and 3 long, simple, spine-like setae. Apex of mesial part with 1 hemiplumose, spine-like seta and 3 long, simple, spine-like setae. Endopod length : width = 2.45, 2.4 times as wide as each part of exopod, distally with 5 simple, spine-like setae, mesial margin with 12 simple setae and 5 hemiplumose, spine-like setae.

Maxilliped (Plate IV a) coxa transverse, subrectangular, more than 2 times as wide as long. Basis inclusive of endite 2.4 times as long as wide. Endite 0.55 times basis length, 1.5 times as long as wide, distal margin truncate with shallow, irregular cusps, lateralmost largest. Distoventrally with 9 fan setae, 4 of which broadly leaf-shaped, with short denticles. Distomedial margin with 6 hemiplumose, spine-like setae. 3 coupling hooks. Palp with 5 articles. Article 1 short, transverse. Article 2 widest and longest, 1.2 times as long as wide, mesial and lateral margins convex, with several long, simple setae. Article 3 0.7 times article 2 width, mesial and lateral margins as in article 2. Article 4 oblongly rectangular, as long as article 3, 2.5 times as long as wide, with several long, simle setae. Article 5 0.8 times article 4 length and width, distally with several long, simple setae and 3 long, simple, spine-like setae. Epipodite 0.73 times basis length, 2.2 times as long as wide, asetose, apex bluntly right-angled.

Pleopod 2 (Plate VII c) cordiform, length : width = 1.33, lateral margins evenly convex, apex bluntly rounded. Ventrally with evenly distributed simple setae, proximomedially replaced by several simple, spine-like setae.

Pleopod 3 (Plate VII d) exopod with 2 articles, lateral margin convex, article 1 laterally with fringe of fine, short setae. Article 2 0.4 times article 1 length, mesial margin straight, apex acute-angled. Endopod distally surpassing exopod article 1, mesial margin straight, lateral margin convexly arched, widest shortly proximally of midlength. Apex truncate, 0.3 times as wide as endopod at midlength, with 3 plumose setae.

Pleopod 4 (Plate VII e) exopod narrow, with two articles, laterally fringed with simple setae. Article 2 0.5 times article 1 length, distally with 2 plumose setae. Endopod delicate, asetose, apex acute-angled.

Pleopod 5 (Plate VII f) delicate, asetose, 0.5 times as long as wide, apex acute-angled.

Uropod (Plate VII g) 0.04 times body length, biramous, sympod reduced, sessile, concealed *in situ*. Endopod 2.5 times as long as wide, distally tapering, at midlaength 2 insertions of broom setae, apex with 6 broom setae. Exopod 0.29 times exopod length, distally with 1 slender, spine-like seta.

Additional description of juvenile female paratype, body length = 1.28 mm

Antenna 2 (Plate I d) 1.70 times as long as body. Flagellum with 23 articles, 0.45 times antenna 2 length. Article 1 and 2 conjoint with suture remaining visible, article 1 about 1.5 times as long as article 2.

Additional description of juvenile male paratype, body length = 1.36 mm

All pereopods except for pereopod 7 preserved, pereopod 1 << 2 < 3 < 4 < 5 < 6. Pereopod 6 2.6 times body length. Bases of all pereopods subequally long. Pereopod 1 (Plate V a) propodo-subchelate, carpus and propodus about equally long, dorsoventrally enlarged. Carpus distoventrally with 4 simple, spine-like setae. Propodus ventrally with 4 simple, spine-like setae and 9 simple setae in two longitudinal rows enclosing dactylus. Dactylus 0.4 times propodus length, 2 slender claws, dorsal claw about 2 times as long as ventral claw. Pereopods 2 – 6 (Plate V b – Plate VI b) ambulatory, slender, propodi progressively longer compared with carpi. Bases < ischii > meri << carpi < propodi >> dactyli. Basis of pereopod 2, carpi of peropods 2 and 3 distally, propodi of pereopods 2, 3, 4, 6 distally with 1 broom seta. Dactyli 0.12 to 0.25 times as long as propodi, 2 slender claws, dorsal claw about 1.5 times as long as ventral claw.

Remarks

Taxonomy within the large genus *Munna* is quite complicated and the species are frequently difficult to identify. The new species *M. heikeae* is one of the fewer species that are more elongated, with a relatively narrower pleotelson that bears less conspicuous spine-like setae in comparison to e.g. *M. minuta* HANSEN, 1916, *M. kroeyeri* GOODSIR, 1842 and *M. boeckii* KRØYER, 1839. In general proportions, it is very similar to *M. limicola* SARS, 1866, which is distributed in the North East Atlantic, the Mediterranean Sea and has been recorded from the Iberian peninsula (RODRÍGUEZ-SANCHEZ *et al.* 2001). However, in *M. limicola* the distolateral serrated edge is absent and the distolateral lobes of the male pleopod 1 are sharply pointed and stronger diverging than in *M. heikeae*. *M. limicola* has a stout, distally truncate and uniramous uropod, completely different from the biramous, relatively slender and distally rounded uropod in *M. heikeae*. For most species the uropod is figured as being uniramous, however, it has to be considered that the diminutive and inconspicuous exopod (approximately 0.02 mm in the described specimen here) may have been overlooked in other species. In *M. heikeae* the male pleopod 1 is tapering distally, the distolateral lobes are distinct but small and not diverging much. The pleopod 1 of *M. heikeae* resembles especially that of *M. wolffi* in its proportions and apical setation and also the uropods of both species are very similar. However, *M. wolffi* has different body proportions, the relatively large head is distinctly wider than any of the pereonites, the pleotelson is narrower, especially caudally of the uropod insertions. For further morphological characters of *M. heikeae* in comparison with similar species of the genus, see Table 2. The male pereopod 1 figured (Plate V a) is small and not fully developed as it comes from a juvenile male specimen.

Table 2: Comparison of morphological characters of *Munna heikeae* n. sp. with similar species of the genus.

	M. heikeae n. sp.	*M. boeckii* Krøyer, 1839	*M. fabricii* Krøyer, 1846	*M. limicola* Sars, 1866	*M. minuta* Hansen, 1916	*M. palmata* Lilljeborg, 1851	*M. spinifrons* Menzies & Barnard, 1959
Body length : width	2.29	1.64 – 1.74	1.76 – 1.92	1.89 – 1.98	1.81	2.20	2.18
Pleotelson length : body length	0.36	0.33	0.29 – 0.35	0.37 – 0.41	0.32 – 0.33	0.38	0.31
Pleotelson length : width	1.35	1.23 – 1.26	1.06 – 1.50	1.46 – 1.55	1.38 – 1.50	1.31	1.22
Pleotelson ventrodistal margin serrated	5 – 6 denticles	4 – 9 denticles	5 denticles	0 denticles	5 denticles	0 denticles	0 denticles
Eyes stalked	short	short	short	long	short	short	short
Dorsolateral bulges on pereonites 1 – 6	present	present	present	present, also on pereonite 7 (figured in Sars 1899)	present	present	absent
Anterolateral spine-like setae on pleotelson	2	4	3 – 4	absent	3	2	2
Antenna 1 flagellum articles	5 (female)	5	3	4 – 5	3 – 4	3	4
Antenna 2 flagellum articles	23 (juvenile female)	approx. 40	approx. 30	approx. 30	approx. 30	16 (male)	unknown
Frons with transversal row of setae	present	absent	present (figured in Sars 1899) otherwise not figured	present (figured in Carton 1960)	absent	present	present, unequally bifid, spine-like setae
Notch at uropod insertion	present	present	present	hardly visible or absent	present	present	present
Uropod exopod length : endopod length	0.29	exopod absent	exopod absent	exopod absent	exopod absent	exopod absent	exopod absent
Uropod endopod tapering	yes	no	no	no	no	no	no
Male plepod 1 distolaterally divergent, subdistally narrower	no	yes	yes	yes	yes	unknown	yes

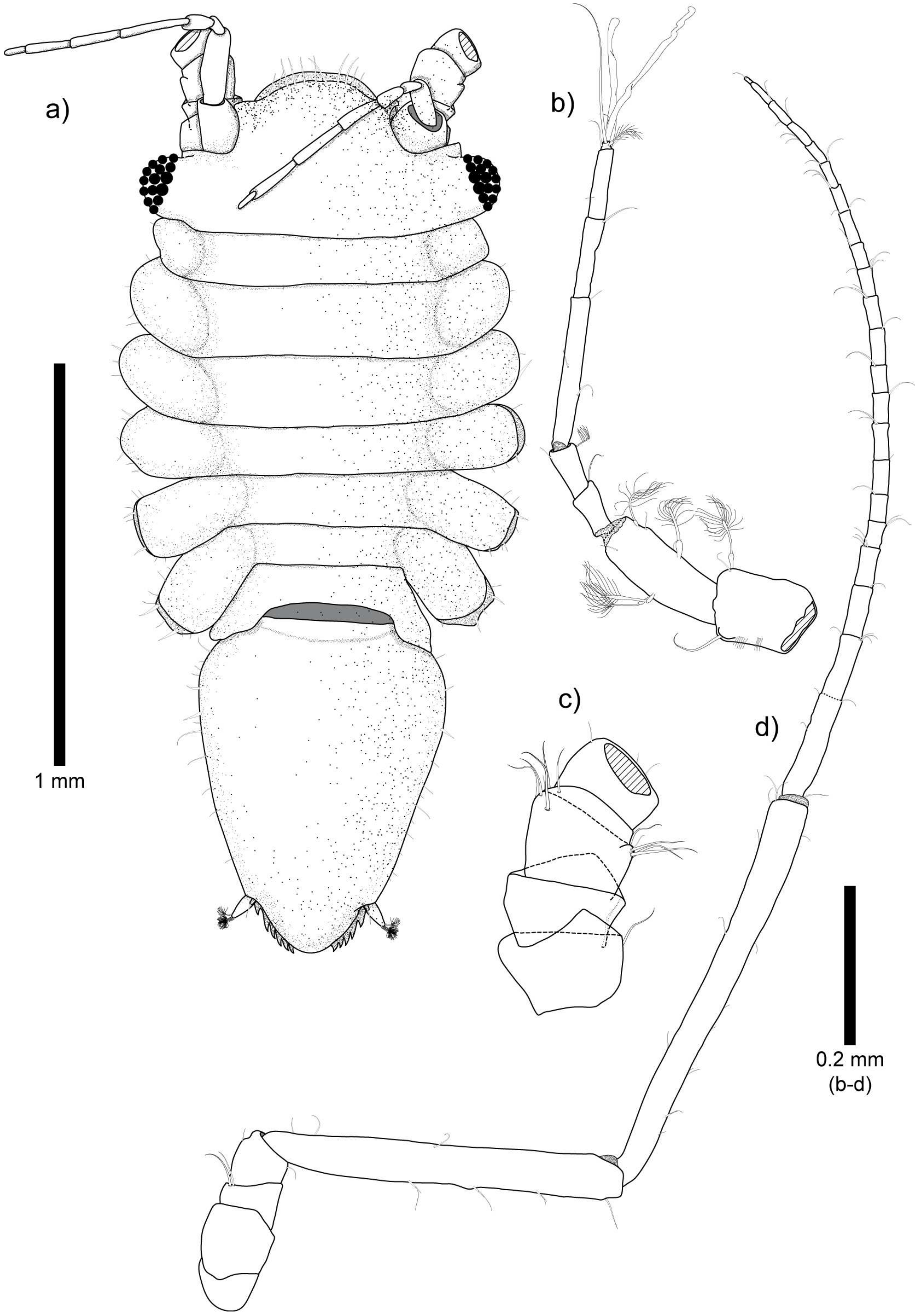

Plate I: *Munna heikeae* n. sp.; male holotype, length 2.29 mm: a) habitus dorsal; female paratype, length 2.16 mm: b) antenna 1; c) antenna 2 (basalmost articles); juvenile female paratype, length 1.28 mm: d) antenna 2.

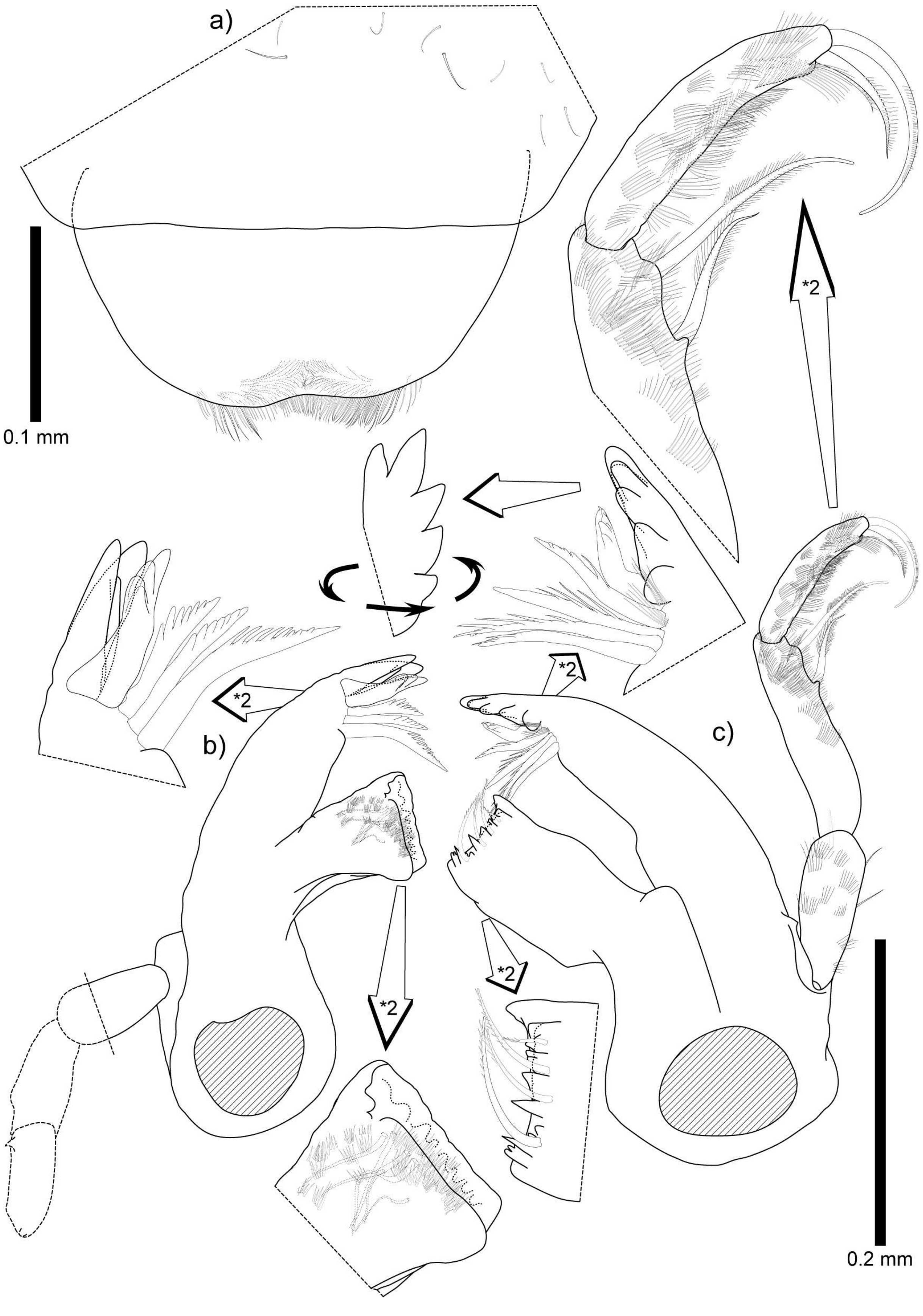

Plate II: *Munna heikeae* n. sp.; female paratype, length 2.16 mm: a) clypeus and labrum; b) left mandible; c) right mandible. Numbers in arrows indicate relative factor of magnification

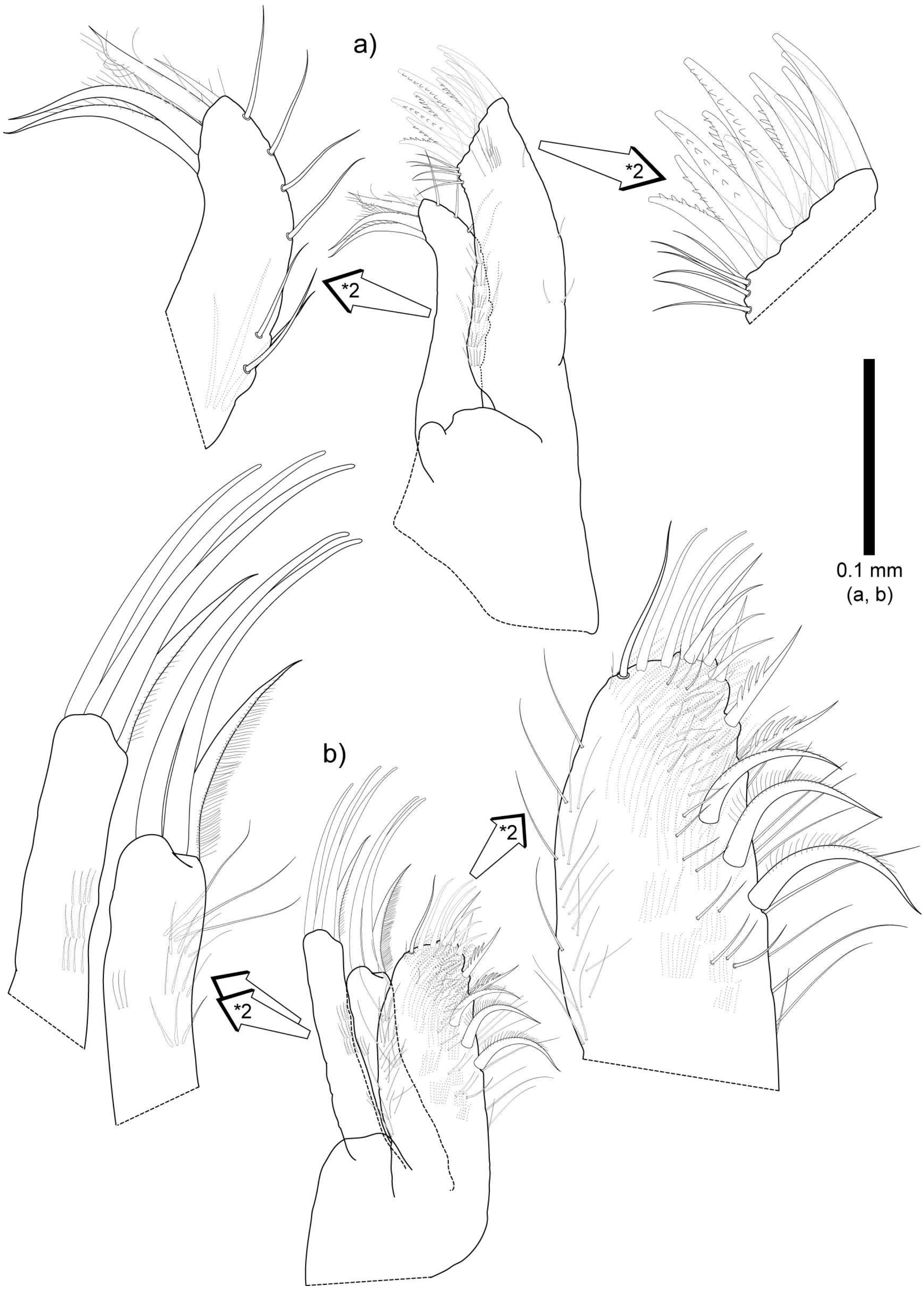

Plate III: *Munna heikeae* n. sp.; female paratype, length 2.16 mm: a) maxilla 1; b) maxilla 2. Numbers in arrows indicate relative factor of magnification

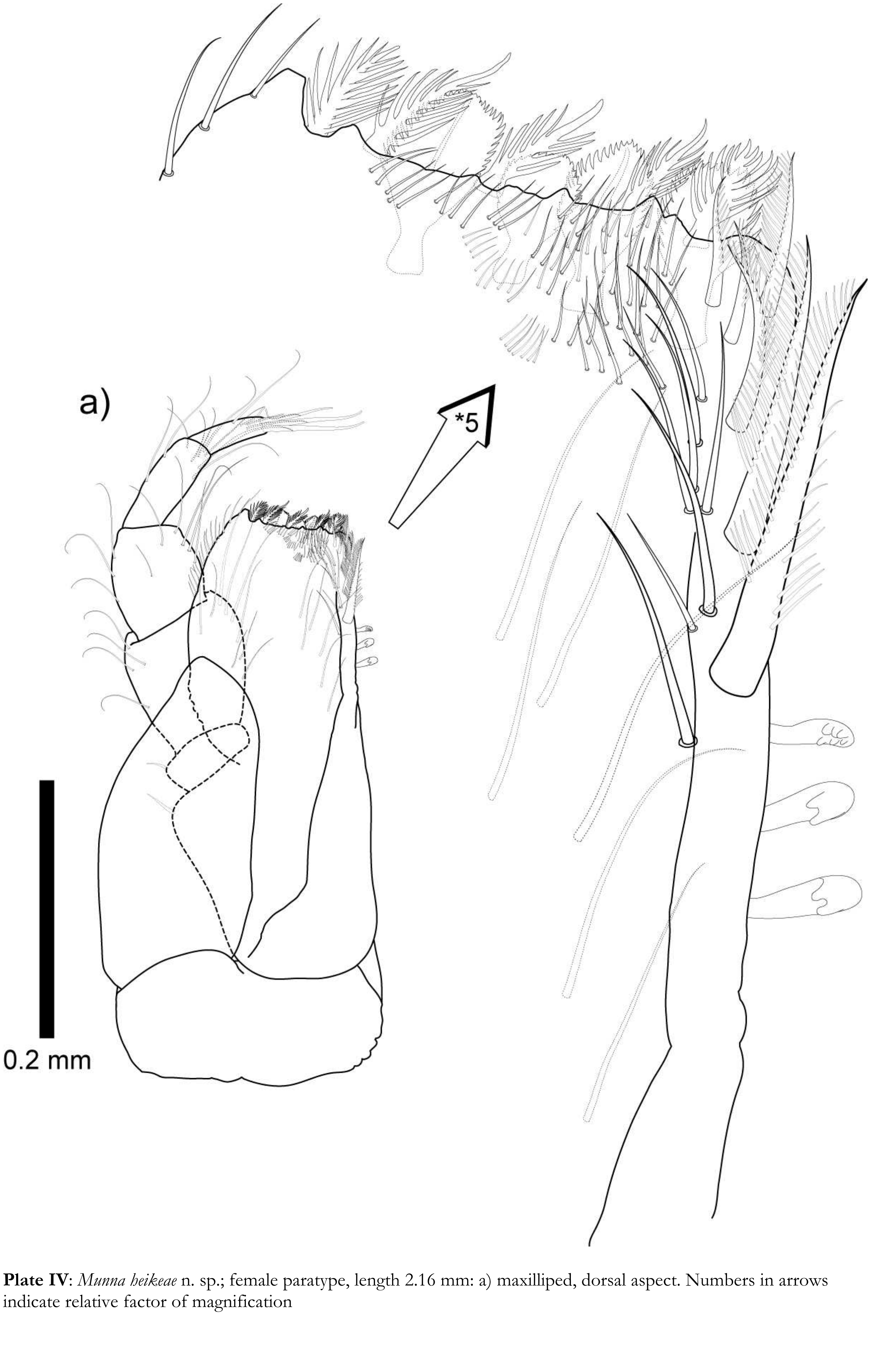

Plate IV: *Munna heikeae* n. sp.; female paratype, length 2.16 mm: a) maxilliped, dorsal aspect. Numbers in arrows indicate relative factor of magnification

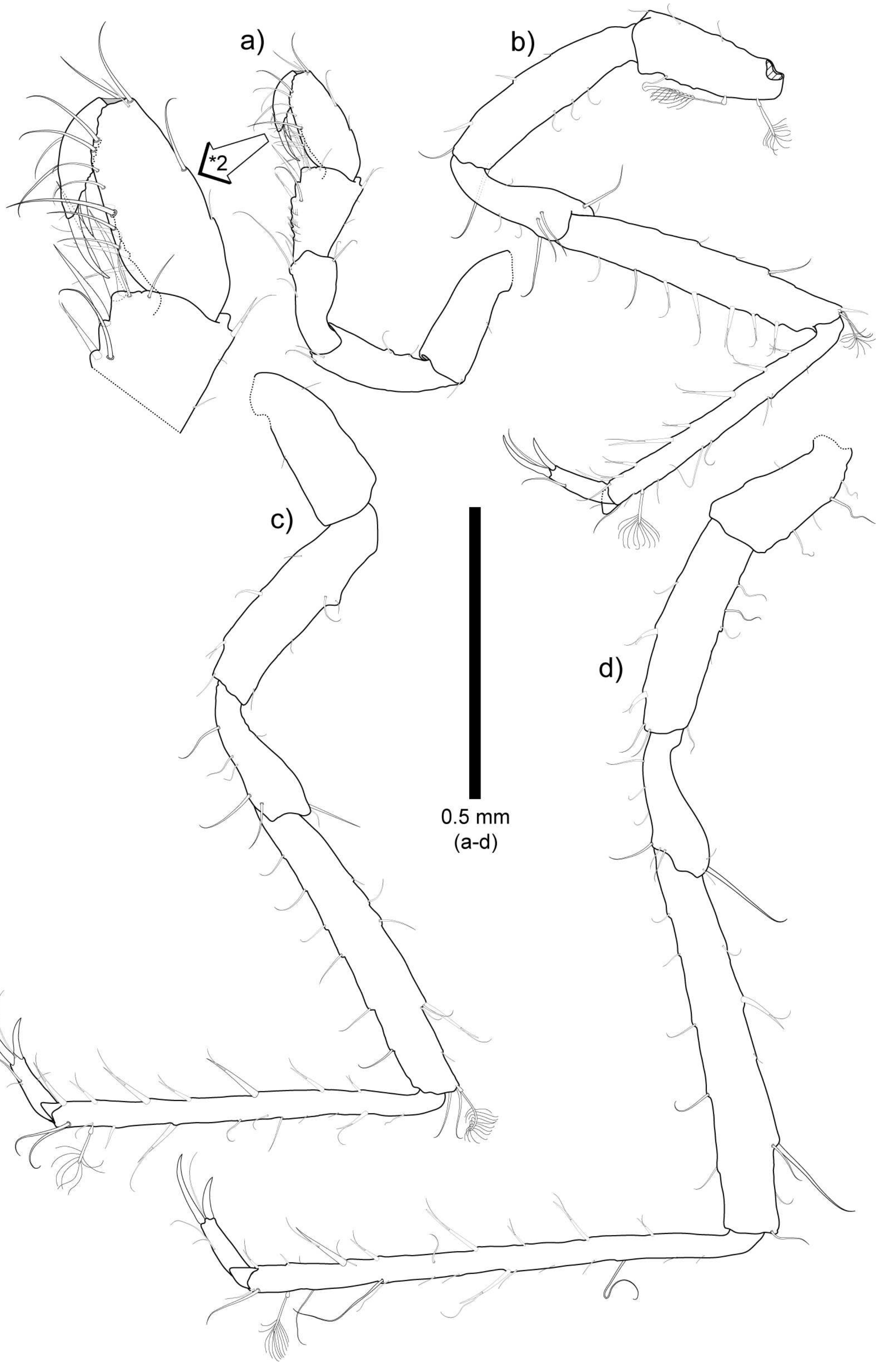

Plate V: *Munna heikeae* n. sp.; juvenile male paratype, length 1.36 mm: a) pereopod 1; b) pereopod 2; c) pereopod 3; d) pereopod 4. Numbers in arrows indicate relative factor of magnification

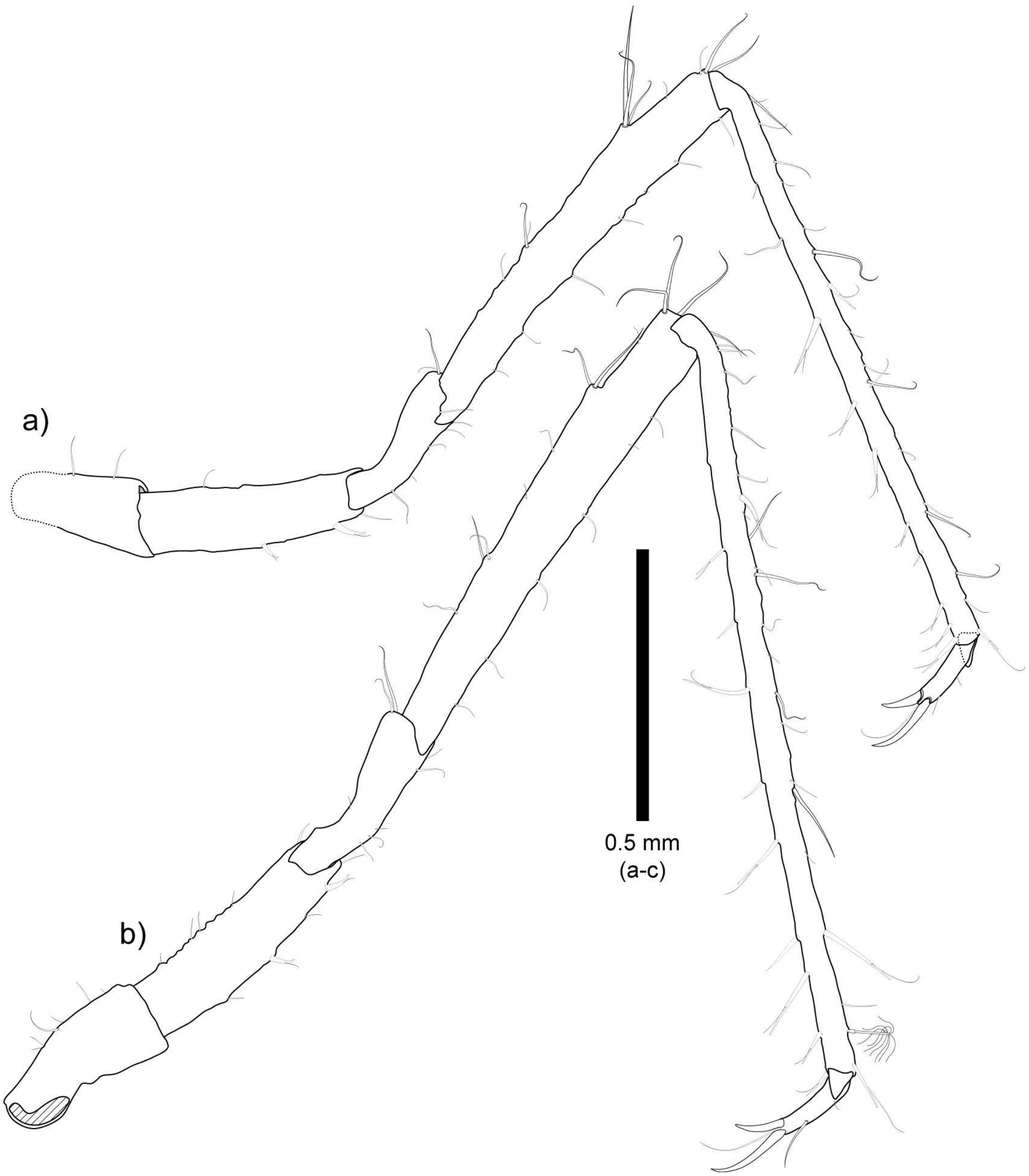

Plate VI: *Munna heikeae* n. sp.; juvenile male paratype, length 1.36 mm: a) pereopod 5; b) pereopod 6

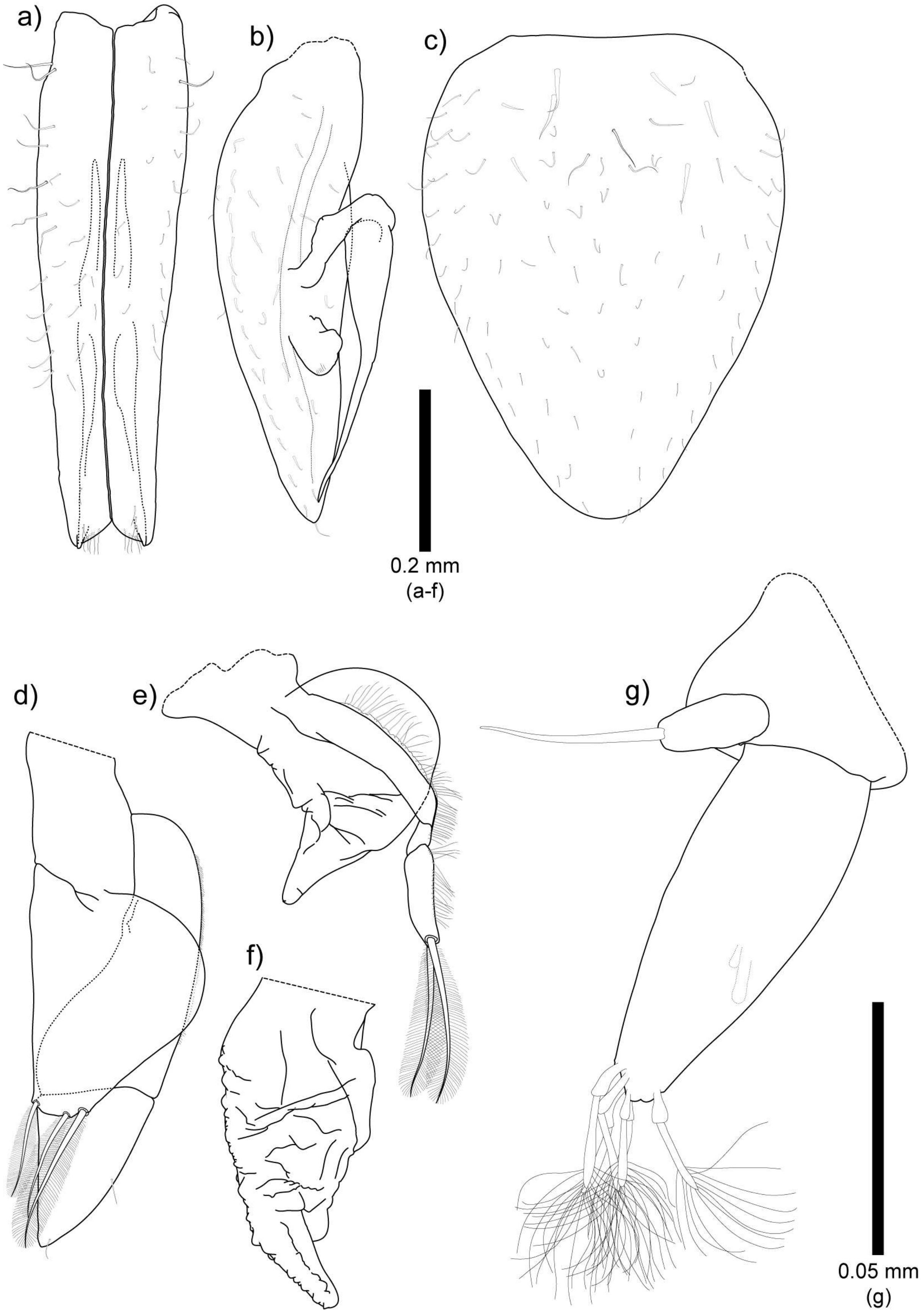

Plate VII: *Munna heikeae* n. sp.; male holotype, length 2.29 mm: a) pleopod 1; b) pleopod 2; female paratype, length 2.16 mm: c) pleopod 2; d) pleopod 3; e) pleopod 4; f) pleopod 5; g) uropod

3.1.2 Family Paramunnidae VANHOEFFEN, 1914

The Paramunnidae – as the name indicates – resemble the Munnidae in their munnoid habitus *sensu* WÄGELE (1989). 148 species have been previously recorded (JUST & WILSON 2007). Usually, they are more dorsoventrally flattened – especially at the pleotelson, which is laterally keeled – than the Munnidae. They are distinguishable from Munnidae in their pleopods covering the anus. They are sometimes referred to by their junior synonym Pleurogoniidae HANSEN, 1916 in determination keys (e.g. KÜHLMANN *et al.* 1993).

Genus *Notoxenoides* MENZIES, 1962

Type species: *Notoxenoides abyssi* MENZIES, 1962

Species included: *N. abyssi* MENZIES, 1962; *N. acalama* KENSLEY, 1984; *N. dentata* MENZIES & GEORGE, 1972; *N. nudicollis* n. sp.; *N. pulchrum* (HANSEN, 1916); *N. vemae* MENZIES, 1962

Diagnosis (modified from Menzies & George 1972)
Paramunnidae with lateral spine-like projections at least on pereonites 2 – 6, mostly also on pereonite 1 and 7. Each pereonite and pleonite 1 with dorsomedial, spine-like projection. Head mostly with long, slender, spine-like eyestalks without ocelli. Pleotelson with serrated lateral margins. Mandibular molar distally wider than proximally, apex truncate. Maxilliped endite quadrate, wider than palp. Male pleopod 1 distally sharply triangular. Uropod leaf-shaped, small, uniramous or biramous, peduncle reduced.

3.1.2.1 *Notoxenoides nudicollis* n. sp.

Material examined: **Holotype**, female (1.16 mm), Continental slope off Ría de Ferrol, Galicia, Spain, 43°48.587' N, 08°51.402' W – 43°49.545' N, 08°51,197' W, 607 m, station: "EBS 600-03". Type material will be deposited in the Zoologisches Museum Hamburg (ZMH), Germany.

Distribution
Known only from *locus typicus*: Continental slope off northern Galicia, Spain. Coordinates listed above.

Etymology: Lat. *nudis* = naked, nude; lat. *collum* = the neck; referring to the new species being the only known *Notoxenoides* with pereonite 1 free of lateral spines.

Diagnosis

Notoxenoides without lateral spine-like projections at pereonite 1. Antenna 2 article 1 medial margin with 3 spines. Article 2 subequal in length to article 1. Lateral spine-like projections granulose, about a third of body width. Pleotelson width subequal to length, lateral margin with row of about 10 pointed denticles proximally of uropod, apically meeting at nearly right angle.

Description of female holotype

Body (Plate VIII a, b) 1.16 mm long, length : width (exclusive of lateral ornamentation) = 2.1, length : depth (exclusive of dorsal ornamentation) = 3.6. Greatest width and depth at pereonite 3. Width of head < pereonite 1 < pereonite 2 < pereonite 3 > pereonite 4 > pereonite 5 > pereonite 6 > pereonite 7 < pleotelson. Head transverse, 0.48 times body width. Median spine-like tubercle near posterior margin. Eyestalks slender, spine-like, about as long as lateral projections of pereonites, pointing anteriolaterally, apically curved, without ocelli. One free pleonite. Pereonites 1 – 7 and free pleonite each with dorsomedial spine-like projection, highest at pereonites 3 and 4, about 0.3 times body depth. Lateral and dorsal spine-like projections with granulose texture of cuticle. Pereonites 2 – 7 with lateral spine-like projections, shortest at pereonites 2 and 3, others up to 0.37 times body width. Free pleonite distinct but narrow. Pleotelson dorsoventrally flattened, cordiform, 0.34 times as long as body, length : width = 1.08. Apex acute, distolateral margins serrate, meeting at nearly right angle.

Uropod 0.03 times body length, about twice as long as wide, inserting dorsolaterally on pleotelson, distally of laterally denticulate margin, uniramous, apex rounded, with 6 – 8 simple setae.

Remarks

The described holotype is the only specimen found. As it is easily distinguished from other species of the genus it was decided not to dissect the specimen which would inevitably destroy the spine-like lateral processes that are most characteristic for identifying this species. Therefore the description does not contain information on other body appendages. Further description of these body parts can be made when more material becomes available. *Notoxenoides nudicollis* is easily recognized by its pereonite 1 lacking any lateral spine-like projections. In *N. dentata* MENZIES & GEORGE, 1972 these are reduced in size, but still clearly visible. *"Pleurogonium" pulchrum* HANSEN, 1916 is hereby transferred to *Notoxenoides pulchrum* (HANSEN, 1916). It is very similar to other species of *Notoxenoides* in the spine-like lateral and middorsal projections on pereonites 1 – 7 which are, however, relatively shorter than in other *Notoxenoides* species.

MENZIES (1962) assumed that the species may in fact belong to *Notoxenoides* which was later rejected by WILSON (1980) who considered it to be closer to *Coulmannia* HODGSON, 1910 based on general head and body proportions. However, this is not supported by synapomorphic characters and both later described species *N. acalama* KENSLEY, 1984 and *N. nudicollis* are very similar in body proportions to *N. pulchrum*. *N. acalama* and *N. pulchrum* both lack eyestalks which are well developed in *N. nudicollis*. The function of the highly elongated, spine-like eyestalks without any ocelli is unknown. It is interpreted here as a vestigial form of the elongated eyestalks of the similar genera *Heterosignum* GAMO, 1976 and *Coulmannia* where these are wider in cross-section and bear apical ocelli.

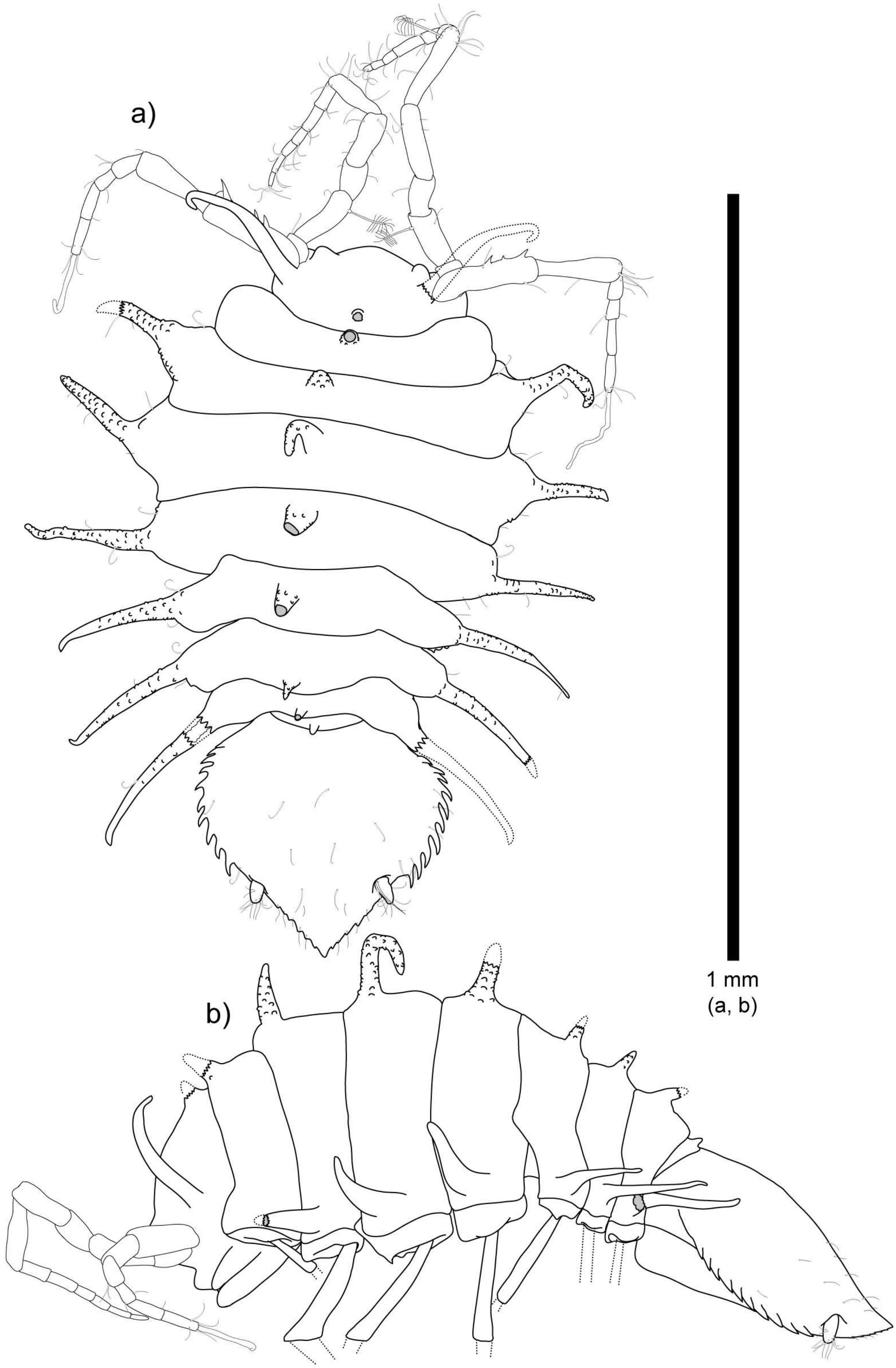

Plate VIII: *Notoxenoides nudicollis* n. sp.; female holotype, length 1.16 mm: a) habitus, dorsal aspect; b) habitus, lateral aspect

3.1.3 "Janiridae" SARS, 1897

The "Janiridae" are a taxonomic wastebasket, they contain all janiroid taxa that were left over after transferring other taxa to separate families. There are no apomorphies known and as a consequence, the use of the term should be dropped in favour of classifying it as Janiroidea *incertae sedis*. The "Janiridae" were considered an artificial (i.e. non-monophyletic) group by WÄGELE (1989) which was later supported by phylogenetic analyses based on morphological (WILSON 1994) and molecular data (RAUPACH *et al.* 2005). The taxon name is therefore marked by quotation marks. However, the term is applied here because it is still much in use. 175 species are included (SCHOTTE *et al.*, 1995 ff., December 2008). A diagnosis is given by WILSON & WÄGELE (1994).

Austrofilius **HODGSON, 1910**

(=*Neojaera* NORDENSTAM, 1933 *sensu* WOLFF 1962)

Type species: *Austrofilius furcatus* HODGSON, 1910

Species included: ?"*A.*" *arnaudi* KUSSAKIN & VASINA, 1980; *A. furcatus* HODGSON, 1910; *A. mediterraneus* (CASTELLÓ, 2002); *A. serratus* VANHOEFFEN, 1914; *A. teiresias* n. sp.

Diagnosis (Modified after WILSON & WÄGELE 1994)

Body dorsoventrally depressed, parallel-sided, about 2.5 to 3 times as long as wide. Head subequally wide as pereonites. Rostrum broad, trapezoidal, anterior margin concave, lateral margins straight to concave, often serrated. Eyes dorsally, with up to 5 ocelli, or absent. Coxae concealed by lateral margins of pereonites in dorsal aspect. Pleotelson flat, laterally and distally rounded, often with 1 – 3 denticles near uropod insertion. Antenna 1 short, 5 – 6 articles, peduncular article 1 distally truncate, about 2 times as wide as article 2. Antenna 2 peduncular articles 1 – 4 swollen, article 3 with conspicuous scale. Molar part of mandible cylindrical, distally truncate. Maxilliped with palp articles 2 and 3 wider than endite. Pereopods ambulatory, similar, dactylus about one third of propodus length, with 2 claws. Male pleopods 1 narrowest at midlength, with distolateral lobes curved and projecting. Pleopod 2 with curved stylet. Female operculum distally rounded. Pleopod 3 endopod with 3 plumose setae, with distinct gap between medial and 2 lateral setae, exopod longer than endopod, with 2 articles, article 1 with distolateral lobe, suture oblique. Uropodal rami both longer than sympod.

Remarks

WILSON & WÄGELE (1994) included "ventral claw smaller than dorsal claw" in their diagnosis of *Austrofilius* which is not the case throughout the whole genus, which was recognized by CASTELLÓ (2002) and can be confirmed here.

3.1.3.1 *Austrofilius teiresias* n. sp.

Material examined: **Holotype**, male (1.41 mm), Continental slope off Ría de Ferrol, Galicia, Spain, 43º47.188 N, 08º53.053 W – 43º 55,312 N, 08º 53.101 W, 810 m, station: "AT 800-02". **Paratype**, female (1.56 mm), same locality, station: "AT 800-02".
Additional material: 5 paratypes, same locality as examined material.
Type material will be deposited in the Zoologisches Museum Hamburg (ZMH), Germany.

Distribution
Known only from *locus typicus*: Continental slope off northern Galicia, Spain. Stations: "AT 600-02", "AT 800-02" at 630 – 810 m depth.
Etymology: Teiresias is the mythological blind seer in SOPHOKLES' tragedies and in HOMER's "Odyssey" referring to the species being the first discovered of the genus to be eyeless.

Diagnosis
Eyeless *Austrofilius* with body more than 2.5 times as long as wide, subparallel. Rostrum with concave, serrated lateral margins. Lateral margin of head with 4 denticles. Lateral margin of pereonites 1 – 4 weakly serrated. Pleotelson wider than long, distally rounded, laterally with two or three denticles. Male pleopod 1 with concave lateral margins, distolateral lobes hook-like, acute, articulate. Male pleopod 2 exopod projecting beyond apex of sympod. Uropodal exopod 1.2 times longer than sympod.

Description of male holotype

Body (Plate IX a) 1.41 mm long, length : width = 2.67. Body almost asetose, dorsoventrally flattened, subparallel by subequally wide head, pereonites and pleotelson, widest at pereonite 1, narrowest at peronite 4 and 5, with the latter being 0.9 times as wide as pereonite 1. Head length: width = 0.67, lateral margins extended, serrate, serrations consisting of 4 anteriorly progressively larger denticles. Rostrum broad, anteriorly projecting over mouthparts, about 0.5 times cephalic length, proximal width 0.42 times, distal width 0.23 times cephalic width. Lateral margins of rostrum pronounced, elevated, serrate, with 6 – 8 denticles. Frontolateral margin strongly embayed at insertion of antenna 1. Posterior margin of head convex. Eyes absent.

Pereonites width 1 > 2 > 3 > 4 = 5 < 6 = 7, yet similar in width. Lateral margins laterally extended, coxae concealed in dorsal aspect. Pereonites 1 – 4 with concave anterior and convex posterior margins, most distinct in pereonite 1. Lateral margins straight, lightly serrate, with 3 to 7 shallow denticles, anterolateral angles acute, in pereonite 1 with simple, spine-like seta. Pereonites 5 – 7 with rounded, smooth lateral margins. Pereonite 5 with acute anterolateral angle. Pereonites 5 and 6 with posteriorly projecting, rounded posteriolateral corners, posteriolateral angle of pereonite 7 acute.

Pleotelson length : width = 0.72, nearly semi-circular, lateral and distal margin evenly rounded. Distolateral margin anteriorly of uropod insertion with 2 conspicuous denticles. Uropodal rami visible, sympod concealed by posterior margin of pleotelson in lateral aspect.

Antenna 1 (Plate IX b) about 0.2 times as long as body, 3 peduncular and 3 flagellar articles. Peduncular article 1 stout, about 1.5 times as long as wide, distolaterally and distomesially with 1 broom seta. Article 2 0.6 times as wide and 1.1 times as long as article 1, length : width = 2.9, distally with 3 simple and 2 broom setae. Article 3 short, distally with 1 simple and 1 broom seta. Flagellar articles subequally long, article 1 almost 2 times as wide as articles 2 and 3, distally with 3 simple setae. Article 2 asetose. Article 3 with 1 simple seta, distally with 2 long, simple setae and 1 aesthetasc.

Antenna 2 (Plate IX c) basalmost 4 peduncular articles preserved. Article 1 and 2 slightly wider than long. Article 3 widest, lateral margin shorter than mesial margin, distomesially with 3 simple and 1 simple, spine-like seta. Lateral scale narrow, pronounced, distally reaching distal margin of article 3, with 2 simple and 1 simple, spine-like seta. Article 4 lateral margin longer thn mesial margin, mesially with 2 simple setae.

Both Mandibles with incisor part consisting of 5 cusps. Left mandible (Plate X a) with *lacinia mobilis* bearing 4 cusps, spine row with 2 serrate and 2 simple, spine-like setae. Right mandible (Plate X b) spine row with 5 simple setae, 2 serrate and 4 simple, spine-like setae. Molar part cylindrical, subdistally with longitudinal row of simple setae, 7 on left, 5 on right mandible. Apex truncate, 5 marginal cusps on left, 6 on right mandible. Palp 0.6 times mandible length, with 3 articles, article 2 about 1.3 times longer than articles 1 and 3. Article 1 distally with 1 long, simple seta. Article 2 distally with 1 simple and 1 hemiplumose, spine-like seta. Article 3 with torsion around longitudinal axis, with several scale setae, distomesially with longitundinal row of 6 – 10 simple, spine-like setae.

Maxilla 1 (Plate XI a) with narrow rami, exopod 4.0 times as long as wide, mesial and distolateral margin with several simple setae. Apex truncate, with 3 denticulate and 8 simple, spine-like setae, distomesially with 3 simple setae. Endopod 0.7 times as long as exopod, 6.3 times as long as wide, with 3 simple setae along its length, distally with 2 simple and 3 simple, spine-like setae.

Maxilla 2 (Plate XI b) exopod with mesial and lateral endite slightly curved mesially. Lateral endite longest, 5.2 times as long as wide, distomesial margin with 4 simple setae. Apex with 1 simple and 3 simple, spine-like setae. Mesial endite not reaching apex of endopod, 0.8 times as wide as lateral endite, mesial margin with 4 simple setae, apex with 2 short and 2 long, simple, spine-like setae. Endopod 3.3 times as long as wide, laterally and mesially with several simple setae, apex with 4 simple, spine-like setae.

Paragnath (Plate XII a) with broad, semi-circular lateral lobes, mesially with 2 longitudinal rows of fine, simple setae, apices blunt, margin fringed with 11 – 12 simple setae, other setation entirely absent. medial lobes rduced to small, asetose bulges.

Maxilliped (Plate XII b) basis 3.3 times as long as wide, widest at insetion of palp. Endite with narrow apex, lateral margin evenly convex. Two coupling hooks, each with 1 pair of denticles. Palp with 5 articles, 0.9 times as long as basis. Article 1 widest, nearly as wide as basis, length : width = 0.5, distolaterally and distomesially with 1 simple seta. Article 2 almost as wide as article 1, 0.9 times as long as wide, distomesial margin with al lobe bearing 3 simple setae. Article 3 0.8 times as wide as article 3, 0.8 times as long as wide, mesial margin convexly enlarged, with 2 simple setae. Article 4 0.5 times as wide as article 3, 1.9 times as long as wide, distally with 5 simple setae. Article 5 0.5 times as wide as article 4, 2.4 times as long as wide, distally with 7 simple setae. Epipodite 0.9 times as long as basis, 2.7 times as long as wide, asetose, with lateral bulge and blunt apex.

Pereopods 1 – 7 (Plate XII c – Plate XIV c) uniformous, ambulatory. Lengths of pereopods 0.41 – 0.55 times body length, largely concealed under pereonites in dorsal aspect. Lenght of pereopod 1 < 2 > 3 > 4 < 5 < 6 < 7, pereopod 4 shortest, pereopod 7 longest. Bases longest articles of pereopods, cylindrical, in pereopod 1 and 5 with 1, in pereopod 4 with 2 proximodorsal broom setae, in pereopod 3 with proximodorsal fringe of fine, simple setae. Ventrally with 2 – 3, dorsally with 0 – 3 simple setae. Ischii about 0.7 times as long as bases, dorsal margin convexly enlarged with 1 conspicuous, simple, spine-like seta, ventrally with 1 – 2, distodorsally with 1 – 3 simple setae. Meri about 0.5 to 0.6 times as long as ischii, with projecting distodorsal lobe bearing 1 – 3 simple, spine-like setae and 0 – 2 simple setae. Distoventrally with 2 – 3 simple setae. Carpi about 2 times as long as meri, in pereopods 2 – 7 with 1 distodorsal broom seta. Dorsal margin lightly serrate in pereopods 2 – 5 and 7. Distoventrally with 1 unequally bifid, spine-like seta, in pereopod 1 with a ventral row of scale setae. Propodi 0.9 to 1 times as long as carpi. Dorsal margin of pereopod 6 and 7 lightly serrate. Ventrally with 2 – 3 unequally bifid, spine-like setae. Ventral margin of pereopod 1 and 4 – 7 with transverse scale setae. Dactyli about 0.25 to 0.3 times as long as propodi, with 2 about equally long claws, pereopod 1 with accessory distoventral, simple, spine-like seta.

Pleopod 1 (Plate XV a) length : width = 2.4, lateral margins evenly concave, narrowest at midlength with 0.67 times proximal width. Ventrally between distolateral lobes a pair of long, simple setae. Distolateral lobes forming an acute, articulated, caudomesially curved projection distally reaching apex of distomedial lobes. Distomedial lobes divergent, distally rounded, lateral margin to apex with 13 to 14 simple setae, mesial margin fringed with many shorter and 2 long, simple setae.

Pleopod 2 (Plate XV b) sympod almost semi-circular with evenly convex lateral and straight mesial margin. Distally with 9 long, simple setae. Exopod distally projecting beyond apex of sympod, distolaterally with many fine, simple setae. endopod with strongly curved stylet, about as long as sympod.

Pleopod 3 (Plate XV c) exopod with 2 articles, article 1 about 1.7 times as long as article 2, with distally projecting distolateral angle bearing a long, simple seta, suture between both articles oblique. Lateral and mesial margins of article 1 and 2 with fringe of fine setae. Lateral setal fringe of article 1 interrupted at midlength, here with a stout, hemiplumose, spine-like seta.Article 2 with acute apex bearing a long, simple seta. Endopod 1.6 times as long as wide, mesially with 2 transverse scale setae, distally with 3 plumose seta, mesialmost widely spaced from the others.

Pleopod 4 (Plate XV d) 1.5 times as long as wide, delicate, lobiform, laterally with scattered, short, simple setae.

Pleopod 5 (Plate XV e) 1.7 times as long as wide, delicate, lobiform, proximomesially with 1, distally with 2 transverse rows of short setules.

Uropod (Plate XV f) sympod 1.4 times as long as wide, distally widest, distomesially with 1, distally with 5 simple setae, distolaterally with 1 simple, spine-like seta. Both rami longer than sympod, apices truncate. Exopod 1.2 times as long as sympod, 3.9 times as long as wide, subdistally with 3, distally with 5 long, simple setae. Endopod 1.6 times as long as sympod, 4.1 times as long as wide, along its length 8 simple and 2 broom setae, apex with 1 broom and 7 long, simple setae

Additional description of female paratype

Body 1.56 mm long, similar to male, pereonite 2 widest. Pleotelson with 3 lateral denticles. Antenna 1 with 3 flagellomers as in male, similar, terminal article only about half as long as second article. Pleopod 2 about 0.8 times as long as wide, distally rounded, apex lightly concave.

Remarks

Austrofilius teiresias is easily recognized by the complete absence of eyes in contrast to all other species of the genus. Furthermore, it is the northernmost record for the genus that originally was thought to be restricted to the Southern Hemisphere (*Austrofilius* = "son of the South"). The discovery of *A. mediterraneus* CASTELLÓ, 2002, was the first record of the genus from the Northern Hemisphere (Columbretes Islands, Western Mediterranean Sea). The new species *Austrofilius teiresias* has also the deepest bathymetric distribution known in the genus, collected from 630 and 810 m depth. Formerly the maximum recorded depth was 385 m for *A. serratus* from Gauss Station, Antarctica (VANHÖFFEN 1914). However, this locality belongs to the Antarctic shelf, as the transition between shelf and continental slope is several hundreds of metres deeper than elsewhere due to the weight of the ice crust. It is assumed here that the genus *Austrofilius* originated in shallow waters and only *A. teiresias* shifted its vertical distribution to bathyal depths and became secondarily eyeless. "*Austrofilius*" *arnaudi* KUSSAKIN & VASINA (1980) has been classified as "Janiridae" *incertae sedis* by WILSON & WÄGELE (1994) and CASTELLÓ (2002) which is followed here. Several diagnostic characters are not present: The head is distinctly narrower than the pereonites, the rostrum is anteriorly straight, not concave, the pereonites are more widely spaced, the third peduncular article of antenna 2 has no scale, the uropodal exopod is shorter than the sympod. In other respect it corresponds with other species of *Austrofilius*: The shape of the mandibe is identical, the pleopod 1 distolateral lobes are acute, hook-like and point posteriorly, the exopod of pleopod 2 caudally surpasses the sympod, the endopodal stylet is strongly curved. A redescription of "*A.*" *arnaudi* is needed to clarify if it actuyally belongs within *Austrofilius* or not.

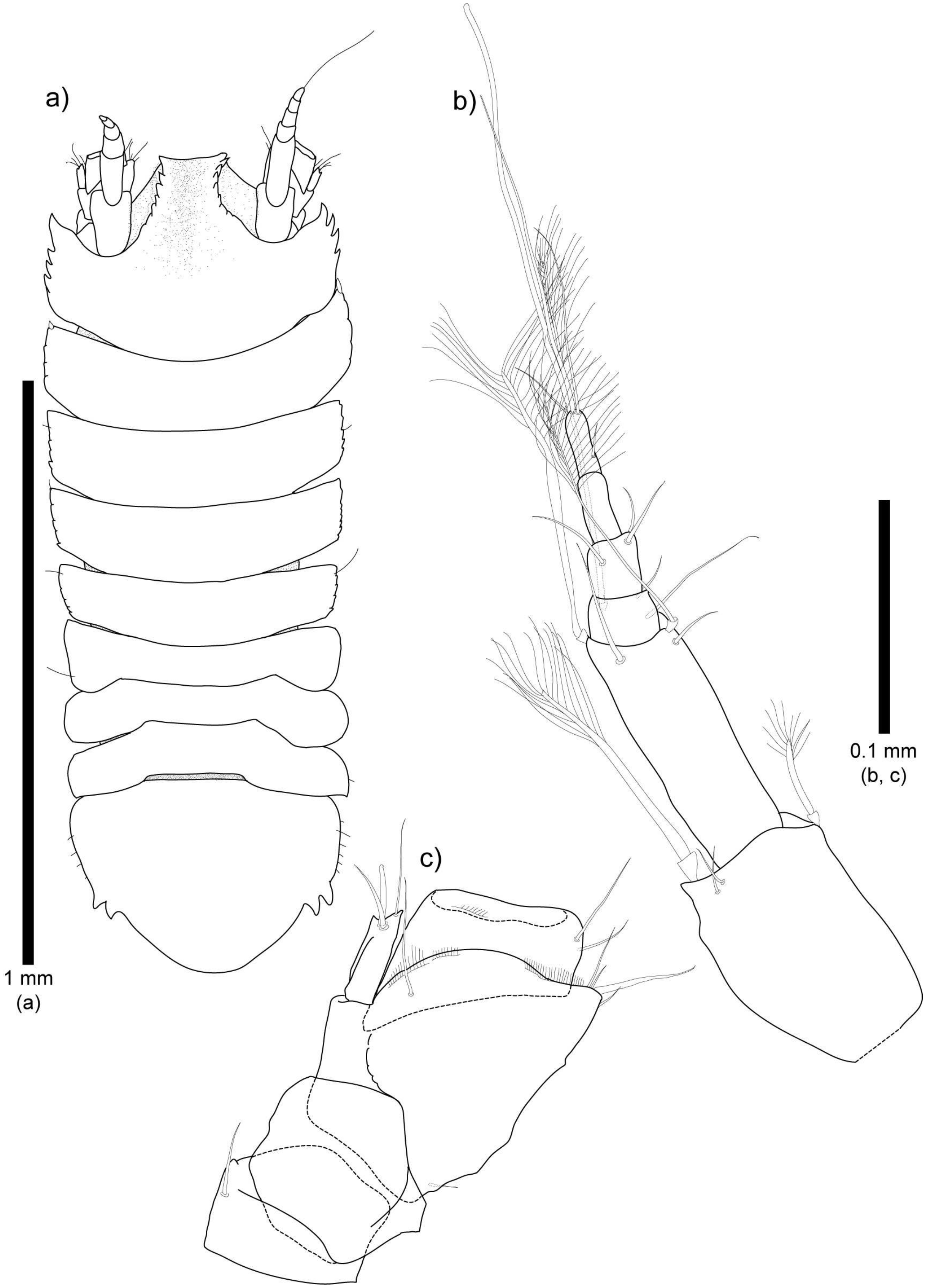

Plate IX: *Austrofilius teiresias* n. sp.; male holotype, length 1.41 mm: a) habitus dorsal; b) antenna 1; c) antenna 2 (basalmost peduncular articles)

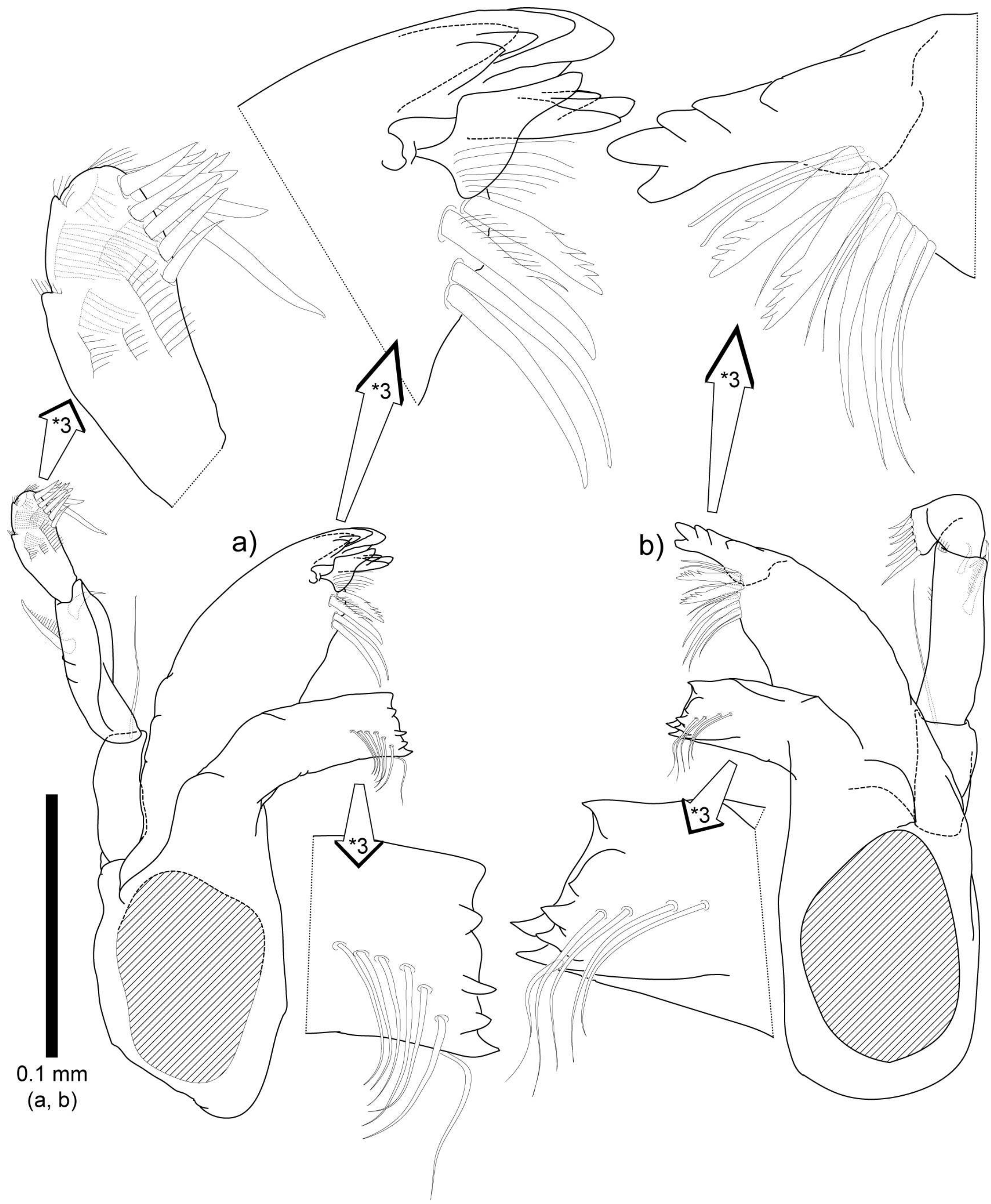

Plate X: *Austrofilius teiresias* n. sp.; male holotype, length 1.41 mm: a) left mandible; b) right mandible. Numbers in arrows indicate relative factor of magnification

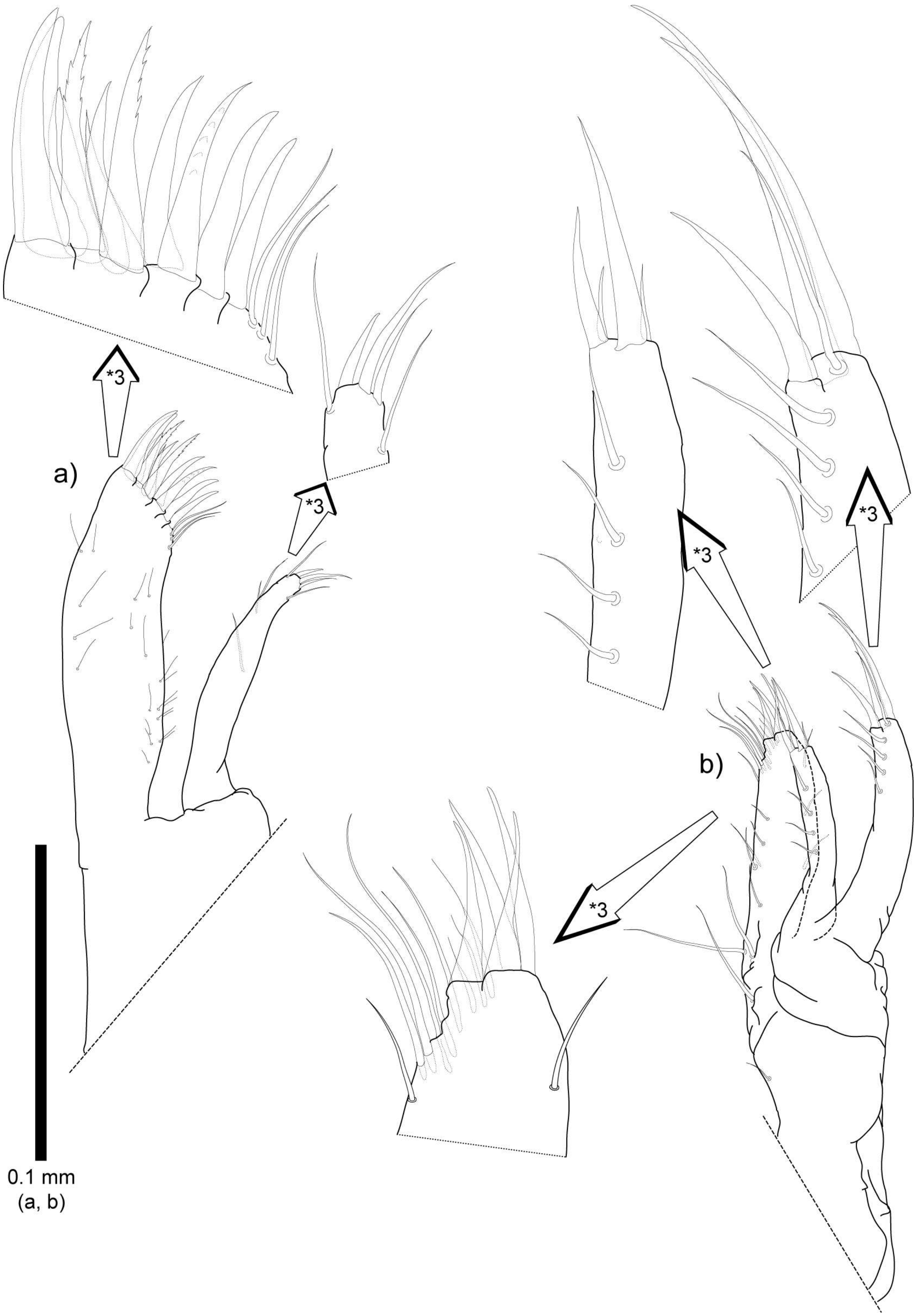

Plate XI: *Austrofilius teiresias* n. sp.; male holotype, length 1.41 mm: a) maxilla 1; b) maxilla 2. Numbers in arrows indicate relative factor of magnification

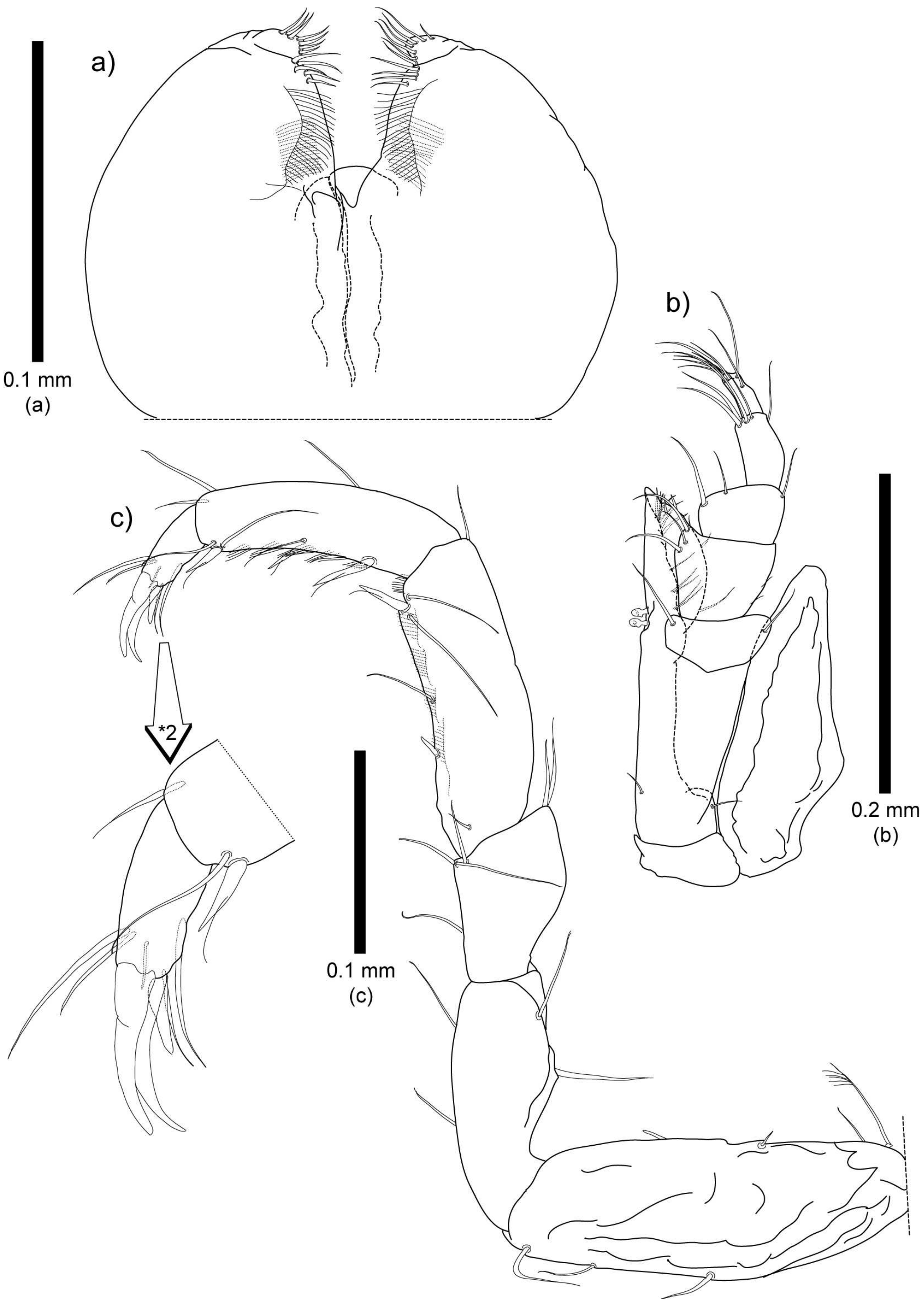

Plate XII: *Austrofilius teiresias* n. sp.; male holotype, length 1.41 mm: a) paragnath; b) maxilliped; c) pereopod 1. Numbers in arrows indicate relative factor of magnification

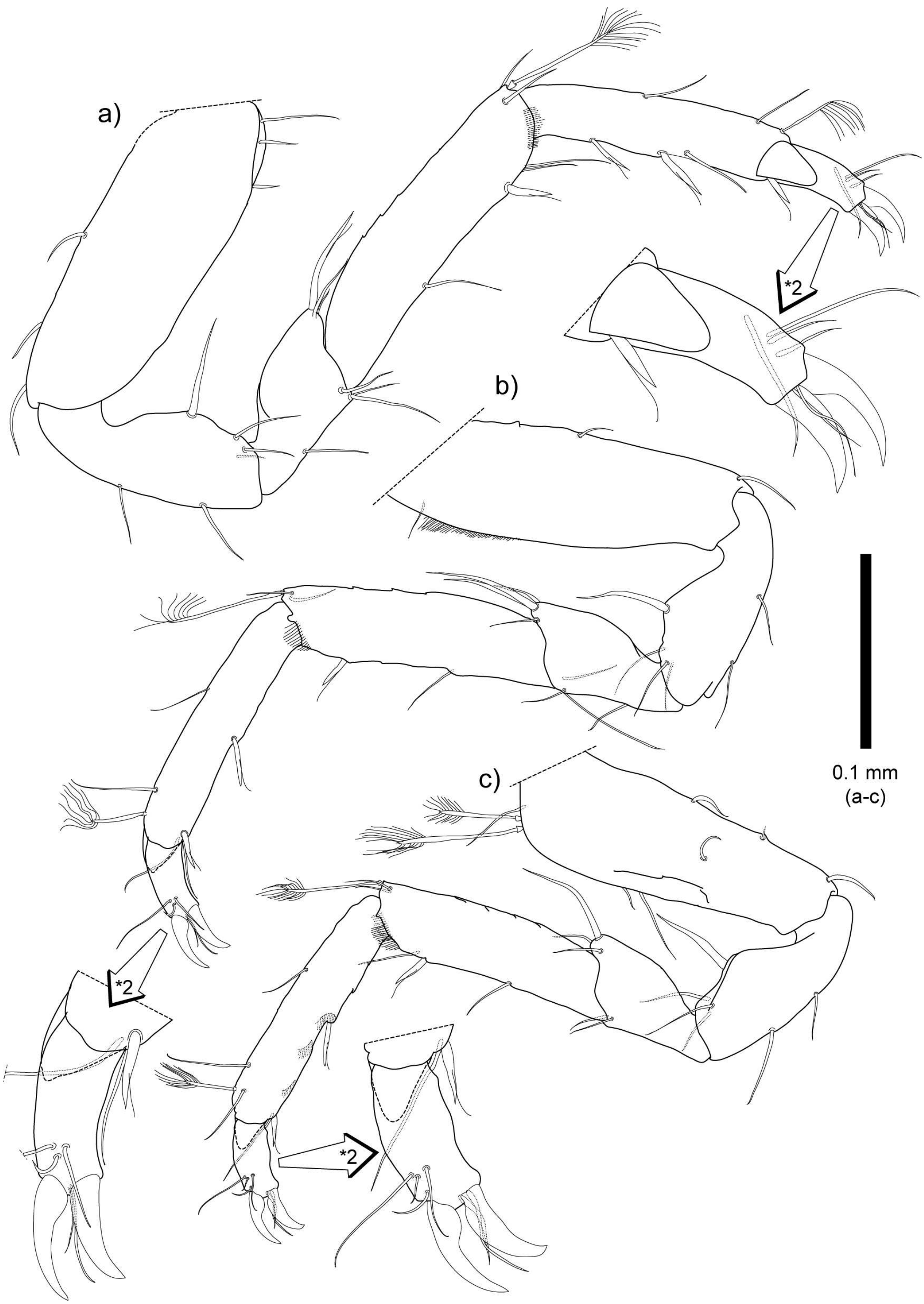

Plate XIII: *Austrofilius teiresias* n. sp.; male holotype, length 1.41 mm: a) pereopod 2; b) pereopod 3; c) pereopod 4. Numbers in arrows indicate relative factor of magnification

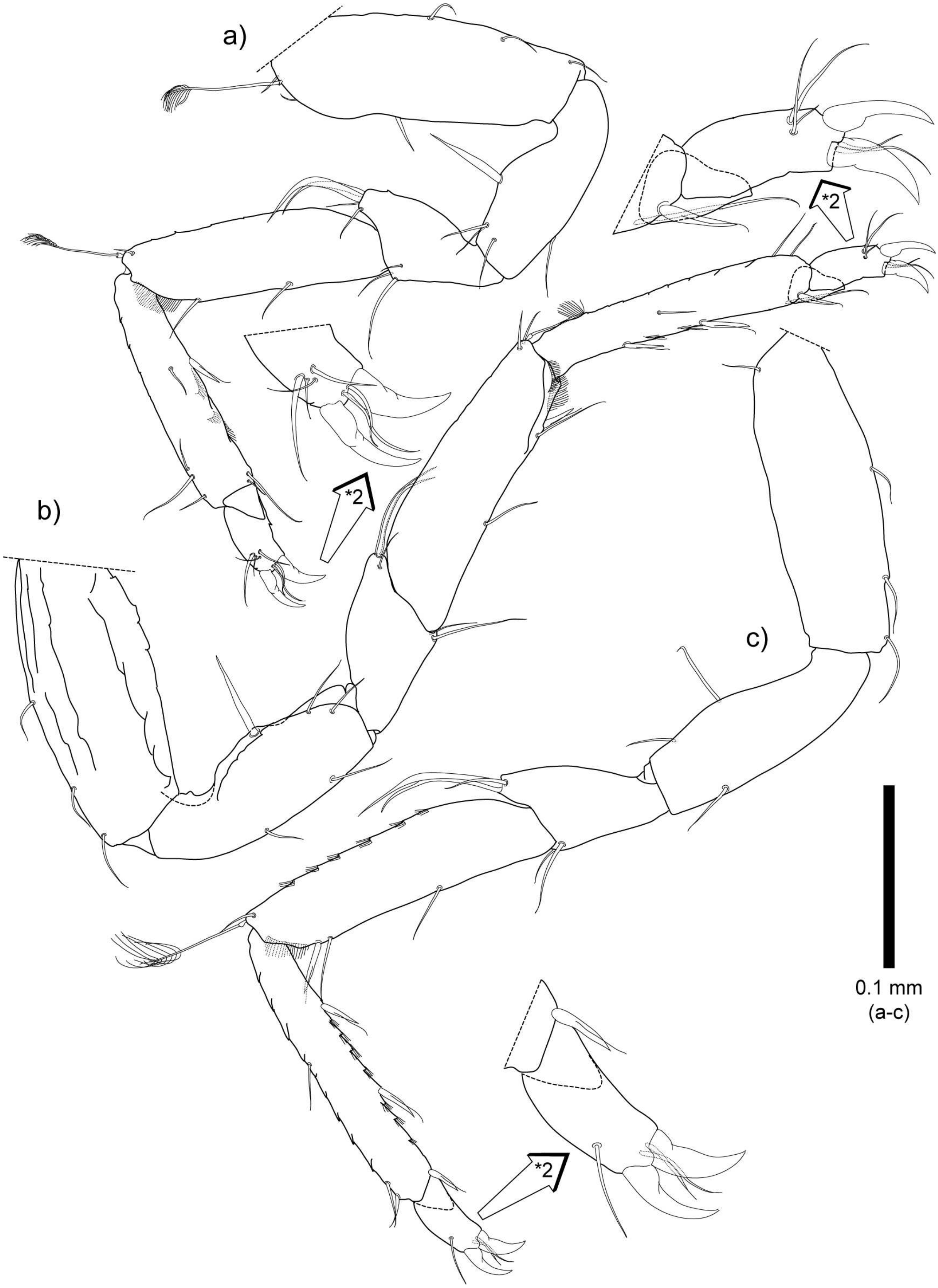

Plate XIV: *Austrofilius teiresias* n. sp.; male holotype, length 1.41 mm: a) pereopod 5; b) pereopod 6; c) pereopod 7. Numbers in arrows indicate relative factor of magnification

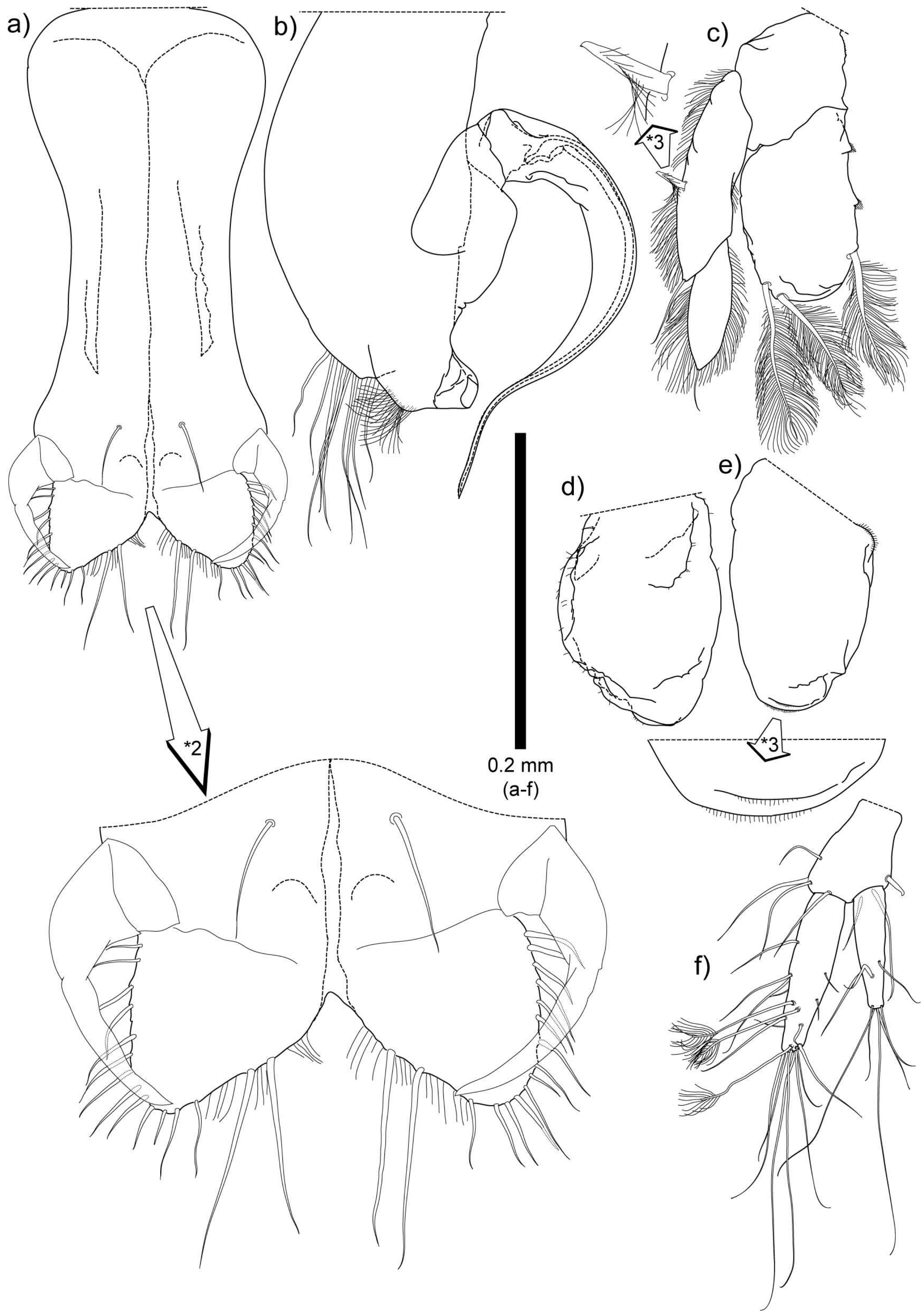

Plate XV: *Austrofilius teiresias* n. sp.; male holotype, length 1.41 mm: a) pleopod 1; b) pleopod 2; c) pleopod 3; d) pleopod 4; e) pleopod 5; f) uropod. Numbers in arrows indicate relative factor of magnification

3.1.4 Family Acanthaspidiidae MENZIES, 1962

The Acanthaspidiidae are a small family of deep-water species (34 previously described species as of December 2008, SCHOTTE *et al.* 1995 ff.) representing the iolelloid habitus *sensu* WÄGELE (1989): a more or less jagged body outline due to the pereonites being laterally extended into lobes. Significantly, the pattern of lateral lobes of this iolelloid habitus is always that pereonites 1, 5, 6 and 7 have one lateral lobe whereas there are two on pereonites 2 – 4. Furthermore, the Acanthaspidiidae have long, cylindrical uropods. The family has been revised and rediagnosed by Just (2001) and consists of the genera *Acanthaspidia* STEBBING, 1893, *Ianthopsis* BEDDARD, 1886, and *Mexicope* HOOKER, 1985.

Genus *Ianthopsis* BEDDARD, 1886

Type species: *not specified* (JUST 2001)

Species included: *I. beddardi* KUSSAKIN & VASINA, 1982; *I. bovallii* (STUDER, 1884); *I. caudata* (RICHARDSON, 1910); *I. certus* KUSSAKIN & VASINA, 1982; *I. laevis* MENZIES, 1962; *I. maximi* n. sp.; *I. monodi* NORDENSTAM, 1933; *I. multispinosa* VANHOEFFEN, 1914; *I. nasicornis* VANHOEFFEN, 1914; *I. nodosa* VANHOEFFEN, 1914; *I. pulchra* (HANSEN, 1916); *I. ruseri* VANHOEFFEN, 1914; *I. studeri* KUSSAKIN & VASINA, 1982; *I. vanhoeffeni* JUST, 2001

Diagnosis

The diagnosis of JUST (2001) is followed here.

3.1.4.1 *Ianthopsis maximi* n. sp.

Material examined: **Holotype**, male (4.17 mm), Continental slope off Ría de Ferrol, Galicia, Spain, 43°53.575' N, 08°56.868' W – 43°54.015' N, 08°56.959' W, 970 m, station: "DRN 1000-03".

Paratype, female (3.98 mm), same region, 43°48.587' N, 08°51.402' W – 43°49.545' N, 08°51,197' W, 607 m, station: EBS 600-03".

Additional material: 3 specimens from same locality as holotype; 9 specimens from same locality as paratype.

Type material will be deposited in the Zoologisches Museum Hamburg (ZMH), Germany.

Distribution

Known only from *locus typicus*: Continental slope off northern Galicia, Spain. Stations: "EBS 600-03", "EBS 800-03", "DRN 1000-03" at 607 – 970 m depth.

Etymology: Dedicated to the author's son, Maxim Lünenstraß.

Diagnosis

Ianthopsis without rostral horn or dorsal spine-like processes on pereonites. Pereonites 2 – 7 with constricted anterior area demarcated by an elevated, serrated ridge. Posterior margin of pereonites 1 – 7 elevated. Head, pereonite 1 and 5 with 1 acute, serrated lobe, pereonites 2 – 4 with 2, 6 and 7 with longer anterior and small posterior lobe. Posteriolateral lobes of pereonites 2 – 4 and anteriolateral lobes of pereonites 6 and 7 distodorsally with 2 or 3 long setae, further distally with small, setose cavity. Head dorsomedially with 1, pereonites 1 – 3 dorsomedially with 2 long setae. Pereonites 1, 3 and 4 with ventromedial, spine-like process. Pleotelson cordiform, wider than long. Anterior margin of labrum concave. Antenna 2 flagellum article 1 as long as all other flagellomers together. Mandibular palp asetose and less than 0.25 times long as mandible body. Uropod endopod exceeding sympod in length, exopod 0.3 times as long as endopod.

Description of mature male holotype

Length 4.17 mm, body as in female paratype described below.

Pleopod 1 (Plate XXIII a) length : width = 1.85, proximally widest, with shallow lateral notch posteriorly of proximal third, progressively narrower from notch to apex. Distolateral and ditomedial lobes complex, distolateral lobes narrow and straight, caudally pointing, proximomedially densely covered with very small setae, laterally with 1 long, simple seta, apex with 4 short, simple setae. Distomedial lobes shorter, caudally pointing with medially curved apex. Medial margin with 5 long, simple setae, numerous scale setae around apex.

Pleopod 2 (Plate XXIII c) length : width = 2.47, widest posteriorly of midlength, apex narrow-angled. Lateral margin from proximally of greatest width of pleopod 2 densely setose, distolateral margin with 7 plumose setae with short setulae, apex with 3 long, simple setae. Exopod bifid, proximal lobe asetose, distal lobe with numerous scale setae. Endopod inserting at midlength of pleopod 2, stylet longer than body length, distal end coiled at least six times.

Pleopod 3 (Plate XXIII d) delicate. Exopod longer than endopod, distal end wide and rounded, lateral and distomedial margin with a row of simple setae, apex with 5 plumose setae. Endopod distally with 8 plumose setae and 1 distomedial, simple seta.

Pleopod 4 (Plate XXIII e) delicate. Exopod about half as long and wide as endopod, distal margin with a row of short setae. Endopod asetose.

Pleopod 5 (Plate XXIII f) delicate, uniramous, ovally shaped, asetose.

Description of female paratype

Body (Plate XVI a, b) 3.98 mm long, head and pereonites laterally expanded by long, spine-like lobes with serrated margin. Length : width (including spine-like lobes) = 1.91. Length : body depth = 4.63. Width of head < pereonite 1 > pereonite 2 < pereonite 3 < pereonite 4 < pereonite 5 > pereonite 6 > pereonite 7 > pleotelson. Pereonites tightly packed, seemingly loosely packed by constricted anterior area of pereonites 2 – 7 (not to be confused with intersegental membrane!) Head, pereonite 1 and 5 with one lobe, pereonites 2 – 4 with two, pereonites 6 and 7 with a longer anterior and a very small posterior lobe. Serrations on margins of spine-like lobes continued on elevated ridge at posterior margin of pereonites 1 – 3 and 5 – 7 and on elevated ridge posterior to constricted area of pereonite 2 – 5 and interruptedly on pereonite 6. Posteriolateral lobes of pereonites 2 – 4 and anteriolateral lobes of pereonites 6 and 7 distodorsally with 2 or 3 long, apically denticulate setae, further distally with a small cavity. Head dorsomedially with 1, pereonites 1 – 3 dorsomedially with a pair of conspicuous, long setae. Rostrum of head distinct but short, forming an anteriorly convex bulge between bases of antenna 1, anteriorly not projecting beyond antenna 1 peduncular article 1, no horn-like rostral projection. Rostrum clearly set off from clypeus, clypeus and labrum anteriorly projecting beyond proximal 4 peduncular articles of antenna 2, anterior margin of labrum concave. Pereonites 1, 3 and 4 with ventromedial, spine-like process. Pleotelson length : body length = 0.22, length : width = 0.87, cordiform, anterolateral margin serrated, lateral margin with 5 short, spine-like setae, distolateral margin bulged at insertion of uropods, apex pointed. Uropods 0.34 times body length, inserting caudolaterally and pointing caudally, only proximal quarter of uropod sympod concealed by pleotelson.

Antenna 1 (Plate XVII a) 0.2 times body length, 3 cylindrical peduncular articles. Article 1 length : width = 2, distally with 1 broom seta and 2 simple setae. Article 2 length : article 1 length = 1.1, length : width = 3.5, distally with 2 broom setae and 3 simple setae. Article 3 length : article 2 length = 0.3, length : width = 1.7, distally with 1 simple seta. Flagellum with 5 progressively narrower articles, length of article 1 < 2 > 3 > 4 > 5. Article 1 distally with 2, article 2 distally with 1 simple seta, article 3 distally with 1 aesthetasc. Article 4 distally with 1 simple seta and 1 aesthetasc. Article 5 distally with 2 simple setae and 1 aesthetasc.

Antenna 2 (Plate XVII b) 0.51 times body length, 6 peduncular articles. Proximal 4 peduncular articles stout and short, length of article 1 > 2 < 3 > 4, article 3 with 1 simple seta and lateral scale distally reaching distal margin of article 4. Scale with 4 simple setae. Article 4 distally with 2 simple setae. Article 5 longer than proximal 4 articles together, with 12 simple setae. Article 6 length : article 5 length = 0.9, with 17 simple setae and 1 broom seta. Flagellum with 12 articles. Proximalmost article as long as peduncular article 6 and as flagellum articles 2 – 12 together, with 27 long, simple setae. Articles 2 – 12 progressively narrower, subequally long. Article 3 with 5, 4 with 1, 5 with 4, 6 with 1, 7 with 9, 8 with 1, 9 with 2, 10 with 5, 11 with 4, 12 with 4 long, simple setae.

Mandibles (Plate XVIII a, b) slender, about 3.8 times as long as wide, incisor part of left mandible with 4, of right mandible with 5 cusps. *Lacinia mobilis* with 4 cusps. Spine row of left mandible with 7, of right mandible with 8 denticulate spine-like setae, progressively increasing in length and number of denticles from distal to proximal end of spine row. Molar part slender, with several scale setae. 7 simple and 2 plumose setae on left, 8 plumose setae on right molar part. Triturating surface of mandibles surrounded by irregularly shaped cusps, smaller on right side. Condyle very short and semi-circular. Palp absent on left side, 0.22 times as long as mandible body on right side, 3 articles without setation.

Maxilla 1 (Plate XIX a) exopod 3.2 times as long as wide. Dorsally with numerous scale setae, proximolaterally with 7, medial margin with a row of 11 simple setae, distomedially with 3 transverse rows of 3 to 4 simple setae. Apex obliquely truncate, with 1 forked, spine-like seta and 11 denticulate, spine-like setae. dorsally with a row of 9 simple setae. Endopod 0.6 times as long as exopod, length : width = 4.7, lateral margin with a row of 7 long, simple setae, distally with many simple setae, apex narrow, with 1 plumose and 1 hemiplumose, spine-like seta.

Maxilla 2 (Plate XIX b) both parts of exopod laterally flexed, about 1.5 times as long as endopod, lateral part slightly longer than mesial part. Apex of lateral part with 2 long, hemiplumose, 1 long, serrated and 1 simple, spine-like seta. Apex of mesial part with 1 long, hemiplumose and 3 long, serrated spine-like setae. Endopod hardly wider than mesial and lateral part of exopod, densely covered with long, simple setae, apically with 4 serrated, spine-like setae.

Maxilliped (Plate XX a) coxa, basis and endite wide, basis including endite 1.6 times as long as wide. Endite with convex lateral and denticulate distolateral margin, dorsally densely covered with simple setae, distal margin dorsally with 3 short, serrated, spine-like setae and ventrally with 5 short, simple, spine-like setae. Medial margin with 3 plumose, spine-like setae. 2 retinacula. Palp with 5 articles, short, length : maxilliped length = 0.42. Articles progressively narrower, length of article 1 < 2 > 3 < 4 >> 5. Article 1 with 1, 2 with 6, 3 with 2, 4 with ten, 5 with 8 long, simple setae. Articles 2 and 3 with distomedial lobe. Epipodite small and slender, with acute apex, asetose, length : maxilliped length = 0.54, length : width = 3.7.

Pereopods 1 – 7 (Plate XXI a – Plate XXII c) uniformly baculiform ambulatory legs, length of pereopod 1 < 2 < 3 < 4 < 5 < 6 > 7, length of pereopod 1 : body length = 0.39, length of pereopod 6 : body length = 0.59. Pereopods dorsally flexed between basis and ischium, less distinctly dorsally flexed between ischium and merus, ventrally flexed between carpus and propodus. Basis of pereopod 3 with 3, 4 with 4, 5 with 1, 6 with 3 broom setae. Carpi and propodi subequally long, ventral margin of both with a row of 2 to 6 unequally bifid, spine-like setae. Carpi of pereopods 2, 3, 6 and 7 with 1 distodorsal broom seta. Distodorsal claw about half as long as dactylus, slender and acute, curved ventrally. Distoventral claw half or less than half as long as distodorsal one.

Pleopod 2 (Plate XXIII b) fused to cordiform operculum, length : width = 1.1, widest posteriorly of midlength, apex narrow-angled. Ventrally elevated at proximal margin and along median axis forming a rounded keel. Ventromedially 1 simple seta, lateral margin with a row of simple setae, distally decreasingly dense. Apex with membraneous seam and 3 plumose setae with short setulae.

Uropod (Plate XXIII g) 0.34 times body length, sympod cylindrical, 5.2 times longer than wide, incised at midlength, laterally with 2, medially with 16 simple setae. Endopod narrow, cylindrical, caudally pointing parallel to longitudinal body axis, length : sympod length = 1.1, with 7 simple setae. Exopod narrow, cylindrical, caudolaterally pointing at an angle of ca. 45 degrees from longitudinal axis, length : endopod length = 0.3, distally with 1 simple seta.

Remarks

The new species *Ianthopsis maximi* is eyeless and the length ratio of uropod rami lies within the of *Ianthopsis* range (which is very wide, though). Apart from this, it generally resembles species of *Mexicope* HOOKER, 1985, especially *M. westralia* JUST, 2001, and unpublished drawings of a new *Mexicope* species by H.–G. MÜLLER in anteriorly projecting mouthparts, absence of dorsal spine-like projections and rostral horns, the remarkable distolateral lobes of pereonites 2 – 4 and 6 – 7 with long, recurved setae, a setose, distodorsal cavity and the presence of conspicuous dorsal spine-like setae in a pairwise order on the pereonites. However, all previously described species of *Mexicope* have eyes on lateral bulges on the lateral spine-like process of the head and – as far as it is preserved – the uropod exopod is about 80 or 90 % of the endopod length (less than a third in *I. maximi*). Unfortunately, the length ratios of the uropod rami are less consistent within *Ianthopsis*. JUST (2001) inctroduces the grade of anterior projection of the mouthparts as a relevant character that separates *Mexicope* from *Ianthopsis*. The term "prognathous" (Just 2001) for the anteriorly projecting mouthparts in *Mexicope* should be avoided as it leads to confusion with "prognathous" in entomology (in contrast to "hypo-" and "orthognathous") where it does not mean to what extent the mouthparts protrude from the head but in which direction they point relative to the longitudinal body axis, here: anteriorly (in this sense, nearly all Asellota are prognathous, exceptions are e.g. the Ilyarachninae). A strong anterior protrusion of the mouthparts is present in *M. sushara* BRUCE, 2004, *M. westralia*, *I. maximi* and – to a lesser extent – in *I. vanhoeffeni* whereas the degree of prolongation of the mouthparts is not clear in *M. kensleyi* (HOOKER, 1985) from the original description or from KENSLEY & SCHOTTE (1989). The mouthparts of the unpublished new species of *Mexicope* (MÜLLER unpublished) are apparently not much projecting anteriorly. This character is therefore excluded from the diagnosis of *Mexicope*.

I. maximi has a short rostrum whereas the vertex uninterruptedly slopes to the frons in *M. westralia*. However, with *M. sushara* it was proved that the rostrum is not always absent in *Mexicope* (BRUCE 2004). The recurved long setae on the posteriolateral projections on pereonites 2 – 4 and on anteriolateral projections on pereonites 6 and 7 found in *Mexicope* are also present in *I. maximi*. However, it is assumed here that this relatively inconspicuous character (which needs high magnification to be detected) may be further distributed within *Ianthopsis* than has been noticed, yet. In general habitus, *I. maximi* also resembles *I. vanhoeffeni* JUST, 2001 especially in the lateral margins of the head and the pereonites and in the anterior constrictions of pereonites 2 – 7. However, *I. vanhoeffeni* has a long rostral horn-like process, one very long (about 1.5 times body depth) dorsomedial process on pereonites 2 – 7 and pairs of dorsolateral processes on pereonites 1 – 4. All these processes are absent in *I. maximi*. Regarding all characters, the new species *I. maximi* seems to be transitional between *Mexicope* and *Ianthopsis*. As a consequence, the separation of *Mexicope* and *Ianthopsis* becomes less distinct. However, *Mexicope* may still prove to be valid if apomorphies were found. At least the following characters are consistent within *Mexicop*e: the almost equally long uropod rami with an endopod longer than the sympod, the maxilliped epipodite being significantly reduced to a maximum length of about 60% of the distance between coxa and palp and the bathymetric range that is exclusively neritic – which makes the existence of eyeless species improbable unless they occur at considerably greater depths.

In the figured female paratype of *I. maximi* the palp of the right mandible is strongly reduced and asetose, the left mandible lacks a palp. So far, no other *Ianthopsis* species without mandibular palp has been recorded and *M. kensleyi* is the only *Mexicope* without it. However, in *M. kensleyi* the palp is absent on both mandibles. As the palp is absent only on one side but present on the other in the examined specimen of *I. maximi* it is assumed that the degree of reduction of the mandibular palp is not only intraspecifically variable but also within the same specimen.

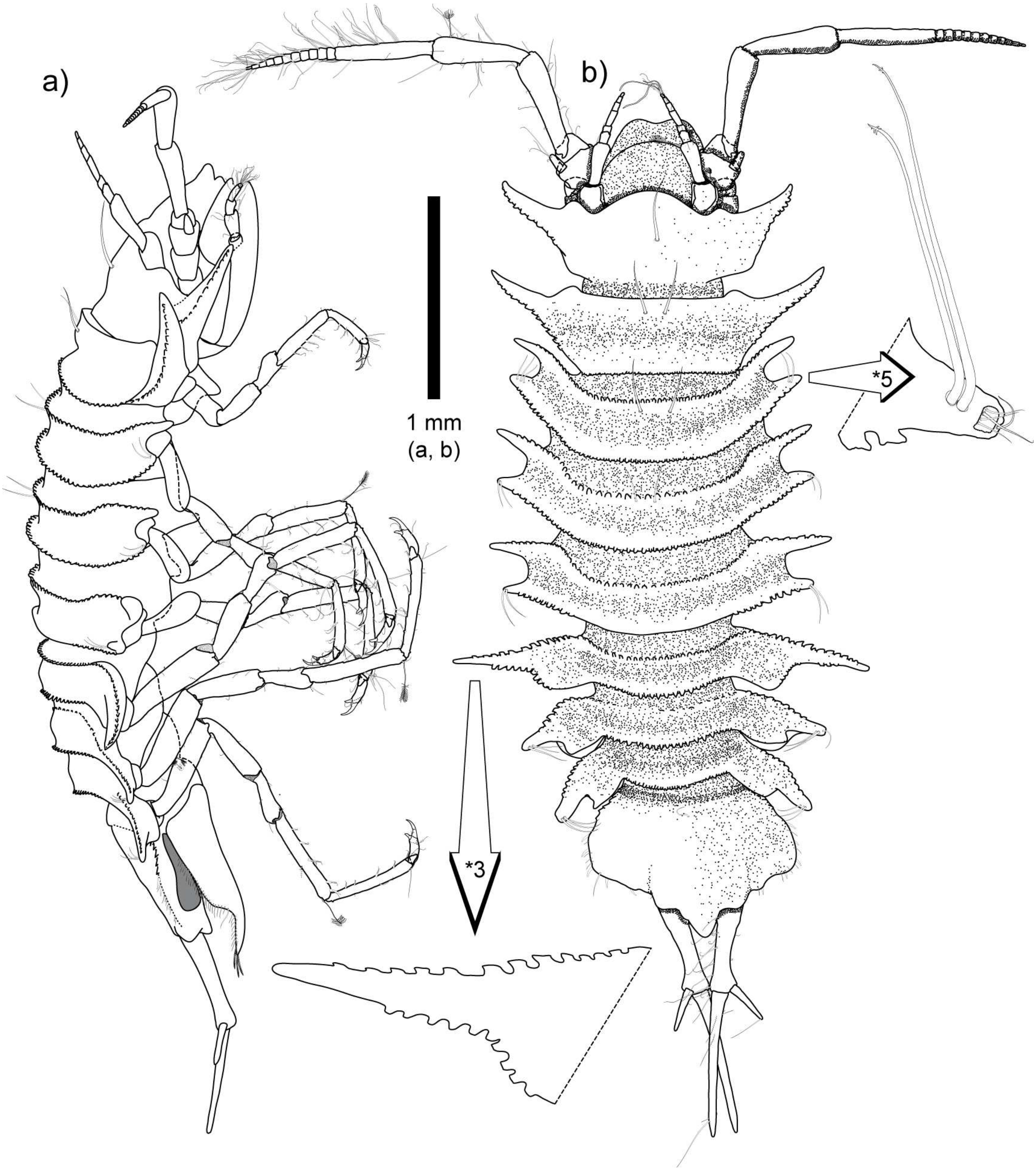

Plate XVI: *Ianthopsis maximi* n. sp.; female paratype, length 3.98 mm: a) habitus lateral; b) habitus, dorsal aspect. Numbers in arrows indicate relative factor of magnification

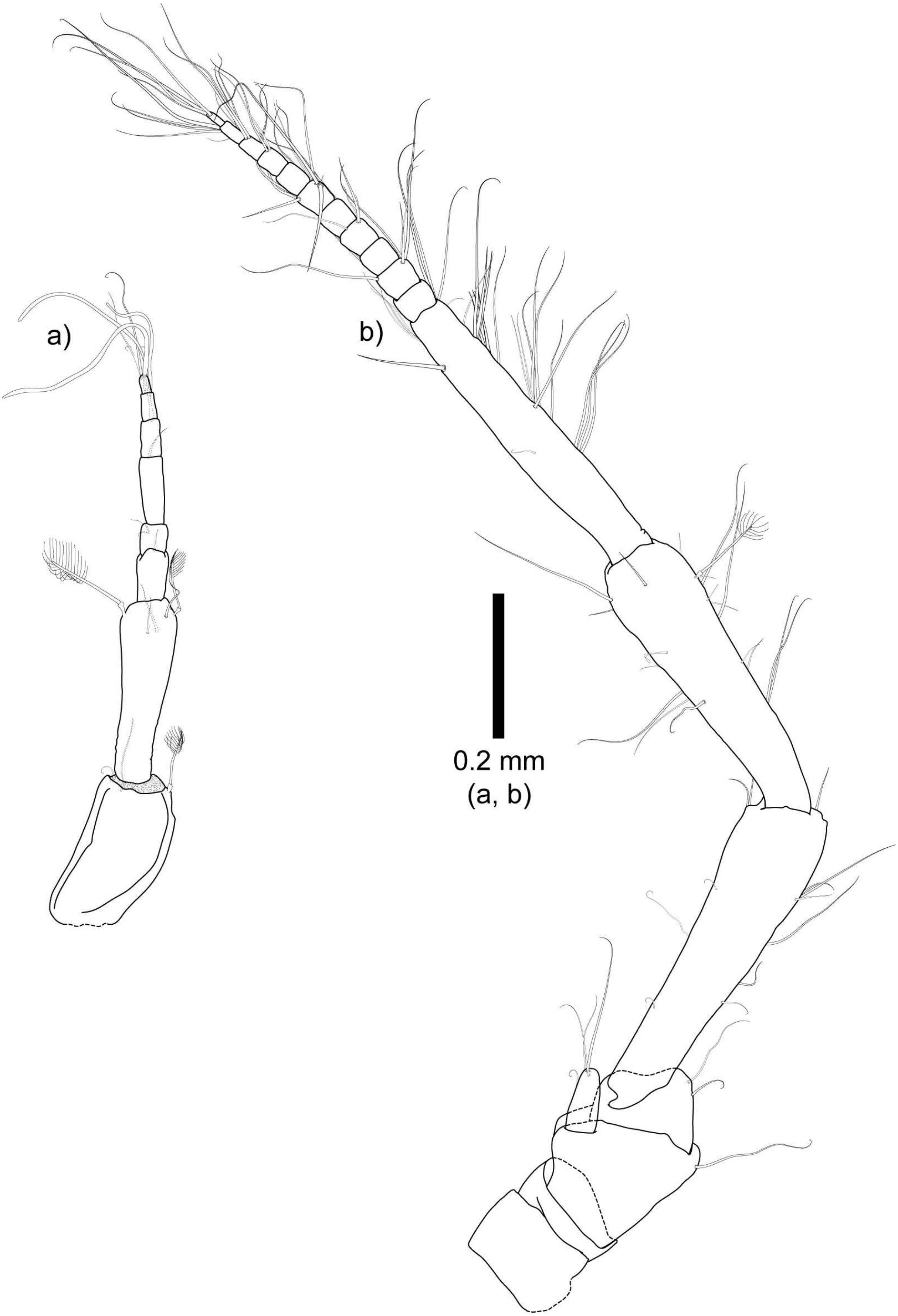

Plate XVII: *Ianthopsis maximi* n. sp.; female paratype, length 3.98 mm: a) antenna 1; b) antenna 2

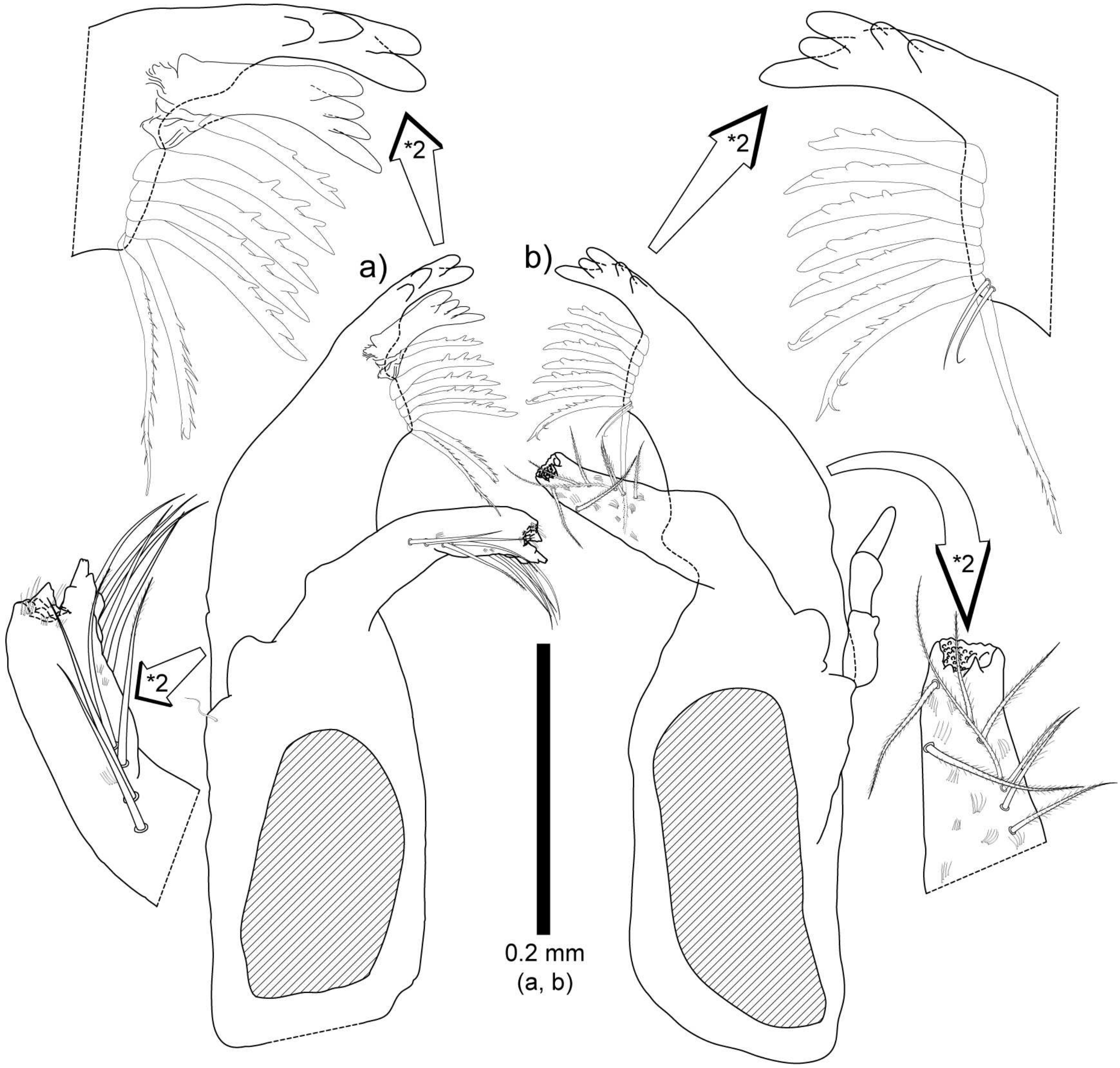

Plate XVIII: *Ianthopsis maximi* n. sp.; female paratype, length 3.98 mm: a) left mandible; b) right mandible. Numbers in arrows indicate relative factor of magnification

Plate XIX: *Ianthopsis maximi* n. sp.; female paratype, length 3.98 mm: a) maxilla 1; b) maxilla 2. Numbers in arrows indicate relative factor of magnification

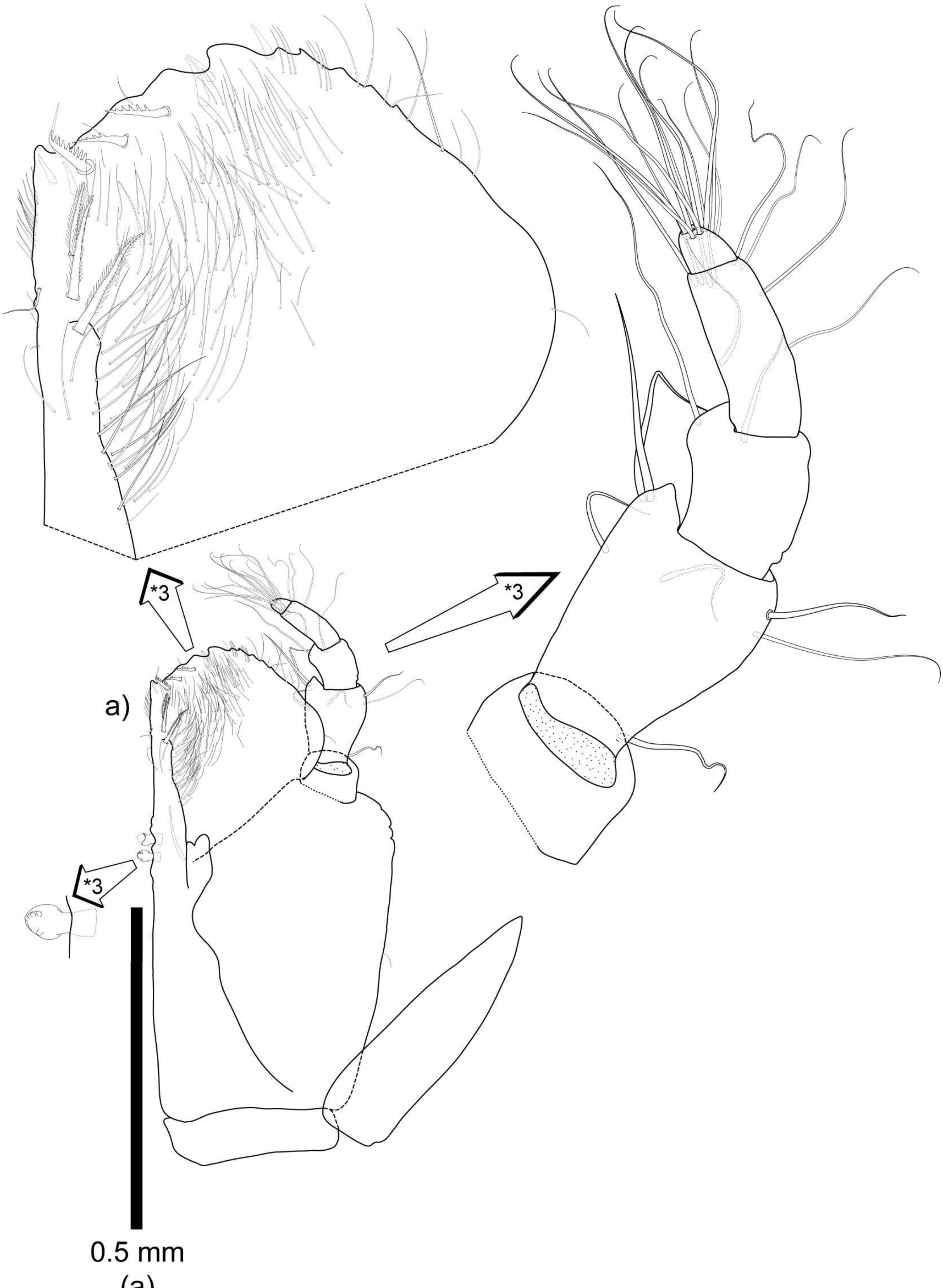

Plate XX: *Ianthopsis maximi* n. sp.; female paratype, length 3.98 mm: a) maxilliped, dorsal aspect. Numbers in arrows indicate relative factor of magnification

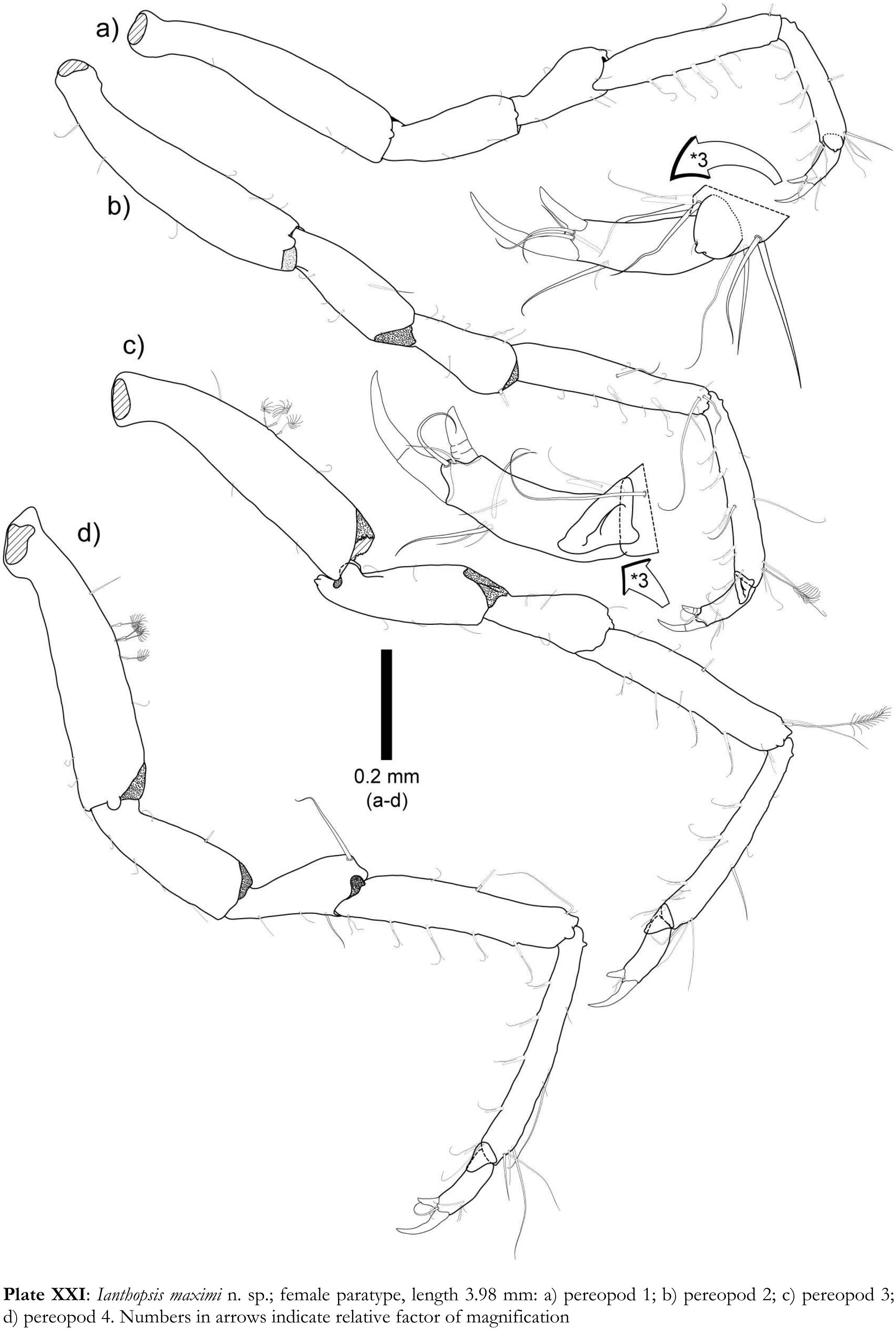

Plate XXI: *Ianthopsis maximi* n. sp.; female paratype, length 3.98 mm: a) pereopod 1; b) pereopod 2; c) pereopod 3; d) pereopod 4. Numbers in arrows indicate relative factor of magnification

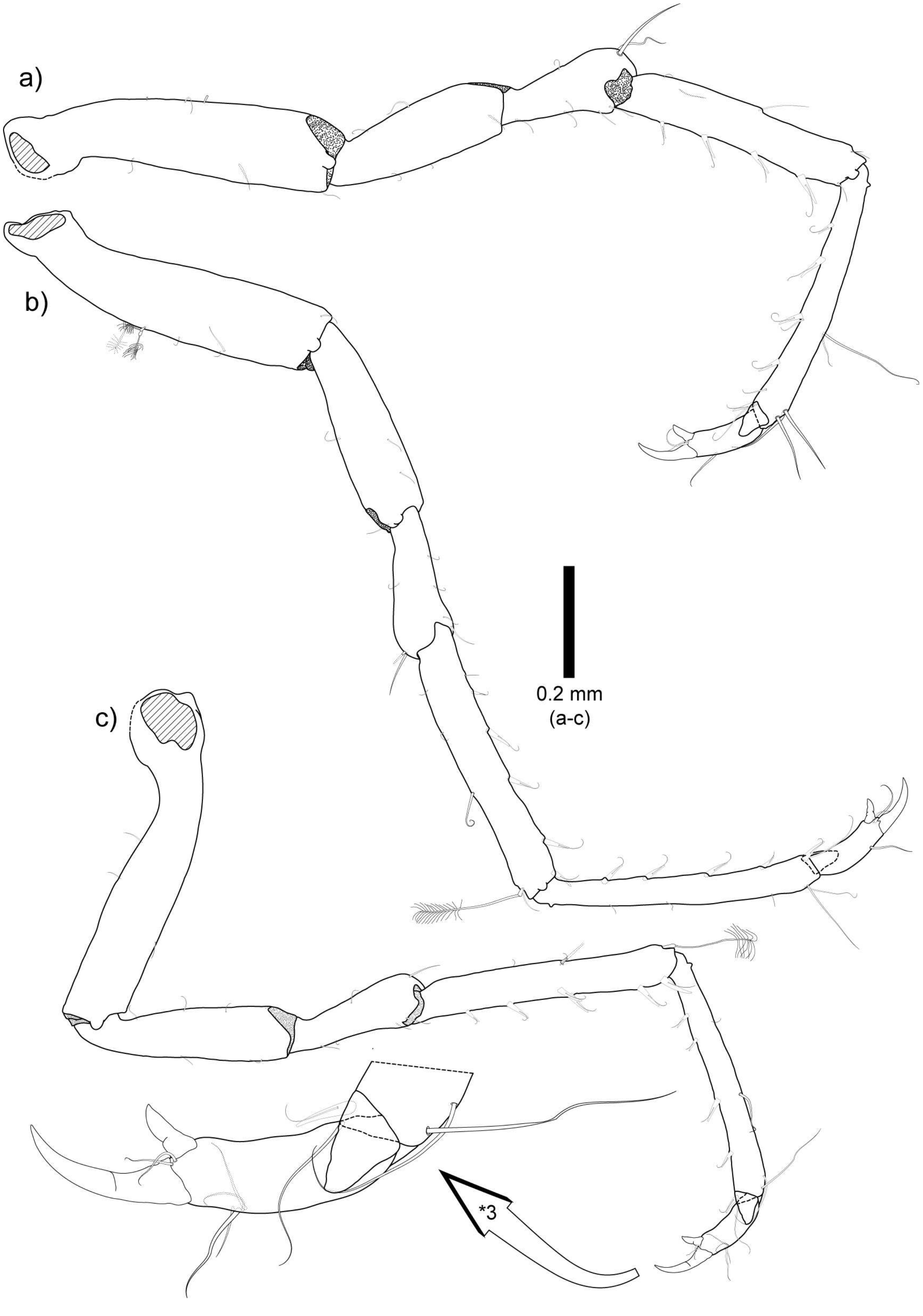

Plate XXII: *Ianthopsis maximi* n. sp.; female paratype, length 3.98 mm: a) pereopod 5; b) pereopod 6; c) pereopod 7. Numbers in arrows indicate relative factor of magnification

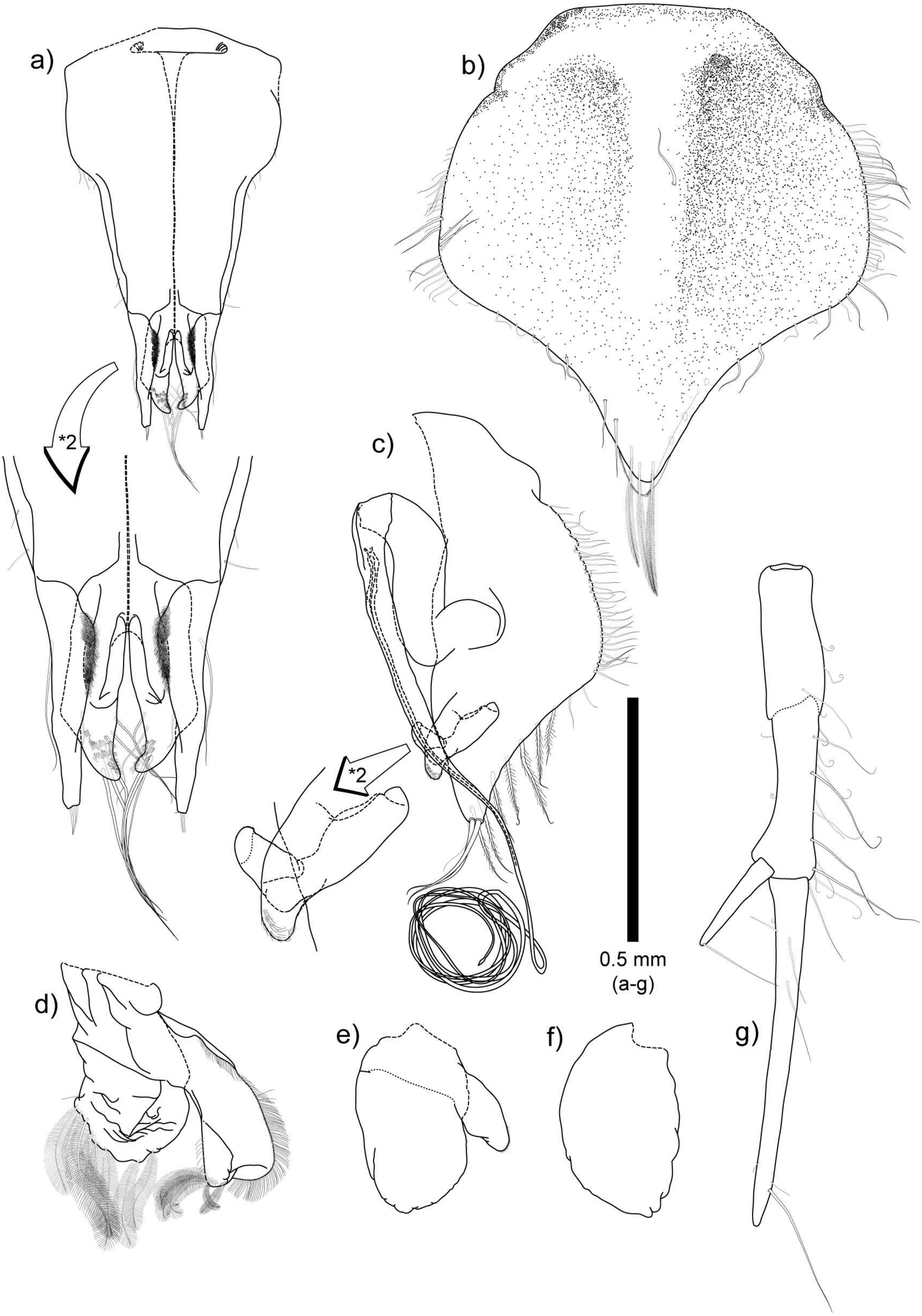

Plate XXIII: *Ianthopsis maximi* n. sp.; male holotype, length 4.17 mm: a) pleopod 1; c) pleopod 2; d) pleopod 3; e) pleopod 4; f) pleopod 5; female paratype, length 3.98 mm: b) pleopod 2; g) uropod. Numbers in arrows indicate relative factor of magnification

3.1.5 Family Munnopsidae LILLJEBORG, 1864

The Munnopsidae are often the predominant isopod family of deep-water samples and consist of more than 300 species (304 as of December 2008: SCHOTTE *et al.* 1995 ff.). They are characterized by their secondary division of the pereon into two functionally and morphologically different units: The pereonites 1 – 4 are relatively loosely packed as in most other Janiroidea, the corresponding pereopods are baculiform and mostly considerably long. This part of the body is named ambulosome (WILSON & HESSLER 1980). Pereonites 5 – 7 are more tightly packed, usually longer than the pereonites of the ambulosome and contain strongly developed muscles attached to the the pereopods that are highly modified for swimming: The carpi and propody are laterally compressed yet dorsoventrally widened to a more or less oval shape. The dorsal and ventral margins of these segments bear a row of swimming setae (specialized plumose setae with articulating insertion). The body part consisting of pereonites 5 – 7 and pleotelson is therefore named natasome. By rapid movement of the natatory pereonites 5 – 7 the Munnopsidae are – although of generally benthic habit – capable of swimming backwards and can relatively freely move in the water column. In deep-sea species of the subfamily Munnopsinae the ambulatory pereopods 3 and 4 are considerably longer than the body – up to 7 times body length in *Munnopsis latifrons* BEDDARD, 1885 with a total length of up to 116 mm (WOLFF 1962). Munnopsinae as well as (unidentified) species of *Munneurycope* STEPHENSEN, 1912 (currently classified as Munnopsidae *incertae sedis*, AYDOGAN *et al.* 1999; MURSCH *et al.* 2008) reported to live bathypelagically. The terminal claws of the pereopods are forming a groove and seclude sensory setae.

Subfamily Lipomerinae TATTERSALL, 1905

Genus *Lipomera* TATTERSALL, 1905

Type species: *Lipomera lamellata* TATTERSALL, 1905.

Species included: *L. (Lipomera) celtica* n. sp.; *L (Lipomera) lamellata* TATTERSALL, 1905; *L. (Paralipomera) knorrae* WILSON, 1989; *L. (Tetracope) curvintestinata* WILSON, 1989

Diagnosis

The generic and subgeneric diagnoses follow WILSON (1889).

3.1.5.1 *Lipomera (Lipomera) celtica* n. sp.

Material examined: **Holotype**, female (1.41 mm), Continental slope off Ría de Ferrol, Galicia, Spain, 43°43.781 N, 08°46.450 W – 43°44.960 N, 08°45.490 W, 402 m, station: "AT 400-03". **Paratypes**, male (0.96 mm), preparatory female (0.92 mm), all from same locality as holotype, station: "AT 400-03".
Additional material: 3 paratypes, same locality. as examined material.
Type material will be deposited in the Zoologisches Museum Hamburg (ZMH), Germany.

Distribution
Known only from *locus typicus*: Continental slope off northern Galicia, Spain. Coordinates listed above.

Etymology: *celtica* is referring to the Celtic people, native inhabitants of Galicia and Ireland, the latter being the type locality of the type species.

Diagnosis
Lipomera with body evenly tapering anteriorly and posteriorly. Pleotelson subtriangular with rounded apex, lateral margins converging at acute angle. Female antenna 1 peduncular article 1 with projecting distolateral lobe. Antenna 1 flagellum with 3 articles in female, 9 articles in male. Pereopod 7 with 5 post-coxal articles, dactylus blunt, well developed. Male pleopod 1 distally truncate, slightly embayed between distomedial and distolateral lobes. Female pleopod 2 acute-angled, distolaterally serrated with row of plumose setae, ventromedially sharply keeled with conspicuous proximoventral spine-like seta. Uropods leaf-shaped, *in situ* not mesially enrolled.

Description of female holotype

Body (Plate XXIV a, b) 1.41 mm long, length : width = 2.3, length : depth = 3.6, widest at pereonite 5, evenly tapering anteriorly and posteriorly. Greatest body depth at pereonite 5. Head parallel-sided and almost cylindrical in cross-section, narrower but deeper than pereonites of ambulosome, length : width = 0.55, width : body width = 0.58. Rostrum short, about twice as wide as long, anteriorly evenly convex, projecting beyond dorsalmost part of frons. Ambulatory pereonites loosely packed, progressively wider from pereonite 1 to 4, pereonites 1 – 3 about equally long, pereonite 4 less than half as long. Anteriolateral angles of all ambulatory pereonites projecting anteriorly, coxal lobes subtriangular, visible in dorsal view. Natasome length : body length = 0.66, with tightly packed pereonites. Pereonite 5 longest and widest, length : width = 0.61, anterior margin convex, lateral margin with bulge due to underlying musculature, posterior margin with a convex medial area of 0.46 times pereonite 5 width, laterally posteriorly sloping with posterioateral corners projecting beyond mid-posterior margin. Pereonite 6 length : width = 0.4, widest at anterolateral angles overlapping lateral margin of pereonite 5, narrowing posteriorly. A pair of dorsolateral bulges laterally of concave posterior margin. Pereonite 7 reduced and crescent-shaped with convex anterior and straight posterior margin, width : body width = 0.27, length : width = 0.4. Pleotelson triangular with rounded apex, length : body length = 0.24, length : width = 0.83, anterior margin sligthly convex, lateral margin straight, slightly concave in lateral view. Uropods leaf-shaped, posteriorly surpassing apex of pleotelson and visible in dorsal view.

Antenna 1 (Plate XXV b) 0.18 times body length, 3 peduncular articles and 3 flagellomers. Peduncular article 1 dorsoventrally flattened. Anteriolateral lobe large and prominent, distally rounded, anteriorly reaching to a third of article 2 length, distally with 1 broom and 1 simple seta, anteriomedial lobe not anteriorly projecting, with 2 broom setae. Article 2 cylindrical, narrower but slightly longer than article 1, laterally with 1 simple seta, distally with 2 simple and 2 broom setae. Article 3 half as wide and half as long as article 2, medially with 1 simple seta. Flagellum article 1 two thirds as long and as wide as peduncular article 3, distally with 2 simple and 1 broom seta. Article 2 twice as long a article 1, asetose. Article 3 as long as article 1, distally slightly tapering, rounded apex with 2 simple setae and 1 aesthetasc.

Antenna 2 (Plate XXV c) proximal 4 peduncular articles preserved, cylindrical, proximalmost article short, *concealed in situ*, joint between article 1 and 2 constricted and more flexible than between the succeeding ones. Article 2 widest, width : cephalic width = 0.24, anterior margin oblique. Article 3 about as long as and slightly narrower than article 2, without scale, dorsally with 2 simple setae. Article 4 slightly longer and narrower than article 3, distally evenly tapering, distal margin bilobate, dorsally with 1 simple seta.

Mandibles (Plate XXVI a, b) with blunt cusps on incisor part, left mandible with 4, right mandible with 3 cusps. *Lacinia mobilis* with 5 cusps. Spine row of left mandible with 1 denticulate, 1 simple and 2 hemiplumose, spine-like setae. Spine row of rigth mandible with 1 denticulate and 2 simple, spine-like setae. Molar part strong with smooth triturating surface. Left molar part distomedially with 3 shallow cusps bearing 2 serrated, spine-like setae. Right molar part distomedially with 3 serrated, spine-like setae. Condyle about 0.6 times as long as molar part. Palp length : mandible body length = 0.81, article 1 laterally rugose with numerous scale setae. Article 2 length : article 1 length = 1.8, with numerous simple setae, distally with 5 scale setae and 2 long hemiplumose, spine-like setae. Article 3 slightly twisted around its longitudinal axis and laterally curved, as long as article 1, with numerous simple and scale setae, concave lateral margin with a row of 8 denticulate, spine-like setae.

Maxilla 1 (Plate XXVII a) exopod 2.6 times as long as wide. Laterally with numerous scale setae. Apex (Plate XXVII b) obliquely truncate, with 11 simple, spine-like setae and 1 denticulate spine-like seta, dorsally with a row of scale setae and 1 simple seta. Endopod (Plate XXVII c) 0.48 times as long as exopod, length : width = 2.9, distal third of lateral margin with 2 simple setae, apex blunt, with 4 simple, spine-like setae.

Maxilla 2 (Plate XXVII d) both endites of exopod half as wide as endopod, lateral endite (Plate XXVII e) as long as endopod, mesial endite (Plate XXVII f) 0.9 times as long. Lateral endite apically with 2 slender, spine-like setae, 2 denticulate, spine-like setae and 1 simple seta. Mesial endite apically with 2 slender, spine-like setae, 1 denticulate, spine-like seta, medial margin with 5 simple setae. Endopod (Plate XXVII g) rounded apex with 9 simple, spine-like setae. Medial margin with short, transverse rows of 2 or 3 simple setae.

Maxilliped (Plate XXVIII a) basis lateral margin convex with a row of simple setae. Endite half as wide as rest of basis, length : width = 2.4, with truncate apex, distal margin with 4 fan setae. 2 retinacula with 5 and 6 distal cusps. Palp length : basis length = 0.83, with 5 articles. Article 1 transverse, article 2 medial margin half as long as lateral, distomedially one, laterally 2 slender, spine-like setae. Article 3 longest, medial margin enlarged to distomedial lobe, with a seam of short setae and 8 slender, spine-like setae, article 4 narrow with distomedial lobe with 2 slender, spine-like setae, article 5 cylindrical, narrow, apically with 4 slender, spine-like setae. Epipodite length : basis length = 0.5, twice as long as wide, distally truncate with 2 simple setae.

Ambulatory pereopods not preserved distally of basis.

Natatory pereopods 5 – 6 dorsally flexed between basis and ischium, ventrally flexed between carpus and propodus. Pereopod 5 (Plate XXX a) 0.59 times, pereopod 6 0.48 times body length. Basis as long as ischium and merus together, ventral margin with numerous long, simple setae. Ischium dorsally with 2 swimming setae. Merus two thirds of ischium length. Carpi dorsolaterally flattened and dorsal margin expanded to semi-circular shape. Pereopod 5 carpus length : width = 0.93, dorsally with 17, ventrally with 7 swimming setae. Pereopod 6 (Plate XXX b) carpus length : width = 1.36, dorsally with 12, ventrally with 4 swimming setae. Propodi laterally flattened, dorsal and ventral margin convexly enlarged, with distodorsal unequally bifid, spine-like seta. Propodus pereopod 5 length = 0.83 times carpus length, length : width = 1.47, dorsally with 9, ventrally with 5 swimming setae. Propodus pereopod 6 length = 0.77 times carpus length,

length : width = 1.78, dorsally with 6, ventrally with 4 swimming setae. Dactyli slender, laterally flattened, with apical, simple seta, unguis pointed, ventrally curved, about a third as long as dactylus. Pereopod 7 (Plate XXX c) vestigial, *in situ* concealed by pereopod 6, lateral margin of pereonite 6 and pleotelson, 0.14 times body length, consisting of only 4 slender, cylindrical articles distally of coxa, article 1 as long as 2 – 4 together, with 1 simple seta. Article 2 a third as long as article 1, with a long, simple seta. Article 3 as long as article 2, with 1 plumose seta. Article 4 as long as article 3. Unguis present, distally rounded.

Pleopod 2 (Plate XXXI e) triangular with acute, cleft apex, length : width = 1.08, width : depth = 2.16, with ventral keel. Keel anteriorly with 4 simple setae and a long, spine-like seta at ventralmost point. Distolateral margin serrated with 5 denticles, each bearing a plumose seta. Pleopods 4 and 5 (Plate XXXI g, h) delicate, ovally shaped, asetose, about a fifth longer than wide. Uropod laterally compressed, leaf-shaped, ventral margin expanded, distally rounded, 0.10 times body length, length : width = 1.74. Ventral margin with 4 simple setae, distolaterally 1 simple seta, dorsal margin distomedially with 1 broom seta.

Description of male paratype

Body 0.96 mm long, As in female paratype but with the following exceptions: Antenna 1 (Plate XXV a) 0.49 times body length, 3 peduncular articles and 9 flagellomers. Peduncular article 1 anteriolateral lobe short, distally rounded, anteriorly reaching to less than a fifth of article 2 length, distally with 1 broom seta, anteriomedial lobe reduced, with 1 broom seta. Article 2 cylindrical, narrower and about 1.5 times as long as article 1, proximomedially with 1 simple seta, distally with 2 simple and 2 broom setae. Article 3 half as wide and half as long as article 2, asetose. Flagellum article 1 two thirds as long and as wide as peduncular article 3, distally with 2 simple setae. Article 2 three times as long a article 1, asetose. Article 3, 4 and 5 two thirds of article 2 length, article 6 half as long as article 5, article 7 and 8 shorter than article 6, article 9 twice as long as article 8, distally tapering with rounded apex. Articles 5 – 8 distally with 1, article 9 with 2 aesthetascs and 2 simple setae.

Ambulatory pereopods baculiform, pereopod 1 (Plate XXVIII b) 0.63 times as long as body, pereopods 2 – 4 (Plate XXIX a – c) subequally long, 1.07, 1.03 and 1.04 times as long as body. Basis pereopod 3 with 2, basis pereopod 4 with 4 broom setae. Carpus pereopods 2 and 3 distoventral margin serrated, carpus pereopod 4 with distodorsal broom seta. Propodus pereopods 2 – 4 with dorsal broom seta at mid-length, ventral margin with 3 to 7 unequally bifid, spine-like setae, ventral margin serrated on pereopod 2. Dactylus slender, scythe-shaped and ventrally curved in pereopods 2 – 4, bearing a slender, acute claw of 0.20 to 0.23 times dactylus length.

Pleopod 1 (Plate XXXI a) length : width = 3.3, widest posterior to proximal quarter, distally evenly tapering, distal quarter ventrally with 6 simple setae. Apex (Plate XXXI b) appearing truncate due to shallow distomedial and slightly shorter distolateral lobes. Distomedial lobes with 3, distolateral lobes with 3 or 4 simple setae, proximally of distolateral lobes another simple seta.

Pleopod 2 (Plate XXXI c) length : width = 1.92, proximolateral margin convex, proximodistal margin serrated with 5 denticles, each bearing a plumose seta. Further proximally a smaller, plumose seta. Distomedially 2 short, plumose setae. Stylet (Plate XXXI d) short, 0.45 times pleopod 2 length, sperm duct opening distally of proximal two thirds.

Pleopod 3 (Plate XXXI f) exopod with 2 articles. Article 1 laterally bulged, distolaterally at insertion of article 2 with acute projection, lateral margin with a seam of simple setae. Article 2 a third longer than article 1, distally rounded, lateral margin with a seam of shorter, simple setae, apex with 1 simple and 2 plumose setae. Endopod surpassing exopod and 1.5 times wider than exopod article 2, apex truncate with 3 plumose setae.

Additional description of preparatory female paratype

0.92 mm long. Antenna 2 (Plate XXV d) almost entirely preserved, distalmost articles of flagellum missing, preserved length 2.64 times as long as body, peduncular article 5 slender, about 11 times as long as wide, subdistally 1 broom seta. Peduncular article 6 1.5 times as long and equally wide as 5, subdistally 3 broom setae. Flagellum preserved by proximal 12 articles progressively tapering and shorter. Articles of flagellum distally with 1 to 4 long, simple setae.

Remarks

Unfortunately the genus and the whole subfamily are based on *Lipomera lamellata* TATTERSALL, 1905, a type species that is one of the least well documented species among the Munnopsidae. The quality of figures in the original description is exceptionally poor and partially doubtful. There are no coxal lobes on the ambulatory pereonites in dorsal view which is very unlikely, instead all pereonites have long, anteriolateral spine-like setae, even on the natatory pereonites. The whole body, especially the pereonites of the natasome, is so generalized and obviously only a rough illustration of how the species may look in reality that there is much room for interpretation. From the drawings, the pleotelson seems to be much wider than in *L. (Paralipomera) knorrae*, *L. (Tetracope) curvintestinata*, and the new species. However, the possibility cannot be ruled out that this is due to a preservational or preparational artifact. If the specimen had been studied on a microscopic slide and covered with a lid, a little pressure would result in a "wider" operculum (i.e. flattened and stretched out, obscuring its three-dimensional depth). During the embedding of the new species, the operculum was found to fold out easily under the covering lid which initially resulted in an outline similar to that of *L. lamellata*. This was corrected later. It is not unlikely that this also happened with the type of *L. lamellata* without being noticed. It would be necessary to redescribe *L. lamellata*, but unfortunately the whereabouts of the type material are unknown and the species has not been recorded again after its initial discovery more than a century ago (WILSON 1989). However, in his revision of the Lipomerinae WILSON (1989) did not declare the species a *nomen dubium*, which would have had consequences for our definition of the whole subfamily. This decision is provisionally followed here for the reason that it is not unlikely that further bathyal samples provide new material that can be identified as *L. lamellata* and could be designated as neotypes. WILSON mentioned that it may not be a rare species but lives in depths that are "too shallow for many deep-sea studies and too deep for most shallow water benthic work". Although the original drawings of *L. lamellata* leave much space for interpretation, it is obvious that it is not conspecific with the new species. The rostrum and the uropods, however, are so much alike in both species (and clearly different from the subgenera *Paralipomera* and *Tetracope*) that *L. celtica* n. sp. is placed in the same subgenus *Lipomera*. The basalmost peduncular article of antenna 1 is apparently sexually dimorphic in the new species as well as in *L. (Tetracope) curvintestinata* and *L. (Paralipomera) knorrae*: In females, the distolateral lobes are relatively larger and more anteriorly projecting than in males, in *L. (Tetracope) curvintestinata* this is also the case for the distomedial lobe.

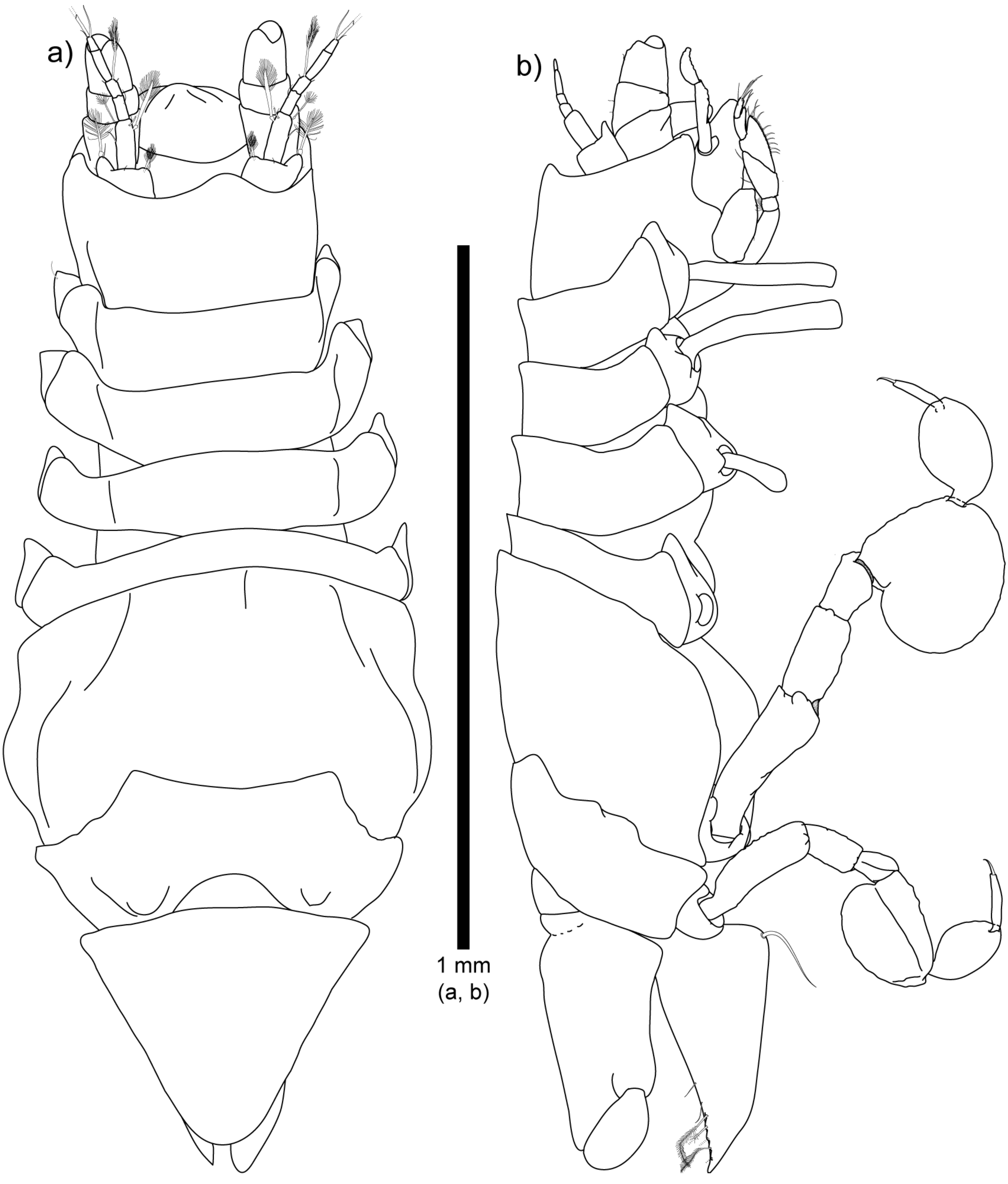

Plate XXIV: *Lipomera (Lipomera) celtica* n. sp.; female holotype, length 1.41 mm: a) habitus dorsal; b) habitus, lateral aspect

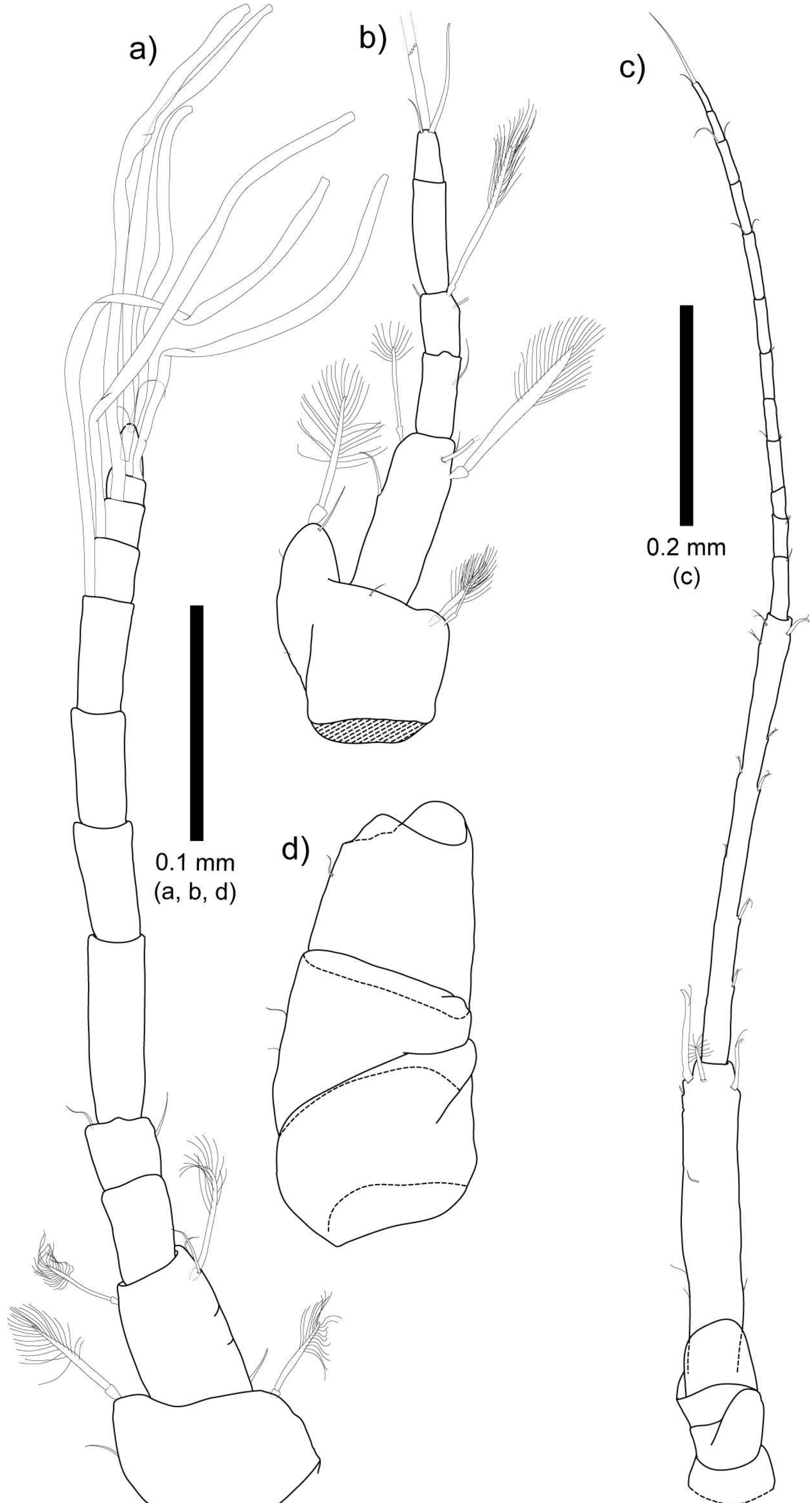

Plate XXV: *Lipomera (Lipomera) celtica* n. sp.; male paratype, length 0.96 mm: a) antenna 1; female holotype, length 1.41 mm: b) antenna 1; c) antenna 2; preparatory female paratype 0.92 mm: d) antenna 2

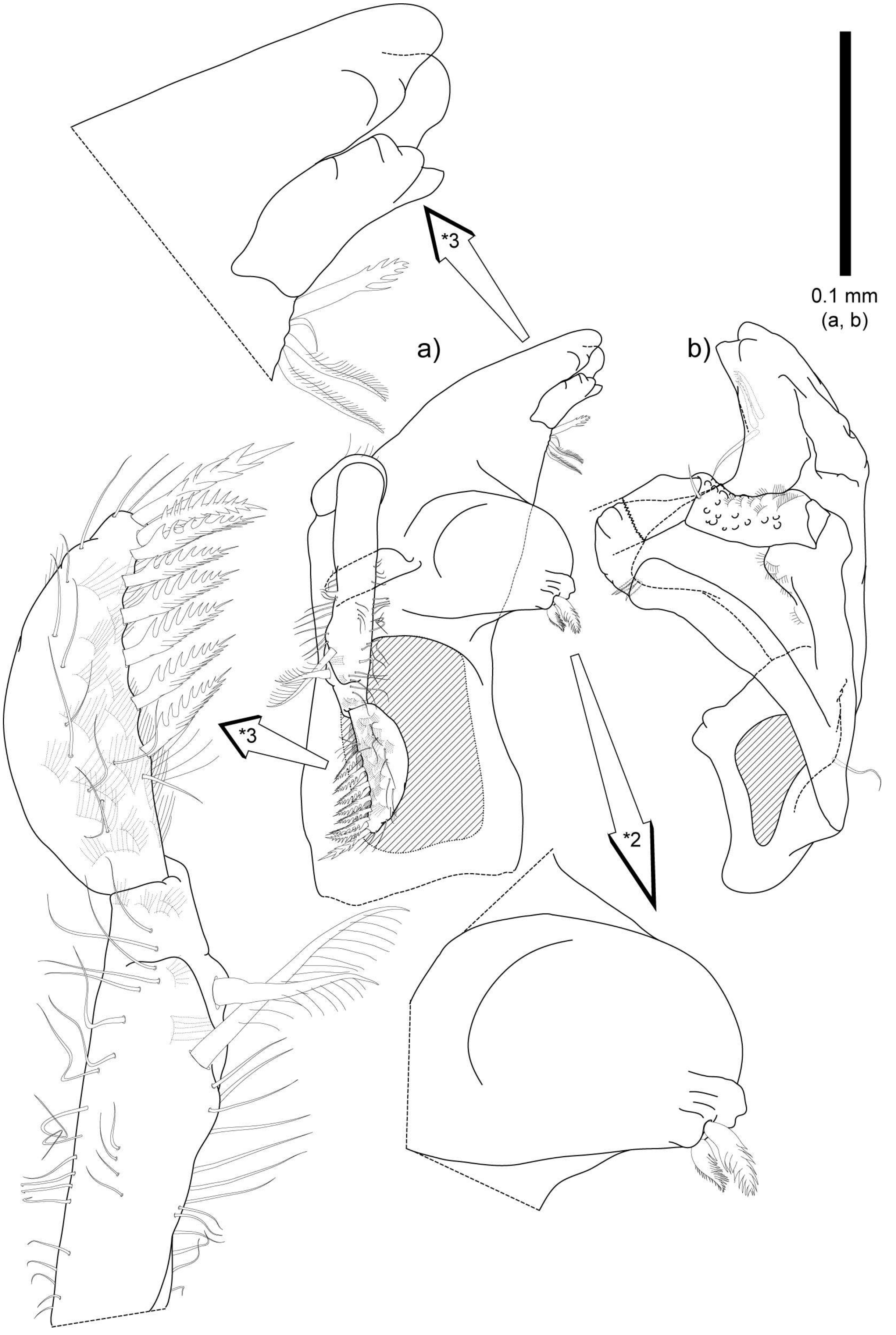

Plate XXVI: *Lipomera (Lipomera) celtica* n. sp.; female holotype, length 1.41 mm: a) left mandible; b) right mandible. Numbers in arrows indicate relative factor of magnification

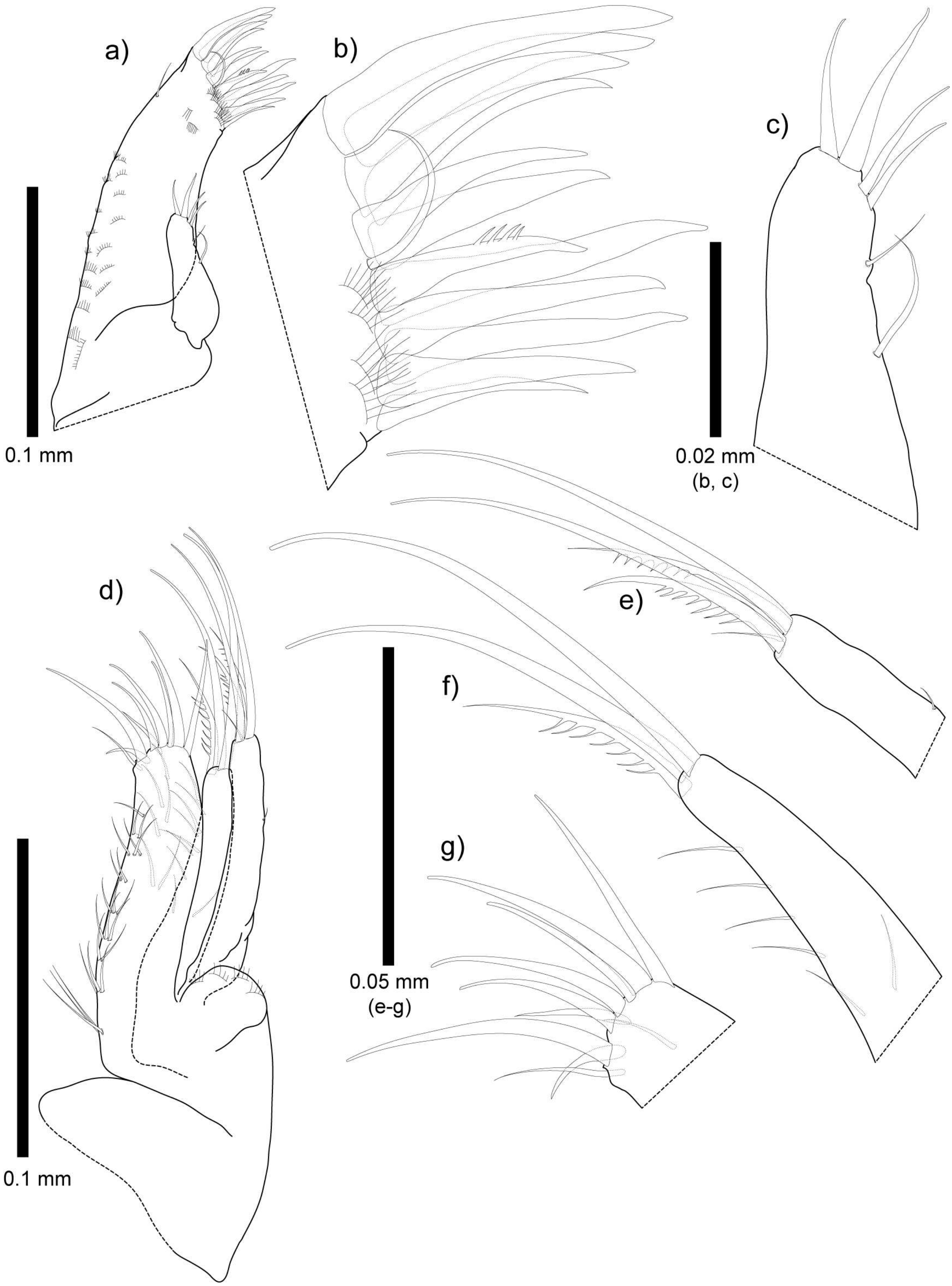

Plate XXVII: *Lipomera (Lipomera) celtica* n. sp.; female holotype, length 1.41 mm: a) maxilla 1; b) maxilla 1 exopod apex; c) maxilla 1 endopod; d) maxilla 2; e) maxilla 2 lateral endite; f) maxilla 2 mesial endite; g) maxilla 2 endopod apex

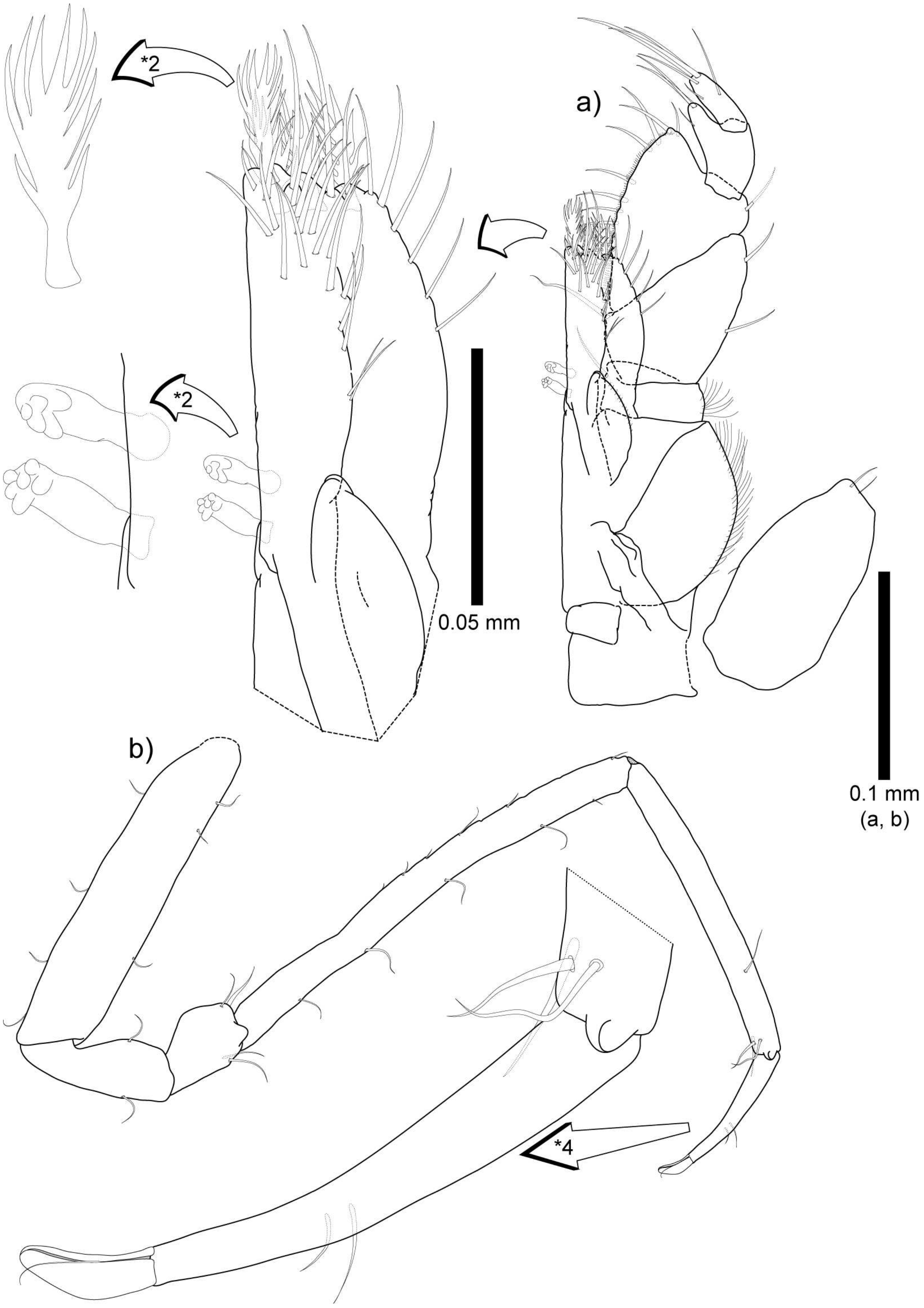

Plate XXVIII: *Lipomera (Lipomera) celtica* n. sp.; female holotype, length 1.41 mm: a) maxilliped; male holotype, length 0.96 mm: b) pereopod 1. Numbers in arrows indicate relative factor of magnification

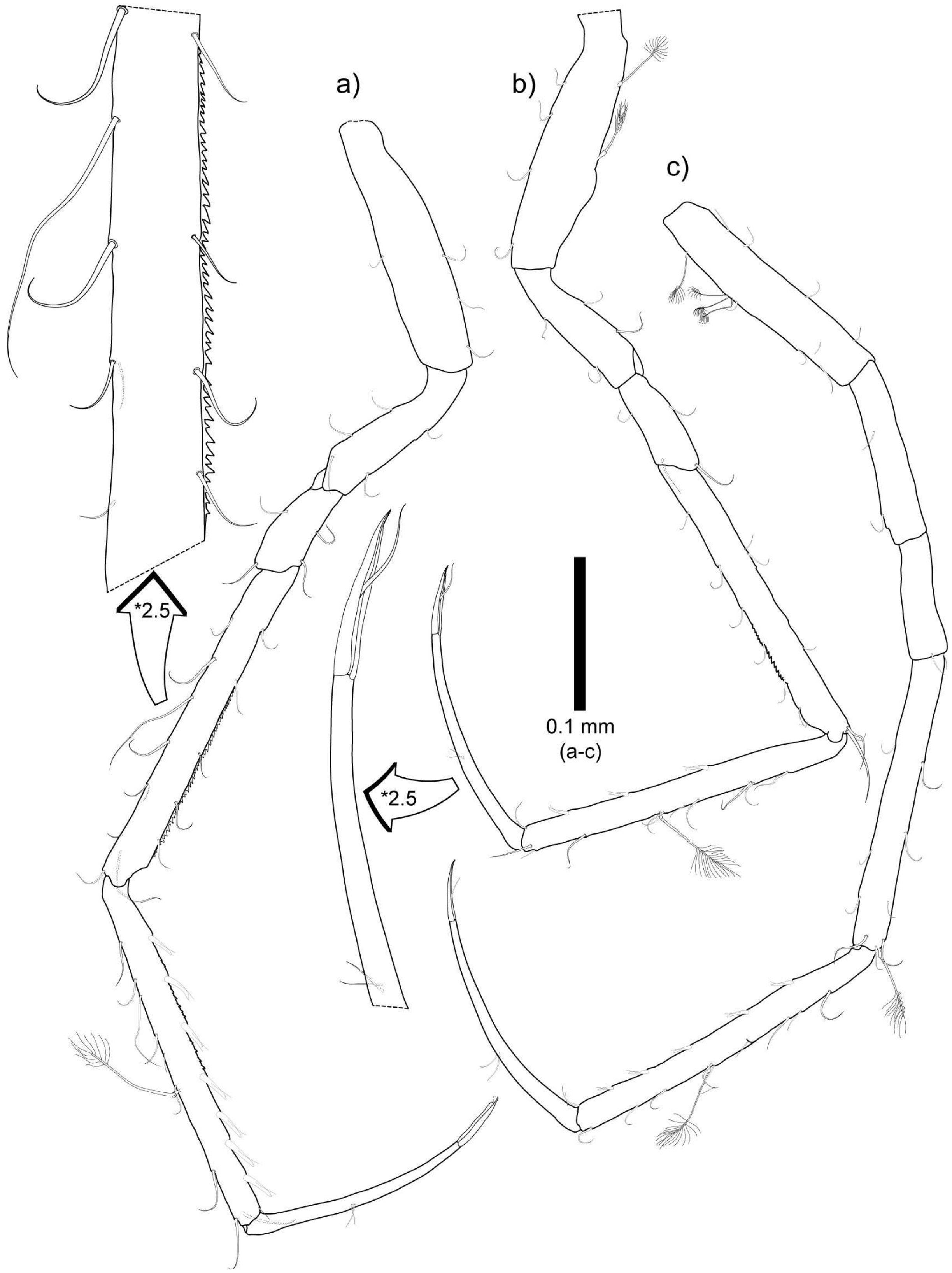

Plate XXIX: *Lipomera (Lipomera) celtica* n. sp.; male paratype, length 0.96 mm: a) pereopod 2; b) pereopod 3; d) perepod 4. Numbers in arrows indicate relative factor of magnification

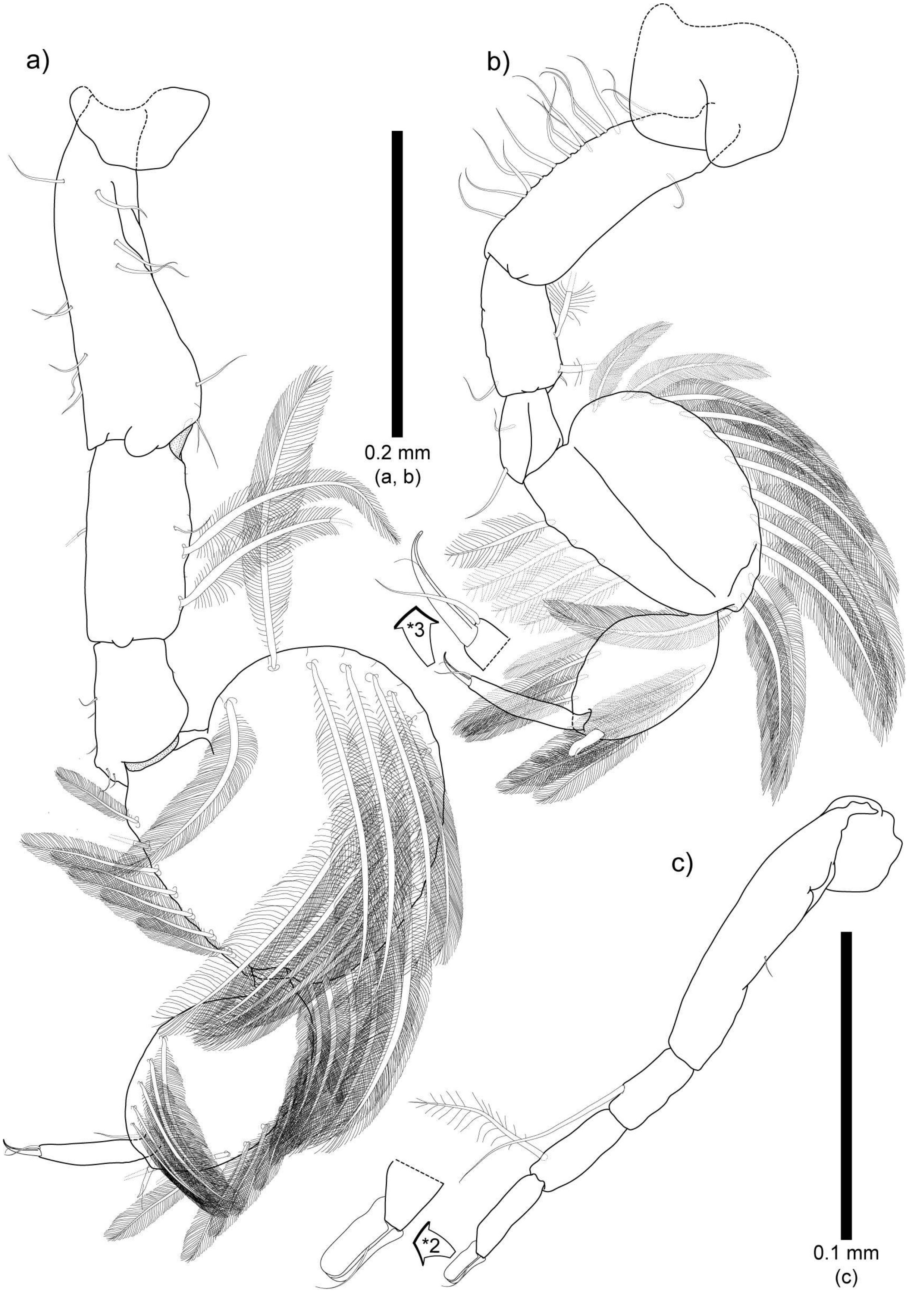

Plate XXX: *Lipomera (Lipomera) celtica* n. sp.; female holotype, length 1.41 mm: a) pereopod 5; b) pereopod 6; c) pereopod 7. Numbers in arrows indicate relative factor of magnification

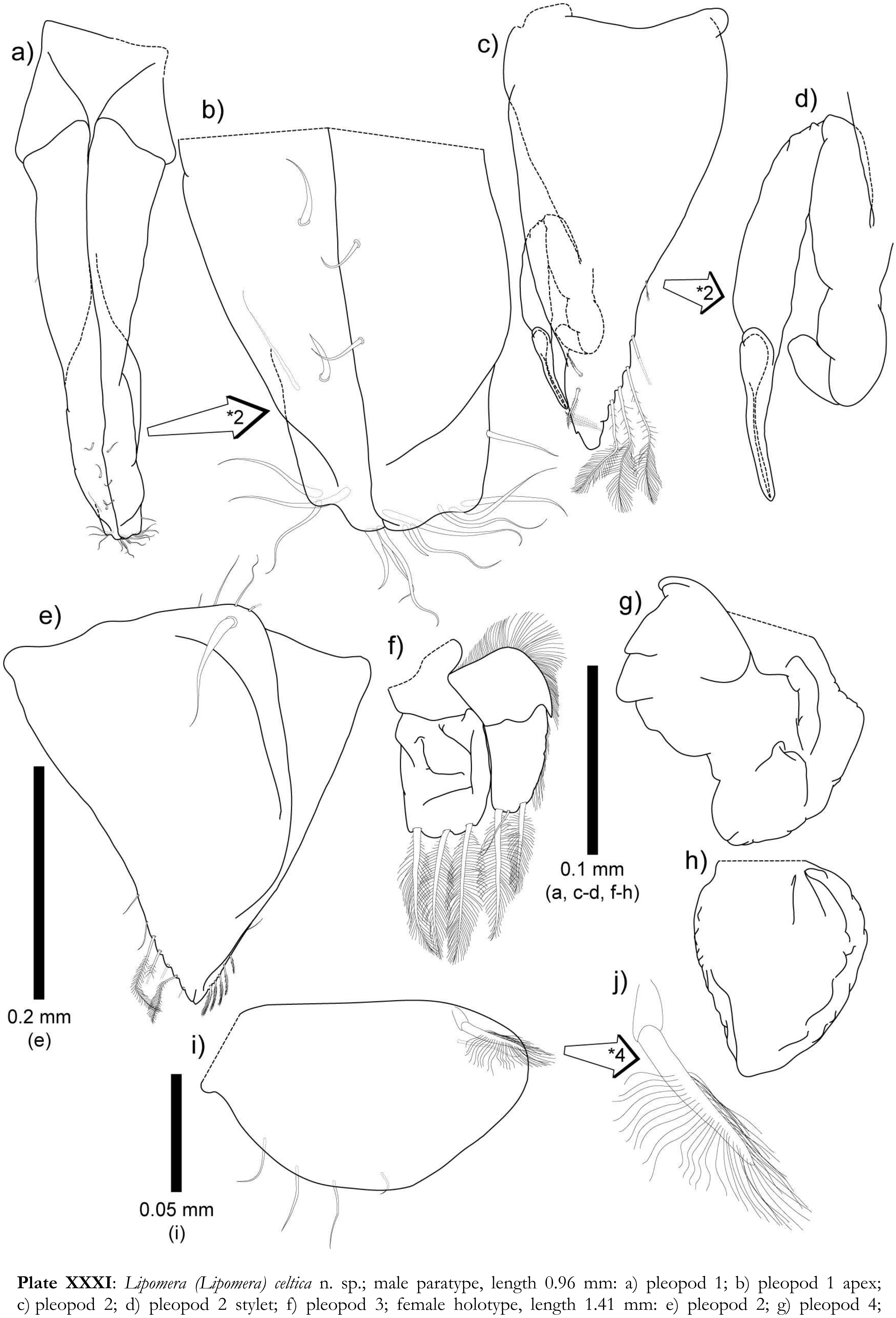

Plate XXXI: *Lipomera (Lipomera) celtica* n. sp.; male paratype, length 0.96 mm: a) pleopod 1; b) pleopod 1 apex; c) pleopod 2; d) pleopod 2 stylet; f) pleopod 3; female holotype, length 1.41 mm: e) pleopod 2; g) pleopod 4; h) pleopod 5; i) uropod; j) distal plumose seta on uropod. Numbers in arrows indicate relative factor of magnification

Subfamily Ilyarachninae Hansen, 1916

Genus *Bathybadistes* HESSLER & THISTLE, 1975

Type species: *Bathybadistes hoplitis* HESSLER & THISTLE, 1975.

Species included: *B. argentinae* (Menzies, 1962); *B. gurjanovae* (Menzies, 1962); *B. longipes* Birstein, 1963; *B. multispinosa* (Menzies, 1962); *B. hoplitis* Hessler and Thistle, 1975; *Bathybadistes penthesilea* n. sp.; *B. scabra* Birstein, 1971; *B. spinosissima* Hansen, 1916; *B. tuberculata* Birstein, 1971; *B. venusta* Birstein, 1971

Diagnosis

The diagnosis of HESSLER & THISTLE (1975) is followed here. A new diagnosis will be provided by MERRIN, MALYUTINA & BRANDT (in prep.).

3.1.5.2 *Bathybadistes penthesilea* n. sp.

Material examined: **Holotype**, male (2.47 mm), Continental slope off Ría de Ferrol, Galicia, Spain, 43°48.587' N, 08°51.402' W – 43°49.545' N, 08°51,197' W, 607 m, station: "EBS 600-03".
Paratypes, 2 females (2.79 mm and 1.59 mm), same locality, station: "EBS 600-03".
Additional material: 46 specimens from same locality as type material.
Type material will be deposited in the Zoologisches Museum Hamburg (ZMH), Germany.

Distribution

Known only from *locus typicus*: Continental slope off northern Galicia, Spain. Stations: "EBS 400-02", "EBS 600-03", "EBS 800-03" at 385 – 790 m depth.

Etymology: Penthesilea is the mythological Amazon queen of HOMER'S "Ilias" who fell in love with Achilleus at the moment of her death. The species is similar to *B. hoplitis* HESSLER & THISTLE, 1975 which has its name derived from ancient Greek "heavily armoured".

Diagnosis

Short and stout *Bathybadistes* with anterior part of body ventrally flexed, widest at head and pereonite 3, pereonites 5 – 7 short and narrow, combined length about half as long as pleotelson. Pleotelson at least wider than pereonites 6 and 7. Anteriodorsal and sometimes posteriodorsal margin of pereonites 1 – 4 with more or less regular row of spines. Mandible incisor part with 1 strong, blunt cusp, spine row, *lacinia mobilis* and palp absent. Antenna 2 at least 2.6 times as long as body, flagellum with at least 12 articles.

Description of male holotype

Body (Plate XXXII b, c) 2.47 mm long, length : width = 2.01, widest at head and pereonite 3, deepest at head, strongly sclerotized. Head (Plate XXXII a) and ambulosome ventrally flexed, mouthparts caudally pointing. Head large, laterally expanded at insertion of mandibles, dorsolaterally bulged, eyeless. Anteriodorsally a row of strong spines, medially interrupted, laterally replaced by weaker, irregularly distributed spines. Frontal area of head (frons and clypeus) not clearly defined, flat and smooth. Anterior margin of clypeus concave at suture of labrum. lateral face of mandibles and incisor part visible *in situ* in frontal and lateral view.

Pereonites 1 – 4 about equal in length, loosely packed dorsally, except for pereonite 3 and 4 tightly connected dorsomedially. Pereonites 1 and 2 anteriodorsally with a row of strong spines. Pereonites 3 and 4 caudolaterally bulged, with shallow, triangular, dorsomedial depression. Anterior margin of pereonite 3 with 4 dorsomedial spines in a row, smaller, irregularly distributed spines dorsolaterally. Pereonite 4 without anteriodorsal row of spines but with a pair of dorsomedial, large spines, smaller spines irregularly distributed dorsolaterally and posteriodorsally, posteriolateral bulges partially overlapping pereonite 5. Pereonites 5 – 7 more tightly packed, each about half as long as pereonites 1 – 4 and progressively narrower and less deep, with posteriodorsal row of 4 – 6 spines. Pleotelson 0.35 times body length, length : width = 1.21, caudally evenly tapering, spines irregularly distributed, anterolateral angles with several long, simple setae, fused pleonite 1 indicated by transverse dorsal groove near anterior margin. Uropodal sympod caudally reaching apex of pleotelson.

Antenna 1 (Plate XXXIII a) peduncular article 1 dorsoventrally flattened with sharply pointed anterolateral lobe, peduncular articles 2 and 3 slender, subequally long. Flagellum about as long as peduncular article 3, consisting of 8 articles of about equal length.

Antenna 2 peduncular articles 1 – 4 preserved, progressively tapering, peduncular article 1 with strong lateral spine, peduncular article 3 with short, triangular scale, anteriorly not reaching anterior margin of article 3.

Pleopod 1 (Plate XXXVIII a) length : width = 3.42, proximally widest, evenly tapering to midlength, distal half almost parallel-sided. ventrodistally each half with curved row of 4 simple setae. Lateral margin folded dorsomedially in distal fifth, with dense seam of fine setae. Distolateral lobes rounded, without setae, distomedial lobes rounded, half as wide as distolateral, distally slightly surpassing distolateral lobes, with 8 simple setae.

Pleopod 2 (Plate XXXVIII b) 0.95 times pleopod 1 length, length : width = 3.03, widest distally of proximal third of its length, lateral margin here with distinct angle, distal half of lateral margin with seam of simple setae, distoventrally 4 plumose setae. Stylet short, 0.37 times as long as pleopod 2, not reaching distal tip of pleopod 2.

Description of female paratype

2.79 mm long, body as in male, except for pereonites 1 – 4 dorsally with anterior and posterior row of spines. Pereonite 4 with conspicuous anterolateral, bifid spine. Antenna 1 peduncular article 1 more than twice as long a wide, distomedially with 2 broom setae, flagellum as long as peduncular article 3 but consisting of 2 articles, the second twice as long as the first and distally with 1 aesthetasc.

Labrum (Plate XXXIV a) width 0.25 times cephalic width.

Mandibles (Plate XXXIV b, c) large, strongly sclerotized with thick cuticle. Palp absent. Incisor part of both mandibles ending in a single, blunt cusp. *Lacinia mobilis* and spine row absent. Molar part weak and slender, triturating surface reduced. Left molar part apically with 2 setulate setae and 1 smaller, simple seta, right molar part apically with 2 simple setae and 1 scale seta.

Maxilla 1 (Plate XXXV a) exopod 2.7 times as long as wide. Lateral margin with 8, medial margin with 3 simple setae. Apex obliquely truncate, with 8 spine-like and 4 denticulate spine-like setae, dorsally with a row of 9 simple setae. Endopod mesially curved, 0.6 times as long as exopod, length : width = 3.6, distal third of lateral margin with a row of 17 simple setae, apex blunt, with 4 slender, spine-like setae, medial margin with 8 simple setae.

Maxilla 2 (Plate XXXV b) both parts of exopod not reaching apex of endopod, lateral part longer than mesial part, both with 2 apical, long, slender spine-like setae and 2 long, simple setae. endopod twice as wide as each part of exopod, apex truncate with 7 simple, 4 slender, spine-like and 4 slender, hemiplumose spine-like setae, the medialmost longest.

Maxilliped (Plate XXXVI a) coxa wider than slender basis. Endite rectangular, length : width = 2.5. Apex transversely truncate, with 1 plumose and 3 hemiplumose setae, dorsally with 1, ventrally with 3 fan setae. Medial margin with 3 retinacula. Palp with 5 articles, article 1 transverse, article 2 longest and widest, distomedially with 3 slender, spine-like setae, article 3 medial margin enlarged to distomedial lobe, with 11 slender, spine-like setae, article 4 narrow with distomedial lobe with 3 slender, spine-like setae, article 5 cylindrical, narrow, apically with 4 slender, spine-like setae. Epipodite large, 0.86 times as long and more than twice as wide as basis, ovally shaped with pointed apex, distally and mesially at midlength a row of simple setae.

Pereopods 1 and 2 baculiform, pereopod 1 (Plate XXXVI b) half as long as body, dactylus short, 2.5 times as long as wide. Pereopod 2 (Plate XXXVI c) 0.95 times as long as body, merus, carpus, propodus and especially dactylus relatively longer than on pereopod 1, dactylus curved, 13 times longer than wide and 6 times longer than dactylus of pereopod 1. Pereopods 3 and 4 unknown posterior of basis.

Pereopods 5 – 7 (Plate XXXVII a – c) dorsally flexed between basis and ischium, dorsally flexed between ischium and merus, ventrally flexed between carpus and propodus. Pereopods 5 and 6 robust, especially basis to carpus. Pereopod 7 longer and more slender, especially at propodus. Ischium dorsally with 2 or 3 plumose setae in pereopod 5 and 6, respectively. Merus and carpus of pereopod 5 and 6 ventrally with a row of slender, spine-like setae, carpus distodorsally with unequally bifid, spine-like seta. propodus longer than carpus, ventrally with a row of 4 or 5 unequally bifid, spine-like setae in pereopod 5 and 6, distodorsally with 1 broom seta, 2 in pereopod 7.

Pleopod 2 (Plate XXXVIII c) fused to operculum, oblongly trapezoidal with apex forming an angle of ca. 90 degrees, length : width = 1.75, with broad ventral keel, notch remaining visible at apex, entire margin with a row of simple setae, distalmost 6 setae on both sides longest and shifted subapically.

Pleopod 3 (Plate XXXVIII d) endopod almost rectangular, apex truncate with 3 plumose setae. Exopod with 2 articles, distally surpassing endopod, lateral margin of both articles with a row of simple setae. Proximal article proximolaterally expanded, distal article half as long as proximal, apex with 6 plumose setae with short setulae.

Pleopod 4 (Plate XXXVIII e) endopod delicate, unsclerotized, elongatedly oval, almost twice as long as wide, without setae. Exopod with 2 articles, distally reaching two thirds of endopod length. Proximal article with expanded lateral margin with a row of simple setae, distal article slightly longer than a third of proximal article, apically 1 long, simple seta.

Pleopod 5 (Plate XXXVIII f) delicate, lobiform, 0.47 times as long as wide, asetose.

Uropod (Plate XXXVIII g) 0.11 times as long as body, sympod laterally flattened, 1.6 times as long as wide, dorsal margin straight, ventral margin convexly enlarged. A row of 21 setae beginning distally of proximal third of ventral margin and reaching distal margin, the proximalmost one and distalmost three being plumose. Endopod cylindrical, 0.43 times as long as sympod, 3.3 times as long as wide, inserting subapically on lateral face of sympod, distally with 6 simple setae.

Description of juvenile female paratype

1.59 mm long. Antenna 2 (Plate XXXIII b) almost entirely preserved, distalmost articles of flagellum missing, preserved length 2.64 times as long as body, peduncular article 5 slender, about 11 times as long as wide, subdistally 1 broom seta. Peduncular article 6 1.5 times as long and equally wide as 5, subdistally three broom setae. Flagellum preserved by proximal 12 articles progressively tapering and shorter. Articles of flagellum distally with 1 to 4 long, simple setae.

Remarks

In general shape, *B. penthesilea* n. sp. most closely resembles *B. spinosissima* (Hansen, 1916) and the type species *B. hoplitis* Hessler & Thistle, 1975. However, *B. spinosissima* shows only pairs of large spines on pereonites 1 – 4, not complete rows. Although the spines of the described male of *B. penthesilea* are not arranged in anterior *and* posterior rows on pereonites 1 – 4, this is the case in the female paratype as well as in *B. hoplitis*. Apparently, there is some degree of variation in this character. However, *B. penthesilea* can be distinguished from *B. hoplitis* by the posterolateral bulges in pereonite 4 contributing to a different outline of pereonite 4 than in *B. hoplitis* and by relatively shorter and narrower pereonites 5 – 7. Of all known species of the genus, *B. penthesilea* shows the highest degree of reduction in the mandible (incisor part blunt, only one cusp, *lacinia mobilis*, spine row and palp completely absent) and in the size of pereonites 5 – 7 which together are hardly more than half as long as the pleotelson.

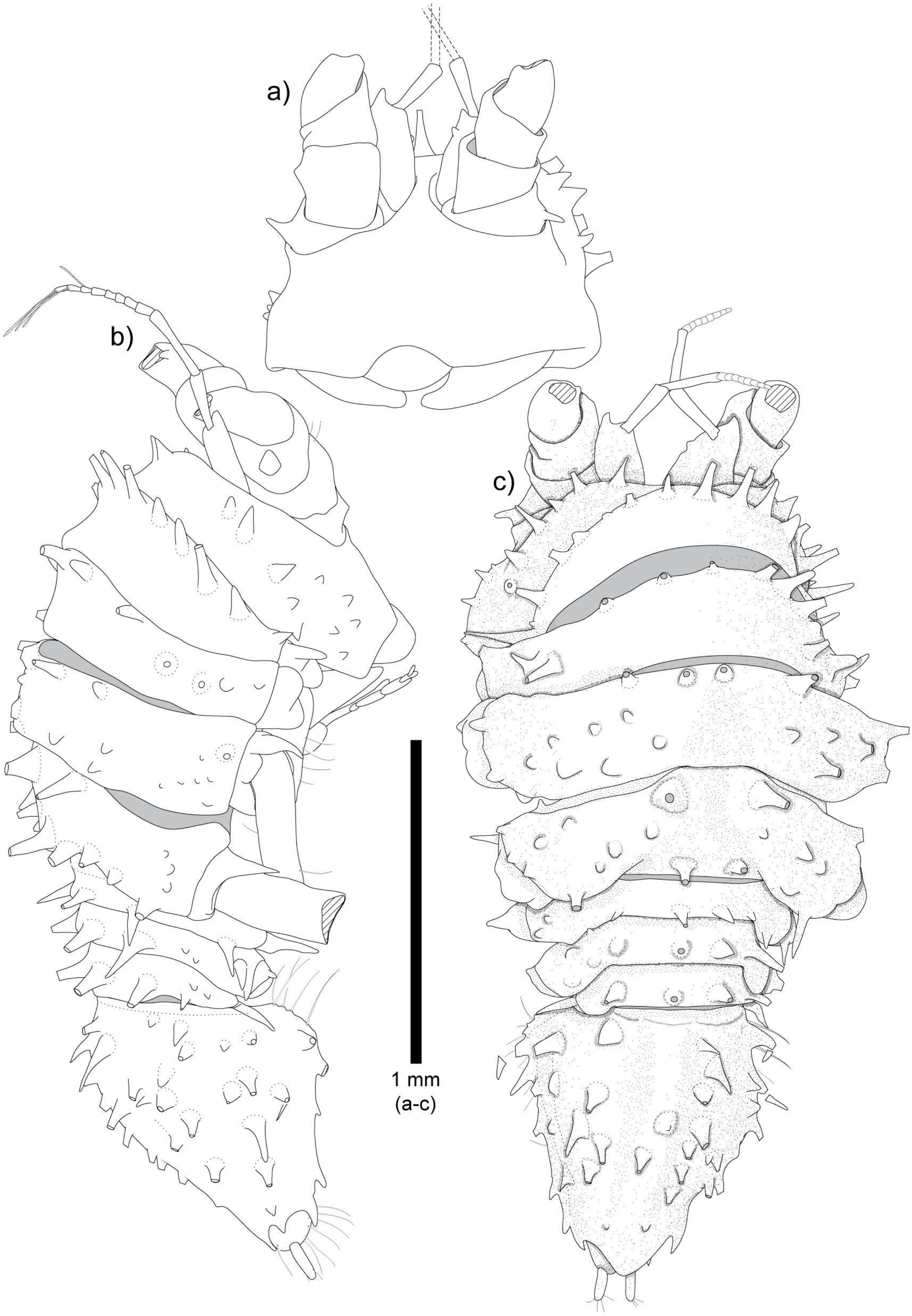

Plate XXXII: *Bathybadistes penthesilea* n. sp.; male holotype, length 2.47 mm: a) cephalothorax, frontal aspect; b) habitus, lateral aspect; c) habitus, dorsal aspect

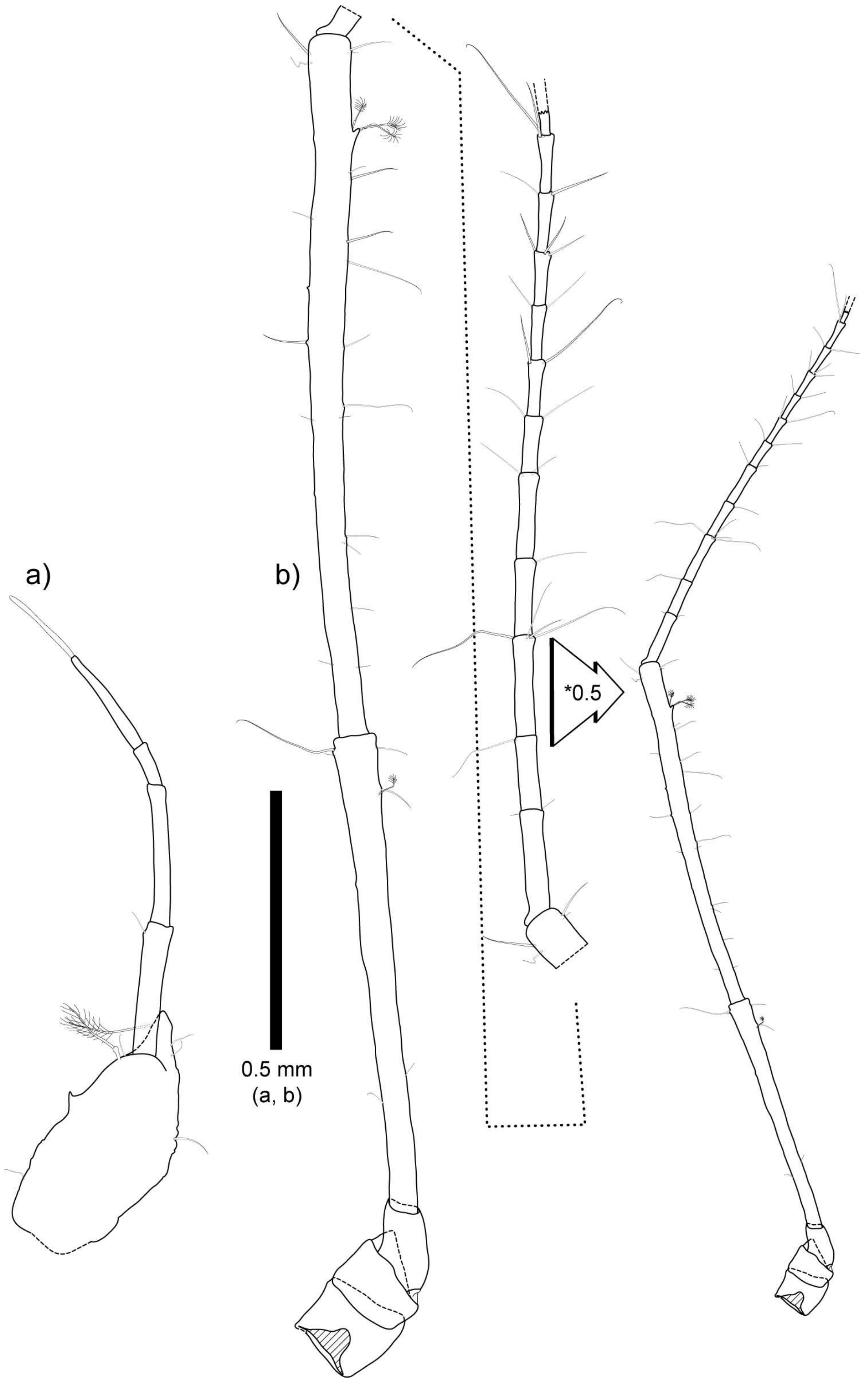

Plate XXXIII: *Bathybadistes penthesilea* n. sp.; male holotype, length 2.47 mm: a) antenna 1; juvenile female paratype, length 1.59 mm: b) antenna 2. Numbers in arrows indicate relative factor of magnification

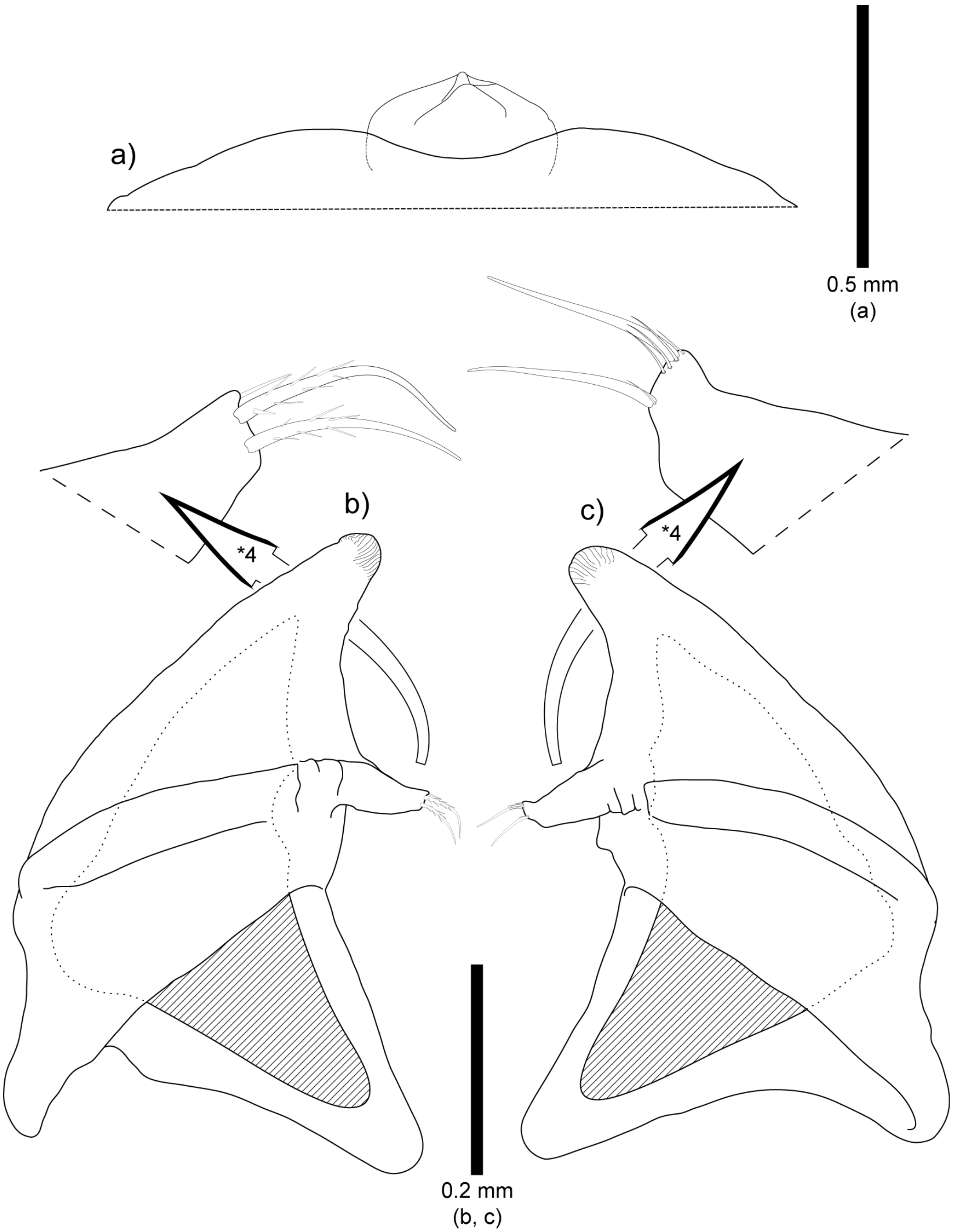

Plate XXXIV: *Bathybadistes penthesilea* n. sp.; female paratype, length 2.79 mm: a) clypeus and labrum; b) left mandible; c) right mandible. Numbers in arrows indicate relative factor of magnification

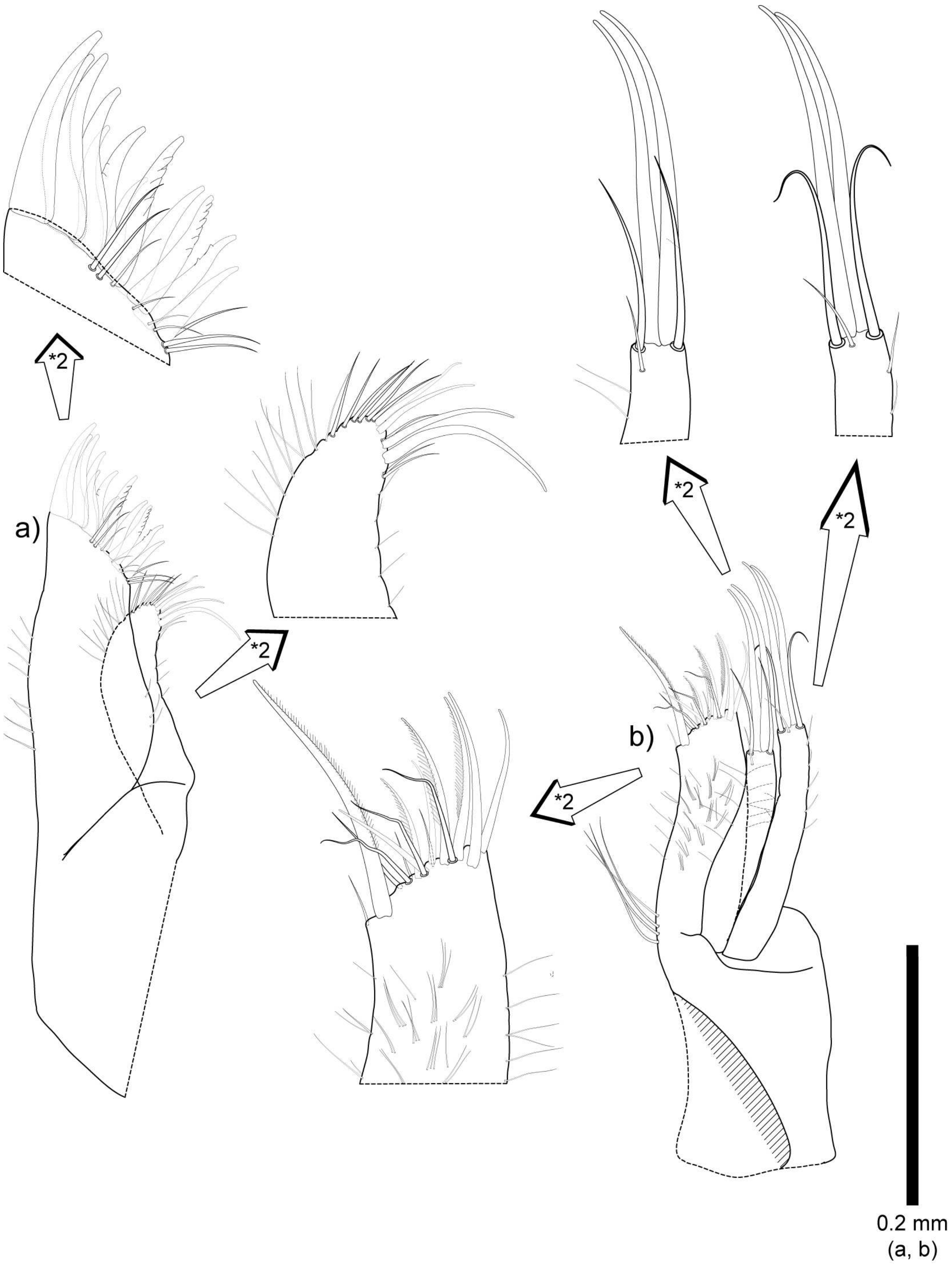

Plate XXXV: *Bathybadistes penthesilea* n. sp.; female paratype, length 2.79 mm: a) maxilla 1; b) maxilla 2. Numbers in arrows indicate relative factor of magnification

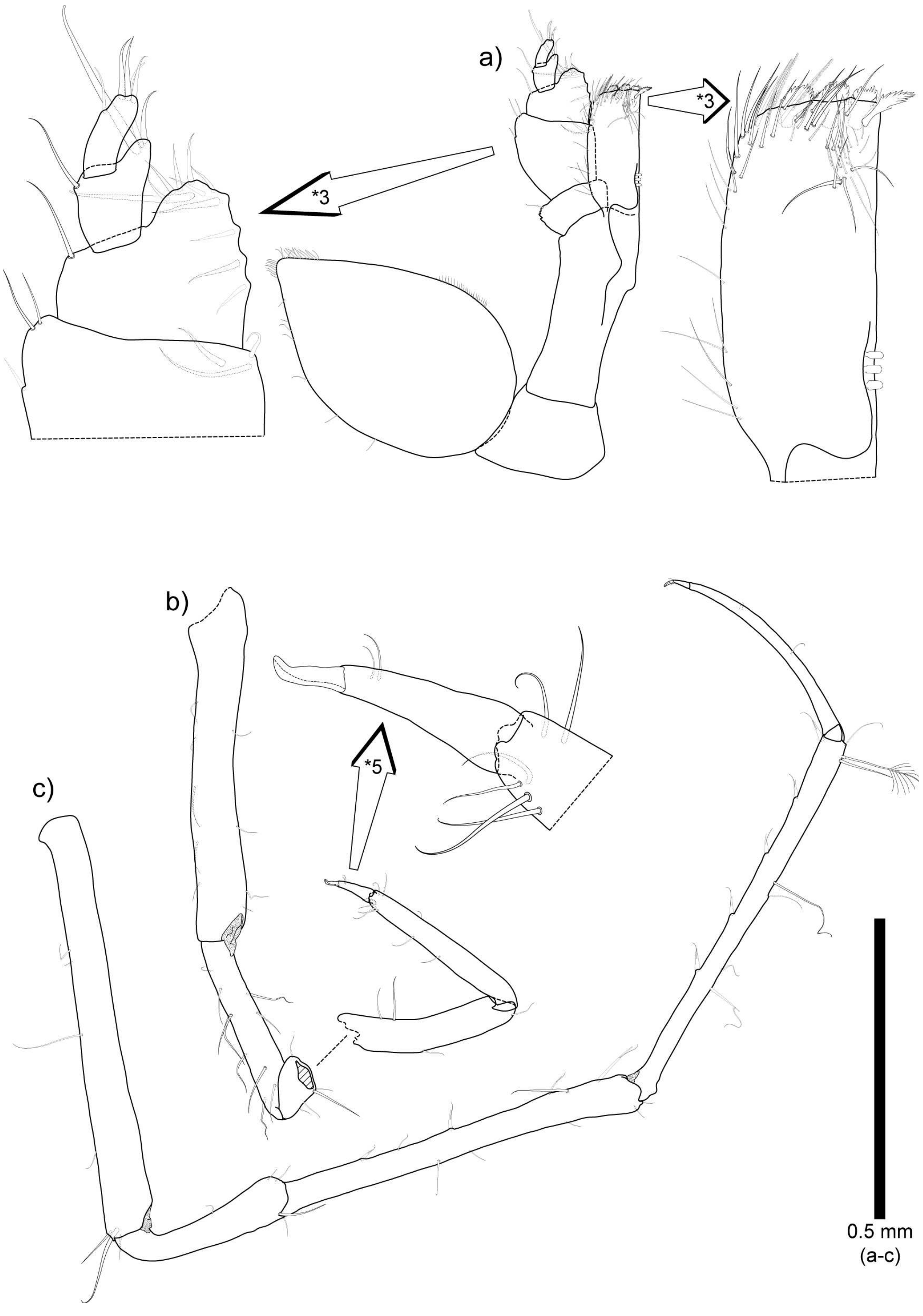

Plate XXXVI: *Bathybadistes penthesilea* n. sp.; female paratype, length 2.79 mm: a) maxilliped; b) pereopod 1; c) pereopod 2. Numbers in arrows indicate relative factor of magnification

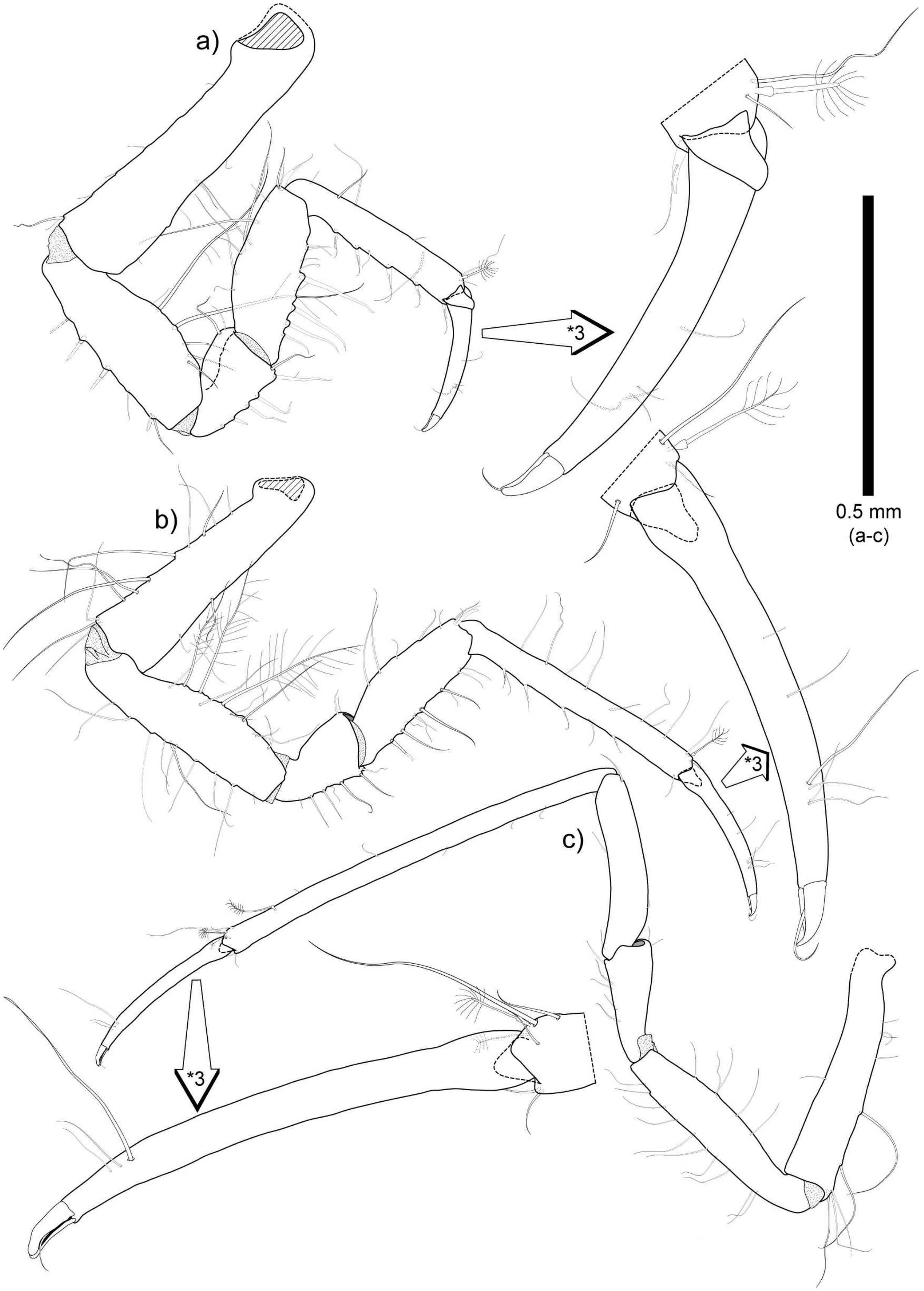

Plate XXXVII: *Bathybadistes penthesilea* n. sp.; female paratype, length 2.79 mm: a) pereopod 5; b) pereopod 6; c) pereopod 7. Numbers in arrows indicate relative factor of magnification

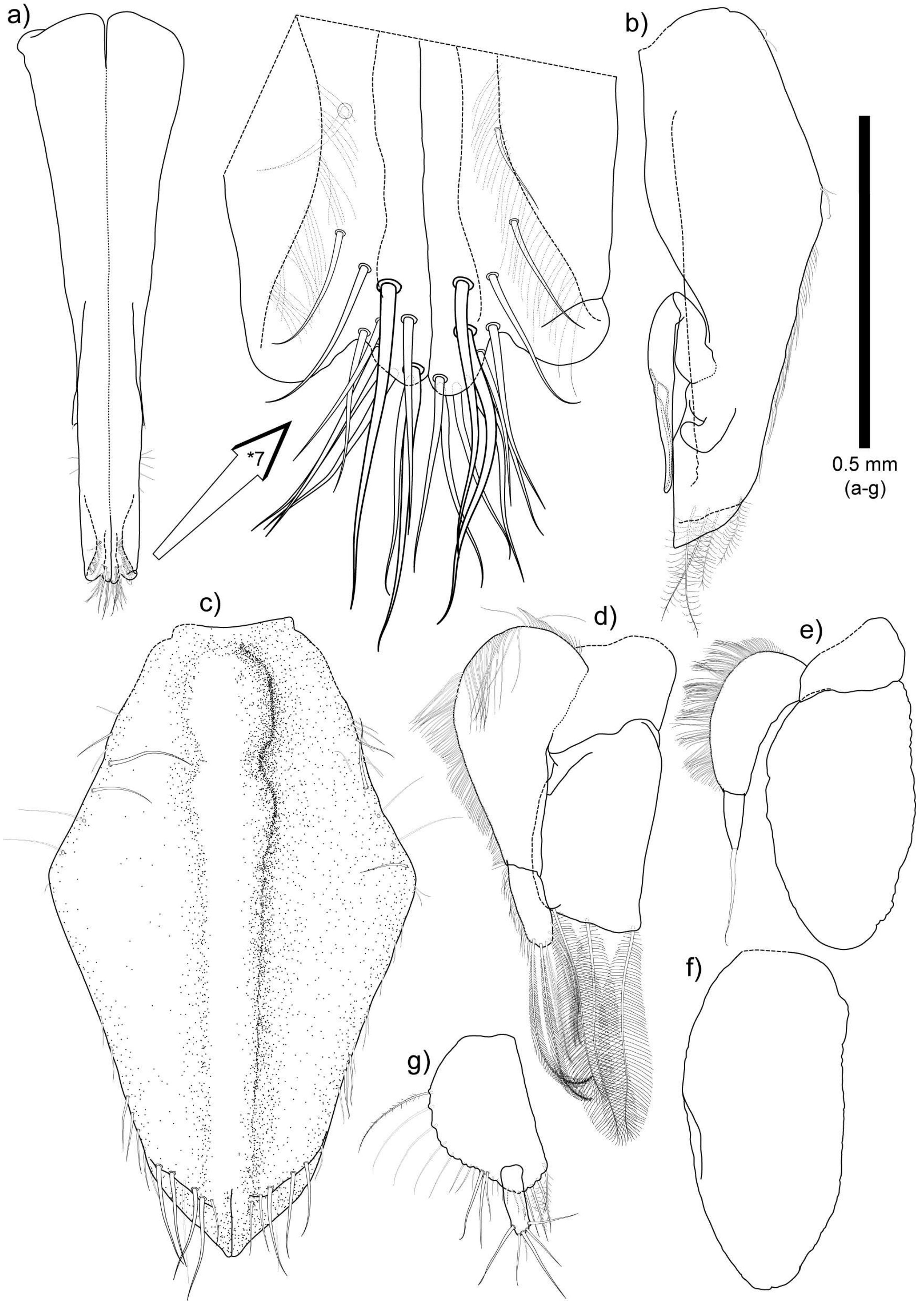

Plate XXXVIII: *Bathybadistes penthesilea* n. sp.; male holotype, length 2.46 mm: a) pleopod 1; b) pleopod 2; female paratype, length 2.79 mm: c) pleopod 2; d) pleopod 3; e) pleopod 4; f) pleopod 5; g) uropod. Numbers in arrows indicate relative factor of magnification

Genus *Pseudarachna* SARS, 1899

Mesostenus G.O. SARS, 1864 partim, non *Mesostenus* GRAVENHORST, 1829.
Pseudarachna G.O. SARS, 1899: 142; NIERSTRASZ & SCHUURMANS-STEKHOVEN, 1930: 129; WOLFF, 1962: 93; HESSLER & THISTLE, 1975: Tab. 1; THISTLE, 1980: lll; SVAVARSSON et al., 1993: 542; KUSSAKIN 2003: 261; MERRIN 2006: 59.

Type species: *Pseudarachna hirsuta* (SARS, 1864).

Species included: *P. hirsuta* (SARS, 1864); *P. nohinohi* MERRIN, 2006

Diagnosis

The generic diagnosis of MERRIN (2006) is followed here, with the following exception: Pleopod 4 exopod with more than 1 plumose seta *or absent*.

3.1.5.3 *Pseudarachna hirsuta* (SARS, 1864)

Mesostenus hirsutus G.O. SARS, 1864: 213; 1868: 114.
Pseudarachna hirsuta G.O. SARS, 1899: 143, Pl. 63; BRADY, 1903: 96; TATTERSALL, 1906: 81; HANSEN, 1910: 217; MASSY, 1912: 82, 90; NIERSTRASZ & SCHUURMANS-STEKHOVEN, 1930: 129; HU1T, 1937: 32-33, Fig. 17; 1941: 100-102, maps 37-38; WOLFF, 1962: 257, 274; SVAVARSSON *et al.*, 1993: 542; KUSSAKIN 2003: 262 – 263; MERRIN 2006: 59.

Material examined: female (1.90 mm), Continental slope off Ría de Ferrol, Galicia, Spain, 43°42.427' N, 08°45.921' W – 43°43.253' N, 08°44.818' W, 300 m, station: "EBS 350-02".
Additional material: 4 females, same locality as examined material.

Distribution

North East Atlantic: Ireland (Lough Hyne, DEGRAVE & HOLMES 1998), North Sea (Helgoländer Tiefe Rinne, CASPERS 1939), Skagerrak, Norway (Hardanger Fjord, Trondheim Fjord, MONOD 1926; SARS 1899; WAHRBERG 1929), continental slope of northern Galicia (this study), South West Iberian Peninsula (RODRÍGUEZ-SANCHEZ *et al.* 2001); eastern Mediterranean Sea (material from expeditions M25/1).

Diagnosis

Pseudarachna with genal region of head at insertion of mandibles distinctly wider than cephalic frons. Pereonites 1 – 3 subequally long. Anterolateral angles of pleotelson with enlarged, simple setae. Peduncular article 1 of antenna 1 with truncate lateral lobe, article 2 distally surpassing lateral lobe of article 1. Maxilliped basis proximally narrow, subequally wide as palp article 1. Maxillipedal palp article 2 lateral and mesial margin not convexly enlarged, hardly wider than article 1. Ventral surface of female pleopod 2 with irregularly distributed long, simple setae, plumose setae restricted to distal margin.Uropodal sympod without bulbous distal denticle.

Redescription of female

Body (Plate XXXIX b – d) 1.90 mm long, length : width = 3.42, widest at pereonite 2, deepest at head, head and ambulosome ventrally enrolled, mouthparts caudally pointing. Cuticle not highly sclerotized, lightly setose. Head (Plate XXXIX a) large, widest at genal region on a level of insertion of antenna 2, tapering anteroventrally, eyeless. Anterior margin of clypeus concave at suture of labrum. Labrum (Plate XLI a) delicate, 0.34 times as wide as anterior margin of clypeus. Lateral face of mandibles and incisor part visible *in situ* in frontal and lateral view. Vertex with many long, simple setae. Length of pereonite 1 > 2 > 3 > 4 < 5 > 6 = 7. Width of pereonite 1 < 2 > 3 > 4 < 5 > 6 > 7 < pleotelson. Pereonites 1 – 4 with anterodorsal pair of dorsal tubercles with central seta, pereonites 2 – 4 anterolateral angles and pereonite 3 sublaterally on anterior margin with additional setose tubercle. Pereonite 5 caudally wider than at anterior margin, with rounded distolateral lobes. Pereonite 6 anterior and lateral margin convex, posterior margin concave, with blunt midventral projection. Pereonite 7 posterior margin straight, narrower than anterior margin, with blunt midventral projection shallower than in pereonite 6. Pleotelson roundedly triangular, 1.14 times as long as wide and 1.95 times as long as deep, widest at anteriolateral angle, here with several long, simple setae. Shallow and wide middorsal, longitudinal keel present. Apex of pleotelson rounded, uropods slightly projecting beyond apex.

Antenna 1 (Plate XL a) with 3 peduncular and 3 flagellar articles. Peduncular article 1 dorsally granulose, with flattened, truncate distolateral lobe anteriorly not reaching anterior margin of article 2. Distomedially with 1, distolateral lobe with 2 broom setae. Article 2 granulose, subcylindrical, distally slightly wider than proximally , slightly longer than article 1 without the distolateral lobe, distally with 3 broom setae. Article 3 0.6 times as long as article 2. Flagellum article 1 about 0.5 times as long as peduncular article 3, about as long as wide, asetose. Article 2 3.5 times as long as article 1. article 3 as long as article 1, distally with 1 long, simple seta and 1 aesthetasc.

Antenna 2 (Plate XL b) basalmost 3 peduncular articles preserved, granulose, Article 1 about as long as wide. Article 2 slightly narrower and as long as article 1, with 1 simple seta. Article 3 without lateral scale, about 1.5 times as long as wide.

Mandibles (Plate XLI b, c) robust, without palp, *lacinia mobilis* and spine row. Incisor part ending in a single, rugose, blunt cusp with thick cuticle. Molar part small and narrow, distally with 2 simple, spine-like setae. Condyle large and prominent, mesially reaching onto base of molar part.

Maxilla 1 (Plate XLII a) exopod 2.5 times as long as wide, laterally and distomesially with two simple setae, apex with 8 simple and 4 serrate, spine-like setae. Endopod 0.7 times as long as exopod, 1.9 times as long as wide, laterally 4 long, simple setae, apex with 1 simple seta and 3 simple, spine-like setae.

Maxilla 2 (Plate XLII b) exopod lateral endite distally surpassing endopod, 5.3 times as long as wide, laterally with short, transverse rows of simple setae, apex with 4 simple, spine-like setae. Mesial endite distally not reaching distal margin of endopod, apex with 3 simple, spine-like setae. Endopod 2.6 times as long as wide, apex rounded with 5 simple, spine-like setae, medialmost longest.

Maxilliped (Plate XLII c) coxa distally tapering, 0.4 times as long as basis, 1.3 times as long as wide. Basis 3.5 times as long as wide, widest at insertion of palp. Endite proximally constricted, 1.9 times as long as wide, lateral margin with fringe of 10 simple setae, apex truncate with 3 simple and 3 fan setae, 2 coupling hooks. Palp 1.1 times as long as basis, with 5 articles. Article 1 transverse, article 2 widest and longest, 1.8 times as long as wide, mesial and lateral margin convex, mesial margin shorter than lateral. Distomesially with 2 simple, spine-like setae, distolaterally 1 simple seta. Article 3 almost 0.5 times article 2 length, about as long as wide, mesial margin with 2 acute denticles and 3 simple, spine-like setae, longer than lateral margin. Article 4 0.9 times as long as article 3, 2.2 times as long as wide, distally with 2 simple setae. Article 5 0.9 times as long as article 4, 4 times as long as wide, distally with 2 simple setae and 1 simple, spine-like seta. Epipodite about as long as basis, 2 times as long as wide, apex narrow angled. Lateral and mesial margin with interrupted fringe of fine, simple setae.

Pereopod 1 (Plate XLIII a) longest, 0.88 times body length, pereopod 2 most robust, pereopod 3 shortest, 0.46 times body length, length of pereopod 1 > 2 > 3 < 4 < 5 > 6. Pereopod 7 incomplete, only basis preserved. Pereopod 1 strongly dorsally flexed between basis and ischium, ischium and merus, ventrally flexed between carpus and propodus. Basis longest article, 6.4 times as long as wide, distally with 1 long, simple seta. Ischium 0.8 times as long as basis, 6.9 times as long as wide, ventrally with 4, dorsally with 5 simple setae. Merus 0.3 times as long as ischium, 2.9 times as long as wide, with rounded, distodorsal lobe, ventrally with 4 simple setae. Carpus 2.5 times as long as merus, 6.3 times as long as wide, distally with 1 simple seta. Propodus 1.3 times as long as carpus, 12.6 times as long as wide, distoventrally with 1, distally with 2 simple setae. Dactylus 0.2 times as long as propodus, 4 times as long as wide, distally with 2 simple setae, claw blunt, 0.4 times dactylus length.

Pereopod 2 (Plate XLIII b) dorsally flexed between basis and ischium. Basis longest, 4.3 times as long as wide, dorsal margin with 6, ventral margin with 6 simple setae, distoventrally 1 simple, spine-like seta. Ischium widest article, 0.5 times as long as basis, 1.6 times as long as wide, with rounded dorsal lobe bearing a central simple, spine-like seta. Ventrally at midlength 4, distoventrally 6 robust, simple setae. Merus 0.4 times as long as ischium, as long as wide, distoventrally with 6 robust, simple setae. Carpus 2.5 times as long as merus, 3.8 times as long as wide, proximoventrally 1, ventrally at midlength 5, distoventrally 2 robust, simple setae. Propodus 0.8 times as long as carpus, 4.4 times as long as wide, ventrally with 3, distoventrally with 3, distodorsally with 5 robust, simple setae. Dactylus 0.6 times propodus length, 5.5 times as long as wide, distally with 8 simple setae, claw absent.

Pereopod 3 (Plate XLIII c) dorsally flexed between ischium and merus, basis 2.9 times as long as wide, distoventrally 1 simple seta. Ischium 1.5 times as long as basis, 5 times as long as wide. Merus 0.4 times as long as ischium, 2.3 times as long as wide. Carpus 1.8 times as long as merus, distally with 2 simple setae. Propodus 0.6 times carpus length, 3.6 times as long as wide, distally with 3 simple setae. Dactylus 0.9 times as long as propodus, 4 times as long as wide, distally with 4 simple setae, claw absent.

Pereopod 4 (Plate XLIII d) dorsally flexed between ischium and merus, basis 2.3 times as long as wide, distally with 3 simple setae. Ischium 2 times as long as basis, 7 times as long as wide. Merus 0.3 times as long as ischium, 2.3 times as long as wide. Carpus 2.2 times as long as merus, 5.7 times as long as wide, ventrally with 2, distally with 4 simple setae. Propodus 0.8 times as long as carpus, 6.4 times as long as wide, dorsally and ventrally with 1, distally with 4 simple setae. Dactylus 0.8 times propodus length, 6.6 times as long as wide, ventrally with 1, distally with 5 simple setae, claw absent.

Pereopod 5 (Plate XLIV a) basis longest article, 4.3 times as long as wide, dorsally with 5 short, ventrally with 7 long, simple setae. Ischium 0.6 times as long as basis, 2.8 times as long as wide, dorsal margin slightly convex, with 2 simple and 3 swimming setae, ventral margin with 3 simple setae, distoventrally 1 long, robust, simple seta. Merus 0.4 times as long as ischium, 1.2 times as long as wide, ventrally with 3 simple setae, medialmost longest. Carpus 2.3 times as long as merus, 1.8 times as long as wide, dorsal margin convexly enlarged, with 9 swimming setae, ventral margin with 3 swimming setae. Propodus 1.1 times as long as carpus, 3.1 times as long as wide, dorsal and ventral margins convex. Dorsally 8 swimming setae, distalmost 2 without setules. Ventrally 9 swimming setae, distalmost 6 without setules. Dactylus 0.4 times propodus length, 3.4 times as long as wide, distoventrally with 3 simple setae, 1 small seta at basis of claw, claw short, acute.

Pereopod 6 (Plate XLIV a) basis longest article, 4.6 times as long as wide, dorsally with 3 short, ventrally with 4 swimming setae, distoventrally with 2 long, simple setae. Ischium 0.6 times as long as basis, 3.5 times as long as wide, dorsal margin slightly convex, with 3 swimming setae, ventral margin with 4 simple setae, distoventrally 1 long, robust, simple seta. Merus 0.5 times as long as ischium, 1.6 times as long as wide, ventrally with 2 simple setae, distoventrally with 2 simple setae. Carpus 1.5 times as long as merus, 2.1 times as long as wide, dorsal margin convexly enlarged, with 5 swimming setae, proximalmost 1 and distalmost 2 without setules, ventral margin with 2 swimming setae. Propodus 1.3 times as long as carpus, 4.8 times as long as wide, Dorsally 3, ventrally 4 long, simple setae. Dactylus 0.6 times propodus length, 4.4 times as long as wide, distoventrally with 1 simple seta, 2 small seta at basis of claw, claw short, acute.

Pereopod 7 not preserved distally of basis.

Pleopod 2 (Plate XLV a) rhomboidal, widest proximally of midlength, length : width = 1.5. Apex narrow-angled, cleft. Ventrally with several long, simple setae, lateral margin with evenly distributed simple setae, distal third of margin on left side with 7, on right side with 8 plumose setae.

Pleopod 3 (Plate XLV b) exopod laterally fringed with fine, simple setae, with 2 articles. Article 1 with convex lateral margin, article 2 0.4 times as long as article 1, reaching distal margin of endopod, distally with 2 plumose setae. Endopod rectangular, 1.9 times as long as wide, distally with 3 plumose setae.

Pleopod 4 (Plate XLV c) delicate, lobiform, asetose, 1.5 times as long as wide.

Pleopod 5 (Plate XLV d) as pleopod 4, 2 times as long as wide.

Uropod (Plate XLV e) 0.04 times body length, 2.6 times as long as wide, uniramous, distally rounded, laterally with 4 plumose setae, distally with 7 simple and 2 plumose setae and inconspicuous, bulbous endopod, about 0.1 times protopod length.

Remarks

Until recently, *Pseudarachna hirsuta* was the only known species of the genus (MERRIN 2006). Whereas *P. hirsuta* is known from the northern hemisphere (North East Atlantic and adjacent seas), the only described other species in the genus, *P. nohinohi* MERRIN, 2006 was found off New Zealand. Although generally similar, both species can easily be separated by the shape of the distolateral lobe of the first peduncular article of antenna 1. *P. nohinohi* also shows more spine-like setae on ischium and carpus of pereopod 2 and more swimming setae on carpi and propodi of pereopods 5 and 6. Furthermore, article 2 of the maxillipedal palp is more rectangular in *P. hirsuta* and with convex medial and lateral margin in *P. nohinohi*. Pleopod 4 is a uniramous, oval, asetose lappet similar to pleopod 5 in the examined specimen of *P. hirsuta*, in the specimen figured by SARS (1899), pleopod 4 has a greatly reduced exopod, hardly a third as long as the endopod. The exopod of pleopod 4 is well developed, more than half as long as the endopod, with two apical plumose setae in *P. nohinohi*, and not reduced as in *P. hirsuta*. The uropod is relatively narrower in *P. hirsuta* (2.6 times as long as wide) than in *P. nohinohi* (2.1 times) and lacks a distal denticle, but it is not more setose as stated by MERRIN (2006, based on SARS' description of *P. hirsuta*). However, the differences in uropodal proportions and setation may be partially due to intraspecific variation and ontogenetic allometry: SARS (1899) figured the uropod of *P. hirsuta* as even narrower (2.8 times as long as wide) and with 9 lateral plumose setae (only three in the described specimen, four in *P. nohinohi*), but his material was a larger specimen of 2.5 mm length compared with 1.9 mm of the specimen used for the rediscription and 1.7 mm of the holotype of *P. nohinohi*, although both latter specimens are brooding females with fully developed oostegites. So far, male specimens have neither been found for *P. hirsuta* nor for *P. nohinohi*. Considering that both species have never been collected in large numbers it is currently not possible to decide whether one or both species are parthenogenetic, whether males are less abundant or whether it is simply an artifact in the record. Two further species ("*Pseudarachna spp.*", MERRIN 2006) from the Tasman Sea remain undescribed.

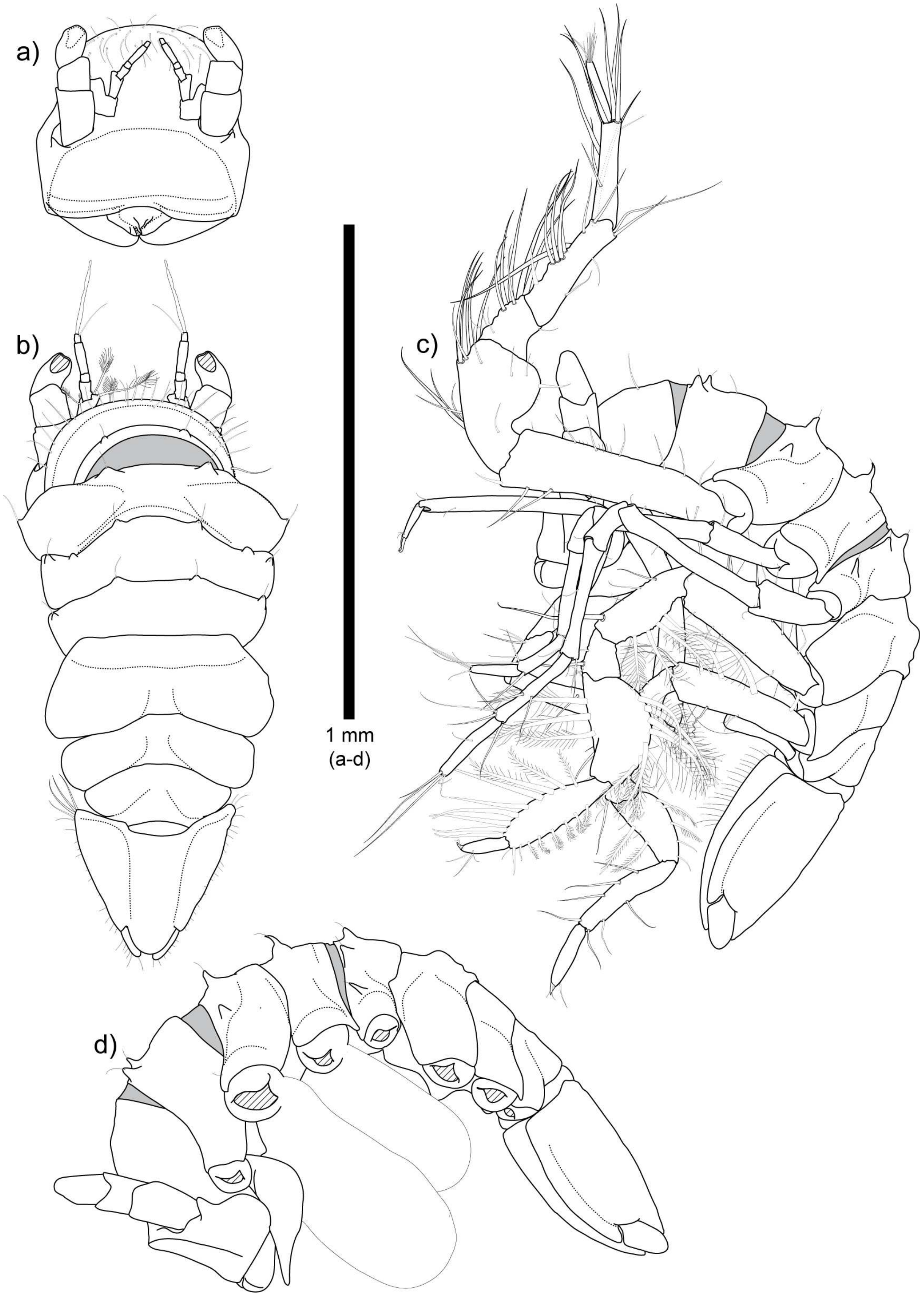

Plate XXXIX: *Pseudarachna hirsuta* (SARS, 1864); female, length 1.90 mm: a) cephalothorax, frontal; b) habitus, dorsal aspect; c) habitus, lateral aspect; d) habitus, lateral aspect, pereopods omitted

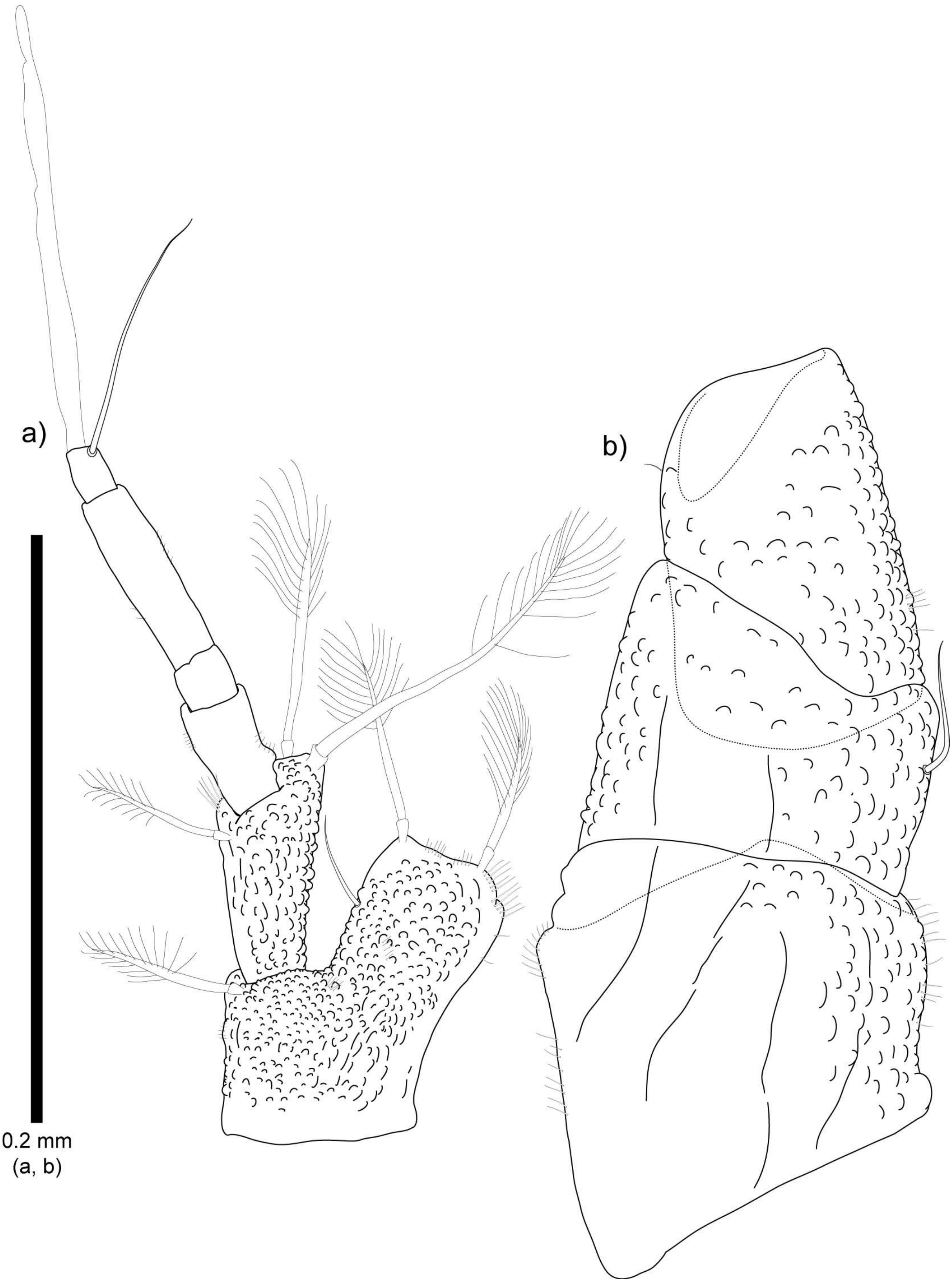

Plate XL: *Pseudarachna hirsuta* (SARS, 1864); female, length 1.90 mm: a) antenna 1; b) antenna 2 (basal peduncular articles)

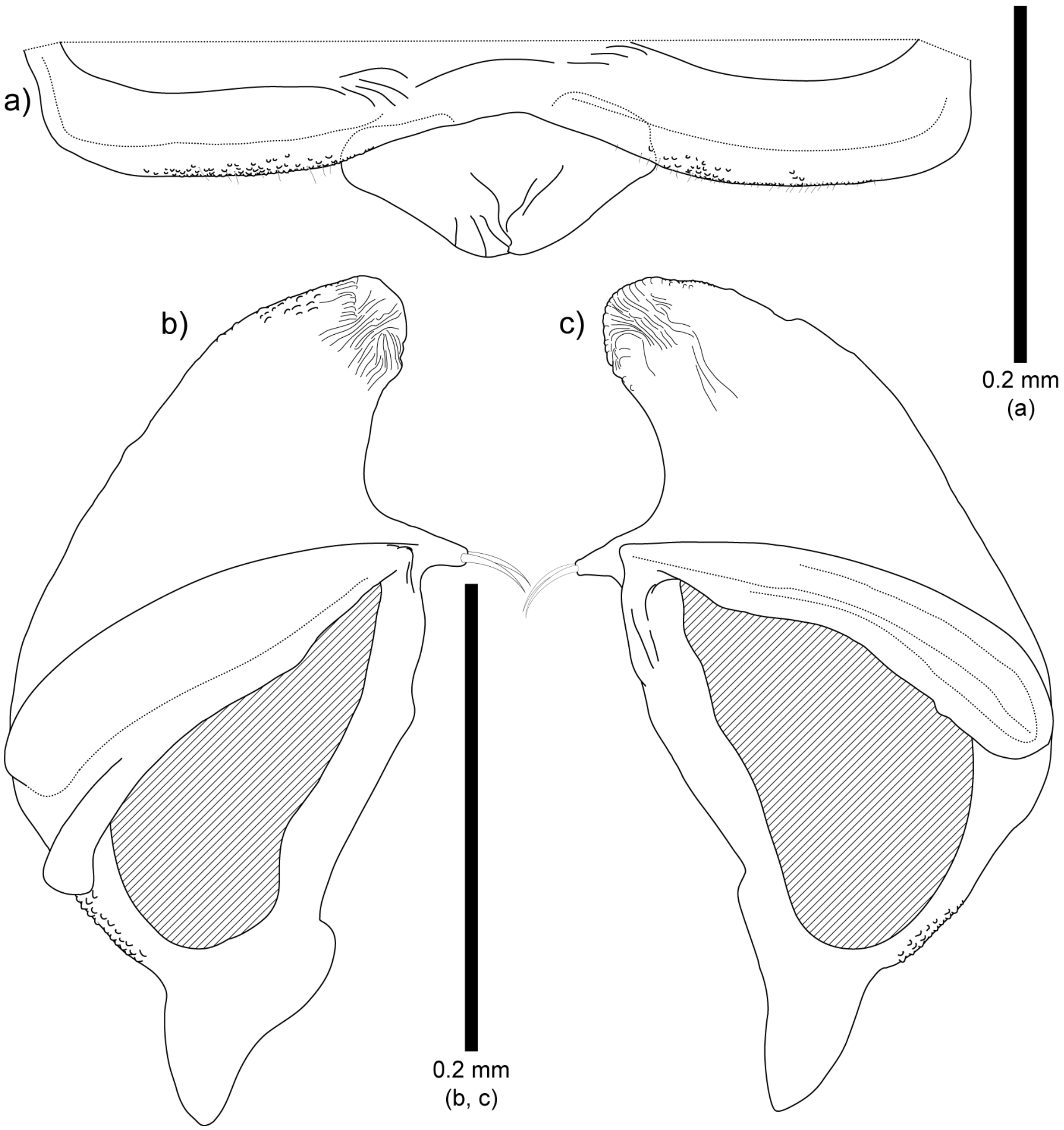

Plate XLI: *Pseudarachna hirsuta* (SARS, 1864); female, length 1.90 mm: a) clypeus and labrum; b) left mandible; c) right mandible

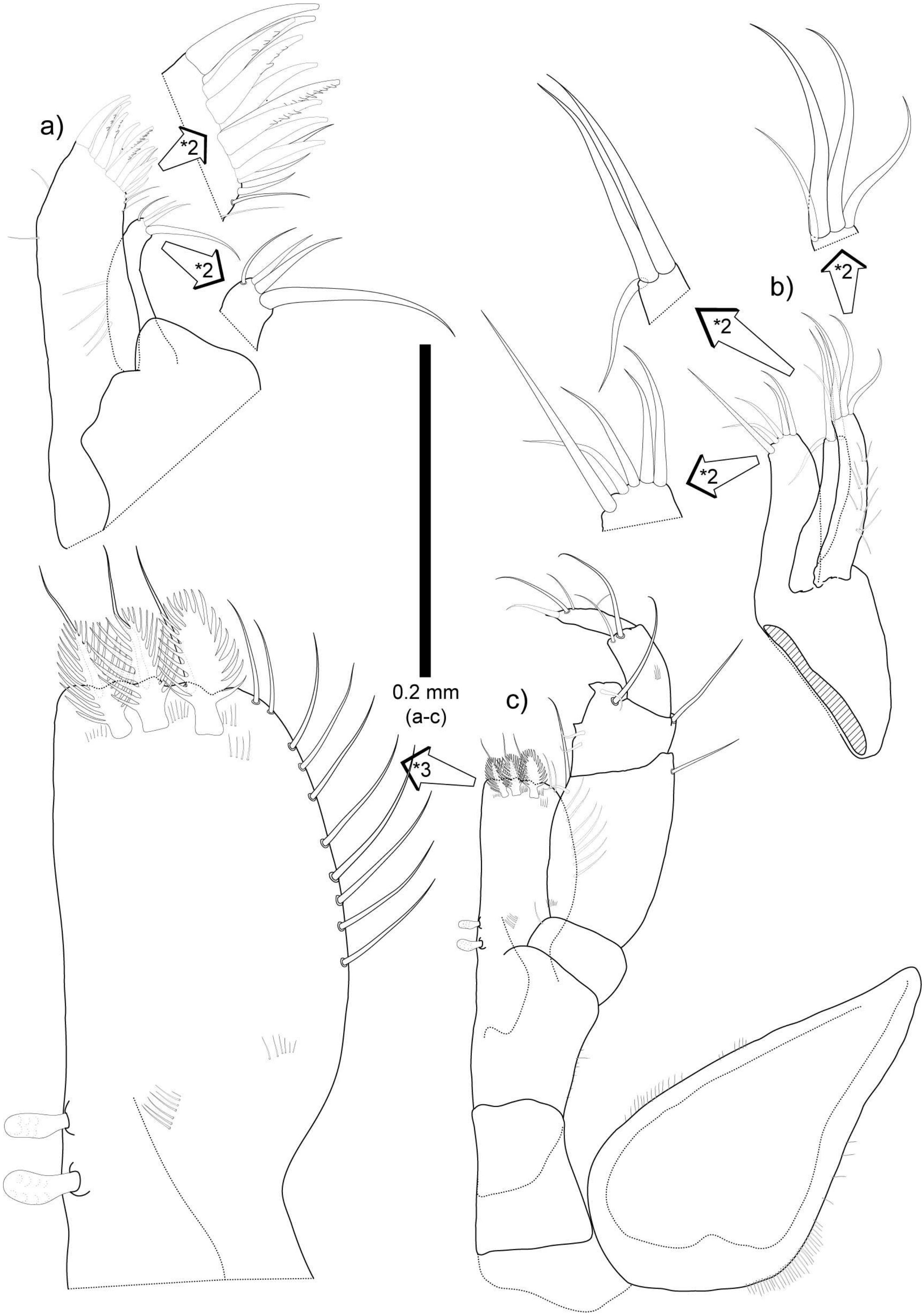

Plate XLII: *Pseudarachna hirsuta* (SARS, 1864); female, length 1.90 mm: a) maxilla 1; b) maxilla 2; c) maxilliped. Numbers in arrows indicate relative factor of magnification

Plate XLIII: *Pseudarachna hirsuta* (SARS, 1864); female, length 1.90 mm: a) pereopod 1; b) pereopod 2; c) pereopod 3; d) pereopod 4

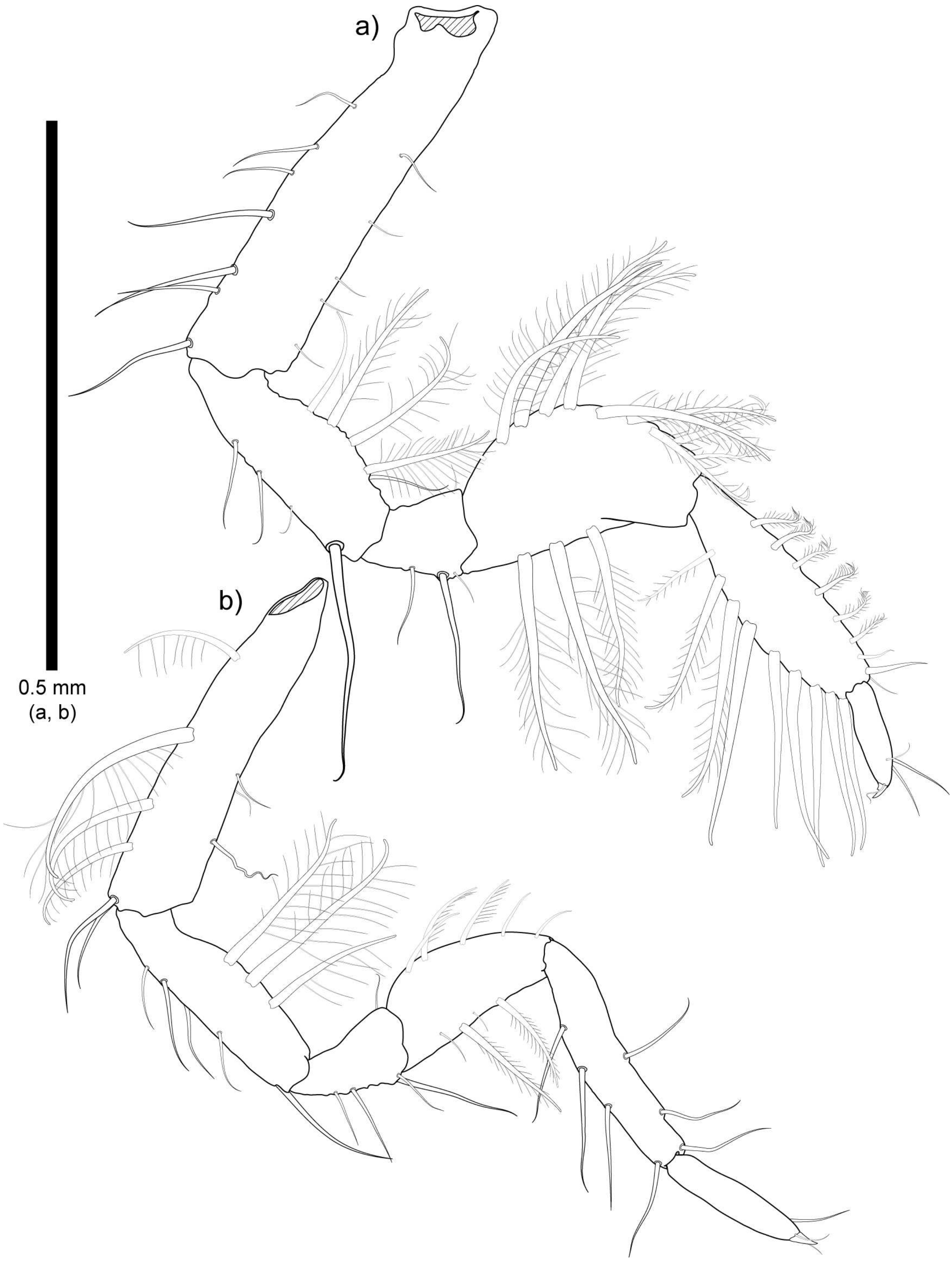

Plate XLIV: *Pseudarachna hirsuta* (SARS, 1864); female, length 1.90 mm: a) pereopod 5; b) pereopod 6

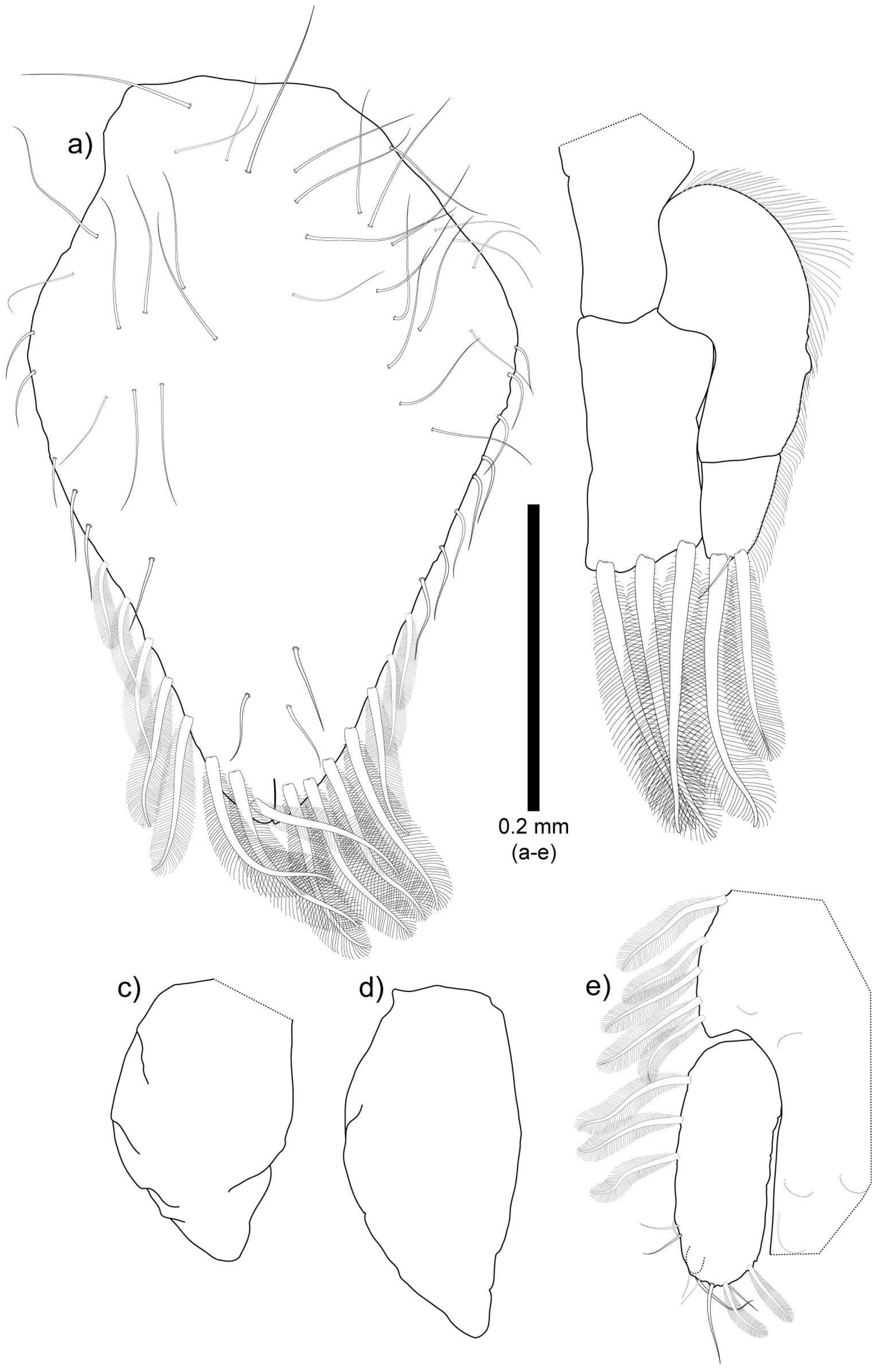

Plate XLV: *Pseudarachna hirsuta* (SARS, 1864); female, length 1.90 mm: a) pleopod 2; b) pleopod 3; c) pleopod 4; d) pleopod 5; e) margin of pleotelson with uropod

Subfamily *Munnopsinae* SARS, 1869

Genus *Munnopsoides* TATTERSALL, 1905

Munnopsoides TATTERSALL, 1905: 25; HANSEN, 1916: 158; GURJANOVA, 1933: 426; BIRSTEIN, 1963: 122; MENZIES & GEORGE, 1972: 292; WI1SON, 1989: 119. KUSSAKIN 2003: 330-331.
Munnopsis (partim) WOLFF, 1962: 187.

Type species: *Munnopsoides australis* (BEDDARD, 1886).

Species included: *M. australis* (BEDDARD, 1886); *M. callidus* MENZIES & GEORGE, 1972; *M. chilensis* MENZIES & GEORGE, 1972; *M. eximius* HANSEN, 1916; *M. tattersalli* BIRSTEIN, 1963A

Diagnosis

Munnopsinae with stiffened, slender natasome, proximally about a third as wide as maximum body width or less. Pereonites 5 – 7 and pleotelson immovably fused, sutural incisions shallow. Pereonite 5 dorsally not wider than long. Pleotelson at least 2 times as long as wide, not narrower than pereonites 5 – 7. Mandibular palp absent. Mandibular spine row reduced. Molar part absent. Maxilliped palp article 4 narrow, without distomedial lobe. Carpi and propodi of pereopods 5 – 7 elongate, at least 4 times as long as wide.

3.1.5.4 *Munnopsoides eximius* HANSEN, 1916

Munnopsoides eximius HANSEN, 1916: 159-160, Pl. XIV, fig. 2q-2h; GURJANOVA, 1933b: 426. KUSSAKIN 2003: 331-333.
Munnopsis eximius WOLFF, 1962: 188-189, Fig. 118b, 119g.

Material examined: ovigerous female (4.42 mm), continental slope off Ría de Ferrol, Galicia, Spain, 43°48.587' N, 08°51.402' W – 43°49.545' N, 08°51,197' W, 607 m, station: "EBS 600-03". Additional material: fragmentary female natasome, same locality.

Distribution

Amphiatlantic; boreal North East Atlantic: South of Iceland, South West of Faroes (HANSEN 1916, identical coordinates in GURJANOVA 1933); Iberian Peninsula: continental slope of northern Galicia (this study); boreal North West Atlantic: Davis Strait (HANSEN 1916, identical coordinates in GURJANOVA 1933).

Diagnosis

Anterior width of pereonite 5 about 0.3 times maximum body width. Incisor part of mandible with 3 weak cusps. Maxilliped palp article 2 as wide as or narrower than basis. Carpi of pereopods 5 – 7 about 8 times as long as wide. Uropods uniramous, with 2 articles, short, about 0.1 times as long as pleotelson.

Redescription of female

Body (Plate XLVI a, b) 4.42 mm long, , length : width = 2.69, widest at pereonite 3, deepest at head, cuticle smooth. Ambulosome subcircular in dorsal aspect, 2.2 times as wide as natasome. Natasome slender, 0.64 times total body length. Head length : width = 1.1, widest at insertion of antenna 2, frontal margin of clypeus straight, setose. Insertion of antenna 1 posteriorly of antenna 2. Distance between bases of antennae 0.55 times cephalic width. Peduncles of antenna 1 and 2 *in situ* pointing laterodorsally. Labrum visible in dorsal aspect, 0.6 times as wide as head.

Pereonites 1 – 4 short, transverse, wider than head, loosely packed, anterior margin dorsally elevated, coxae visible in dorsal aspect, asetose. Pereonites 1 – 3 shortest at midlength. Median length of pereonite 1 < 2 < 3 < 4; width of pereonite 1 < 2 < 3 > 4. Pereonite 1 strongly arched posteriorly, lateral margins anteriorly reaching under insertion of antenna 2. Pereonite 2 less arched than pereonite 1. Pereonite 3 less arched than pereonite 2, distolateral angle pointing laterally. Pereonite 4 not conspicuously arched posteriorly.

Pereonites 5 – 7 and pleotelson fused, sutures remaining visible, much narrower than ambulatory pereonites, asetose. Pereonite 5 at midlength 0.27 times as wide as body width. Pereonites 5 – 7 cylindrical, with concave posteriodorsal margins, posteriolateral margins oblique, coxae placed far posterior to posteriodorsal margins, widest at coxae.

Pleotelson 0.37 times as long as body, 2.1 times as long as wide, oblongly oval in dorsal aspect apex consisting of small, rounded bulb, dorsum with strong median keel, triangular in cross-section. Uropod insertion terminal. Uropods uniramous, minute, about 0.1 times pleotelson length.

Antenna 1 (Plate XLVII a) with 3 peduncular and 11 flagellar articles. Peduncular article 1 1.4 times as long as wide, proximally widest, strongly rugose, distolateral lobe rounded. Proximomesially with 2 broom setae. Arrticle 2 0.4 times as long as article 1, 2 times as long as wide, distally with 2 broom setae. Article 3 0.6 times as long as article 2, 2 times as long as wide. Flagellum article 1 0.5 times as long as peduncular article 3, about as long as wide, distally with 1 broom seta. Article 2 5 times as long as article 1. Article 3 0.3 times as long as article 2. Article 4 1.1 times as long as article 3. Articles 4 – 11 progressively shorter, articles 5 – 10 with 1 aesthetasc, article 11 with 2 aesthetascs and 1 broom seta.

Antenna 2 (Plate XLVII b) basal 3 peduncular articles preserved, all strongly rugose by cuticular scales. Article 1 widest, about as long as wide, widest distally. Article 2 narrower, slightly longer than wide, distal margin oblique. Article 3 distally tapering, with two unequally long distal lobes.

Mandibles (Plate XLVIII a, b) without palp, molar part and spine row, laterally strongly rugose, proximolaterally with 1 long, simple seta. Pars incisiva on both sides narrow, with 3 cusps. *Lacinia mobilis* narrow, set apart from pars incisiva, with 3 small cusps.

Paragnath (Plate XLVIII c) lateral lobes 2.27 times as long as wide, lateral margin convex, mesial margin straight. Apex with 1 cusp and 5 simple, spine-like setae. Distolateral margin with fringe of 16 – 18 simple setae, other setation absent. Mesial lobes blunt, 0.64 times as long as lateral lobes, 2.75 times as long as wide, sparsely covered with short, simple setae.

Maxilla 1 (Plate XLIX a) exopod 3.5 times as long as wide. Apex with 4 simple and 8 serrate, spine-like setae. endopod 0.7 times as long as exopod, 2.5 times as long as wide, laterally distally of midlength a fringe of 14 simple setae, mesially several short, simple setae. Apex with 2 scale setae and 8 simple spine-like setae, further mesially a much longer, serrated, spine-like seta with shallow denticles.

Maxilla 2 (Plate XLIX b) exopod with lateral endite about 1.3 times as long as mesial endite, 5.6 times as long as wide, distally with 4 long, pectinate, spine-like setae. Mesial endite distally reaching apex of endopod, distally with 4 long, pectinate, spine-like setae. Endopod 3 times as long as wide, lateral margin with several simple setae, proximomesially several long, simple setae, apex with 3 simple and 3 pectinate, spine-like setae. Mesial margin subapically with 1 longer, pectinate, spine-like seta.

Maxilliped (Plate L a) coxa transverse, 0.3 times as long as wide. Basis 2.3 times as long as wide, widest at insertion of palp, lateral margin with fringe of short, simple setae. Endite 0.3 times as long as total length of basis, 1.9 times as long as wide, distoventrally with densely setose area. Distal margin obliquely truncate, lateral margin longer than mesial margin, distal margin with 6 denticles and 3 simple, spine-like setae., distolateral angle with 9 narrow, acute denticles. 2 coupling hooks. Palp 0.9 times as long as basis, with 5 articles. Article 1 transverse, 0.3 times as long as wide. Article 2 longest and widest, 4.7 times as long as article 1, 1.2 times as long as wide, proximomesial and distal margin concave, proximolateral margin convex..Laterally with fringe of short, simple setae, distolaterally 2 long, simple setae. Article 3 0.5 times as long as article 2, 0.8 times as long as wide, lateral margin convex, mesial margin with enlarged, pointed distomesial lobe and 8 simple, spine-like setae. Article 4 0.4 times as long as article 3, 1.7 times as long as wide, distomesially with 2 simple, spine-like setae. Article 5 1.1 times as long as article 4, 2.8 times as long as wide, laterally with 2 simple setae, distally with 3 simple, spine-like setae. Epipodite symmetrical, proximally evenly rounded, distally evenly tapering. Apex narrow, pointed, with 1 simple seta.

Pereopods 1 – 4 not preserved distally of bases.

Pereopods 5 – 7 slender, natatory, dactyli absent, carpi longest articles. Lengths progressively slightly decreasing from pereopod 5 to 7, pereopod 5 0.55 times, pereopod 7 0.52 times body length.

Pereopod 5 (Plate L b) basis 6.5 times as long as wide. Ischium almost as long as basis, 8.5 times as long as wide. Merus 0.2 times as long as ischium, 1.5 times as long as wide. Carpus 6.4 times as long as merus, dorsal and ventral margin only slightly enlarged, 7.7 times as long as wide. Dorsal and ventral margin each with 11 swimming setae. Propodus 0.6 times as long as carpus, 4 times as long as wide, distal tip pointed with 1 simple seta. Dorsal margin convex, with 21 swimming setae. Distoventrally 3 swimming setae.

Pereopod 6 (Plate LI a) basis 7.3 times as long as wide. Ischium 0.9 times as long as basis, 7.8 times as long as wide. Merus 0.2 times as long as ischium, 1.5 times as long as wide. Carpus 5.9 times as long as merus, dorsal and ventral margin straight, 9.6 times as long as wide. Dorsal margin with 8, ventral margin with 15 swimming setae. Propodus 0.6 times as long as carpus, 4.5 times as long as wide, distal tip pointed. Dorsal margin convex, with 18 swimming setae. Distoventrally 3 swimming setae.

Pereopod 7 (Plate LI b) basis 6.1 times as long as wide. Ischium almost as long as basis, 7.5 times as long as wide. Merus 0.2 times as long as ischium, 1.5 times as long as wide. Carpus 6.2 times as long as merus, dorsal margin only slightly enlarged, ventral margin slightly concave, 7.4 times as long as wide. Dorsal margin with 12, ventral margin with 14 swimming setae. Propodus 0.6 times as long as carpus, 4.3 times as long as wide, distal tip pointed with 1 simple seta. Dorsal margin convex, with 20 swimming setae and membraneous seam. Distoventrally 3 swimming setae.

Pleopod 2 (Plate LII a) *in situ* 1.9 times as long as wide, v-shaped in cross-section with sharp median keel, 1.1 times as wide as long when splayed out under covering lid of microscopic slide. Lateral margin evenly convex, distal margin slightly concave, distal half of margin with membraneous seam and evenly distributed, short, simple setae.

Pleopod 3 (Plate LII b) exopod with 2 articles, narrow. Article 1 7.4 times as long as wide, laterally and distomesially fringed with fine, simple setae. Article 2 0.3 times as long as article 1, 7 times as long as wide, laterally and mesially fringed with fine, simple setae, apex with 1 simple, spine-like seta. Endopod lobiform, asetose, 5 times as wide and 1.2 times as long as exopod, 1.9 times as long as wide.

Pleopod 4 (Plate LII c) delicate, lobiform, asetose, 2.1 times as long as wide.

Pleopod 5 (Plate LII d) as pleopod 4, 1.8 times as long as wide.

Remarks

WOLFF (1962) rejected the concept of *Munnopsoide*s being distinct from *Munnopsis* SARS, 1861 and considered it a junior synonym of the latter. However, *Munnopsoides* is regarded valid here, because all known species are consistent in their natasome being much narrower than the ambulosome, the mandibular palp is always absent and the carpi and propodi of pereopods 5 – 7 are more elongated.

HANSEN (1916) figured *M. eximius* with antennae 1 and 2 being more widely spaced than in the specimen described here, however, WOLFF (1962) found *M. eximius* and *M. australis* BEDDARD, 1886 (which has antennae 1 and 2 spaced as narrow as in the specimen of *M. eximius* examined here) to be very similar in studying the type material of *M. eximius*. According to his listed distinguishing characters, female specimens of *M. eximius* differ from *M. australis* in a slightly wider pereonite 5, maxilliped palp article being as wide as maxilliped basis (wider than basis in *M. australis*), relatively longer carpi on the natatory pereopods 5 – 7 (eight times longer than wide compared with seven times longer than wide in *M. australis*) and shorter uropods (a tenth of pleotelson length in *M. eximius* versus a seventh in *M. australis*). These characters given for *M. eximius* correspond with the specimen examined here. As no males were found, other differences as those in stylets of male pleopods 2 cannot be regarded here.

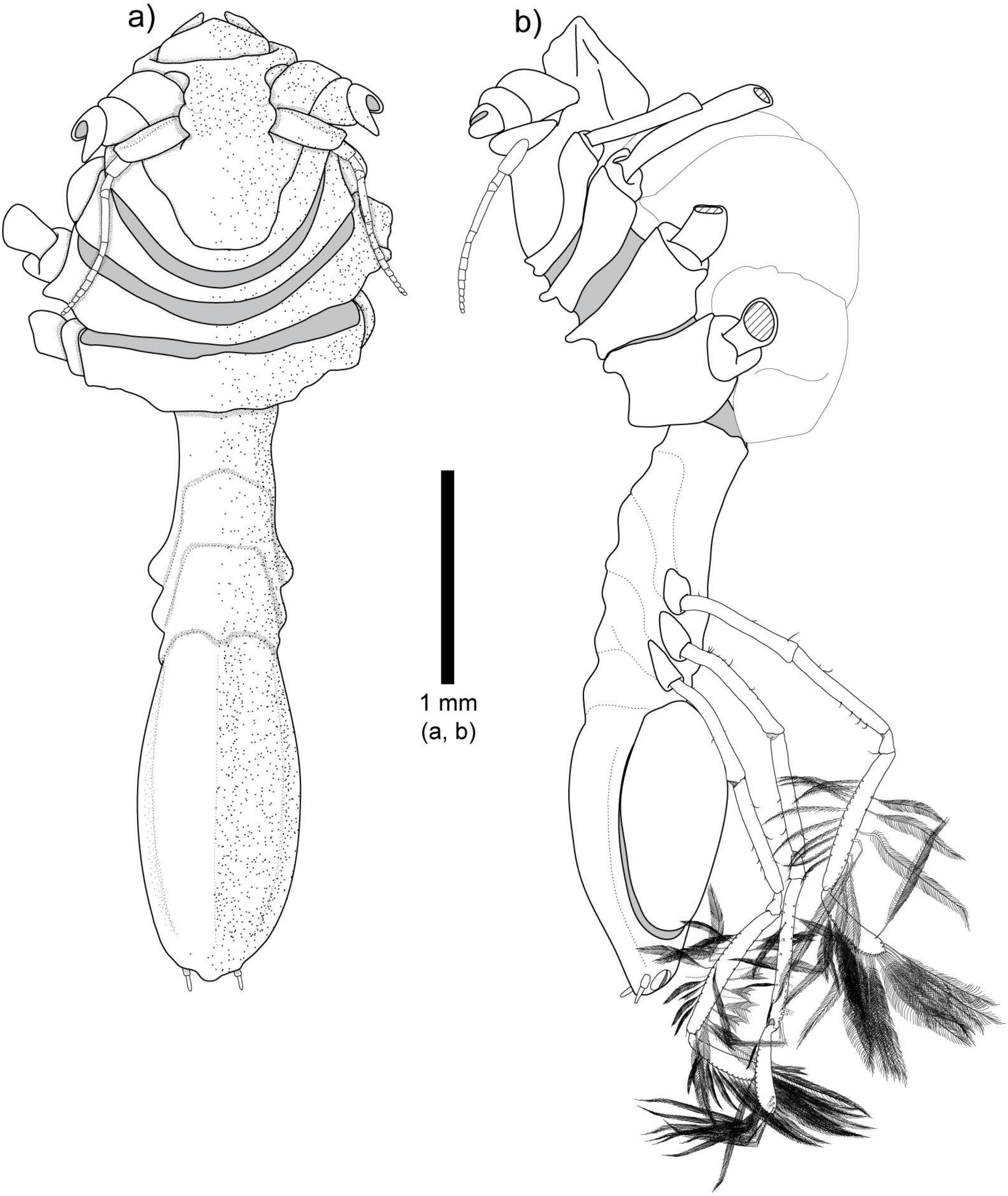

Plate XLVI: *Munnopsoides eximius* HANSEN, 1916; female, 4.42 mm: a) habitus, dorsal aspect; b) habitus, lateral aspect

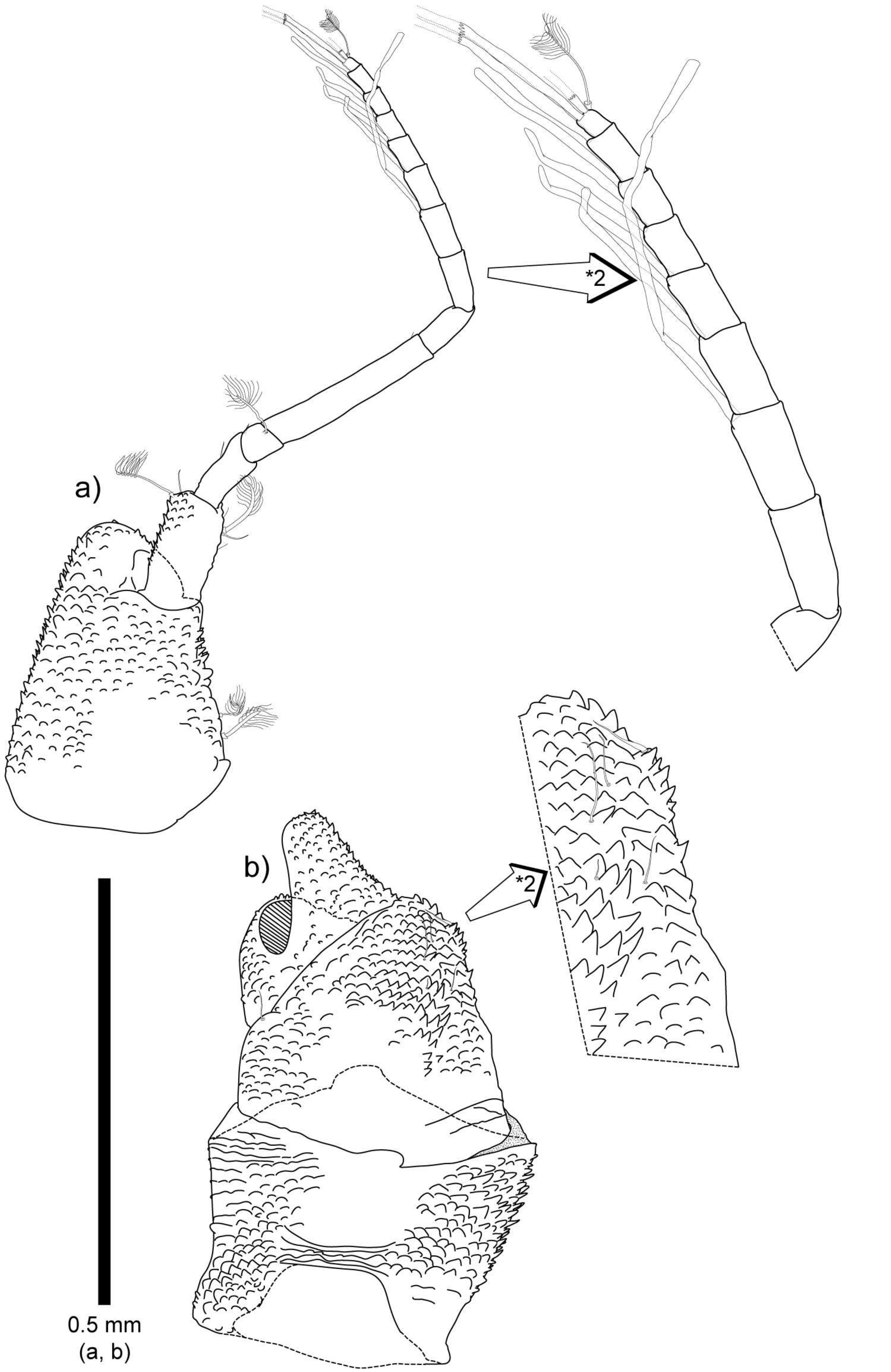

Plate XLVII: *Munnopsoides eximius* HANSEN, 1916; female, 4.42 mm: a) antenna 1; b) antenna 2. Numbers in arrows indicate relative factor of magnification

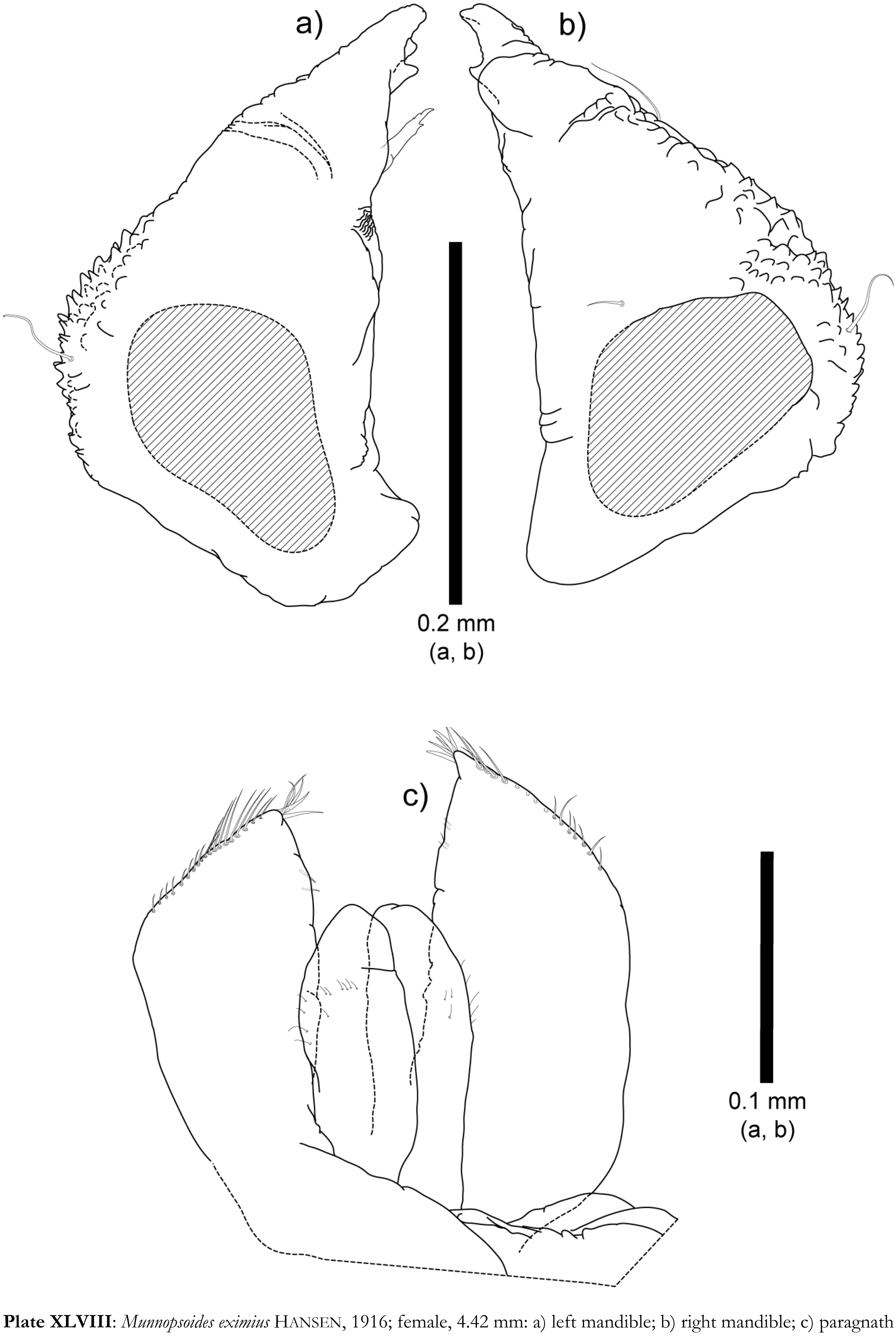

Plate XLVIII: *Munnopsoides eximius* HANSEN, 1916; female, 4.42 mm: a) left mandible; b) right mandible; c) paragnath

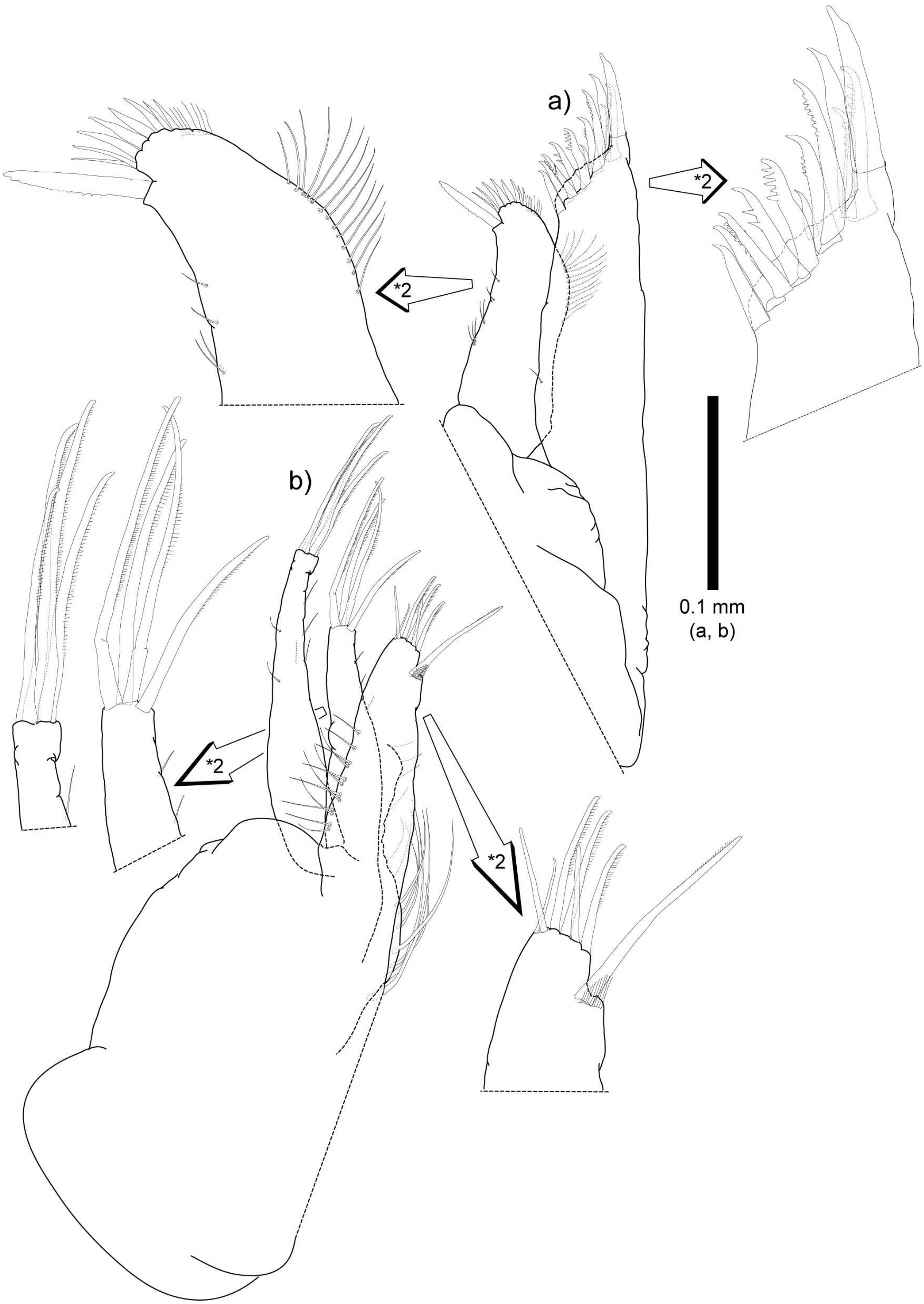

Plate XLIX: *Munnopsoides eximius* HANSEN, 1916; female, 4.42 mm: a) maxilla 1; b) maxilla 2. Numbers in arrows indicate relative factor of magnification

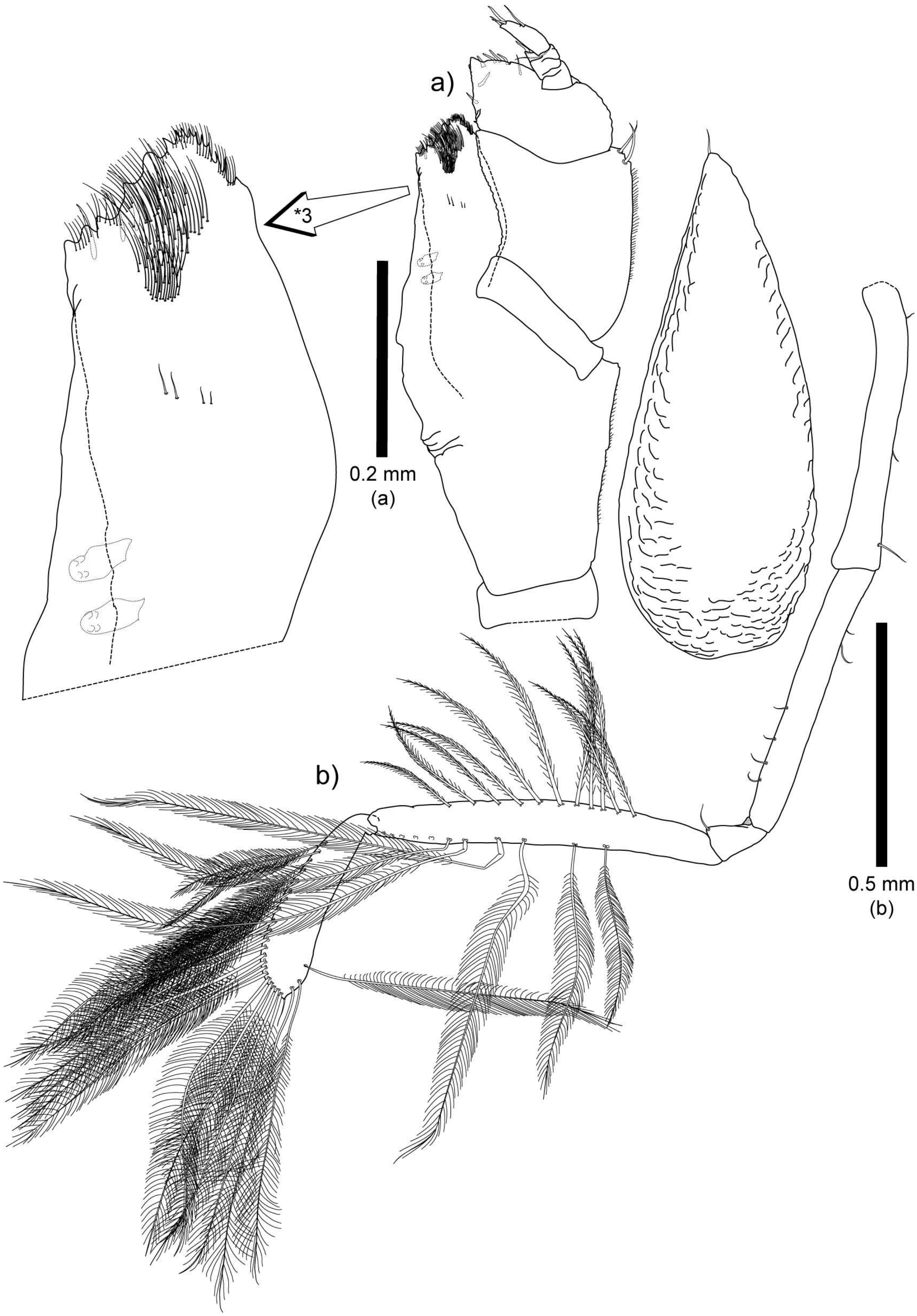

Plate L: *Munnopsoides eximius* HANSEN, 1916; female, 4.42 mm: a) maxilliped; b) pereopod 5. Numbers in arrows indicate relative factor of magnification

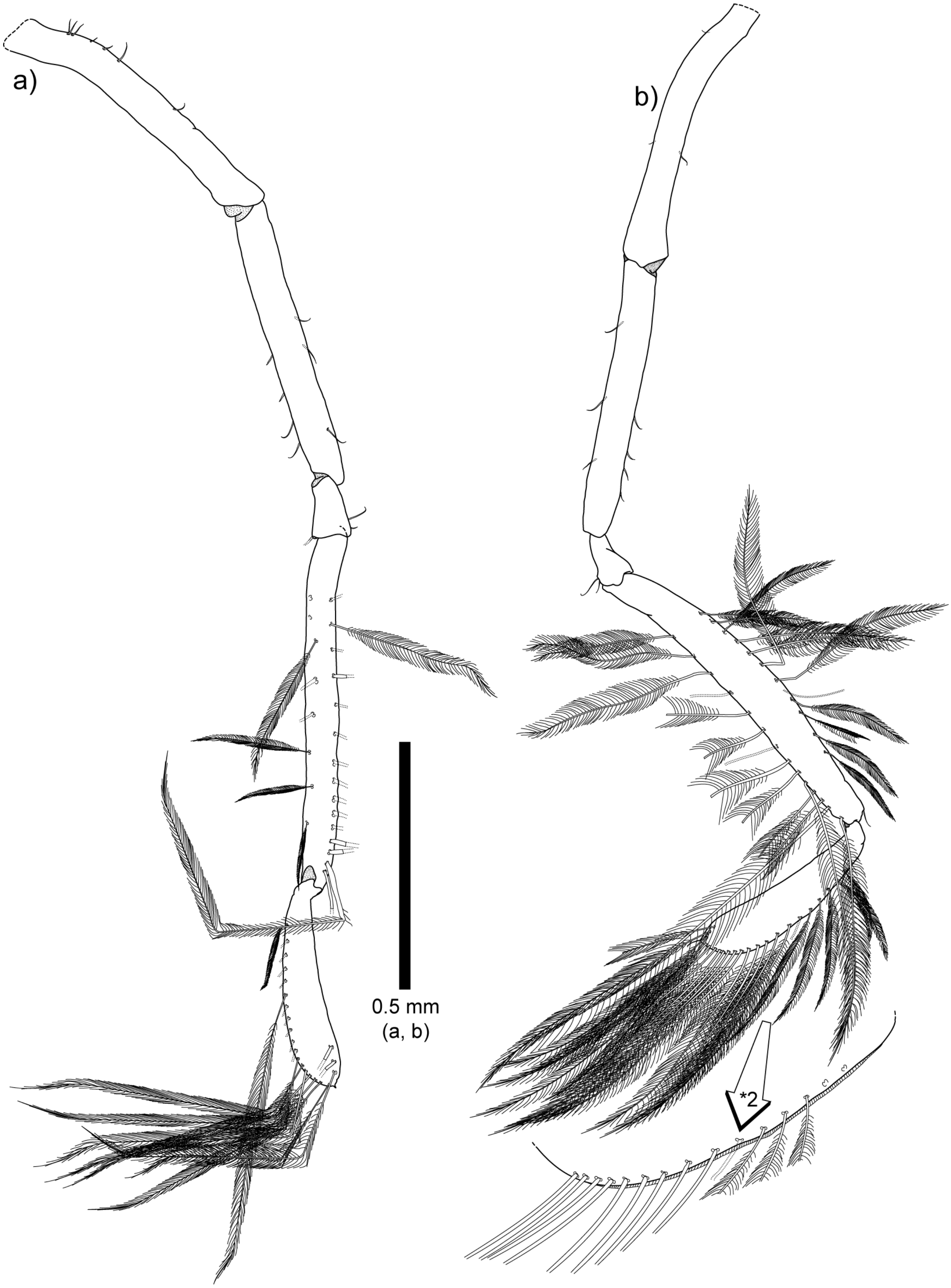

Plate LI: *Munnopsoides eximius* HANSEN, 1916; female, 4.42 mm: a) pereopod 6; b) pereopod 7. Numbers in arrows indicate relative factor of magnification

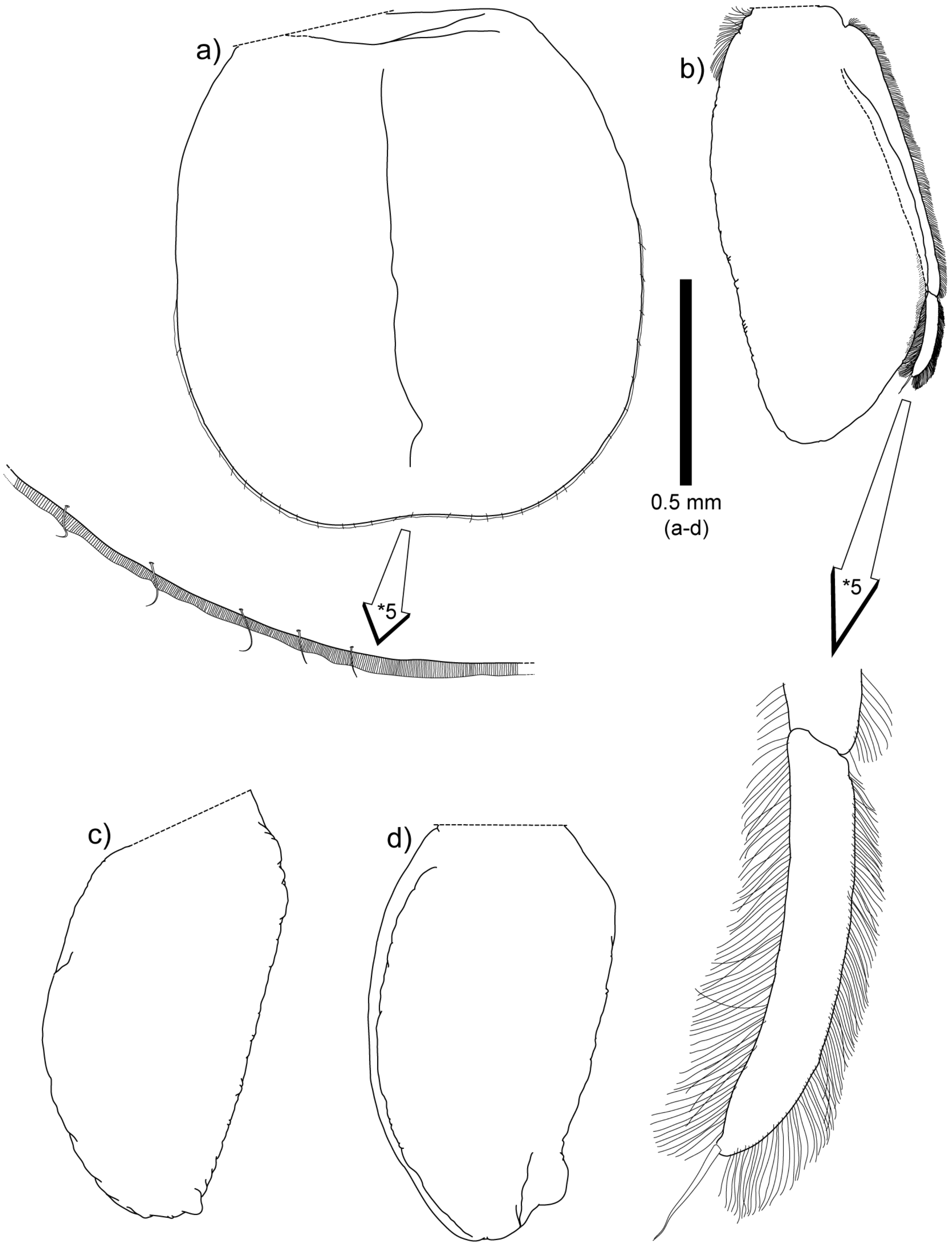

Plate LII: *Munnopsoides eximius* HANSEN, 1916; female, 4.42 mm: a) pleopod 2; b) pleopod 3; c) pleopod 4; d) pleopod 5. Numbers in arrows indicate relative factor of magnification

3.1.6 Family Macrostylidae HANSEN, 1916

The taxon name is derived from the uniramous uropods with elongated sympod. Macrostylidae are slender-bodied and short-legged, especially the middle pereopods are shorter than anterior and posterior ones. The dactylus of pereopod 3 is bent dorsally and the pleotelson bears a pair of statocysts which lead to the assumption that Macrostylidae are tube-dwelling (HESSLER & SANDERS 1967, WÄGELE 1989), which was questioned by BRANDT (2004) because of the elongated pereopod 7 in at least one species (*M. longipedis* BRANDT, 2004). So far, the family consists of the two genera *Macrostylis* SARS, 1864 and *Desmostylis* BRANDT, 1992 with 57 species altogether (SCHOTTE *et al.* 1995 ff.) A recent diagnosis was provided by BRANDT (2004).

Genus *Macrostylis* SARS, 1864

Macrostylis G.O. SARS, 1864: 13; BEDDARD, 1886: 173; G.O. SARS, 1899: 120; HANSEN, 1916; GURJANOVA, 1932: 47; WOLFF, 1956: 99; 1962: 91; MENZIES, 1962: 128; BIRSTEIN, 1963: 70; 1970: 302-303; MEZHOV, 1988; BRANDT, 1992: 74; 2004: 2; KUSSAKIN 1999: 337 – 339.
Vana MEINERT, 1890: 195.

Type species: *M. spinifera* SARS 1864 (by monotypy)

Species included: *M. abyssicola* HANSEN, 1916; *M. affinis* BIRSTEIN, 1963; *M. amplinexa* MEZHOV, 1989B; *M. angulata* MEZHOV, 1999; *M. belyaevi* MEZHOV, 1989; *M. bifurcatus* MENZIES, 1962; *M. bipunctatus* MENZIES, 1962; *M. birsteini* MEZHOV, 1993; *M. capito* MEZHOV, 1989; *M. caribbicus* MENZIES, 1962; *M. carinifera carinifera* MEZHOV, 1988; *M. carinifera dilatata* MEZHOV, 1988; *M. compactus* BIRSTEIN, 1963; *M. curticornis* BIRSTEIN, 1963; *M. dellacrocei* AYDOGAN, WÄGELE & PARK, 2000; *M. elongata* HANSEN, 1916; *M. emarginata* MEZHOV, 2000; *M. expolita* MEZHOV, 2004; *M. foveata* MEZHOV, 2000; *M. galatheae* WOLFF, 1956; *M. gestuosa* MEZHOV, 1993; *M. hadalis* WOLFF, 1956; *M. hirsuticaudis* MENZIES, 1962; *M. lacunosa* MEZHOV, 2004; *M. latifrons* BEDDARD, 1886; *M. latiuscula* MEZHOV, 2004; *M. longifera* MENZIES & GEORGE, 1972; *M. longipes* HANSEN, 1916; *M. longiremis* (MEINERT, 1890); *M. longissima* MEZHOV, 1981; *M. longiuscula* MEZHOV, 1981; *M. longula* BIRSTEIN, 1970; *M. magnifica* WOLFF, 1962; *M. mariana* MEZHOV, 1993; *M. minutus* MENZIES, 1962; *M. polaris* MALYUTINA & KUSSAKIN, 1996; *M. porrecta* MEZHOV, 1988; *M. rectangulata* MEZHOV, 1989; *M. reticulata* BIRSTEIN, 1963; *M. sarsi* BRANDT, 1992; *M. setifer* MENZIES, 1962; *M. setulosa* MEZHOV, 1992; *M. spiniceps* BARNARD, 1920; *M. spinifera* SARS, 1864; *M. squalida* MEZHOV, 2000; *M. subinermis* HANSEN, 1916; *M. truncatex* MENZIES, 1962; *M. tumulosa* MEZHOV, 1989; *M. urceolata* MEZHOV, 1989; *M. vemae* MENZIES, 1962C; *M. vigorata* MEZHOV, 1999; *M. vinogradovae* MEZHOV, 1992; *M. viriosa* MEZHOV, 1999; *M. vitjazi* BIRSTEIN, 1963; *M. wolffi* MEZHOV, 1988; *M. zenkevitchi* BIRSTEIN, 1963

Diagnosis

The diagnosis of BRANDT (2004) is followed here.

3.1.6.1 *Macrostylis longiremis* (MEINERT, 1890)

Vana longiremis MEINERT, 1890: 195, Pl. II, Fig. 63-73.
Macrostylis longiremis G. O. SARS, 1899: 250, suppl. Pl. II, Fig. 1; HANSEN, 1916: 81-82, PL. VII, Fig. 5a; GURJANOVA, 1932: 49, Pl. XVII, 63; WOLFF, 1962: 257; KUSSAKIN 1999: 345 – 347.

Material examined: ovigerous female (2.28 mm), continental slope off Ría de Ferrol, Galicia, Spain, 43°51.873' N, 08° 53.683' W – 43°53.120' N, 08°53.301' W, 790 m, station: "EBS 800-03".

Distribution

North East Atlantic: Skagerrak (HANSEN 1910, 1916; HULT 1937, 1941, MEINERT 1890, SARS 1899); West of Iceland (HANSEN 1916, HULT 1941, KUSSAKIN 1999); continental slope of northern Galicia (this study).

Diagnosis

Macrostylis with body about 4 times as long as wide, head wider than long. Unit of pereonites 1 – 3 anteriolaterally evenly rounded. Pereonite 3 devoid of posteriolateral angled projections. Pereopod 3 carpo-propodal joint flexed dorsally. Uropodal sympod less than 2 times ramus length.

Redescription of female

Body (Plate LIII a, b) about 4 times as long as wide and about 6 times as long as deep, widest at pereonite 4, dorsum and lateral margins of head and pereon smooth and asetose, pleotelson laterally and caudally with short, simple setae. Head length : width = 0.83, lateral margins evenly tapering, anterior margin broadly rounded, dorsum devoid of any ornamentation. Unit of pereonites 1 – 3 together 0.27 times body length, length : width = 1.1. Posterior margins of pereonites 1 and 2 convex, posterior margin of pereonite 3 straight. Lateral margins of pereonites 1 and 2 anteriorly tapering, lateral margins of pereontite 3 parallel. Median length of pereonite 1 > 2 < 3. Anteriolateral angles of pereonite 3 rounded. Pereonites 4 – 7 progressively tapering caudally, with acutely projecting distolateral angles with distal short, spine-like seta. Pereonites 5 and 6 slightly longer than pereonites 4 and 7. Pereonite 4 with convex lateral bulge, pereonites 5 – 7 with evenly convex lateral margins. Pleotelson 0.24 times body length, length : width = 1.44. Lateral margins lghtly setose, lightly convex in anterior half, lightly concave anterior and posterior of uropod insertion, apex convex. Uropod 1.1 times pleotelson length.

Antenna 1 (Plate LIII c) 0.09 times body length, with 5 articles. Article 1 widest, distally with 1 simple, 1 broom and 2 simple, spine-like setae. Article 2 as long as article 1 and 0.7 times as wide, distally with 2 simple and 2 broom setae. Articles 3 – 5 progressively smaller. Article 3 with 4 simple setae, article 5 with 1 simple seta and 1 aesthetasc.

Antenna 2 (Plate LIII d) peduncular articles 1 and 2 preserved, article 1 about 1.5 times as long as wide, with 1 simple, spine-like seta and 7 short, simpe setae. Article 2 about as wide as and 0.8 times as long as article 1. Distal articles not preserved.

Labrum (Plate LIV a) visible in dorsal aspect, about 2 times as wide as long, medially embayed and asetose, anterior margin with a row of medially pointing, mesially progressively larger, spine-like setae, apex lightly embayed and devoid of setae.

Mandibles (Plate LIV b, c) without palp, incisor parts of both sides with 4 cusps. *Lacinia mobilis* of left mandible with 6 cusps, proximalmost cusp largest. Spine row of left mandible with 10 pectinate, spine-like setae, spine row of right mandible with 10 pectinate, spine-like setae and 1 proximal spine-like seta with 3 broad, apical and 3 long, spine-like cusps. Molar part distally tapering with truncate apex. Molar part of right mandible with 3 simple and 7 serrated, spine-like setae, left mandible with asetose apex of molar part.

Maxilla 1 (Plate LV a) exopod 2.7 times as long as wide, lateral margin with transverse rows of short, simple setae, truncate apex with 3 simple setae and 6 simple and 4 serrated, spine-like setae. Endopod 0.43 times as wide as exopod, nearly reaching truncate apex of exopod, distomesially with a row of 4 simple and 3 simple, spine-like setae.

Maxilla 2 (Plate LV b) exopod with lateral endite longer and mesial endite shorter than endopod, lateral and mesial endite distally with 3 long, spine-like setae. Endopod 3.1 times as long as wide, apex rounded with a row of 9 simple, spine-like setae.

Paragnath (Plate LVI a) lateral lobes divergent, about 1.7 times as long as wide and 1.5 times al long as medial lobes, distally densely setose. Lateral margins convex, with unevenly long, simple setae, mesial margins almost straight, with longitudinal row of distally progressively longer, simple, spine-like setae. Medial lobes about 2 times as long as wide, almost not overlapping, distally rounded and densely setose.

Maxilliped (Plate LVI b) endite about 0.5 times as wide as basis, distally reaching palp article 3, distodorsally with 3 simple, spine-like setae, mesially 2 coupling hooks. Palp 0.57 times as long as basis. Article 1 rectangular, short. Article 2 widest, almost quadrate, slightly wider than long, mesial margin with 3 simple, spine-like setae. Article 3 about half as long and 0.8 times as wide as article 2, distolaterally with 2 simple, spine-like setae, mesial margin convex, with 5 simple, spine-like setae. Articles 4 and 5 0.3 times as wide as article 2, stout and progressively tapering. Article 4 distally with 4, article 5 distally with 2 simple, spine-like setae. Epipodite oblongly triangular with acute apex, about as long as basis, 2.7 times as long as wide.

Pereopods (Plate LVII a – d; Plate LVII a – c) dorsally flexed between bases and ischii, ventrally flexed between carpi and propodi except for pereopod 3 with strong dorsal flexion between carpus and propodus. Length of pereopod 1 < 2 > 3 >4 < 5 < 6 = (?; pereopod 6 incomplete) 7.

Bases of pereopods 1, 2, 4, 5 longest articles, pereopod 3 with ischium as long as stout basis, pereopods 6 and 7 with carpus being longest article. Bases of pereopods 1 – 6 dorsally with 4, 4, 3, 1, 4 and 4 broom setae, pereopods 3 and 4 basis with 1 ventral broom seta. Basis of pereopod 7 dorsally with longitudinal row of 12 long, serrated setae. Ischii dorally slightly convex in pereopods 1, 2, 4 – 7, with large dorsal lobe in pereopod 3. Ventrally with longitudinal fringe of short setae in pereopod 1, 3 simple, spine-like setae in pereopods 3 and 4, 3 robust, simple setae and 3 distoventral simple setae in pereopods 5 and 6. Distodorsally with 4 simple, spine-like setae in pereopod 2, 3 simple, spine-like setae and 1 strong, unequally bifid, spine-like seta at apex of dorsal lobe in pereopod 3. Meri with distodorsal lobe, small in pereoods 1, 2, 5 – 7, enlarged and projecting in pereopods 3 and 4, in pereopods 1 – 7 with 2, 4, 6, 3, 3, 5, 3 spine-like setae. Pereopods 2 – 4 ventrally with 3 simple, spine-like setae, pereopods 5 and 6 distoventrally with 3 and 2 simple, spine-like setae. Carpi of pereopods 1 – 4 short and robust, slender in pereopods 5 – 7, longest article in pereopods 6 and 7. Distodorsally with 1, 2, 3, 1, 1, 1 spine-like seta in pereopods 1 – 6, 1 broom seta in pereopod 5 and 6. Ventrally with 3, 4, 1, 2, 3, 2, 2 simple, spine-like setae in pereopods 1 – 7. Propodi distoventrally with 1 – 2 simple, spine-like setae, pereopod 5 distodorsally with 1 broom seta, pereopod 6 distalmost part of propodus not preserved. Dactyli with 2 claws, dorsal claw longer.

Pleopod 2 (Plate LIX a) 1.48 times as long as wide, widest in proximal third, lateral margin convex except for slightly concave distal third. Ventrally with many long, simple setae, distalmost third devoid of setae. Distal half of ventral margin with a fringe of short setae. Apex convex, slightly truncate, with 13 plumose setae.

Pleopod 3 (Plate LIX b) exopod with 2 subequally long articles, article 2 broadly lancet-shaped. Lateral fringe of simple setae on entire article 1 to proximal third of article 2, distally asetose. Endopod subrectangular, 1.9 times as long as wide and about 1.4 times as long as exopod article 2, distally with 3 plumose setae.

Pleopod 4 (Plate LIX c) exopod narrow, almost 10 times longer than wide, lateral margin with fringe of 10 evenly distributed simple setae, apex with a long, simple, spine-like seta. Endopod almost 1.5 times as long as exopod, about 2 times as long as wide, asetose.

Pleopod 5 (Plate LIX d) 1.7 times as long as wide, oval, asetose.

Uropod (Plate LIX e) sympod 1.7 times as long as ramus, proximal third slightly wider, demarcated from distal two thirds by narrow constriction. 1 broom seta and 9 simple setae, 1 plumose seta proximally to constriction. Ramus with 3 simple setae, apex with 1 broom seta and 3 simple setae.

Remarks

The asetose apex of the left mandible's molar part is no preparational artefact as no damages are apparent. It is interpreted as an individual deformition or moulting damage. *M. longiremis* is very similar to *M. polaris* MALYUTINA & KUSSAKIN, 1996 and *M. spinifera* SARS, 1864 – and probably closely related to them (MEZHOV 2000) – but lacks the posteriolateral angles of pereonite 3 and the strong ventral spine-like projections of both of the latter species. Merus and carpus of pereopod 4 are wider in *M. longiremis* than in both other species. *M. longiremis* can be easily distinguished from *M. spinifera* by the longer uropodal ramus with an uropod sympod : ramus length ratio = 1.7 in the examined specimen and 3.9 in *M. spinifera.* In *M. polaris*, this ratio is 2.6. However, in the specimen of *M. longiremis* figured by SARS (1899), the uropodal sympod is 2.4 times as long as the ramus which indicates some intraspecific variation. The carpo-propodal joint in *M. longiremis* bends dorsally but is figured straight to slightly ventrally in *M. spinifera* and *M. polaris* (SARS 1899, MALYUTINA & KUSSAKIN 1996). Other macrostylids have been described with or without the dorsal bend (for a comparison see e.g. KUSSAKIN 1999). This character deserves a closer analysis of functional morphology as it may suggest that at least the species with the dorsal bend are tubicolous as suggested by HESSLER & SANDERS (1967) and WÄGELE (1989). In this case, the third pereopod may be dorsally held against the tube wall in order to serve as additional support, allowing the animal to move either with the dorsal or ventral body side facing upward. The assumption of Macrostylidae as being tube-dwelling isopods was refuted by BRANDT (2004) based on a species with extremely elongated pereopods 7 (*M. longipedis* BRANDT, 2004) which she supposed would be subject to damage or loss by burrowing. However, the pereopod 7 is normally much shorter in other macrostylids, such an abberantly long pereopod 7 in one species is not representative for the whole family. Besides, even an elongated pereopod 7 is not inevitably a hindrance for burrowing, as this limb is orientated posteriorly *in situ* and would be the least of all limbs to suffer from burrowing, provided that the animals would burrow head first. The robustness of the anterior pereopods with rows of strong, spine-like setae, the peculiar, dorsally orientated posture of pereopod 3 and the fact that the middle pereopods (3 and 4) are shortest, still suggests a tubicolous lifestyle. Pereonites 1 – 3 are fused to an immobile unit that is stronger and slightly deeper than the posterior pereonites 4 – 7, this fusion is similar to that of pereonites 5 – 7 in Munnopsidae and suggests that the robust pereopods of these pereonites are supported by a similarly strong musculature. For the unit consisting of pereonites 1 – 3 in Macrostylidae, the term oryctosoma is proposed, from Greek *ορψκτειν* = to dig and *σομα* = body.

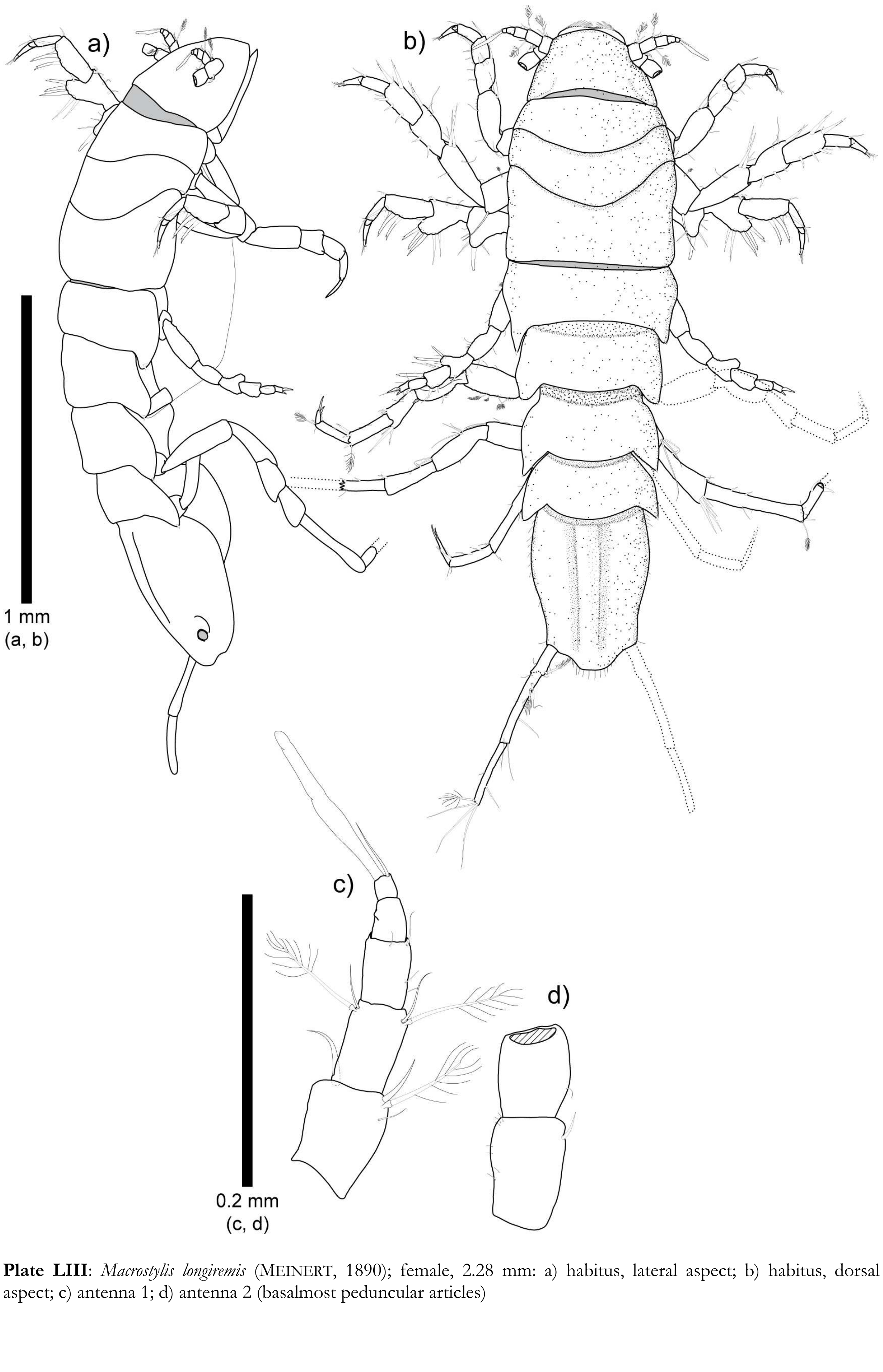

Plate LIII: *Macrostylis longiremis* (MEINERT, 1890); female, 2.28 mm: a) habitus, lateral aspect; b) habitus, dorsal aspect; c) antenna 1; d) antenna 2 (basalmost peduncular articles)

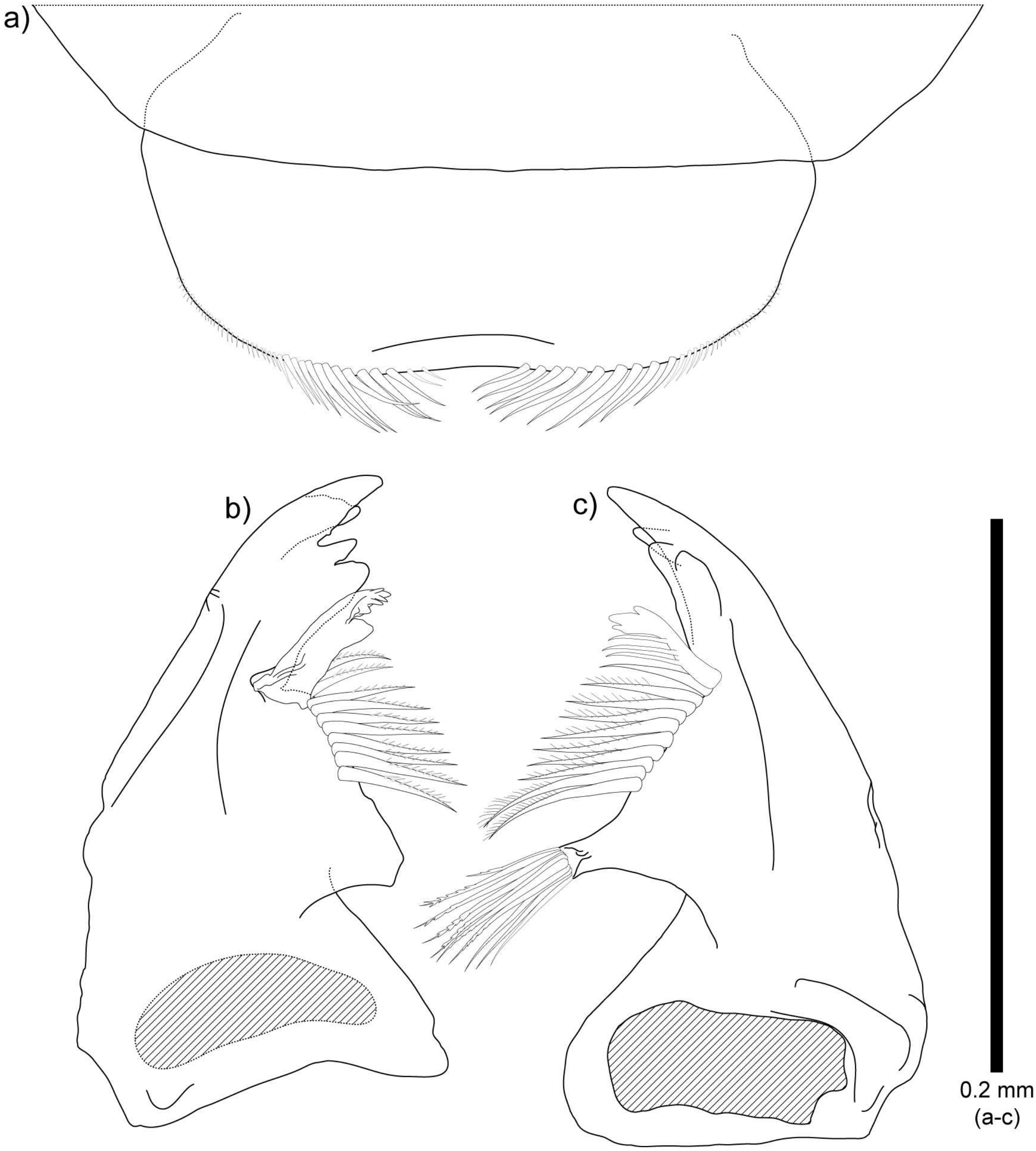

Plate LIV: *Macrostylis longiremis* (MEINERT, 1890); female, 2.28 mm: a) clypeus and labrum; b) left mandible; c) right mandible

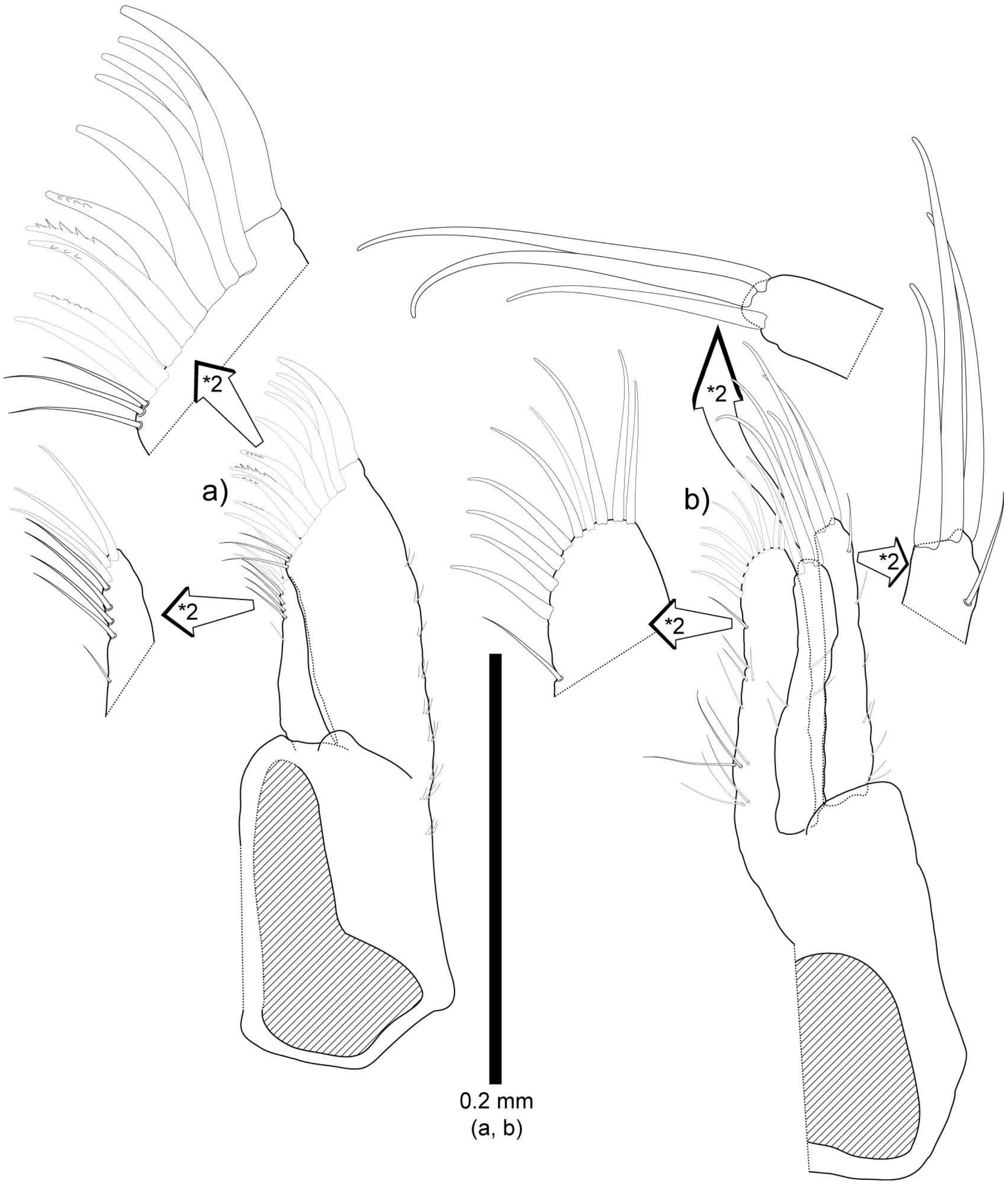

Plate LV: *Macrostylis longiremis* (MEINERT, 1890); female, 2.28 mm: a) maxilla 1; b) maxilla 2. Numbers in arrows indicate relative factor of magnification

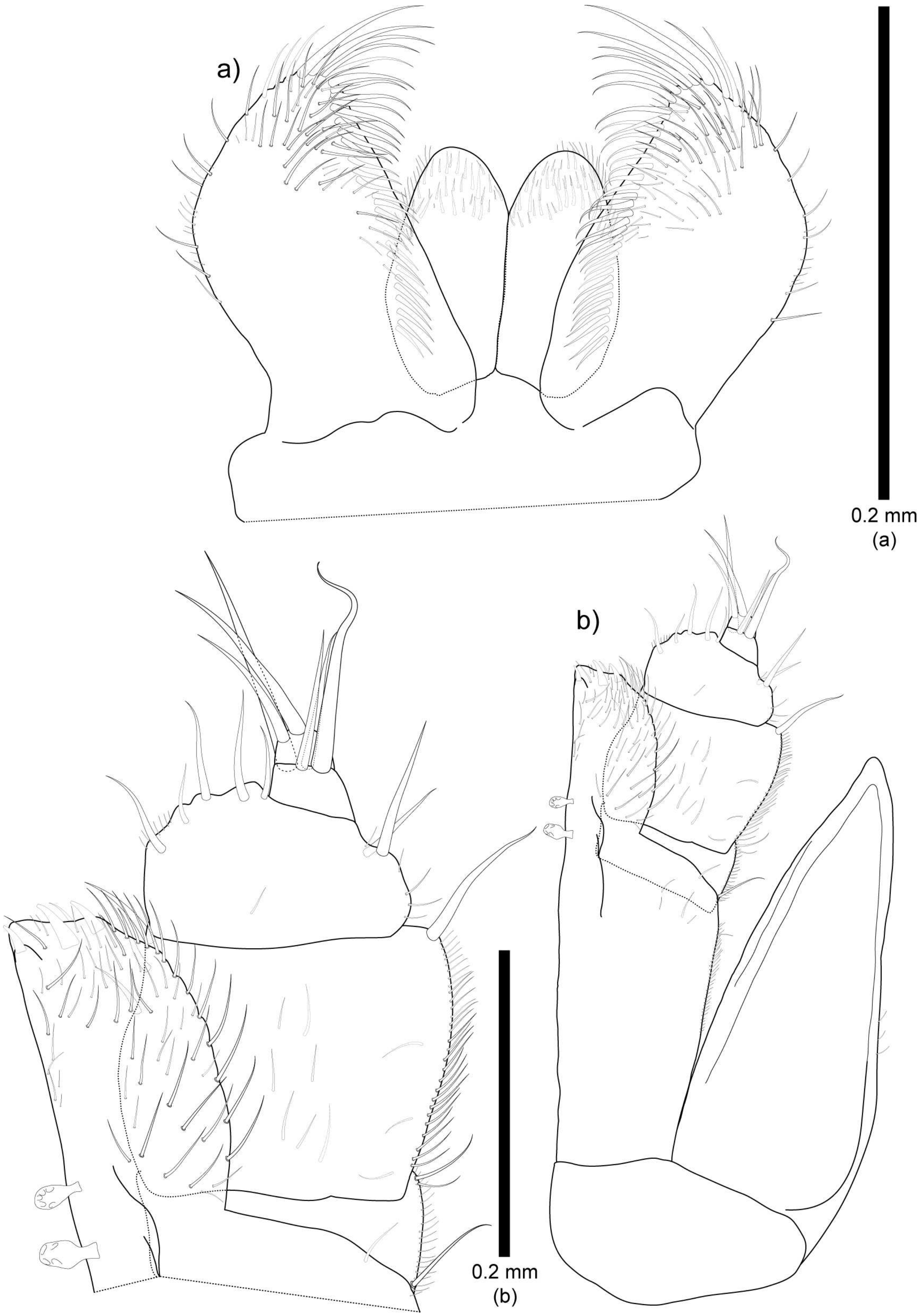

Plate LVI: *Macrostylis longiremis* (MEINERT, 1890); female, 2.28 mm: a) paragnath; b) maxilliped. Numbers in arrows indicate relative factor of magnification

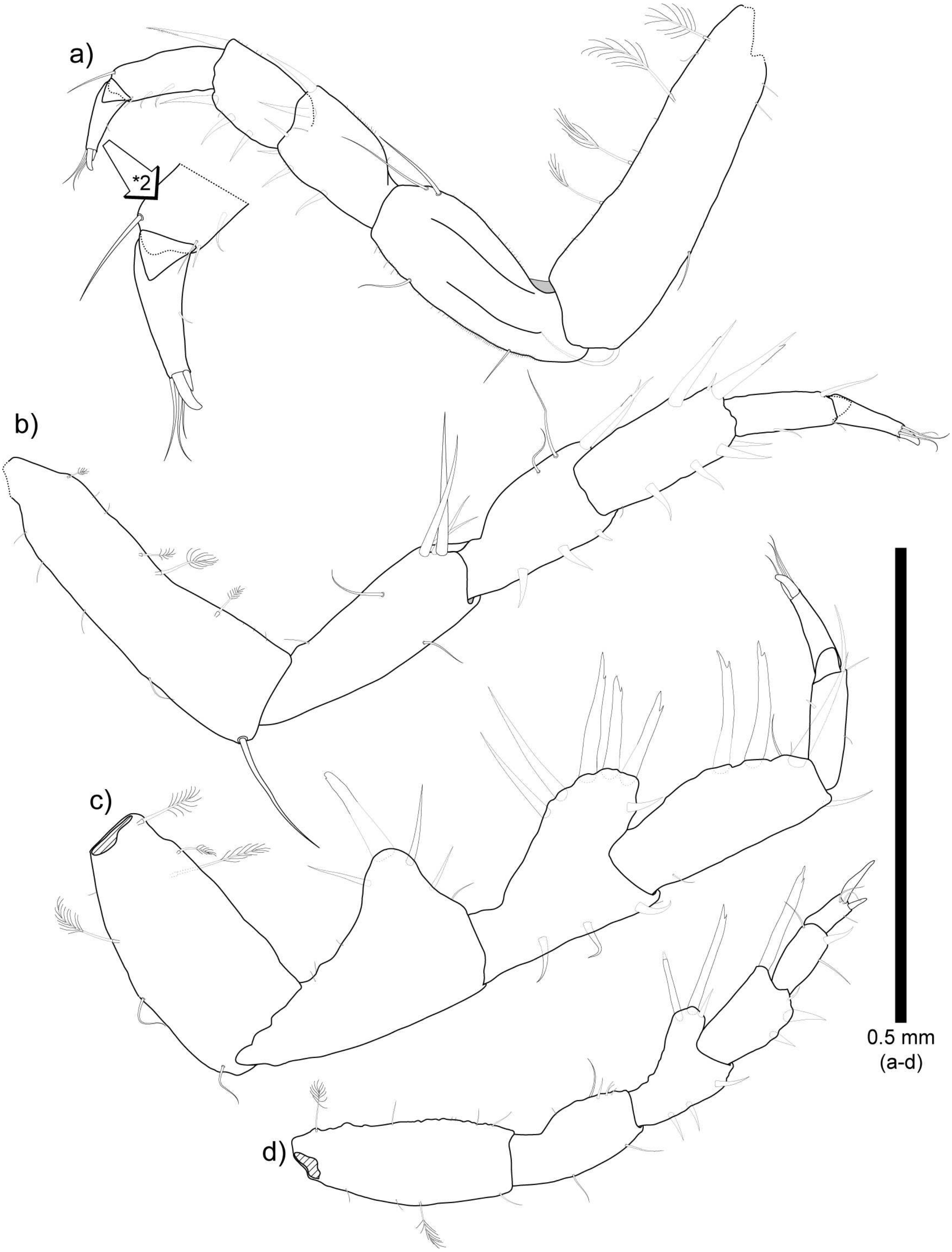

Plate LVII: *Macrostylis longiremis* (MEINERT, 1890); female, 2.28 mm: a) pereopod 1; b) pereopod 2; c) pereopod 3; d) pereopod 4

Plate LVIII: *Macrostylis longiremis* (MEINERT, 1890); female, 2.28 mm: a) pereopod 5; b) pereopod 6; c) pereopod 7. Numbers in arrows indicate relative factor of magnification

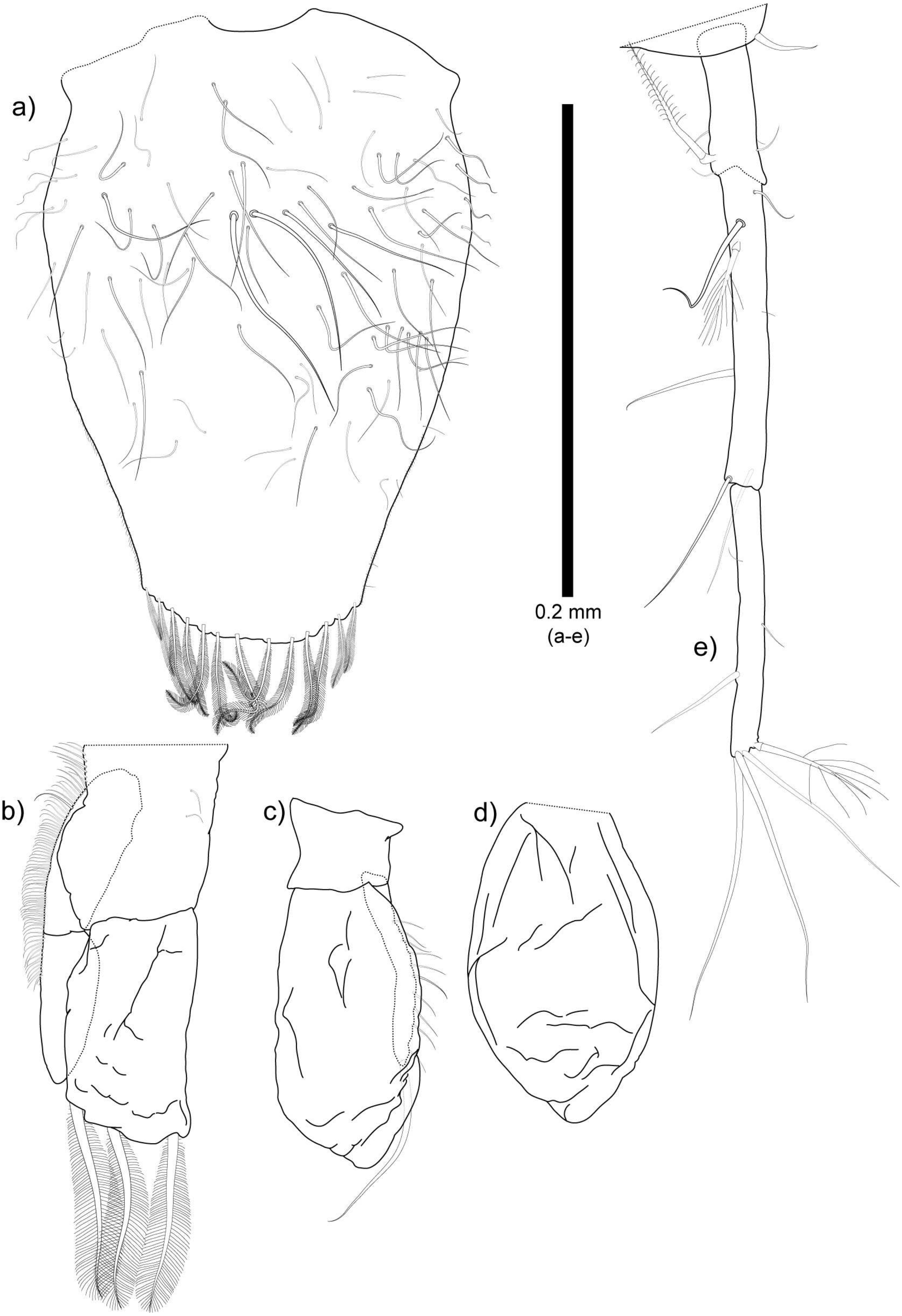

Plate LIX: *Macrostylis longiremis* (MEINERT, 1890); female, 2.28 mm: a) pleopod 2; b) pleopod 3; c) pleopod 4; d) pleopod 5; e) uropod

3.1.7 Family Ischnomesidae HANSEN, 1916

The Ischnomesidae are characterized by a considerably elongated and usually fragile body. Especially pereonite 5 (and sometimes also pereonite 4) is usually several times longer than broad. As pereopod 4 inserts anteriorly and pereopod 5 inserts posteriorly there is a distinct gap in the row of pereopods. Pereopod 1 is carpo-subchelate (WÄGELE 1989), the anus is located outside of the pleopod chamber. Ischnomesidae were revised and rediagnosed by MERRIN & POORE (2003), currently they are represented by 105 described species (December 2008: SCHOTTE *et al.* 1995 ff.).

Genus *Ischnomesus* RICHARDSON, 1908

Type species: *Ischnosoma bispinosum* SARS, 1868 by monotypy.

Species included: *I. anacanthus* WOLFF, 1962; *I. andriashevi* BIRSTEIN, 1960; *I. antarcticus* SCHULTZ, 1979; *I. armatus* HANSEN, 1916; *I. bacilloides* (BEDDARD, 1886); *I. bacillopsis* (BARNARD, 1920); *I. bacillus* (BEDDARD, 1886); *I. bidens* MENZIES, 1962; *I. birsteini* WOLFF, 1962; *I. bispinosus* (SARS, 1868); *I. brenkei* n. sp.; *I. bruuni* WOLFF, 1956; *I. calcificus* MENZIES & GEORGE, 1972; *I. caribbicus* MENZIES, 1962; *I. carolinae* CHARDY, 1974; *I. chardyi* KUSSAKIN, 1988; *I. curtispinis* BRANDT, 1992; *I. decemspinosus* MENZIES, 1962; *I. elongatus* BIRSTEIN, 1963; *I. fragilis* BIRSTEIN, 1971; *I glabra* KENSLEY, 1984; *I. gracilis* CHARDY, 1974; *I. hessleri* KUSSAKIN, 1988; *I. justi* MERRIN & POORE, 2003; *I. latimanus* BIRSTEIN, 1971; *I. magnificus* MENZIES, 1962; *I. multispinis* MENZIES, 1962; *I. norvegicus* SVAVARSSON, 1984; *I. paucispinis* MENZIES, 1962; *I. planus* WOLFF, 1962; *I. profundus* HANSEN, 1916; *I. roseus* WOLFF, 1962; *I. simplex* MENZIES & GEORGE, 1972; *I. simplissimus* MENZIES, 1962; *I. spaercki* WOLFF, 1956; *I. tasmanensis* MERRIN & POORE, 2003; *I. vinogradovi* BIRSTEIN, 1963; *I. wolffi* MENZIES, 1962

Diagnosis

The diagnosis of MERRIN & POORE (2003) is followed here.

3.1.7.1 *Ischnomesus brenkei* n. sp.

Material examined: **Holotype**, male (4.37 mm), Continental slope off Ría de Ferrol, Galicia, Spain, 43°48.587' N, 08°51.402' W – 43°49.545' N, 08°51,197' W, 607 m, station: "EBS 600-03".

Paratype, female (4.85 mm), same locality, station: "EBS 600-03".

Additional material: 4 specimens from same locality as material examined.

Type material will be deposited in the Zoologisches Museum Hamburg (ZMH), Germany.

Distribution

Known only from *locus typicus*: Continental slope off northern Galicia, Spain. Coordinates listed above.

Etymology: Dedicated to the author's friend Dr. Nils Brenke who was participant of the "DIVA-Artabria 1" expedition in 2002 and whose helpful comments are acknowledged hereby.

Diagnosis

Ischnomesus with body almost 6 times longer than wide. Pereonite 1 anteriolaterally with 1 long, laterally with 1 shorter spine. Pereonites 2 and 4 – 6 with lateral, spine-like projection protruding over coxa. Pereonites 1 – 4 with anteriodorsal, pereonites 5 – 7 with posteriodorsal pair of spine-like tubercles. Pereonites 2 – 7 dorsally with irregularly distributed spine-like tubercles, mostly with apical, simple seta. Pleotelson dorsomedially elevated, with a pair of dorsomedial, spine-like tubercles with apical seta posterior of anterior third of pleotelson, shallow dorsomedian carina in posterior half. Lateral margin of pleotelson with 3 shallow tubercles. Mandibular palp absent. Male pleopod 1 3 times as long as wide, widest between divergent, distally produced, blunt distolateral lobes. Male pleopod 2 sympod nearly 3 times as long as wide, laterally and distally rounded, distally with row of simple setae. Exopod distally almost reaching apex of sympod. Endopod with blunt stylet 0.5 times as long as sympod. Female pleopod 2 broadly oval, with shallow median keel, distal margin slightly concave, with a pair of parasagittal tubercles with short, spine-like seta.

Description of male holotype

Body (Plate LX a, b) 4.37 mm long, 5.6 times as long as maximum width of pereonites 1 – 4 (excluding spines), narrowest at anterior half of pereonite 5 at 0.07 times body width. Cuticle moderately calcified and brittle. Head about as long as wide, 0.6 times as wide as pereonite 1, eyeless, fused to and embedded in pereonite 1, peduncles of antenna 1 and 2 dorsally pointing. Pereonites 1 – 7 0.3, 0.2, 0.3, 1.2, 1.8, 0.4, 0.6 times as long as wide. Median lengths of pereonites 1 – 3 similar, with length of pereonite 1 > 2 < 3. Widths of pereonites 1 – 4 similar, with width of pereonite 1 > 2 < 3 = 4. Pereonites 2 – 7 dorsally, pereonites 4 and 5 also laterally with irregularly distributed spine-like tubercles, mostly with apical, simple seta. Pereonites 1 – 4 with anteriodorsal, pereonites 5 – 7 with posteriodorsal pair of spine-like tubercles. Pereonite 1 anteriolaterally with 1 long, laterally with 1 shorter spine. Pereonites 2 and 4 – 6 with lateral, spine-like projection protruding over coxa. 1 short, free pleonite. Pleotelson 0.13 times as long as body, 1.2 times as long as wide, dorsomedially elevated, with a pair of dorsomedial, spine-like tubercles with apical seta posterior of anterior third of pleotelson. Shallow dorsomedian carina in posterior half. Lateral margin convex, with 3 shallow tubercles, posteriolateral margin bulged at insertion of uropods. Uropod not preserved.

Pleopod 1 (Plate LXIV a) 3 times as long as wide, widest between distolateral lobes, evenly tapering along proximal thirds of length to 0.7 times maximum width, distal third posteriorly evenly diverging, strongly cleft between distolateral lobes. Distoateral lobes distally produced, blunt. Distolateral lobe of left side mesially with 1 short, simple, spine-like seta, other setation absent.

Pleopod 2 (Plate LXIV b) sympod 2.8 times as long as wide, laterally and distally evenly rounded, distally with 4 robust, simple setae. Exopod asetose, distally almost reaching apex of sympod. Endopod with blunt stylet tapering only in distalmost quarter of its length. Stylet 0.5 times as long as sympod, 6.6 times as long as wide.

Description of female paratype

Body 4.85 mm, similar to male.

Antenna 1 (Plate LX c, d) incomplete, peduncular articles 1 and 2 and proximal part of article 3 preserved on left side. Peduncular article 1 stout, 1.3 times as long as wide, with 1 simple and 2 broom setae in right antenna 1, with 3 simple setae in left antenna 1. Article 2 slightly curved, 5.5 times as long as article 1, 18.5 times as long as wide, 8, simple setae along longitudinal axis, distalmost longest, distally with 4 simple setae. Article 3 incomplete, slightly narrower than article 2.

Antenna 2 (Plate LX e) peduncular articles 1 – 4 preserved, cylindrical. Article 1 as long as wide, asetose. Article 2 0.8 times as long and slightly narrower as article 1, distally with 4 slender, spine-like setae. Article 3 1.8 times as long as article 2, 1.8 times as long as wide, with 2, distally with 6 slender, spine-like setae. Article 4 0.7 times as long as article 3, 1.3 times as long as wide, distally with 3 slender, spine-like setae.

Mandibles hardly curved mesially, right mandible larger than left, palp absent. Left mandible (Plate LXI a) incisor part with 5 blunt cusps, *lacinia mobilis* with 3 cusps, spine row with 1 simple and 6 serrated spine-like setae. Molar part large, 1.2 times as long as proximal width, distally truncate, ventral margin of triturating surface elevated, mesially ending in acute cusp, dorsal margin elevated, broadly rounded, with 3 hemiplumose setae. Triturating surface slightly concave, with several tubercles and shallow cavities. Right mandible (Plate LXI b) incisor part with 5 blunt cusps, spine row with 1 simple and 7 serrated spine-like setae. Molar part large, 1.2 times as long as proximal width, anteriodistally flattened, posteriodorsal margin of triturating surface with 1 plumose and 4 hemiplumose setae.

Paragnath (Plate LXI c) 0.9 times as long as wide, medial lobes absent. Lateral lobes broadly rounded, proximally with several zones densely covered with small setae, mesially and laterally with many scale setae, distomesial and distolateral margin with many longer, simple setae, apex with 1 simple and 2 serrate, spine-like setae.

Maxilla 1 (Plate LXII a) exopod 4 times as long as wide, mesially and distolaterally with short, transverse rows of 2 – 5 simple setae. Apex (Plate LXII c) with 3 serrate and 11 simple, spine-like setae. Endopod (Plate LXII b) 0.6 times as long as exopod, 2.7 times as long as basal width, mesially curved and distally tapering to blunt apex. Entire lateral margin with evenly spaced, short, transverse rows of 2 – 4 simple setae. Apex with 8 simple, spine-like setae and 2 large, dilated, serrated spine-like setae with unevenly long denticles.

Maxilla 2 (Plate LXII d) exopod with lateral endite (Plate LXII e) distally reaching apex of endopod, 3.1 times as long as wide, laterally and mesially with several short, transverse rows of 3 – 5 simple setae. Apex with 4 pectinate, spine-like setae. Mesial endite (Plate LXII e) 0.9 times as long as lateral, 3.8 times as long as wide, laterally with scattered transverse, short rows of simple setae, apex with 3 pectinate and 1 simple, spine-like setae. Endopod (Plate LXII f) 1.9 times as long as wide, distally rounded, lateral and mesial margin with several short, transverse rows of 2 – 6 simple setae, distal half densely covered with long, simple setae. Proximomesial margin with 2 curved, pectinate, spine-like setae. Distal margin with 1 stout, serrated, 2 stout, pectinate and 5 simple, spine-like setae.

Maxilliped (Plate LXIII a) ventrally with several unevenly distributed scale setae on basis, palp articles 2 and 3 and epipodite. Coxa transverse, 0.3 times as long as wide, 0.14 times as long as basis. Basis 2.3 times as long as wide, widest at proximal half. Lateral margin with incomplete fringe of fine, simple setae. Endite (Plate LXIII b 0.3 times as long as total length of basis, 1.3 times as long as wide, dorsally densely covered with fine, long, simple setae. Distal margin truncate, with 2 simple and 5 pectinate, spine-like setae and 2 fan setae. Palp with 5 articles, 0.8 times as long as basis. Article 1 transverse, 0.4 times as long as wide, lateral margin convex with 1 long and 1 short, simple, spine-like seta. Article 2 longest and widest, 2.1 times as long as article 1, 0.9 times as long as wide, proximal margin narrower than distal, mesial margin convex with 12 distally progressively stronger, simple setae. Distolaterally 1 simple, spine-like seta. Article 3 0.8 times article 2 length, 0.7 times as long as wide, mesial margin convexly enlarged, laterally with 1, distomesially with 4 simple, spine-like setae. Article 4 as long as article 3, 1.9 times as long as wide, mesially pointing, distoventrally with 1, distally with 5 simple, spine-like setae. Article 5 not preserved. Epipodite as long as basis, 2.7 times as long as wide, distally blunt.

Pereopods 1 – 7 broken off distally of basis, except for pereopod 3. Pereopod 3 (Plate LXIII c) slender, 0.8 times as long as body, basis and carpus equally long and longest articles, dorsally flexed between basis and ischium and between ischium and merus. Basis 7.8 times as long as wide, distally with 1 short, simple, spine-like seta. Ischium 0.8 times as long as basis, ventral margin with 3 simple setae, dorsal margin with 2 short, simple, spine-like setae and 1 distodorsal simple seta. Merus 0.6 times as long as ischium, 4.5 times as long as wide, distally widest. Dorsally with 2, ventrally with 3 simple setae. Carpus 2.3 times as long as merus, 13 times as long as wide, dorsal margin with 4 simple setae and 1 distodorsal broom seta, ventral margin with 7 simple setae. Propodus 0.5 times as long as carpus, dorsally with 3, distodorsally with 3, distoventrally with 3 slender, simple setae. Ventral margin with 4 slender, unequally bifid, spine-like setae. Dactylus 0.5 times as long as propodus, 8.5 times as long as wide, distally with 2 simple setae and 1 claw of 0.2 times dactylus length.

Pleopod 2 (Plate LXIV c) broadly oval, 1.2 times as long as wide, with shallow median keel, lateral margin evenly convex, distal margin truncate, slightly concave, with a pair of parasagittal tubercles with short, spine-like seta.

Pleopod 3 (Plate LXIV d) exopod with 1 article, 5.6 times as long as wide, lateral margin with fringe of fine, simple setae and 4 evenly distributed longer, simple setae. Apex narrow, with 1 plumose seta. Endopod subrectangular, distally truncate, 1.6 times as long as wide. Distal margin with 3 plumose setae.

Pleopod 4 (Plate LXIV e) delicate, lobiform, asetose, 1.7 times as long as wide.

Pleopod 5 absent.

Uropod not preserved in this or any other discovered specimen.

Remarks

Due to the pattern of spination, the new species *Ischnomesus brenkei* is easily distinguished from any other Atlantic species of the genus. The combination of two lateral spines on pereonite 1 and one supracoxal spine on pereonites 2 and 4 – 6, a dorsal pair of spine-like tubercles and irregularly distributed, apically setose, spine-like tubercles on each pereonite renders it unlikely to mistake this species for others from the Atlantic that usually have a spination consisting of only a single lateral spine on the pereonites, often only on pereonite 1. Superficially, the spination of the pereon resembles *I. spaercki* WOLFF, 1956, yet the latter has many, distolaterally progressively longer spines on the pleotelson and a completely different male pleopod 1 with long, acute distolateral and short, setose, distomedial lobes. Although absolute body size has to be regarded with caution, it shall be noted that at 16 mm length it is more than three times as long as the largest specimen (the described female paratype) of *I. brenkei* n. sp. Besides, it is known only from hadal depths of the Kermadec Trench in the southern Pacific Ocean. *I. brenkei* n. sp. is also similar to the South West Pacific *I. tasmaniensis* MERRIN & POORE, 2003 in overall pattern of spination on the pereonites. However, the latter has only one pair of lateral spines on pereonite 1 and 3 conspicuous lateral spines on the pleotelson. The male pleopod 1 of *I. tasmaniensis* also has blunt, distolateral lobes that are projecting caudally and the male pleopod 2 is very similar to that of *I. brenkei* n. sp.

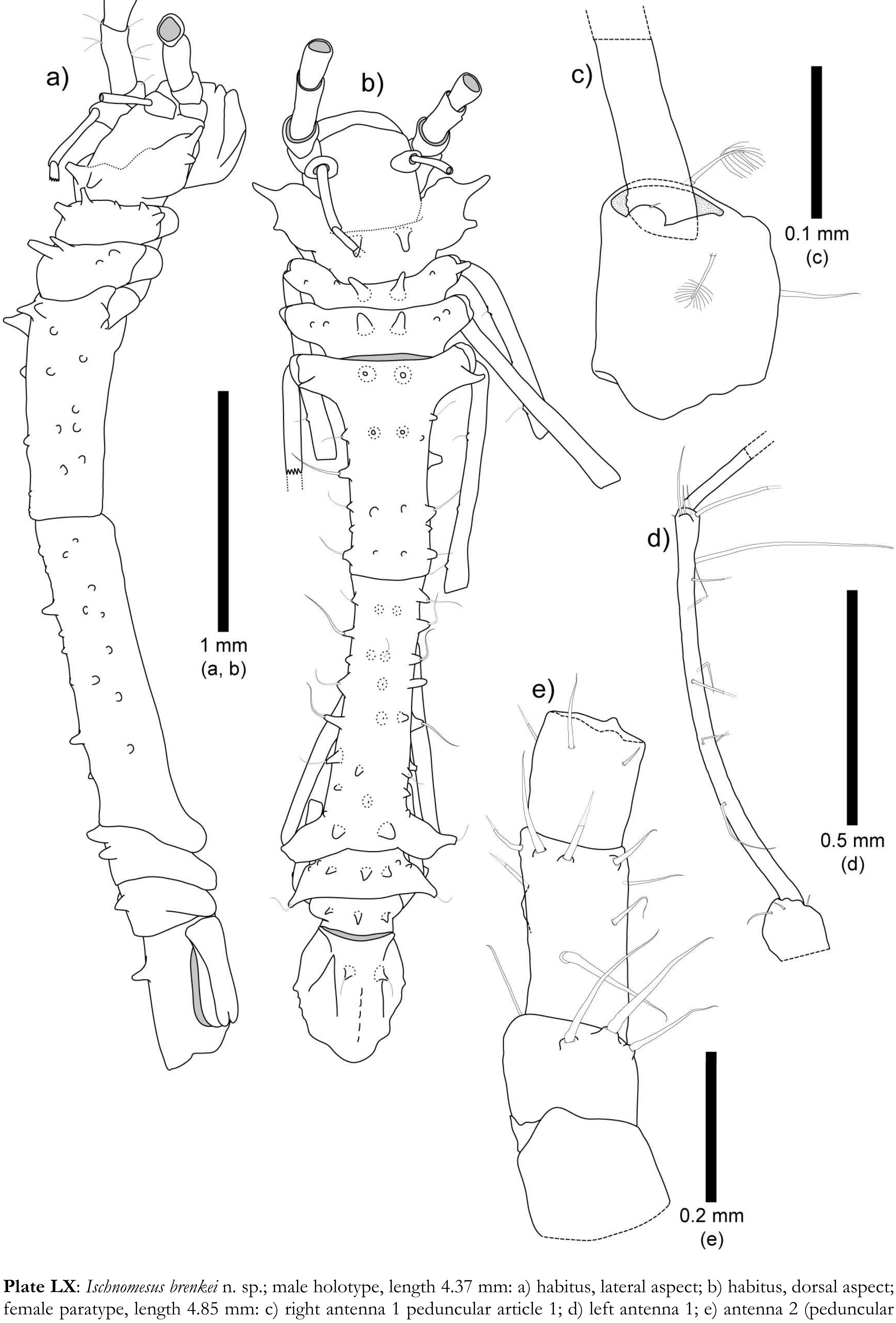

Plate LX: *Ischnomesus brenkei* n. sp.; male holotype, length 4.37 mm: a) habitus, lateral aspect; b) habitus, dorsal aspect; female paratype, length 4.85 mm: c) right antenna 1 peduncular article 1; d) left antenna 1; e) antenna 2 (peduncular articles 1-4)

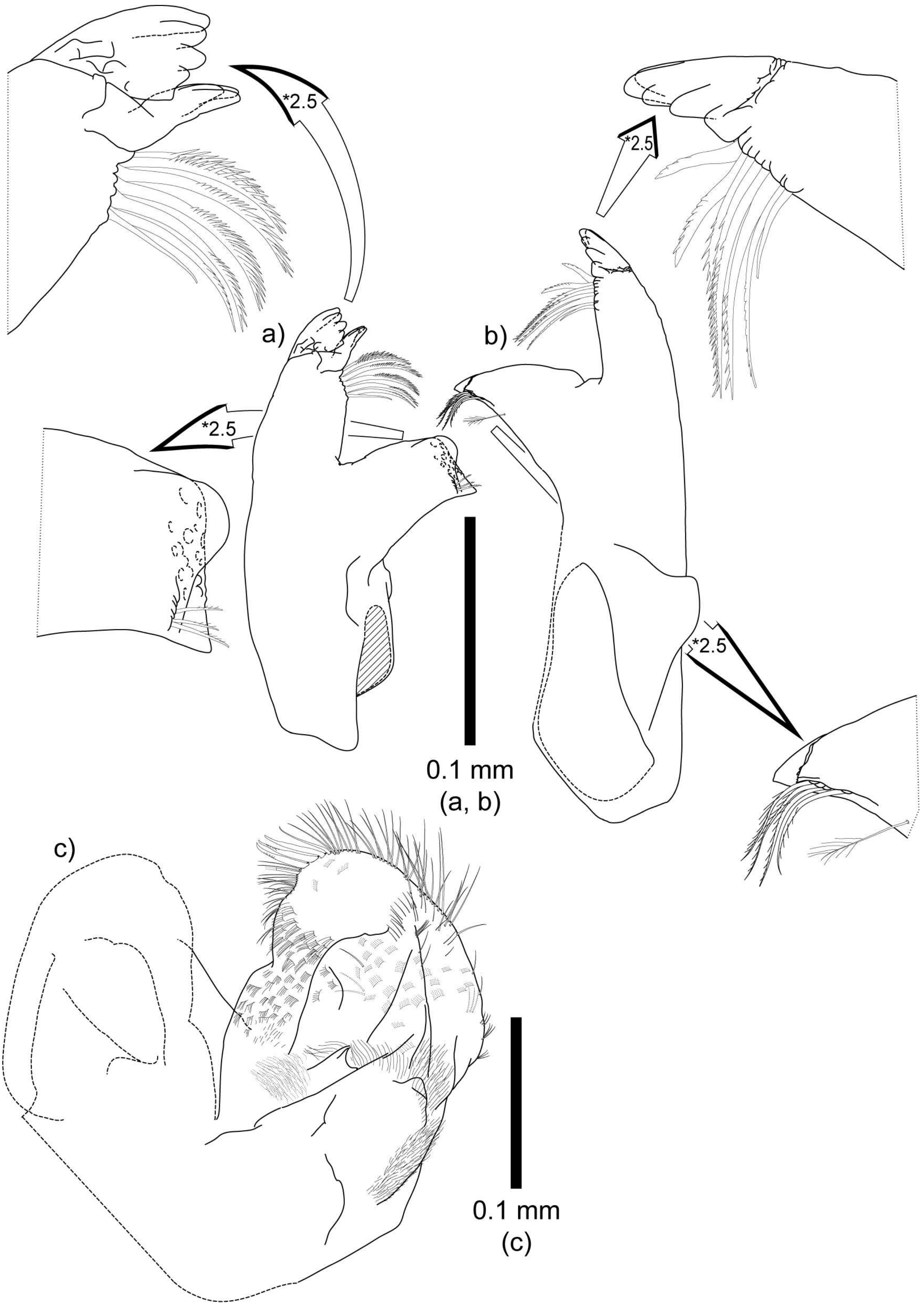

Plate LXI: *Ischnomesus brenkei* n. sp.; female paratype, length 4.85 mm: a) left mandible; b) right mandible; c) paragnath (setation on left side omitted). Numbers in arrows indicate relative factor of magnification

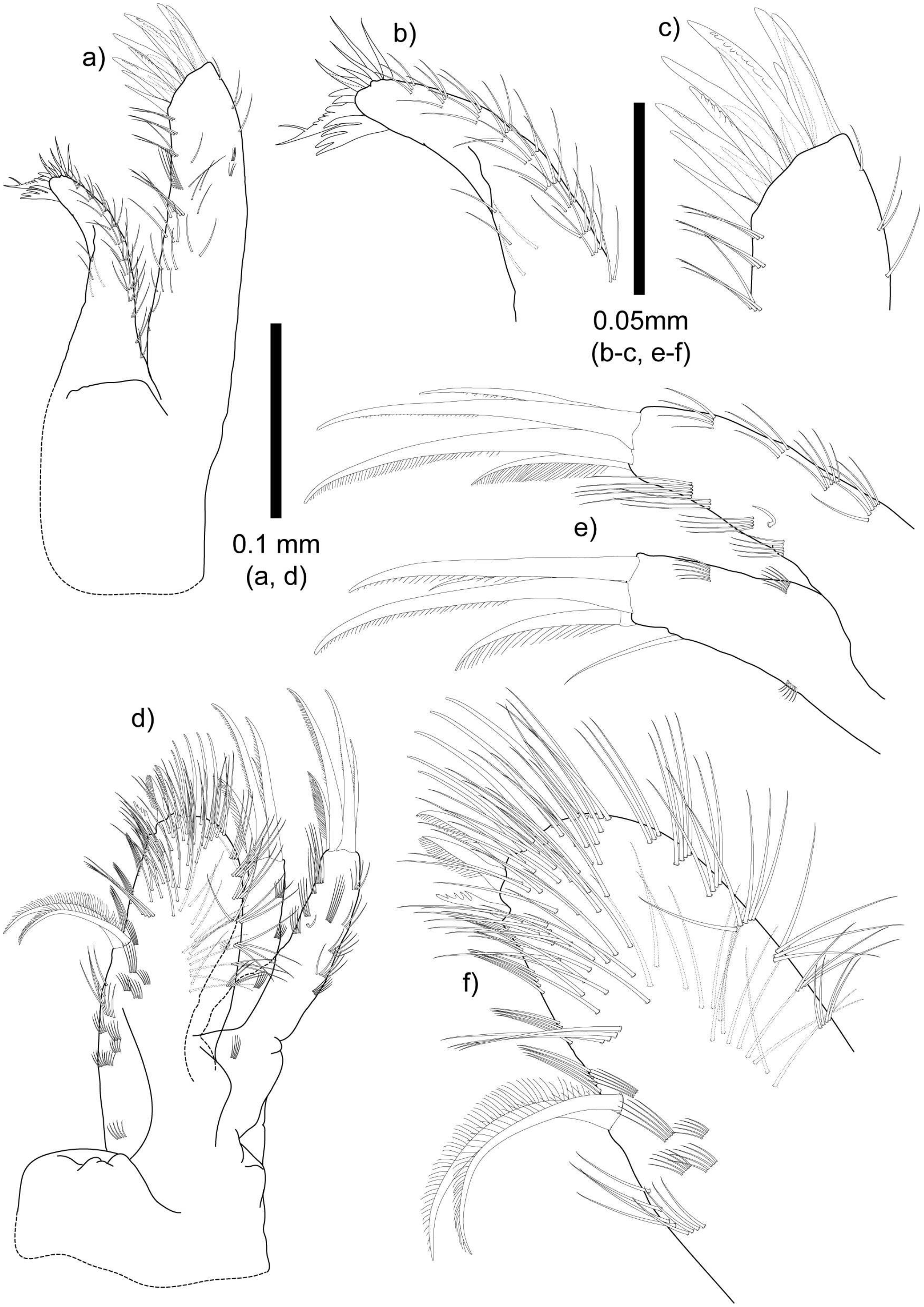

Plate LXII: *Ischnomesus brenkei* n. sp.; female paratype, length 4.85 mm: a) maxilla 1; b) maxilla 1, endopod; c) maxilla 1, exopod; d) maxilla 2; e) maxilla 2 exopod (lateral and mesial endite); f) maxilla 2 endopod

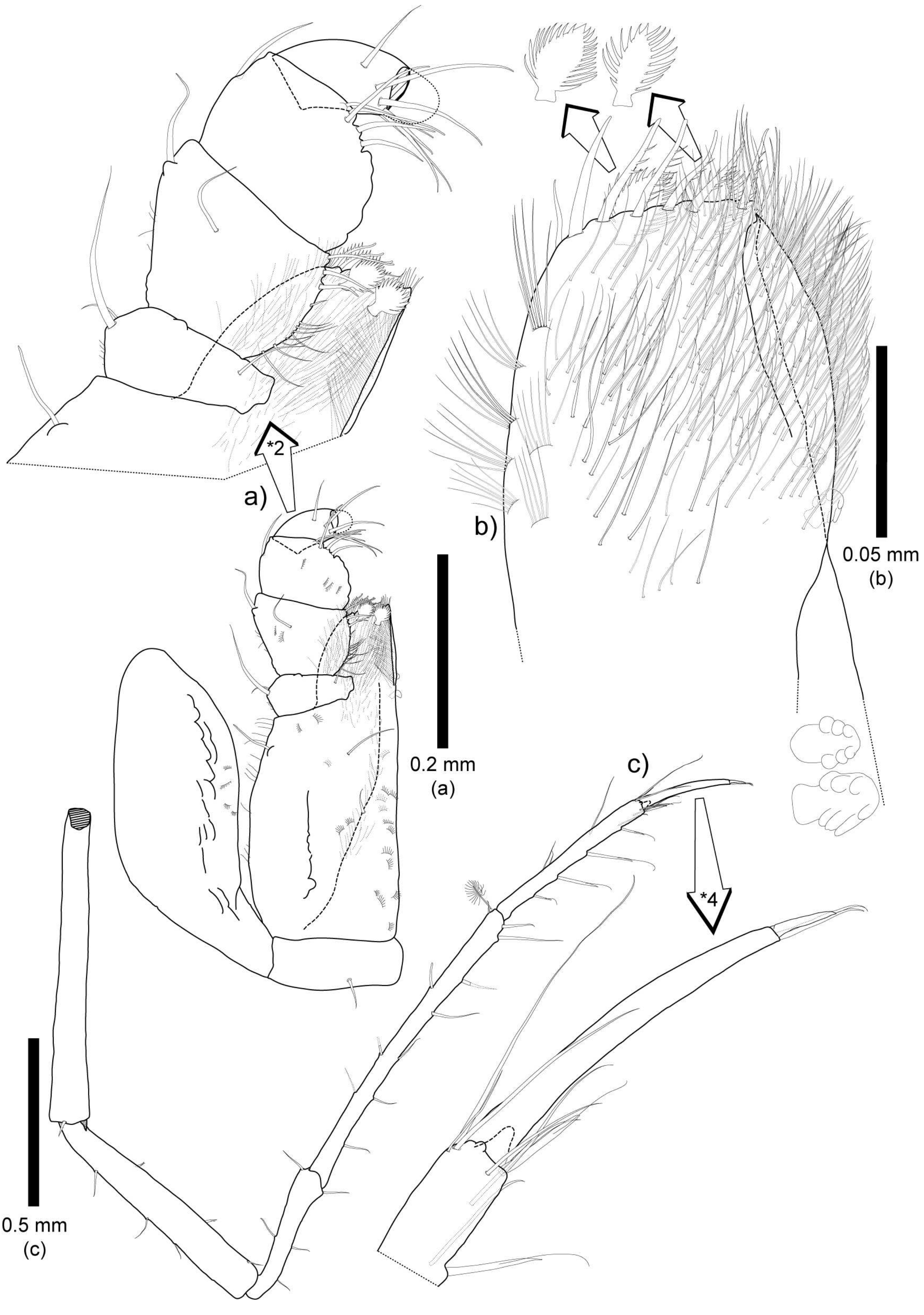

Plate LXIII: *Ischnomesus brenkei* n. sp.; female paratype, length 4.85 mm: a) left maxilliped, ventral aspect; b) right maxilliped endite, dorsal aspect; c) pereopod 3. Numbers in arrows indicate relative factor of magnification

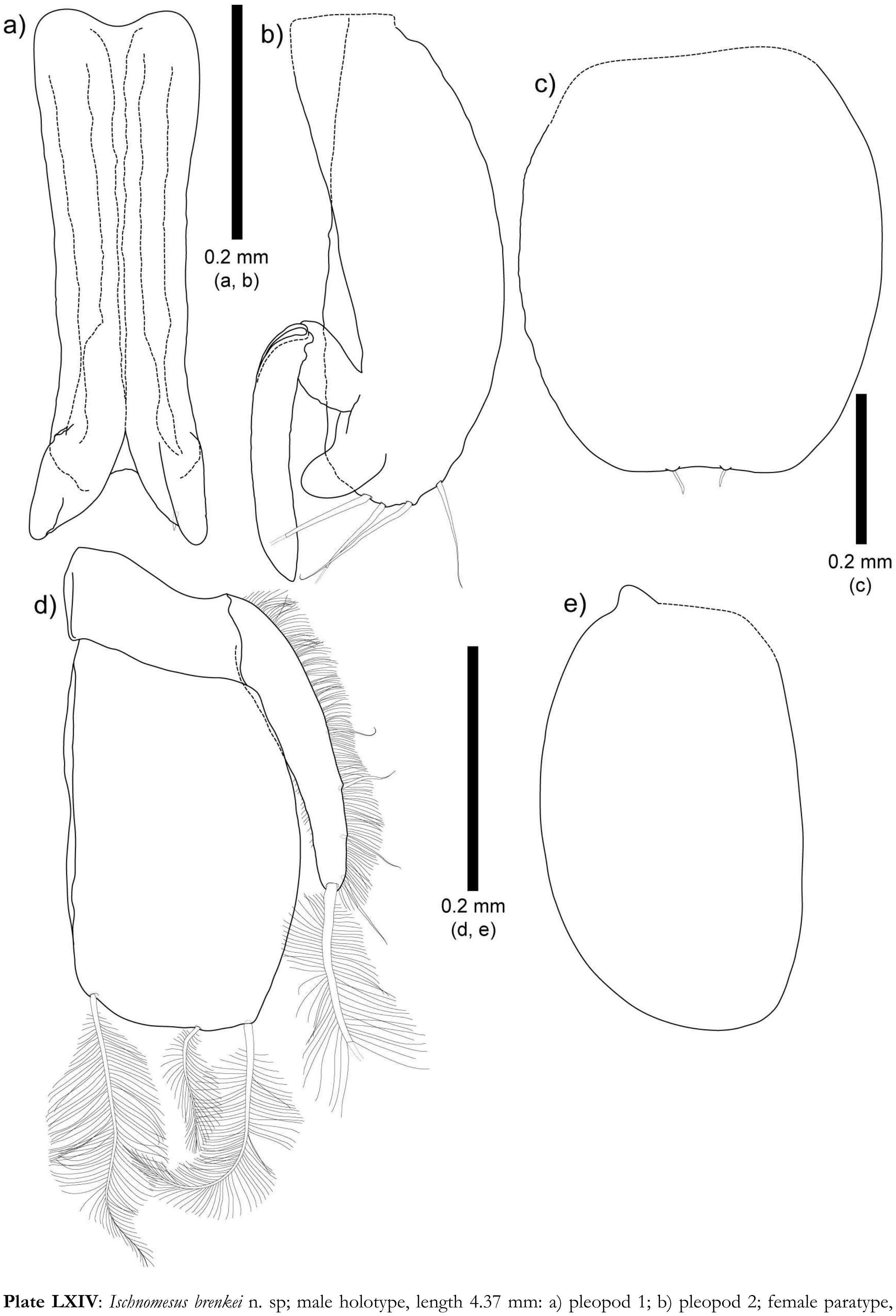

Plate LXIV: *Ischnomesus brenkei* n. sp; male holotype, length 4.37 mm: a) pleopod 1; b) pleopod 2; female paratype, length 4.85 mm: c) pleopod 2; d) pleopod 3; e) pleopod 4

Valvifera SARS, 1882

The Valvifera are characterized by enlarged, flattened uropods that insert more anterolaterally than in other isopods and completely cover the pleopod chamber ventrally (GRUNER 1965).

3.1.8 Arcturidae BATE & WESTWOOD, 1869

The valviferan Arcturidae are characteristic hemisessile suspension feeders (WÄGELE 1989), the Antenna 2 is elongated and is functionally used as a walking limb. Pereopod 1 is reduced in size and serves as an additional mouthpart, pereopods 2 – 4 bear long, setulose filtering setae and form a filtering apparatus for catching plancton, pereopods 5 – 7 are short walking legs that bear strong, curved claws for clutching to e.g. algae. After revision by POORE (2001) the family has been split up with the erection of new families (especially Antarcturidae POORE, 2001) and the remaining Arcturidae *sensu stricto* consist of 148 species (September 2007: SCHOTTE *et al.* 1995 ff.).

Diagnosis: The diagnosis of POORE (2001) is followed here.

Genus *Arcturopsis* KOEHLER, 1911

Type species: *Astacilla giardi* BONNIER, 1896 (designated in KING & POORE 2001).

Species included: *A. giardi* (BONNIER, 1896); *A. mammifer* n. sp.; *A. rudis* KOEHLER, 1911; *A. senegalensis* KOEHLER, 1911

Diagnosis

The diagnosis of KING & POORE (2001) is followed here.

3.1.8.1 *Arcturopsis mammifer* n. sp.

Material examined: **Holotype**, female (5.31 mm), Continental slope off Ría de Ferrol, Galicia, Spain, 43°48.587' N, 08°51.402' W – 43°49.545' N, 08°51,197' W, 607 m, station: "EBS 600-03".

Paratypes, male (7.88 mm), manca 1 (2.51 mm), same locality, station: "EBS 600-03".

74 specimens from same locality as type material.

Type material will be deposited in the Zoologisches Museum Hamburg (ZMH), Germany.

Distribution

Known only from *locus typicus*: Continental slope off northern Galicia, Spain. Stations: "EBS 350-03", "EBS400-02", "EBS 600-03", "AT 600-02", "EBS 800-03", "AT 800-02", "DRN 800-02", "DRN 1000-03", "AT 1000-03", "AT 1000-02" at 350 – 1140 m depth.

Etymology: *mamma* lat.: female breast, *ferre* lat.: to carry, referring to the dorsal pair of tubercles on pereonite 4 resembling a human female breast in lateral view.

Diagnosis

Stout *Arcturopsis* with moderately rugose cuticle, head with one anteromedian and a pair of postocular dorsal tubercles present in all developmental stages. Antenna 2 with two flagellar articles with serrated ventral margin. Midventral structure on pereonite 3 in stage 2 juvenile male straight, triangular in cross-section. Female pereonite 4 anteriorly widest, almost as wide as long, anteriodorsally with a pair of conspicuous tubercles with enlarged, mesially concave base and pointed tip. Pereonite 4 in stage 2 juvenile male about 4.5 times as long as wide. Pleotelson wide, lateral margin convex, posteriolateral margin slightly concave, apex rounded.

Description of female holotype

Body (Plate LXV a, b) 5.31 mm long, stout, cylindrical, length : width = 3.66. Anterolateral margins of head rounded. Head fused with pereonite 1, suture indicated by dorsolateral groove. Eyes rounded, dorsolateral, consisting of ca. 40 – 50 ocelli. Lateral margin of pereonite 1 extended to an angled lobe, anterolaterally overlapping and partially fused with lateral margin of head. Dorsum of head and pereonite 1 with anteromedial, pointed tubercle, a pair of sharply pointed tubercles posterior to eyes, medial, rounded tubercle on pereonite 1. Pereonite 2 and 3 with shallow lateral tubercles, lateral margins extended. Width of pereonite 1 = 2 < 3 < 4. Pereonite 2 width = pereonite 1 width, pereonite 3 1.2 times as wide as pereonite 2. Pereonite 4 widest anteriorly due to lateral expansion, tapering posteriorly, length : width = 1, width : pereonite 3 width = 1.3, length : pereonite 3 length = 4.5. Anterior half with conspicuous pair of dorsal tubercles with pointed tip, base of tubercle oval, length : width = 2.4, medial margin concave. Rounded tubercle on posterior dorsal margin. Pereonites 5 – 7 progressively decreasing in length, inconspicuous paired tubercles, lateral margins with triangular extension. Pleotelson about as long as pereontes 5 – 7 together, sutures of 3 pleonites indicated by dorsal groove, length : width = 1.7. small anterolateral wings, lateral margin posterior to wings convex, posterolateral margin concave, apex rounded.

Antenna 1 (Plate LXVI a) anteriorly hardly surpassing peduncular article 2 of antenna 2, 1 peduncular and 3 flagellum articles. Flagellum distally with 1 aesthetasc, 3 simple setae and 1 broom seta.

Antenna 2 (Plate LXVI b) slender, 0.55 times as long as body, 5 peduncular articles. Peduncular articles 2 – 5 strongly ganulated. Article 3 with 1 simple seta plus 4 distal simple setae, article 4 with 12 plus distally 6 simple setae, article 5 with 18 plus distally 8 simple setae. Flagellum with 2 about equally long articles. Flagellum article 1 distally with 7 simple setae, anterior half of ventral margin serrated. Article 2 with 4 plus 4 distal simple setae and 1 broom seta, entire ventral margin serrated. Claw slender, almost straight, about 0.5 times as long as flagellum article 2. Mouthparts concealed by laterally expanded head and pereonite 1.

Left mandible (Plate LXVI c) incisor part with 3 cusps, *lacinia mobilis* with 3 cusps. Molar part with concave triturating surface, ventral margin with serration consisting of 8 cusps and 1 setulate seta. Right mandible (Plate LXVI d) incisor part with 3 cusps, spine row with 4 denticulate spine-like setae, distalmost with 3 cusps, resembling *lacinia mobilis* of left mandible. Molar part with concave triturating surface, ventral margin smooth, with 1 setulate seta.

Maxilla 1 (Plate LXVII a) exopod with convex lateral margin, dorsally densely setose, several long, simple setae on medial margin. Apex obliquely truncate, with 11 smooth, spine-like setae. Endopod 0.57 times as long and 0.47 times as wide as exopod, with 3 apical, setulate setae.

Maxilla 2 (Plate LXVII b) medial part of exopod with 3, shorter lateral part with 2 setulate setae. Endopod as long as and twice as wide as medial part of exopod, with 12 setulate setae.

Maxilliped (Plate LXVII c) endite apically truncate, with 3 fan setae, medial margin straight, with 3 setulate, spine-like setae and 2 retinacula. Palp 1.2 times as long as basis including endite. Length of palp article 1 < 2 < 3 > 4 > 5. Article 1 without setae. Article 2 ventrally, mesially and laterally with many simple setae. Article 3 ventrally with many simple setae, mesially with 10 long, partially setulose setae. Article 4 mesially with 6 simple setae and 7 long, partially setulose setae, laterally 2 more long, partially setulose setae. Article 5 distally rounded, with 1 simple and 8 long, partially setulose setae. Epipodite 0.7 times as long as basis including endite, 1.35 times as long as wide, oval shaped, entire margin with row of simple setae.

Pereopod 1 (Plate LXVIII a) concealed by laterally expanded head and pereonite 1, flexed between basis and ischium. Basis cylindrical, 3.5 times as long as wide, laterally several scale setae, distally 2 long setae. Ischium 0.5 times as long as basis, medially with several scale setae , 3 long, simple and 2 long, hemiplumose setae, distodorsally 4 long setae. Merus, carpus, propodus and dactylus dorsoventrally flattened. Merus mesially with 3 long, simple setae and 1 long, hemiplumose seta, dorsally 2 long, hemiplumose setae. Carpus 1.9 times as long as merus, mesially with 17 long, hemiplumose setae mostly in pairwise order, dorsally 4 long, hemiplumose setae. Propodus 0.8 times as long as carpus, mesially with 14 long, hemiplumose setae mostly in pairwise order, dorsally 12 long, hemiplumose setae. Dactylus 0.35 times as long as propodus, mesially with 4 long, hemiplumose setae. Claw slender, medially curved, 1.5 times as long as dactylus. Oostegite weakly sclerotized, oval, 0.6 times as long as basis.

Pereopods 2 to 4 about equally long, flexed between carpus and propodus, dactylus absent, cuticle of oostegite, basis, ischium, merus and carpus rugose, hemiplumose setae mostly arranged in pairwise order. Pereopod 2 (Plate LXVIII b) merus with 12, carpus with 16, propodus with 12 long, hemiplumose setae on mesial margin. Pereopod 3 (Plate LXIX a) basis with 8, ischium with 5, merus with 14, carpus with 14, propodus with 16 long, hemiplumose setae on mesial margin. Pereopod 4 (Plate LXIX b) ischium with 6, merus with 13, carpus with 13, propodus with 15 long, hemiplumose setae on mesial margin. Oostegites of pereopod 2 and 3 sclerotized, oval, about 0.1 times as long as basis, anterior margins setose. Oostegite of pereopod 4 anteriorly extended and setulose, *in situ* covering oostegite of pereopod 3, posterior lobe triangular, separated by oblique suture.

Pereopods 5 – 7 (Plate LXX a – c) decreasing in length, flexed between basis and ischium and between propodus and dactylus. Cuticle from basis to carpus rugose, propodus and dactylus smooth, ventral margins of merus to propodus with row of scale setae. basis of pereopod 5 proximally with 4, pereopod 6 with 2, pereopod 7 with 3 broom setae, propodus of pereopod 5 dorsally with 4, pereopod 6 with 6, pereopod 7 with 3 broom setae. Secondary claw immovable, 0.3 times or less than primary.

Uropod (Plate LXX d) 3.3 times as long as wide, ventrally rugose, posteriolateral margin with row of simple setae, posteriorly succeeded by 3 longer setae. Exopod inserting proximally of endopod, caudally reaching to about midlength of endopod, mesial margin convex, with 3 simple setae. Endopod triangular, suture transverse, lateral margin with row of simple setae.

Description of male paratype (stage 2 juvenile male, compare KING & POORE 2001)

Body (Plate LXV c, d) 7.88 mm long, 1.48 times as long as female, cylindrical and slender. Head, anteromedial and postocular tubercles on head and tubercle pereonite 1 as in female. Width of pereonite 1 > 2 > 3 > 4. Pereonite 2 0.9 times as wide as pereonite 1, pereonite 3 0.9 times as wide as pereonite 2, pereonite 4 0.8 times as wide as pereonite 3. Pereonite 3 with straight midventral structure projecting ventrally, sharply triangular in cross-section, length slightly exceeding depth of pereonite 3. Pereonite 4 4.4 times as long as wide, anterior half narrower than posterior, without dorsal tubercles. Pereonites 5 – 7 and pleotelson as in female, pereopod 5 relatively longer in comparison with pereopod 6 and 7.

Pleopod 1 (Plate LXX e) protopod mesially at midlength with 4 coupling hooks, rami equally long, about 5 times as long as wide, exopod with shallow notch at midlength, apically with 4 plumose setae, endopod distomesial margin with row of simple setae, apically with 5 plumose setae.

Pleopod 2 (Plate LXX f) protopod mesially with 4 coupling hooks, rami equally long, evenly widening distally, apices rounded, endopod apically with 5, endopod with 10 plumose setae. *appendix masculina* simple, straight, surpassing endopod by 1/3 of its length. Lateral margin of exopod with row of simple setae.

Description of manca 1

Body (Plate LXV e) 2.51 mm long. Sex indeterminable, head with anteromedial tubercle present but shallow, postocular tubercles fully developed. Pereonite 4 about as long as pereonites 1 – 3 together. Pereopod 7 absent.

Remarks

Unfortunately, the material of the new species contained no mature males. For this reason – and because the generally low percentage of male specimens in the material suggests a sex ratio with females being significantly more numerous than males – a brooding female specimen was designated as a holotype. In *A. giardi* (BONNIER, 1896), the most comprehensively described species so far (KING & POORE 2001), fully mature males have a trifid, strongly curved midventral appendage on pereonite 3 that exceeds 3 times body height, whereas in a stage 2 juvenile male of *A. giardi*, the midventral appendage is of similar length and shape than in the stage 2 juvenile male of *A. mammifer* (KING & POORE 2001). However, any developmental stages of *A. mammifer* can easily be distinguished from *A. giardi*, even as manca 1. *A. mammifer* is generally stouter and shorter, with the dorsal tubercles on the head always conspicuous, especially the postocular pair. In stage 2 males of *A. mammifer*, the width of pereonites is *decreasing* from pereonite 1 to 4. The female of *A. mammifer* has more oval oostegites on pereopod 1 – 3, whereas they are more triangular and elongated in *A. giardi*. The oostegite of pereopod 4 has a posterior lobe with a transverse suture in *A. giardi*, this suture is oblique in *A. mammifer*. The spine-like setae on the exopod of *A. mammifer* are all smooth, they are denticulate in *A. giardi*. The maxilliped of *A. mammifer* has two coupling hooks, only one is present in *A. giardi*. The uropod has a longer exopod in *A. mammifer*, reaching at midlength of the endopod. *A. mammifer* more closely resembles *A. rudis* KOEHLER, 1911 in the general proportions of the body and in the presence of an anteriodorsal pair of conspicuous tubercles (referred to as "horns" in KING & POORE 2001) on pereonite 4 which are exclusively present in these two species. However, whereas the position of these tubercles is the same in both species, their shape is not. They are narrow, acute and pointing anteriolaterally in *A. rudis*, in *A. mammifer* their base covers a much larger area of the dorsum and they are not evenly tapering to the tip which is therefore clearly demarcated. Besides, the body of both sexes is much more rugose in *A. rudis*, the pereonite 4 has wide posteriolateral angles and is therefore much less tapering posteriorly than in *A. mammifer*, besides it is so strongly rugose that it is more reminiscent of the one of *Arcturella dilatata*. The oostegite of pereopod 4 is much wider than in *A. mammifer* and has a convex lateral margin. *A. rudis* has a pleotelson distinctly longer and narrower than A. rudis. In their diagnosis of the genus, KING & POORE (2001) included the male pleopod 1 exopod being laterally notched and bearing three long, proximal setae on posterior face of exopod. The notch is present in *A. mammifer*, the three setae are absent, however. As no copulatory males of *A. mammifer* are known, the new species cannot aid in answering the question whether these setae are typical for the genus or if they merely are a species specific character of *A. giardi*, as they have not been reported from any other species of *Arcturopsis*, yet. No fully mature male specimen was found in the material. As this is a relatively large and highly calcified species, dissection of the female holotype was possible without causing too much damage to the remaining specimen.

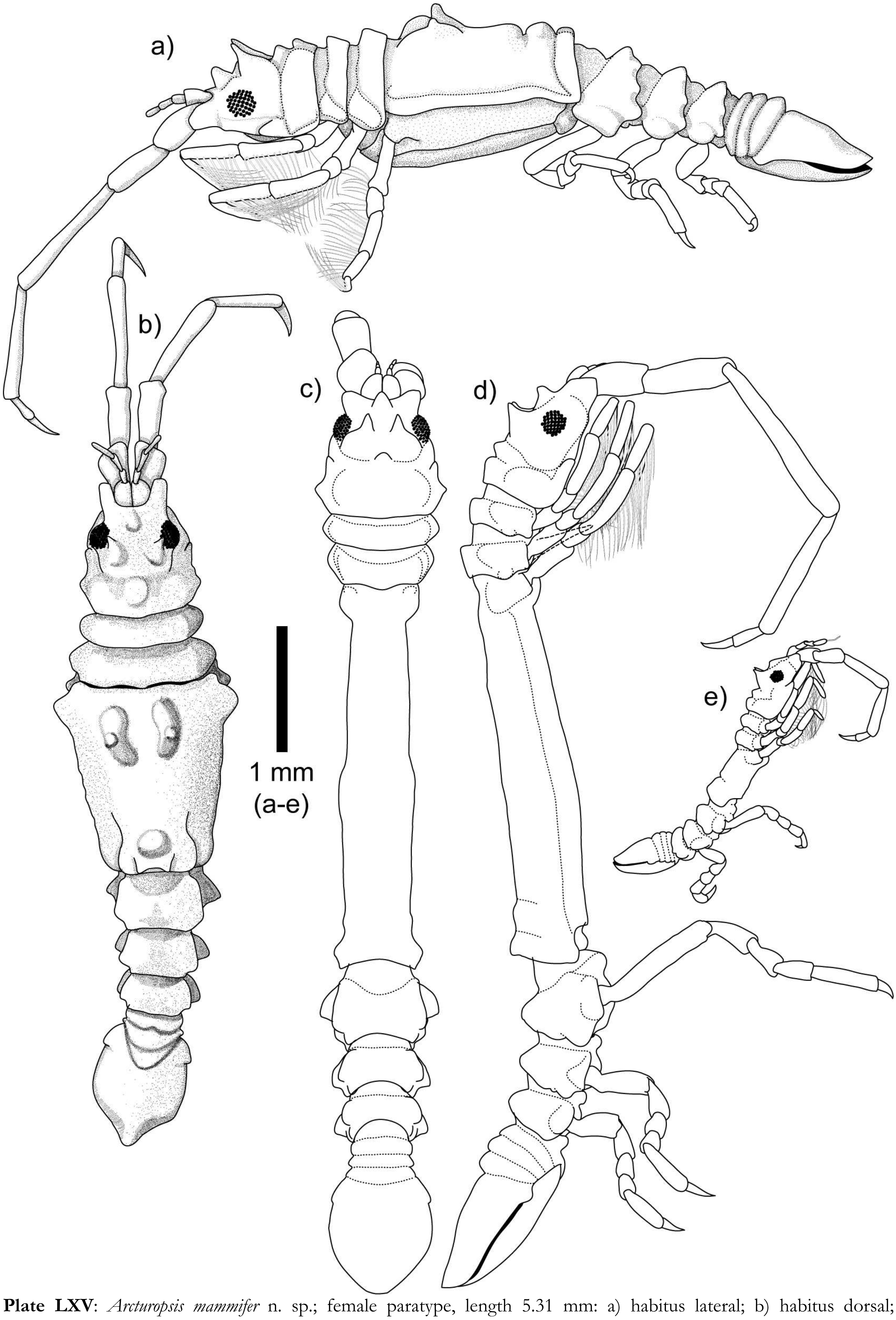

Plate LXV: *Arcturopsis mammifer* n. sp.; female paratype, length 5.31 mm: a) habitus lateral; b) habitus dorsal; male holotype, length 7.88 mm: c) habitus dorsal; d) habitus lateral; manca 1 paratype, length 2.51 mm: e) habitus lateral

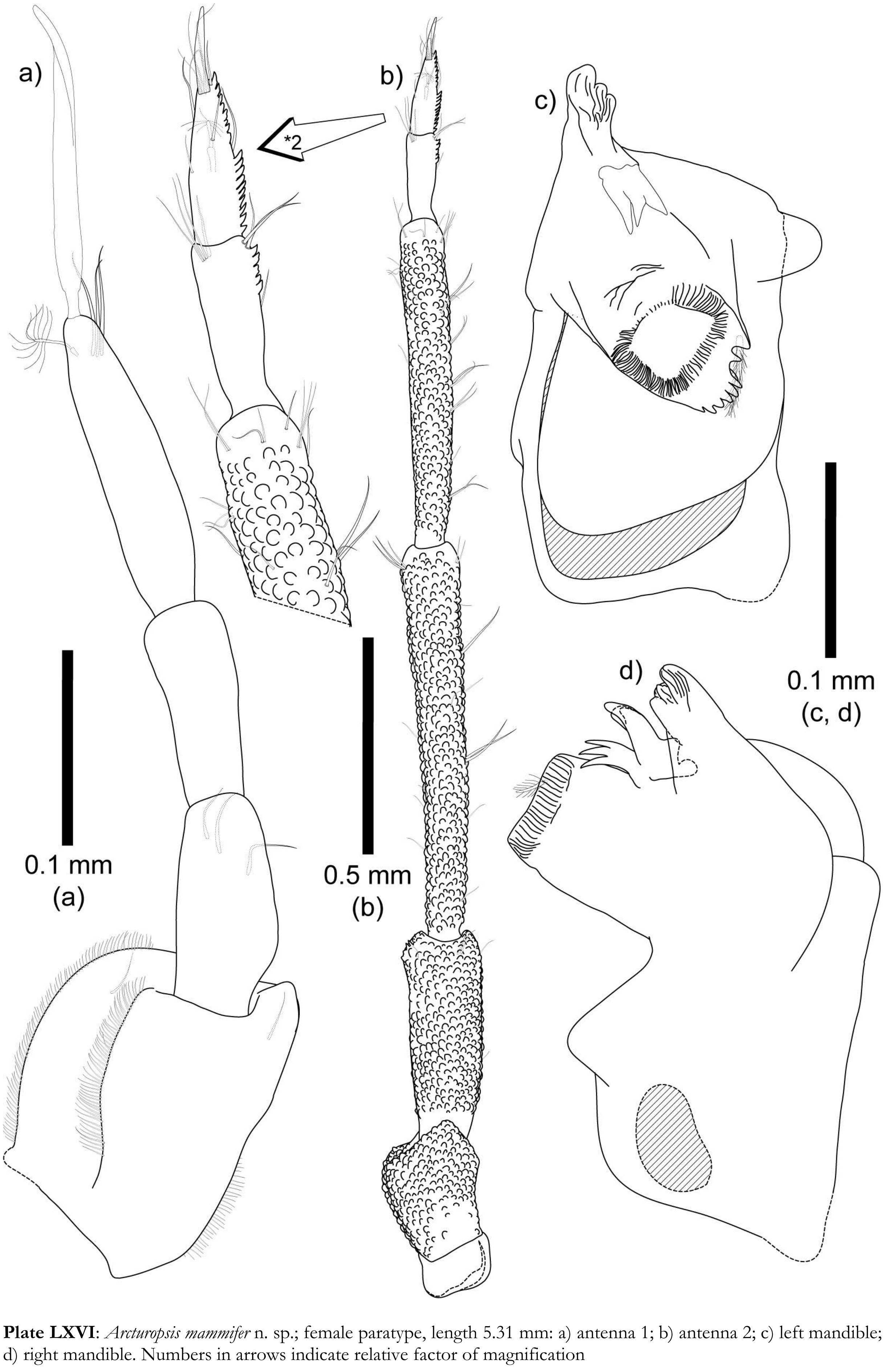

Plate LXVI: *Arcturopsis mammifer* n. sp.; female paratype, length 5.31 mm: a) antenna 1; b) antenna 2; c) left mandible; d) right mandible. Numbers in arrows indicate relative factor of magnification

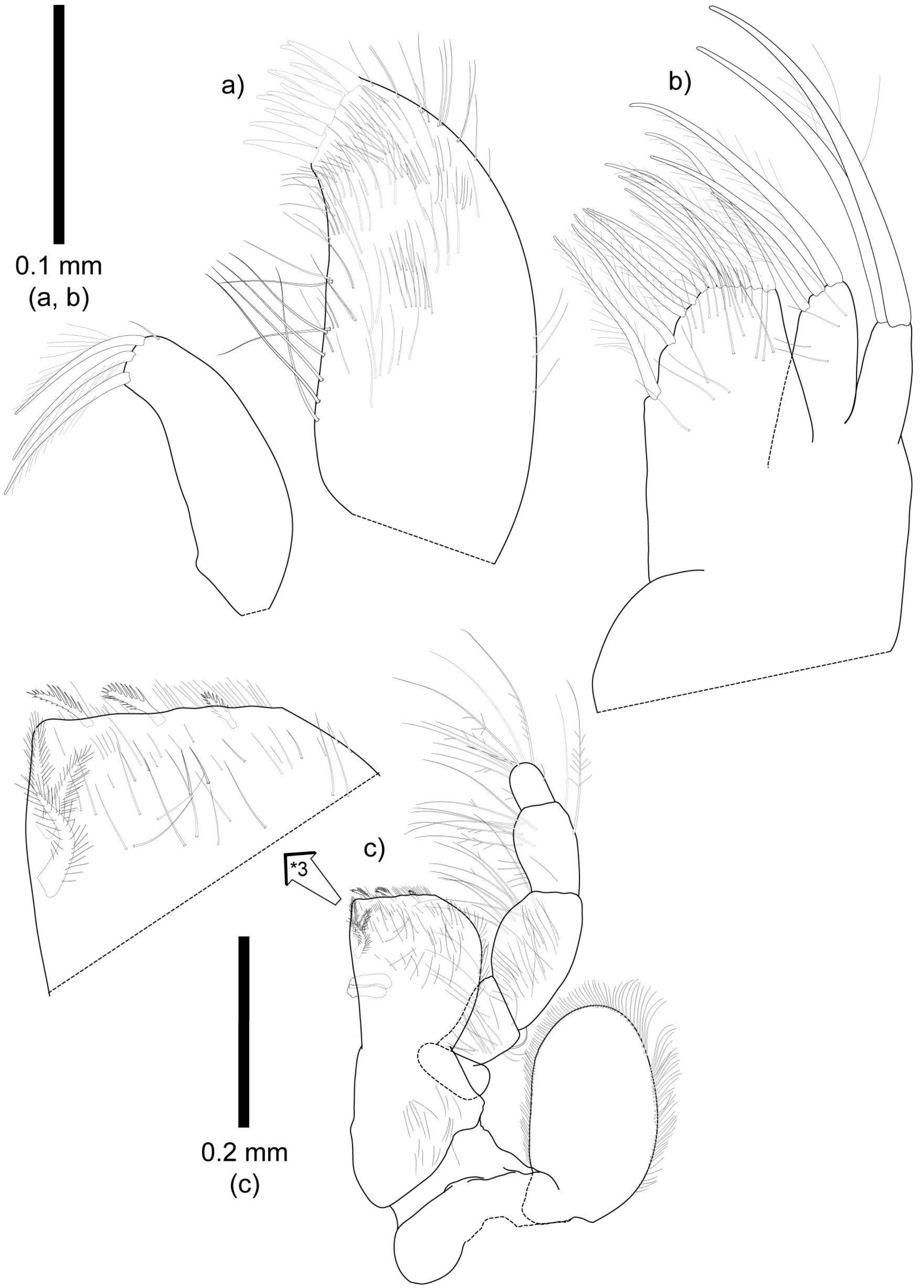

Plate LXVII: *Arcturopsis mammifer* n. sp.; female paratype, length 5.31 mm: a) maxilla 1; b) maxilla 2; c) maxilliped. Numbers in arrows indicate relative factor of magnification

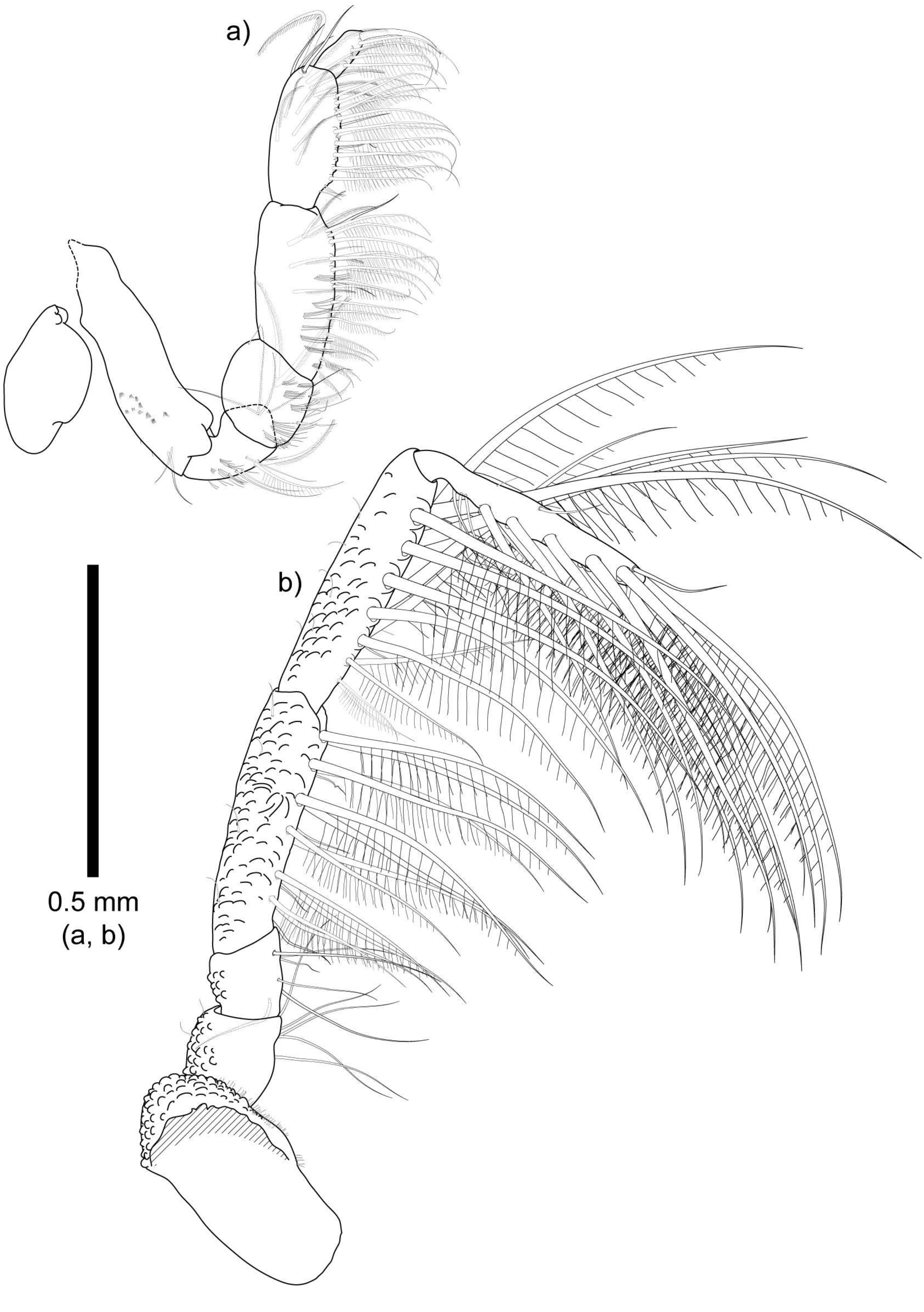

Plate LXVIII: *Arcturopsis mammifer* n. sp.; female paratype, length 5.31 mm: a) pereopod 1; b) pereopod 2

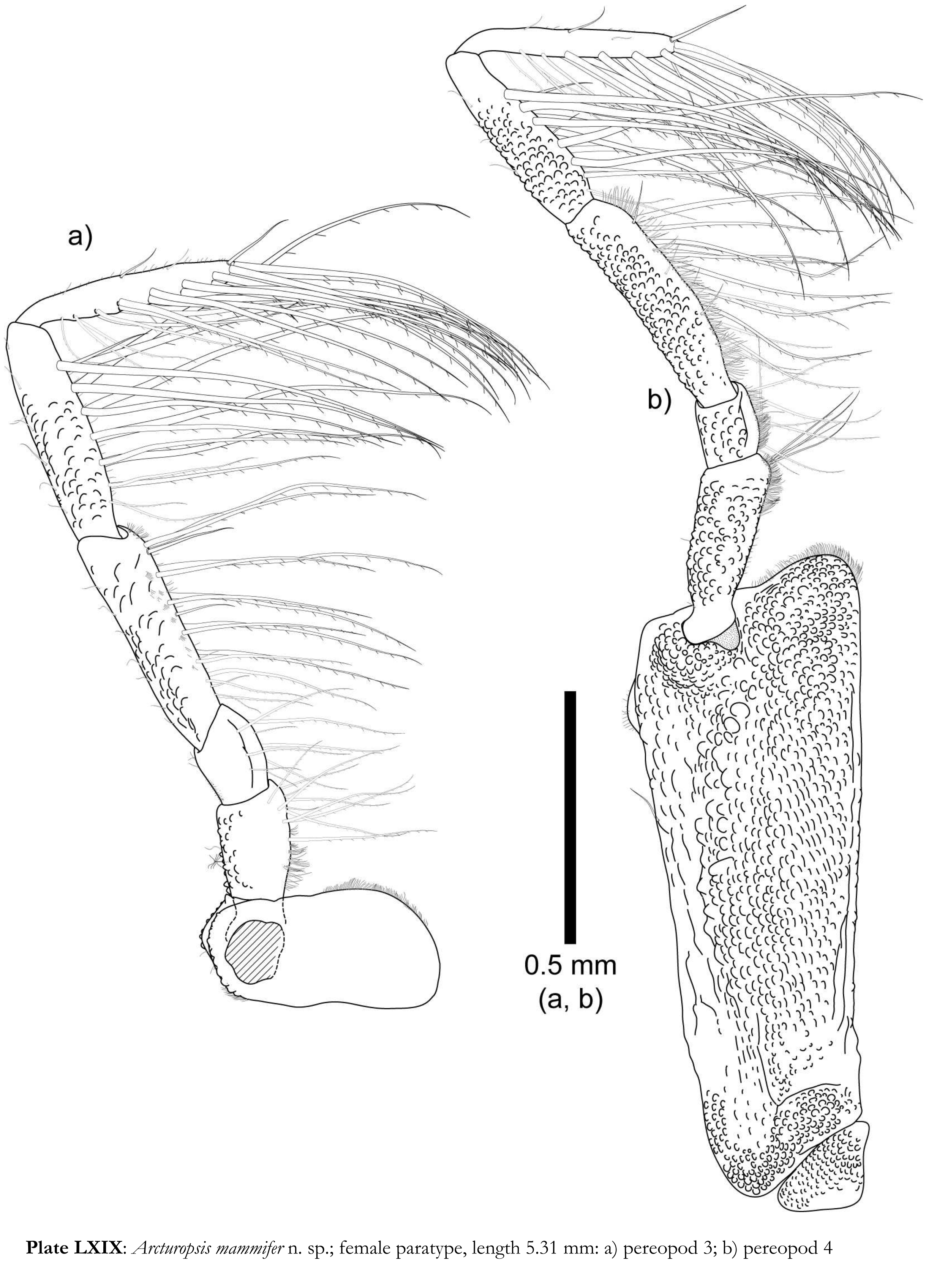

Plate LXIX: *Arcturopsis mammifer* n. sp.; female paratype, length 5.31 mm: a) pereopod 3; b) pereopod 4

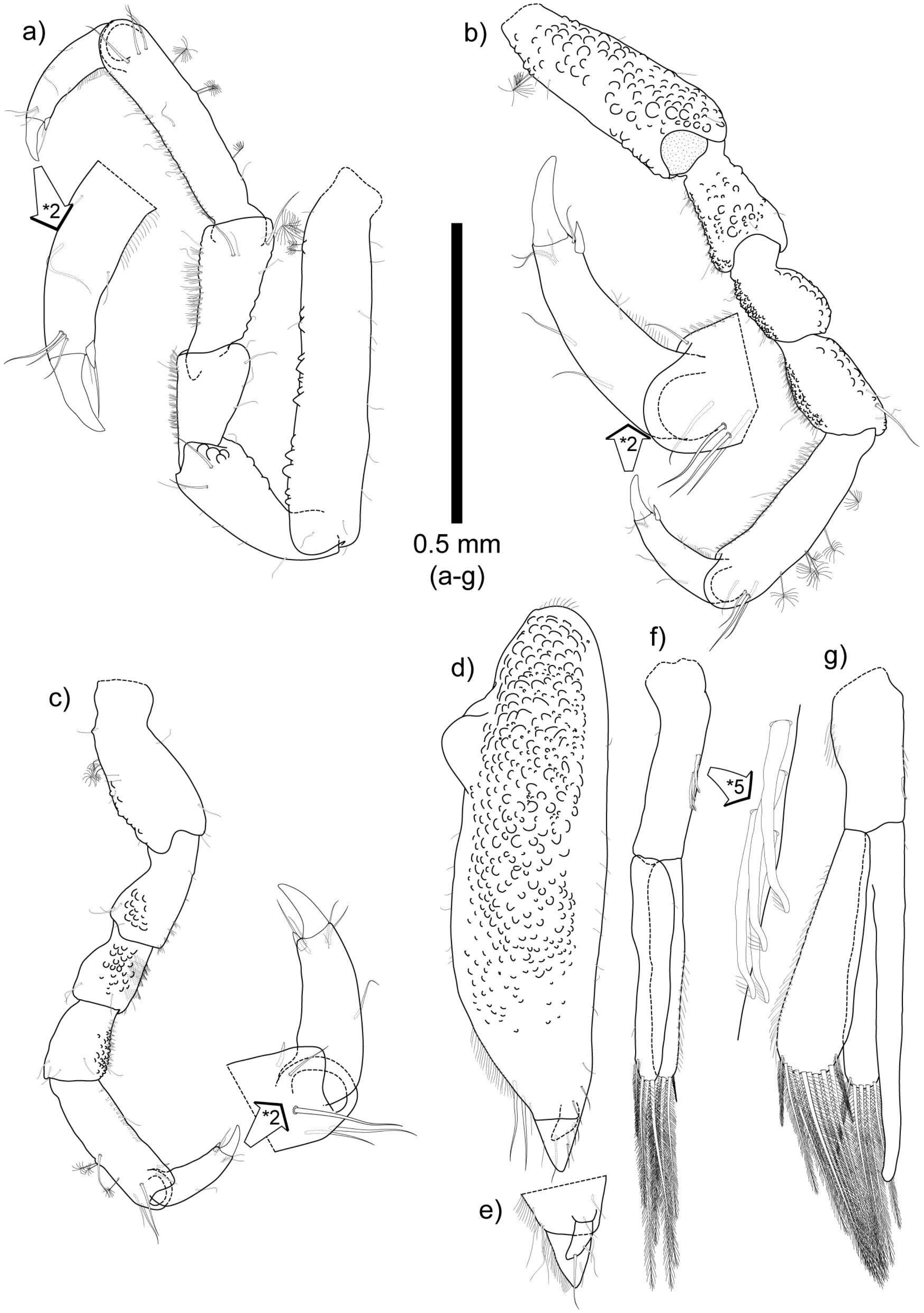

Plate LXX: *Arcturopsis mammifer* n. sp.; female paratype, length 5.31 mm: a) pereopod 5; b) pereopod 6; c) pereopod 7; d) right uropod, ventral aspect; e) apex of left uropod, dorsal aspect; male holotype, length 8.31 mm: f) pleopod 1; g) pleopod 2. Numbers in arrows indicate relative factor of magnification

Suborder Cymothoidea DANA, 1852

The Cymothoidea in its present constellation (MARTIN & DAVIS 2001) represent the remainder of the paraphyletic (BRUSCA & WILSON 1991) Flabellifera Sars, 1882 after separation of the Sphaeromatidea Wägele, 1989. According to WÄGELE (1989) Cymothoidea include the Gnathiidea Hansen, 1916 based on the recognition of *Protognathia bathypelagica* (SCHULTZ, 1977) as representing a family (Protognathiidae WÄGELE & BRANDT, 1988) morphologically transitional between Gnathiidae and Cirolanidae.

3.1.9 Family Cirolanidae DANA, 1852

The Cirolanidae are carnivorous (mostly scavenging) Cymothoidea DANA, 1852 of conservative habitus (oval body outline, uropods and telson forming a tail fan, all pleopods similar), they are more distributed in the neritic zone although some deep-sea species have been reported (WÄGELE 1989), the best known example being the giant species *Bathynomus giganteus* MILNE EDWARDS, 1879. So far, 457 species are known (September 2007: SCHOTTE *et al.* 1995 ff.).

A recent diagnosis was provided by BRUSCA, WETZER & FRANCE (1995) and is followed here.

Genus *Metacirolana* KUSSAKIN, 1979

Metacirolana NIERSTRASZ, 1931: 147; KUSSAKIN 1979: 212 – 213; BRUCE 1981: 950; 1986: 31; KENSLEY 1984: 33; BRUSCA & IVERSON 1985: 36; KENSLEY & SCHOTTE 1989: 153; BRUSCA *et al.* 1995: 64 – 68.
Paracirolana NIERSTRASZ, 1931: 147.

Type species: *Metacirolana japonica* (HANSEN, 1890)

Species included: *M. agaricicola* KENSLEY, 1984; *M. agujae* MÜLLER, 1991D; *M. anatola* BRUCE, 1986; *M. anocula* (KENSLEY, 1984B); *M. arnaudi* KENSLEY, 1989; *M. basteni* (BRUCE, 1980D); *M. bicornis* (KENSLEY, 1978C); *M. calypso* BRUSCA, WETZER & FRANCE, 1995; *M. convexissima* (KENSLEY, 1984B); *M. costata* NUNOMURA, 1999B; *M. fishelsoni* (BRUCE & JONES, 1978); *M. fornicata* (MEZHOV, 1981); *M. halia* KENSLEY, 1984A; *M. hanseni* (BONNIER, 1896); *M. japonica* (HANSEN, 1890); *M. joanneae* (SCHULTZ, 1966A); *M. mayana* (BOWMAN, 1987); *M. mbudya* BRUCE, 1981C; *M. menziesi* KENSLEY, 1984A; *M. monodi* (JONES, 1976); *M. nana* (BRUCE, 1980D); *M. neocaledonica* BRUCE, 1996A; *M. pigmentata* MÜLLER & SALVAT, 1993; *M. ponsi* JAUME & GARCIA, 1992; *M. riobaldoi* (LEMOS DE CASTRO & LIMA, 1976); *M. rotunda* (BRUCE & JONES, 1978); *M. rugosa* (BRUCE, 1980C); *M. serrata* (BRUCE, 1980B); *M. spinosa* (BRUCE, 1980C)

Diagnosis

The diagnosis of BRUSCA *et al.* (1995) is followed here.

Remarks

According to BRUSCA *et al.* (1995), NIERSTRASZ (1931), who originally erected the genus (for *M. japonica* and *M. hanseni*) cannot remain the valid author of the genus by having not designated a type species. Instead they credit KUSSAKIN (1979) as valid author for *Metacirolana* for his designation of *M. japonica* as type species. BRUCE (1986) only noted Kussakin's designation of the holotype, without deviating from NIERSTRASZ' authorship. According to ICZN article 13.3.1 the switch of authorship is correct in this case, even though KUSSAKIN himself (1979) credited NIERSTRASZ as author. According to ICZN article 12.1 the authorship of Nierstrasz would only have been retained if his original description had been *prior* to 1931, which was not the case. For correctness, BRUSCA *et al.* are followed in this case, but it is still suggested that a decision by the ICZN to retain NIERSTRASZ'S authorship should be made here, as that of KUSSAKIN would have been unintentionally and that of NIERSTRASZ was not questioned for more than six decades.

3.1.9.1 *Metacirolana hanseni* (BONNIER, 1896)

Eurydice polydendrica NORMAN & STEBBING, 1882: 665, 684 (nom. nud.).
Cirolana hanseni BONNIER, 1896: 574; HANSEN, 1905: 353 – 355, Pl. 33, Fig. 4, Pl. 34, Fig. la – 1k; 1916: 165; MONOD, 1930: 145; GURJANOVA, 1932: 81, Pl. XXXI, 124.
Metacirolana hanseni NIERSTRASZ, 1931; KUSSAKIN 1979: 214 – 216.

Material examined: male (4.51 mm), Continental slope off Ría de Ferrol, Galicia, Spain, 43°53.575' N, 08°56.868' W – 43°54.015' N, 08°56.959' W, 970 m, station: "DRN 1000-03".
Additional material: 53 specimens from same locality as examined material.

Distribution
North East Atlantic: Golfe de Gascogne (BONNIER 1896), continental slope of northern Galicia (this study, stations: "DRN 1000-03", "AT 1000-03", "AT 1000-02" at 350 – 1140 m depth), between Scotland and Faroes (HANSEN 1905), South West of Faroes (HANSEN 1916); Scotland (TATTERSALL 1905).

Diagnosis
Metacirolana with body slightly more than 2.5 times longer than wide. Lateral margins of pereonites 2 – 7 convex, resulting in uneven body outline. Pleon distinctly set off from pereon by narrow pleonite 1, width of pleonite 1 < 2 < 3 > 4 > 5. Pleotelson devoid of tubercles or carinae, concave at insertion of uropod, about as long as wide, distal margin evenly rounded with irregular shallow denticles. Antenna 1 *in situ* posteriorly reaching anterior margin of pereonite 2. Antenna 2

about 1.5 times as long as antenna 1. Male pleopod 2 with *appendix masculina* about 1.3 times as long as endopod. Maxillipedal palp article 1 article 3 proximally 1.5 times as wide as article 4. Uropod sympod with distomedial projection distally not reaching midlength of endopod. Exopod length : width = 3.7 Endopod surpassing exopod, length : width = 2.3.

Redescription of male

Body (Plate LXXI a, c) 4.51 mm long, length : width = 2.6, length : depth = 5.1. Dorsum ornamented with chromatophore pattern. Head about as long as pereonite 1, without dorsal tubercles or carinae, rostrum short and blunt, concealed in dorsal aspect. Clypeus (Plate LXXI b) distally widest, lateral and distal margins concave. Eyes well developed, consisting of about 25 ocelli. Pereonite 1 about 1.3 times as long as pereonite 2, lateral margin finely serrate. Pereonites 2 – 7 subequally long, lateral margins convex, resulting in uneven body outline especially at pereonites 5 – 7, coxal plates laterally finely serrate, pereonite 7 with blunt distolateral projection. Coxal plates of pereonites 4 – 7 with oblique carina. Pleon set off from pereon by narrow pleonite 1. Width of pleonite 1 < 2 < 3 > 4 > 5. Pleotelson about as long as wide, lateral margin concave at insertion of uropod, distally broadly rounded and worn, devoid of dorsal tubercles.

Antenna 1 (Plate LXXII a) about 0.25 times body length, *in situ* posteriorly almost reaching posterior margin of pereonite 1. Peduncular article 1 stout, almost as wide as long, distally with 5 short, simple setae. Article 2 cylindrical, about 1.3 times as long as article 1, length : width = 2.5, distally with 2 simple and 1 broom seta. Article 3 as long as article 2, narrower, distally with 3 long, simple setae. Flagellum with 7 articles, slightly shorter than peduncle, articles progressively tapering. Article 1 short, article 2 longest, 1.3 times as long as peduncular article 3, article 3 0.5 times as long as article 2, article 4 0.7 times as long as article 3, distally with 1 aesthetasc, articles 5 – 7 short, article 5 distally with 3, articles 6 and 7 distally with 1 aesthetasc, article 7 distally with 1 long, simple seta.

Antenna 2 (Plate LXXII b) about 1.5 times as long as antenna 1. Peduncular article 1 stout, rugose. Article 2 stout, with irregular cuticular carinae, distolaterally with 2 simple setae. Article 3 as long as articles 1 and 2 combined, distal half with shallow, transverse cuticular carinae, mesially 1 broom seta, distally 1 broom and 3 simple setae. Article 4 narrower and 1.2 times as long as article 3, distally with 1 broom and 6 simple setae. Flagellum with 12 articles, progressively tapering, distally with 2 – 5 simple setae. Article 1 2 times as long as article 2, article 12 0.5 times as long as article 11.

Labrum (Plate LXXII c) transverse, more than 2 times as wide as long, distomedially with 9 short, spine-like setae.

Left mandible (Plate LXXIII a) with 3, right mandible (Plate LXXIII b) with 4 cusps. Ventralmost cusp of mandible 4 smallest. Left mandible with spine row consisting of 10 simple, spine-like setae, right mandible with spine row consisting of 10 simple and 5 serrate, spine-like setae. Molar part dorsoventrally flattened, elongatedly oval, anterior margin crenulate with 15 acute denticles on left and 21 on right mandible. Palp slightly shorter than mandible body, with 3 articles. Article 1 asetose, about 2 times as long as wide. Article 2 2.5 times as long as article 1, distolaterally with 3 simple, 1 pectinate, 1 hemiplumose, and 7 plumose, spine-like setae. Article 3 0.3 times as long as article 2, distally with 3 hemiplumose, spine-like setae.

Maxilla 1 (Plate LXXIV a) exopod massive, length : width = 1.71, mesially curved, distally obliquely truncate, with 2 simple, 1 serrated and 7 forked, spine-like setae. Endopod 0.5 times exopod length, length : width = 2.5, distally rounded with 1 small denticle, 2 simple setae and 3 robust, circumplumose, spine-like setae.

Maxilla 2 (Plate LXXIV b) exopod with lateral and mesial endite not separated in proximal third. Lateral endite longer, distally obliquely truncate, with 1 simple and 2 hemiplumose, spine-like setae. Mesial endite mesially with 1 hemiplumose, distally with 1 simple and 2 hemiplumose, spine-like setae. Endopod short, slightly broader than basis of exopod, distally truncate with 2 simple, 3 hemiplumose, 2 distally plumose and 3 robust, circumplumose, spine-like setae.

Maxilliped (Plate LXXV a) coxa about 3 times as long as basis without endite. Basis mesially with 1 simple seta. Endite 0.3 times as wide as rest of basis, distally rounded, reaching at midlength of mesial margin of palp article 1, mesially with 1 coupling hook, distally with 1 simple seta and 1 long, hemiplumose seta. Palp article 1 distally widening to 1.5 times basis width, mesially with 3, distolaterally with 1 simple seta. Article 2 as wide as article 1, mesially with 6, laterally with 3 simple setae. Article 3 0.6 times as wide as article 2, with rounded, mesially and distolaterally with 1 simple seta, projecting distomesial lobe with 4 simple and 2 hemiplumose setae. Article 5 0.6 times as wide as article 4, laterally with 1 simple seta, distally rounded, with 4 simple and 2 hemiplumose setae.

Pereopods 1 – 7 (Plate LXXV b – d; Plate LXXVI a – d) of similar length, with progressively narrower ischii to dactyli from 1 to 7. Bases with lamellate seam and 0 – 6 broom setae (0, 1, 3, 3, 4, 6).

Pleopods 1 – 5 (Plate LXXVII a – e) sympods mesially with 0 – 4 coupling hooks (4, 3, 3, 3, 0), sympods of pleopod 1 – 3 distomesially with 1 plumose, spine-like seta. Sympod of pleopod 4 distomesially with 1 spine-like seta. Sympods of pleopods 1 – 5 distolaterally with 1 spine-like seta, pleopod 1 – 2 lateral margin with rows of fine setae, pleopod 3 lateral margin with fringe of fine setae. Exopods distally progressively stronger rounded from pleopod 1 to 5, slightly surpassing exopods, distally with 14 – 24 plumose setae (14, 23, 24, 22, 14). Endopods of pleopods 1 – 4 distally with 6 – 14 plumose setae (9, 14, 11, 6). *Appendix masculina* about 1.3 times as long as endopod of pleopod 2, straight with acute apex. Endopod of pleopod 5 asetose.

Uropod (Plate LXXVII f) rami *in situ* not reaching distal margin of pleotelson, sympod with distomedial projection distally not reaching midlength of endopod, with 4 short, plumose setae. Exopod length : width = 3.7, distally tapering, entire lateral and distal half of mesial margin crenulate, distally with 2 denticles and 3 long, simple setae. Endopod surpassing exopod, about 2.3 times longer than wide. Lateral margin nearly straight, crenulate, with 4 short, plumose setae. Apex worn. Mesial margin convex, crenulate with 9 plumose setae.

Remarks

Metacirolana hanseni is easily distinguished as it is the only species of the genus known to occur in the North Atlantic. It is generally similar to the type species, *M. japonica* (HANSEN, 1890), but has a distally broader clypeus and a pleotelson with the lateral margin being embayed at the insertion of uropods and devoid of dorsolateral carinae and distal plumose setae which are present in *M. japonica*. It also has a longer antenna 1 but shorter antenna 2 than *M. japonica* and a narrower uropodal endopod.

BRUSCA *et al.* (1995) discuss the presence of an accessory tooth medially to the incisor part of the right mandible to be a possible unique character for *Metacirolana*. This character can be confirmed for *M. hanseni*. In the material of "DIVA-Artabria 1", the species occurs at stations of 970 – 1140 m depth and was not found at shallower stations, which yielded other cirolanid species. According to KUSSAKIN (1979) the bathymetric range of *M. hanseni* is 370 – 1000 m. The specimen examined for the redescription shows a colour pattern which should not be regarded as a character of any taxonomic value, as it is apparently subject to high intraspecific variation. Other specimens from the same stations showed colour patterns varying within a broad range from almost uniformly dark to completely lacking any chromatophores.

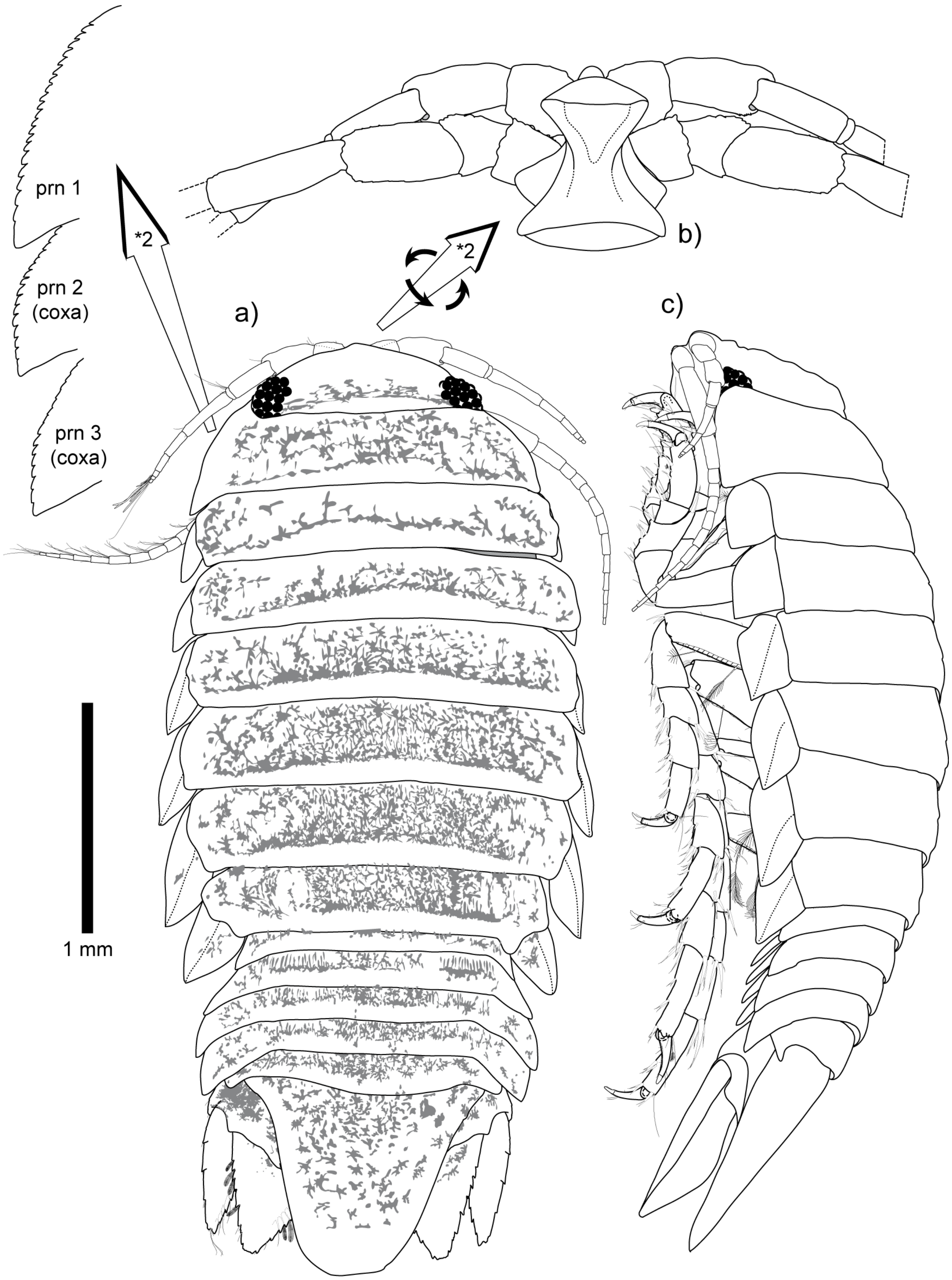

Plate LXXI: *Metacirolana hanseni* (BONNIER, 1896); male, length 4.51 mm: a) habitus, dorsal aspect; b) clypeus and bases of antennae, ventral aspect; c) habitus, lateral aspect. Numbers in arrows indicate relative factor of magnification

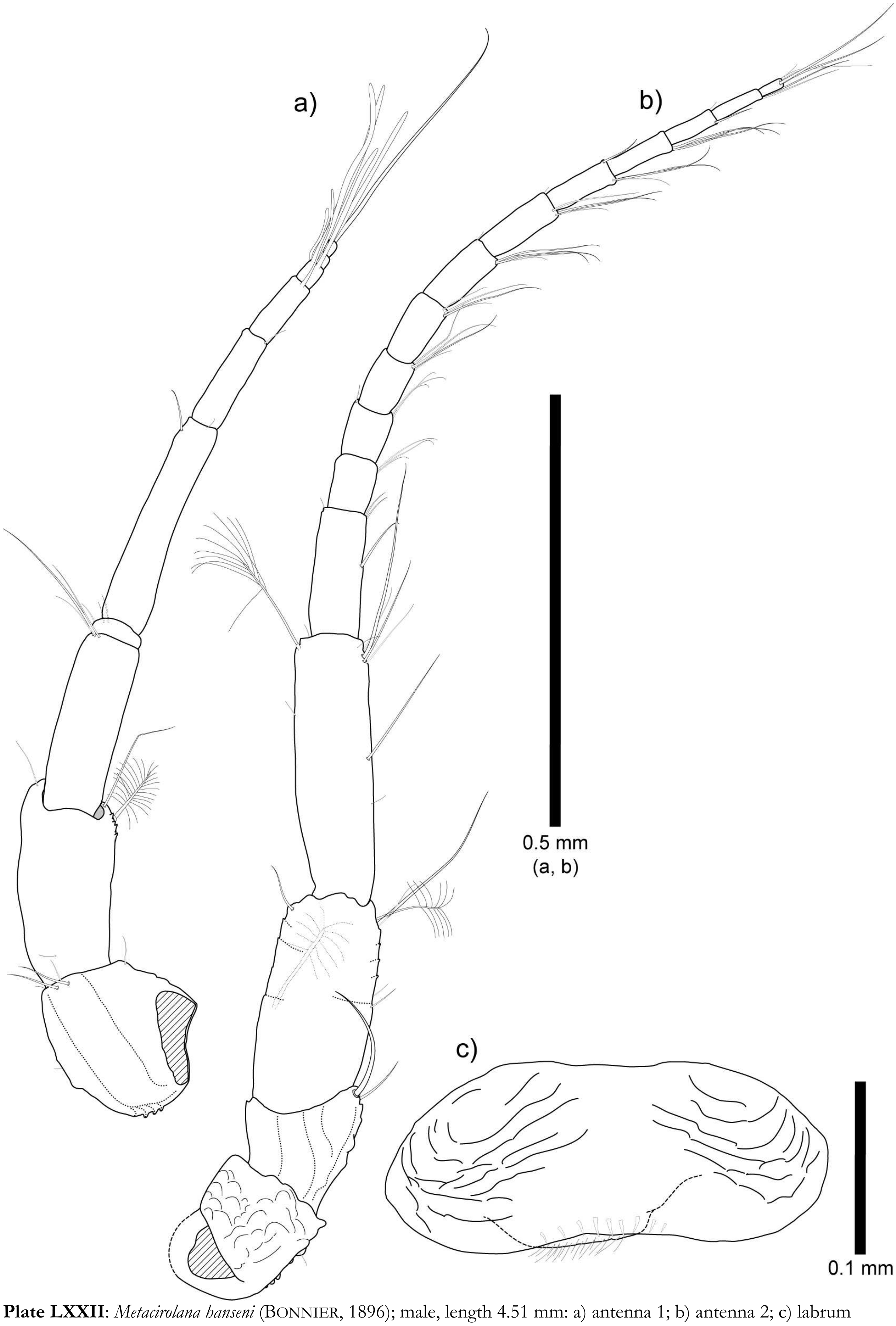

Plate LXXII: *Metacirolana hanseni* (BONNIER, 1896); male, length 4.51 mm: a) antenna 1; b) antenna 2; c) labrum

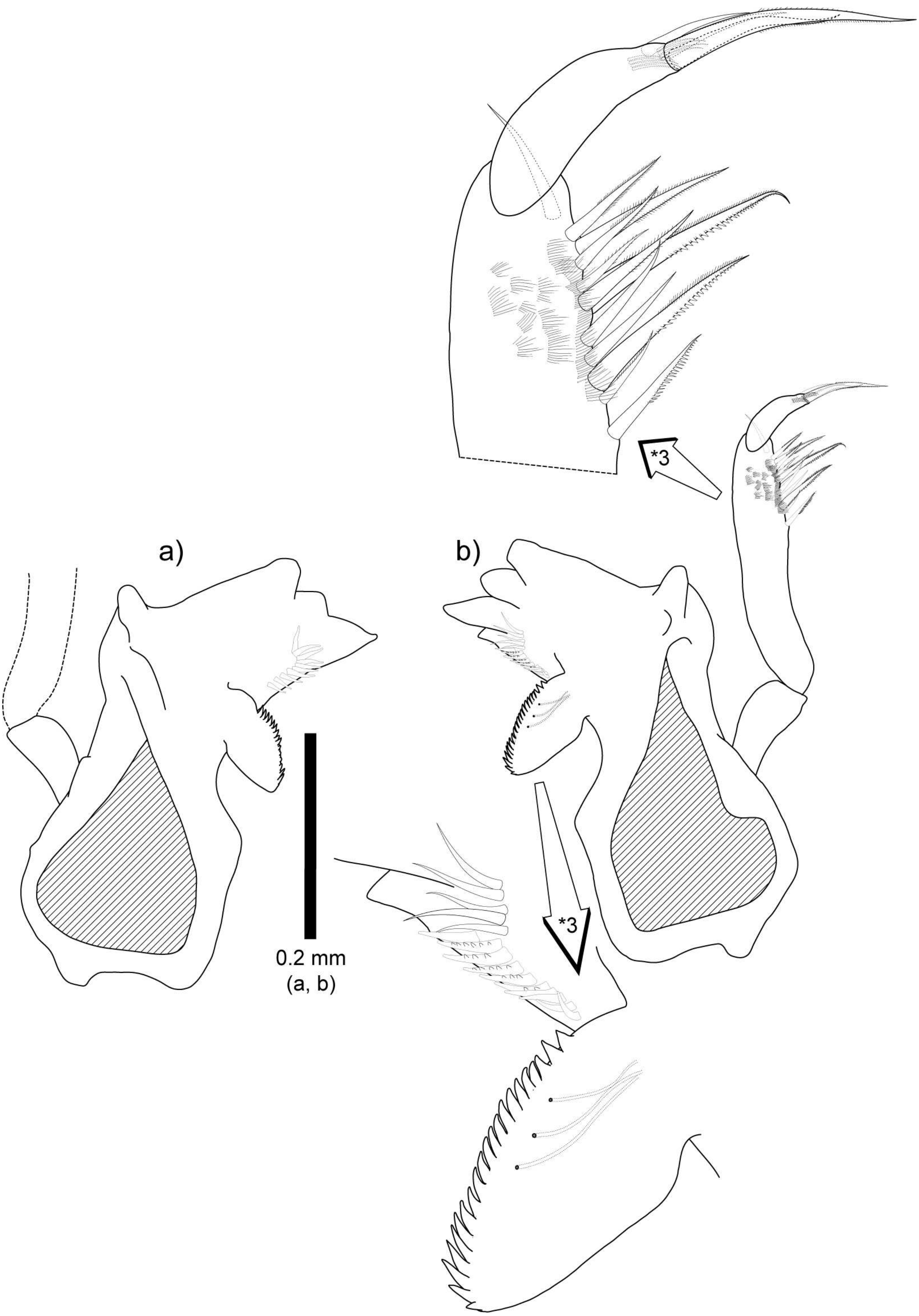

Plate LXXIII: *Metacirolana hanseni* (BONNIER, 1896); male, length 4.51 mm: a) left mandible; b) right mandible. Numbers in arrows indicate relative factor of magnification

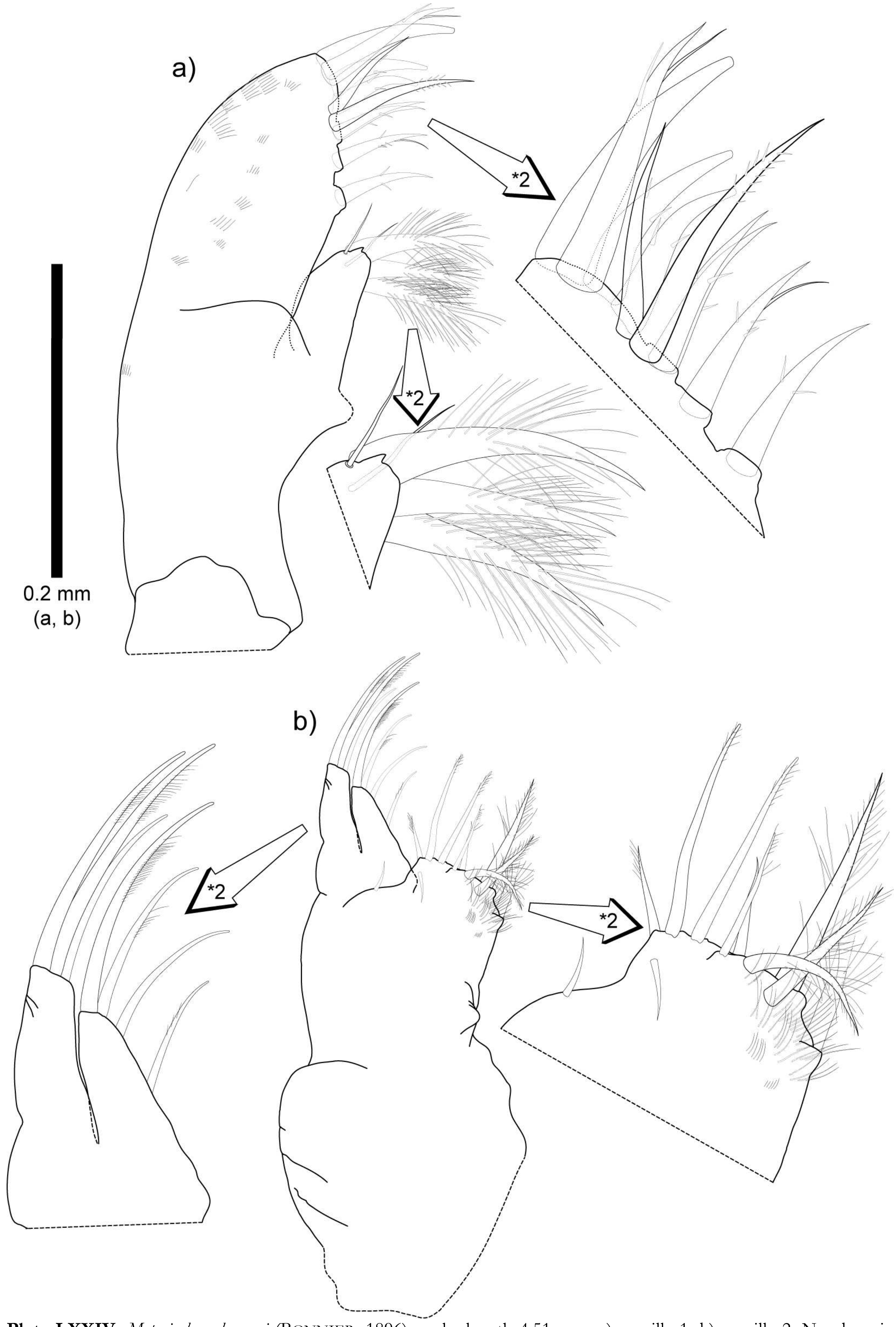

Plate LXXIV: *Metacirolana hanseni* (BONNIER, 1896); male, length 4.51 mm: a) maxilla 1; b) maxilla 2. Numbers in arrows indicate relative factor of magnification

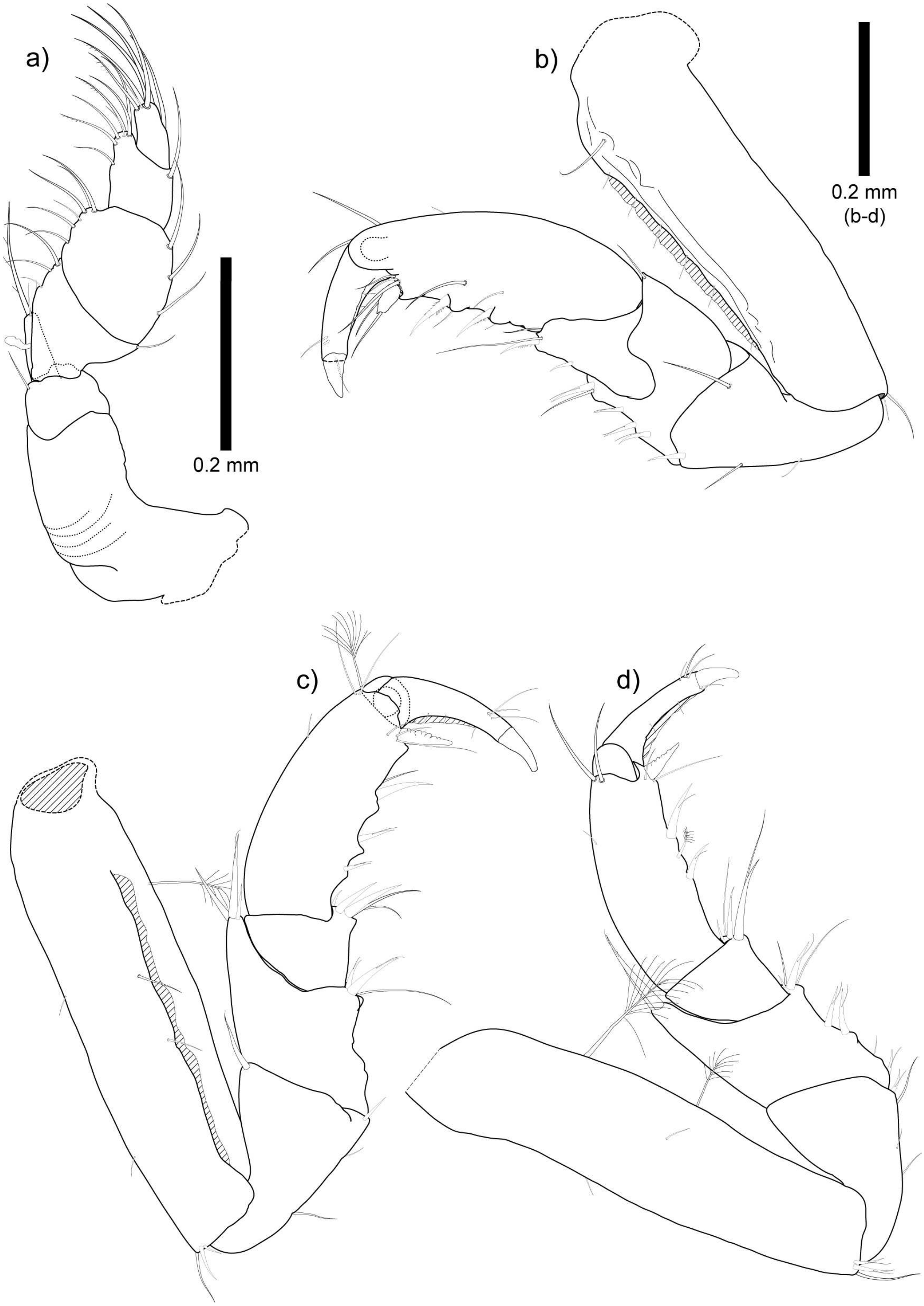

Plate LXXV: *Metacirolana hanseni* (BONNIER, 1896); male, length 4.51 mm: a) maxilliped; b) pereopod 1; c) pereopod 2; d) pereopod 3

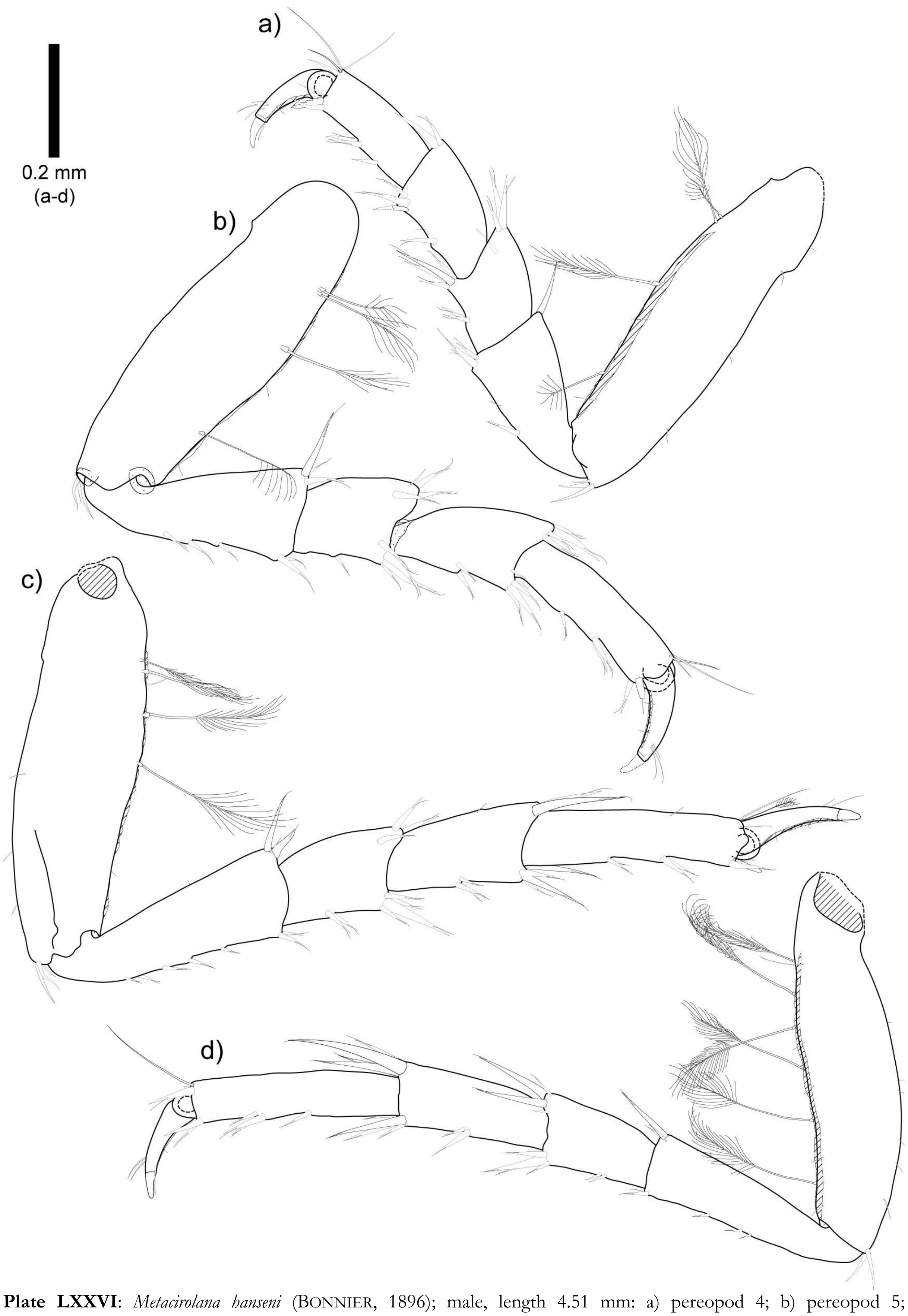

Plate LXXVI: *Metacirolana hanseni* (BONNIER, 1896); male, length 4.51 mm: a) pereopod 4; b) pereopod 5; c) pereopod 6; d) pereopod 7

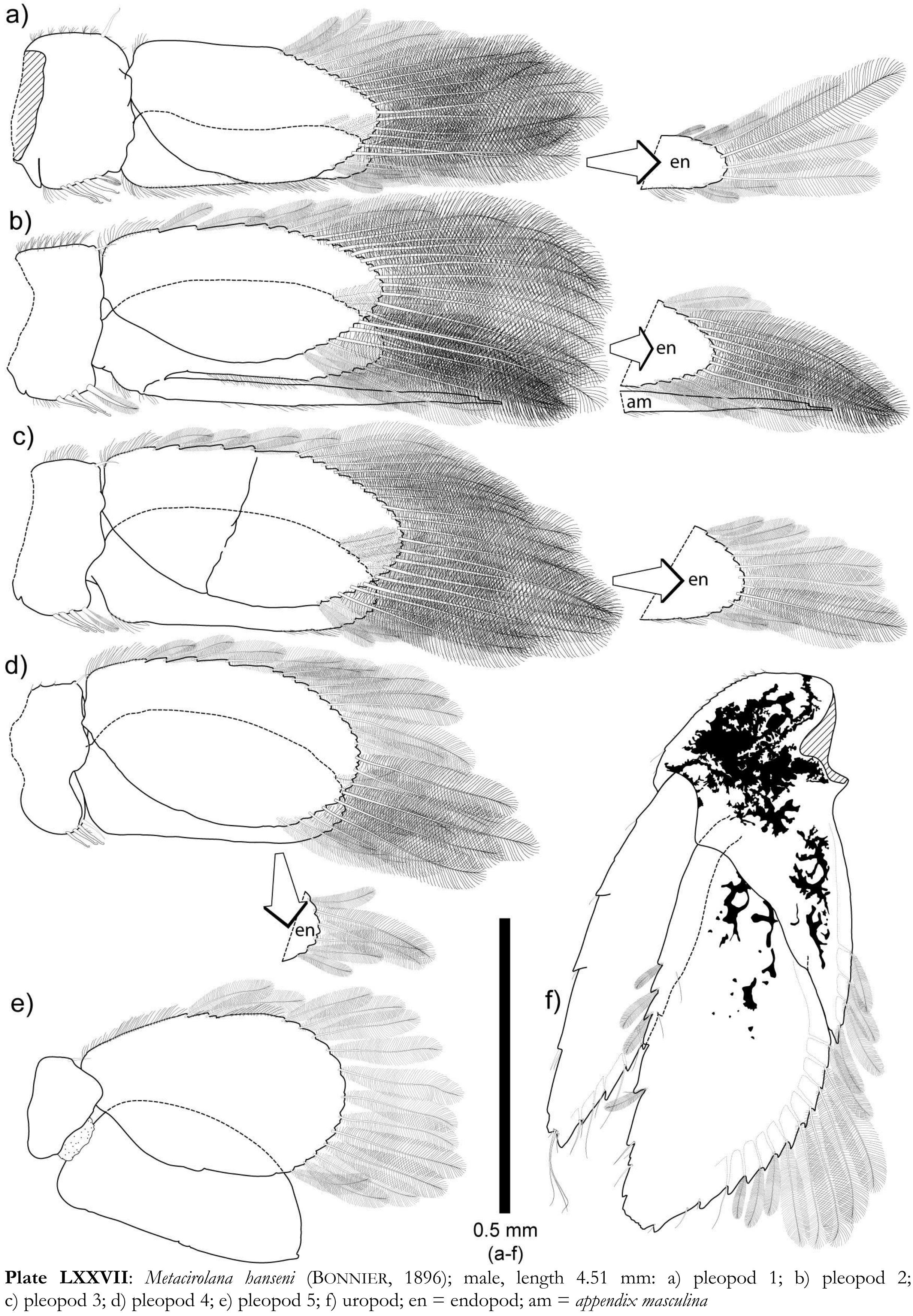

Plate LXXVII: *Metacirolana hanseni* (BONNIER, 1896); male, length 4.51 mm: a) pleopod 1; b) pleopod 2; c) pleopod 3; d) pleopod 4; e) pleopod 5; f) uropod; en = endopod; am = *appendix masculina*

3.1.10 Family Gnathiidae LEACH, 1814

Gnathiidae – especially the bizarre males – differ so much from the general habitus of isopods that they were often not recognized as such. One of the main reasons for this is that the first pereonite functionally belongs to the head and the pereopod 1 is transformed to a pylopod ventrally covering the mouthparts. Adult male gnathiids have enlarged heads with large pincer-like mandibles projecting anteriorly, which are reminiscent of the cephalons of stag beetles (Coleoptera: Lucanidae) or ants (Hymenoptera: Formicidae). The pereopod 7 is absent so that only 5 pairs of walking legs remain, a unique constellation within the Isopoda. The confusion was worsened by the sexual and dimorphism and the great morphological difference between adult and juvenile stages: *Praniza* LATREILLE, 1817 and *Zuphea* RISSO, 1816 had been erected as separate genera but were later recognized to be the fed and unfed 3 larval stages of Gnathiidae (SMIT & DAVIES 2004). Gnathiid larvae are haematophagous ectoparasites on fish, adult stages do not feed anymore but have been reported to live at least to 2 years after reaching maturity (WÄGELE 1989). Gnathiid taxonomy is problematic and based on the morphology of the male stages (SMIT & BASSON 2002), in many cases female individuals cannot be recognized as being conspecific with their male counterparts, especially when samples consist of several species. So far (September 2007: SCHOTTE *et al.* 1995 ff.) 182 species have been described.

A recent diagnosis including a revision and phylogenetic analysis was provided by COHEN & POORE (1994).

Genus *Caecognathia* DOLLFUS, 1901

Species included: *C. abyssorum* (G. O. SARS, 1872); *C. agwillisi* (SEED, 1979); *C. akaroensis* (MONOD, 1926); *C. albescenoides* (MENZIES, 1962); *C. amakusaensis* (NUNOMURA, 1992); *C. andamanensis* SVAVARSSON, 2002; *C. antarctica* (STUDER, 1884); *C. bicolor* (HANSEN, 1916); *C. branchyponera* COHEN & POORE, 1994; *C. caeca* (RICHARDSON, 1911); *C. calva* (VANHOEFFEN, 1914); *C. consobrina* (MONOD, 1926); *C. coralliophila* (MONOD, 1926); *C. crenulatifrons* (MONOD, 1926); *C. diacamma* COHEN & POORE, 1994; *C. dolichoderus* COHEN & POORE, 1994; *C. elongata* (KRØYER, 1847); *C. floridensis* (MENZIES & KRUCZYNSKI, 1983); *C. galzini* (MÜLLER, 1989); *C. gnamptogenys* COHEN & POORE, 1994; *C. hirsuta* (G. O. SARS, 1877); *C. hodgsoni* (VANHOEFFEN, 1914); *C. huberia* COHEN & POORE, 1994; *C. kikuchii* (NUNOMURA, 1992); *C. leptanilla* COHEN & POORE, 1994; *C. nasuta* (NUNOMURA, 1992); *C. nieli* SVAVARSSON, 2006; *C. nipponensis* (MONOD, 1926); *C. ovalifrons* n. sp.; *C. pacifica* (MONOD, 1926); *C. paratrechia* COHEN & POORE, 1994; *C. pilosipes* (MONOD, 1926); *C. polaris* (Hodgson, 1902); *C. polythrix* (MONOD, 1926); *C. pustulosa* (HALE, 1924); *C. regalis* (MONOD, 1926); *C. robusta* (G. O. SARS, 1879); *C. saikaiensis* (NUNOMURA, 1992); *C. samariensis* (MÜLLER, 1988); *C. sanctaecrucis* (SCHULTZ, 1972); *C. schistifrons* (STEBBING, 1913); *C. serrata* (RICHARDSON, 1908); *C. stygia* (G.O. SARS, 1877); *C. trachymesopus* COHEN & POORE, 1994; *C. vanhoeffeni* (MENZIES, 1962); *C. vemae* (MENZIES, 1962); *C. wagneri* (MONOD, 1925C)

Diagnosis

The diagnosis of COHEN & POORE (1994) is followed here.

3.1.10.1 *Caecognathia ovalifrons* n. sp.

Material examined: **Holotype**, male (2.15 mm), Continental slope off Ría de Ferrol, Galicia, Spain, 43°57.030' N, 08°56.151' W – 43°57.248' N, 08°54.133' W, 1140 m, station: "AT 1000-02". **Paratype**, male (2.13 mm), same locality as holotype, station: "AT 1000-02".
Additional material: 4 males, same region as type material, 43°47.188' N, 08°53.053' W – 43°55.312' N – 08°53.101' W at 810 m depth.
Type material will be deposited in the Zoologisches Museum Hamburg (ZMH), Germany.

Distribution
Known only from *locus typicus*: Continental slope off northern Galicia, Spain. Coordinates listed above.

Etymology: *ovalifrons* refers to the broad, oval, dorsal sulcus of the cephalosome of this species.

Diagnosis
Small and slender *Caecognathia* without eyes. Cephalosome and pereonites 2 – 6 subequally wide. Shallow paraocular ornamentation consisting of confluent granules. Frontal border evenly rounded, produced, anterior margin irregularly granulose. Frontolateral processes absent. Oval shaped anteromedian depressed area distinct and large, about a third as wide and half as long as cephalosome. Mandible with smooth blade. Pereopod 4 with conspicuous distal spine.

Description of male holotype

Body (Plate LXXVIII a – c) 2.15 mm long, about 3.8 times as long as wide. Cephalosome about 1.1 times wider than long, almost as wide as pereonite 2, with almost parallel lateral margins. Dorsolaterally granulate. Frontal border convex, evenly rounded, produced, anterior margin irregularly granulose. Anteromedian depressed area regularly oval shaped, distinct and large, 0.3 times as wide as and 0.5 times as long as cephalosome. Shallow paraocular ornamentation consisting of enlarged granules. Supraocular lobe short. Posterior median tubercle absent. Eyes absent. Pereon subparallel, several long, simple setae along body, especially laterally. Pereonite 2 widest, pereonites 3 – 6 subequally wide as cephalosome. Pereonite 1 dorsolaterally concealed by cephalosome. Pereonite 2 about 1.3 times longer than pereonite 1. Pereonite 5 with areae laterales almost as long as pereonite 5. Pereonite 6 with lobi laterales, short lobuii present, apically with long, simple seta. Pleonites subequally wide, inconspicuous pleonal epimeria on pleonites 2 – 5.

Description of male paratype

Body as in holotype, 2.13 mm long.

Antenna 1 (Plate LXXIX a) 0.9 times cephalosome length, peduncular articles covered with several scale setae. Article 2 distally with 2 simple setae and 1 broom seta. Article 3 as long as article 1 and 2 together, distally with 3 broom setae. Flagellum with 5 articles, about 1.5 times as long as peduncular article 3. Article 1 small, with 2 broom setae. Article 2 and 3 about 1. 7 times as long as articles 4 and 5. Article 5 distally with 3 aesthetascs.

Antenna 2 (Plate LXXIX b) about 1.3 times as long as antenna 1. Peduncular articles 1 and 2 short, asetose. Articles 3 and 4 long, with transverse rows of fine setae. Article 3 distally with 1 hemiplumose, 4 simple, and 1 broom seta. Article 4 distally with 4 simple and 4 broom setae. Flagellum with 6 articles, about 0.6 times as long as peduncular articles. Flagellum articles subequally long, progressively narrower, distally with 1 – 3 simple setae, article 6 distally with 5 simple setae.

Mandible (Plate LXXIX c) about 0.7 times as long as cephalosome width, moderately curved, with small lateral incisor, mandibular seta absent, mandibular blade smooth, lightly concave.

Maxilliped (Plate LXXIX d) with 5 articles (basis and 4-articled palp), basis semicircular, asetose. Endite reaching palp article 2, distally obliquely truncate, asetose, coupling hooks absent. Lateral margins of palp articles 1 – 4 with 3, 5, 4 and 8 stout, simple setae.

Pylopod (Plate LXXVIII d) with 3 articles, article 1 1.6 times as long as wide, posterior and posteriolateral margin with interrupted fringe of short, simple setae. Article 2 0.15 times as long as article 1, asetose. Article 3 minute, fused to article 2.

Pereopods 2 – 6 slender, bases not dilated, similar in shape. Propodi ventrally and distoventrally with 1 serrate, spine-like seta. Dactyli about a third as long as propodi. Pereopod 2 (Plate LXXX a) basis dorsally with 4 irregular, shallow tubercles. Merus with distodorsal lobe with 3 spine-like setae. Carpus ventrally with 1 serrate, 1 plumose and 1 simple spine-like seta. Pereopod 3 (Plate LXXX b) basis dorsally with 2 projecting tubercles. Merus distodorsal lobe with 1 simple seta. Carpus ventrally with 3 simple, spine-like setae. Pereopod 4 (Plate LXXX c) basis dorsally with 2 shallow tubercles, distoventrally with 1 pointed, granulose, spine-like projection. Merus distodorsal lobe with 1 simple and 1 simple, spine-like seta. Pereopod 5 (Plate LXXI a) basis dorsally with 3 irregular tubercles. Merus distodorsal lobe with 1 simple and 1 simple, spine-like seta. Pereopod 6 (Plate LXXXI b) basis dorsally with 2 pointed tubercles. Merus distodorsal lobe with 1 simple and 2 pectinate, spine-like setae. Carpus ventrally with 2 simple and 1 serrate, spine-like seta.

Pleopods 1 – 5 (Plate LXXXII a – e) sympods mesially with 2 coupling hooks. Endopods progressively smaller from pleopod 1 to 5, about 1.2 to 1.4 times longer than exopods. Endopods of pleopod 4 and 5 distally with 2 plumose setae. Exopods distally with 0 – 5 plumose setae (0, 3, 3, 5, 5). Pleopod 2 with inconspicuous *appendix masculina*, resembling a spine-like seta.

Pleotelson (Plate LXXXI f) 1.3 times longer than wide, with strongly angled notch near insertion of uropods, distally evenly tapering, middorsally, posteriodorsally and apically a pair of simple setae.

Uropod (Plate LXXXI e) endopod slightly surpassing exopod, about 4 times longer than wide, distally truncate, laterally 2, mesially 1, distally 3 short, and 4 long, simple setae. Exopod about 5 times longer than wide, distally rounded, laterally fringed with 7 fine, simple setae, laterally 1, distally 6 long, simple setae.

Remarks

The new species *Caecognathia ovalifrons* is easily distinguished by its comparatively large, oval shaped anteromedian depressed area, absence of eyes, small adult size (adult gnathiid males do neither feed nor grow anymore, so their size is more consistent than in other isopods) and pereopod 4 with large distoventral spine. It is the first record of complete lack of eyes for the genus. However, absence of eyes is a character of little taxonomic value above species level and is not surprising regarding the bathymetric range of this new species. The broadly rounded frontal border, the absence of frontolateral processes and the smooth mandibular blade allow no other classification than within *Caecognathia*, the shallow paraocular ornamentation consists of enlarged, confluent granules and is not as strongly developed as in species of *Gnathia*, so an addition to the generic diagnosis by COHEN & POORE (1994) is not necessary.

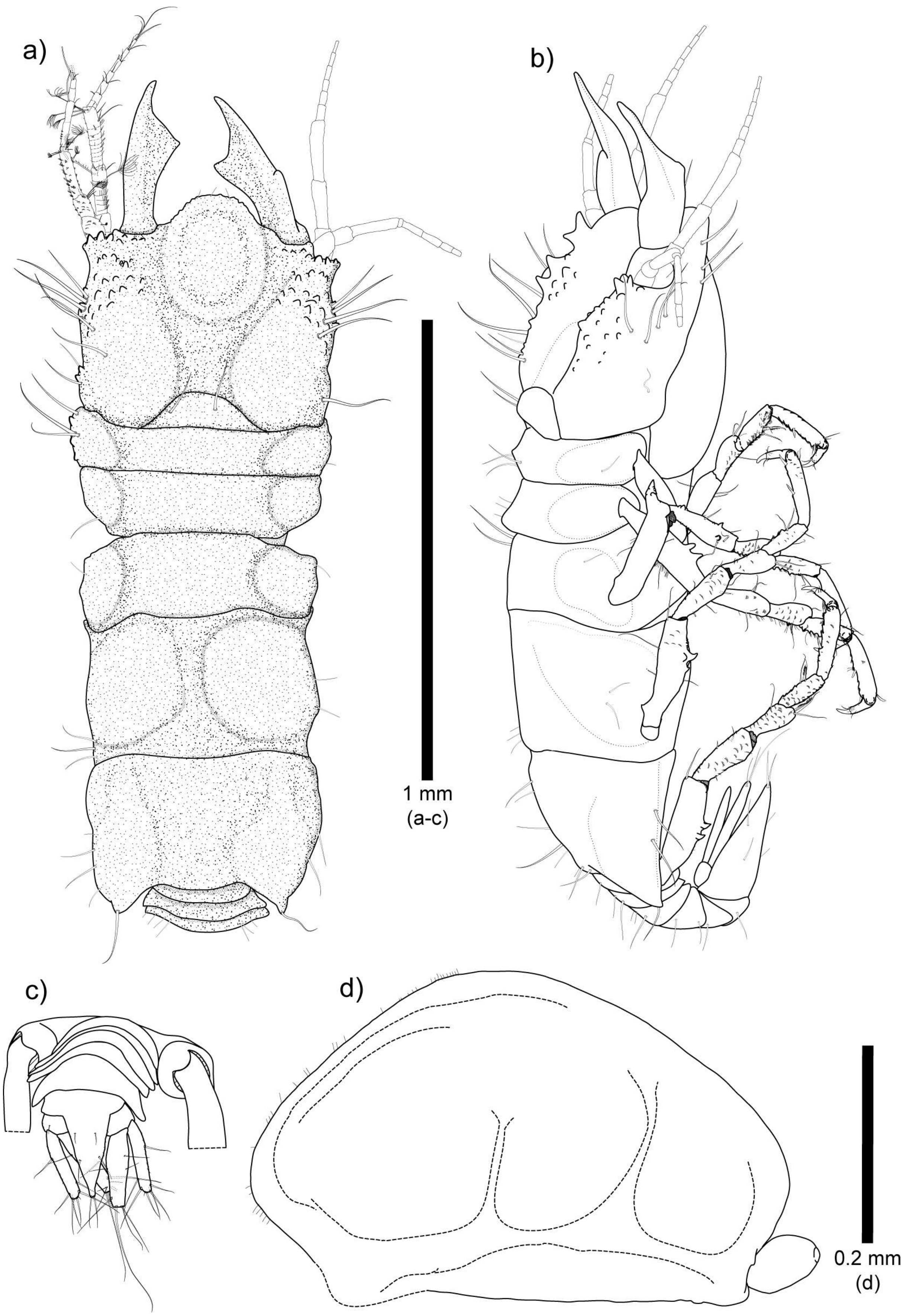

Plate LXXVIII: *Caecognathia ovalifrons* n. sp.; male holotype, length 2.15 mm: a) habitus, dorsal aspect; b) habitus, lateral aspect; male paratype, length 2.13 mm: c) pleon; d) pylopod

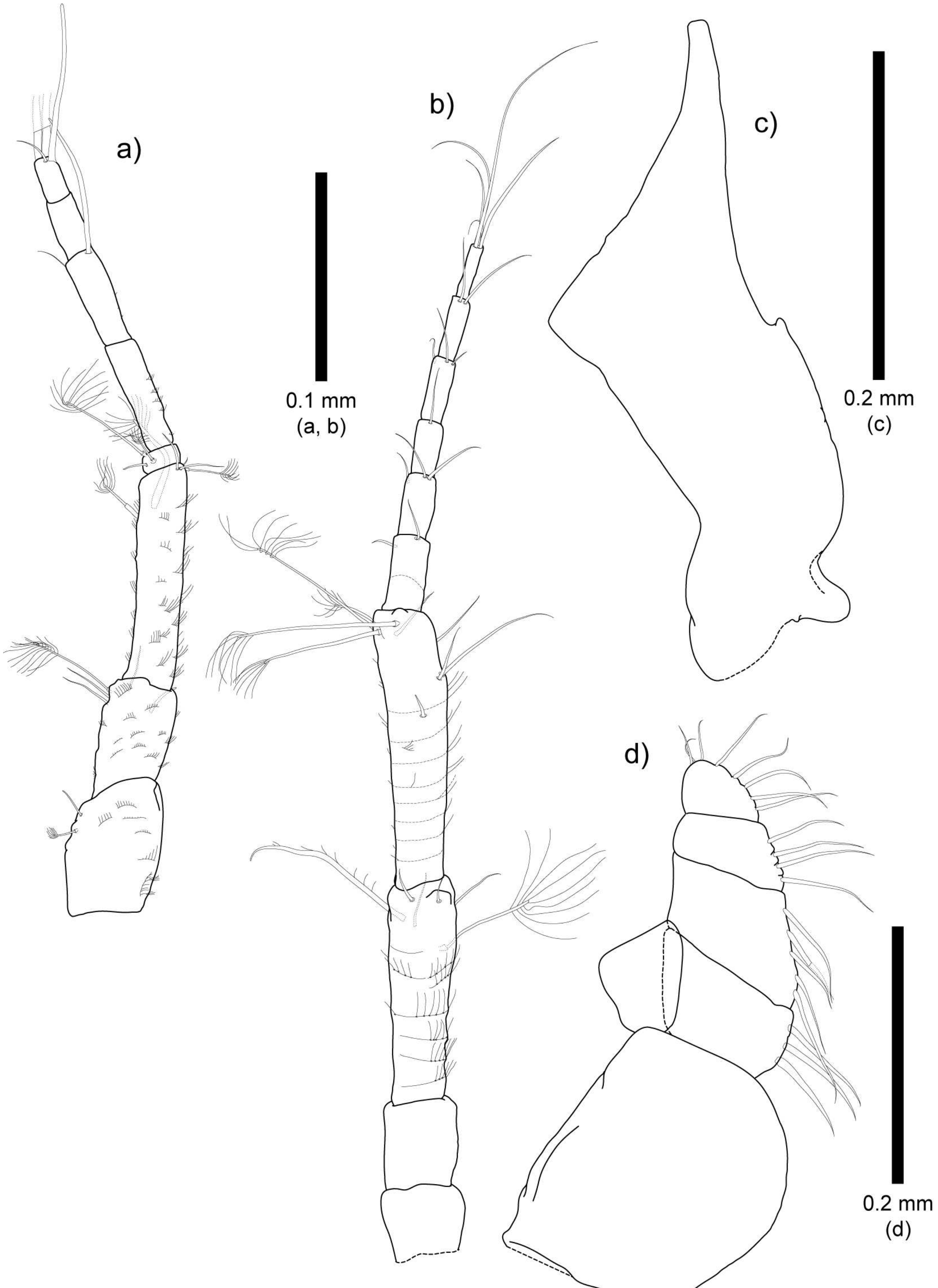

Plate LXXIX: *Caecognathia ovalifrons* n. sp.; male paratype, length 2.13 mm: a) antenna 1; b) antenna 2; c) right mandible; d) maxilliped

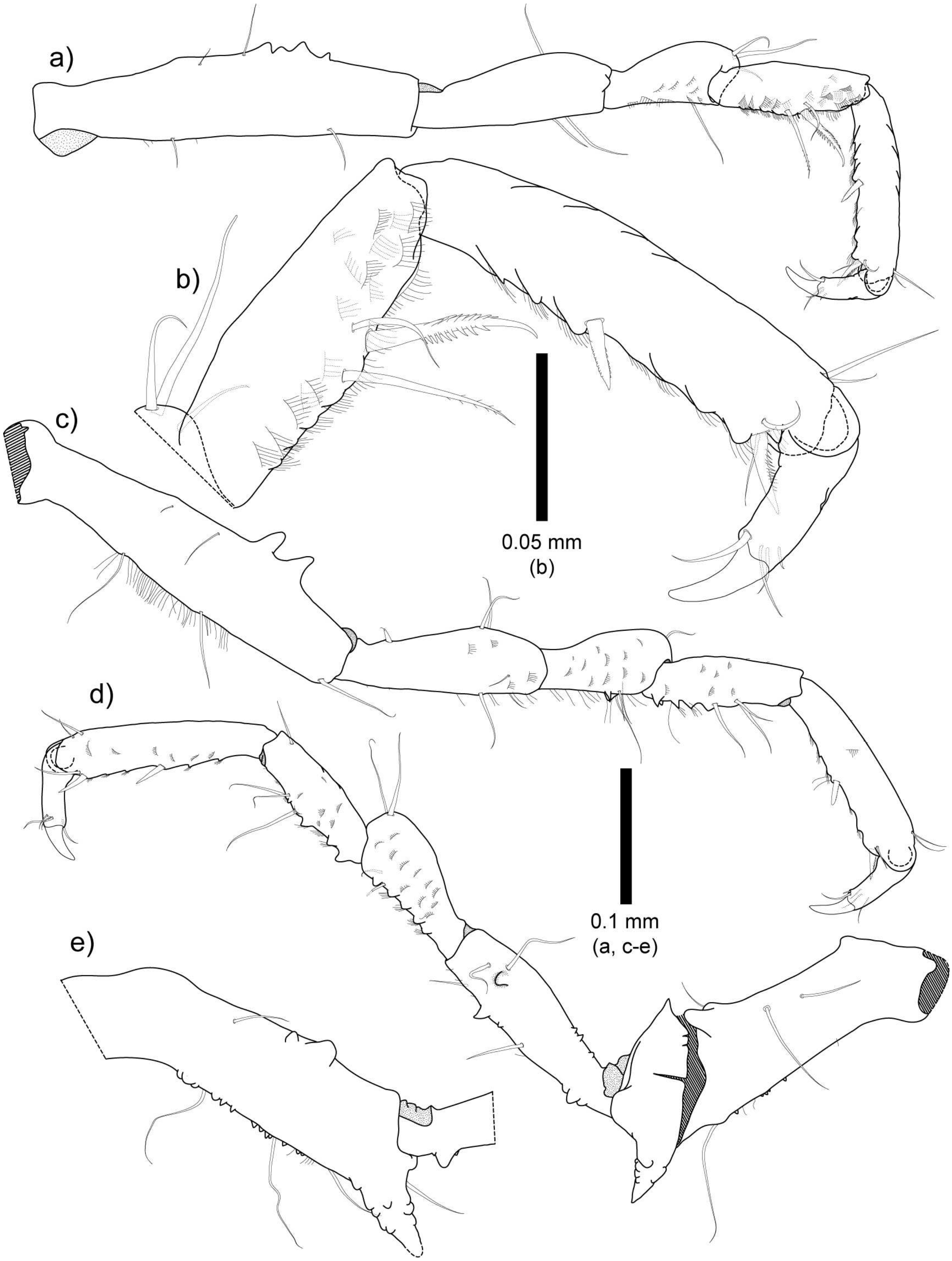

Plate LXXX: *Caecognathia ovalifrons* n. sp.; male paratype, length 2.13 mm: a) pereopod 2; b) pereopod 2 carpus, propodus and dactylus; c) pereopod 3; d) right pereopod 4; e) left pereopod 4 basis

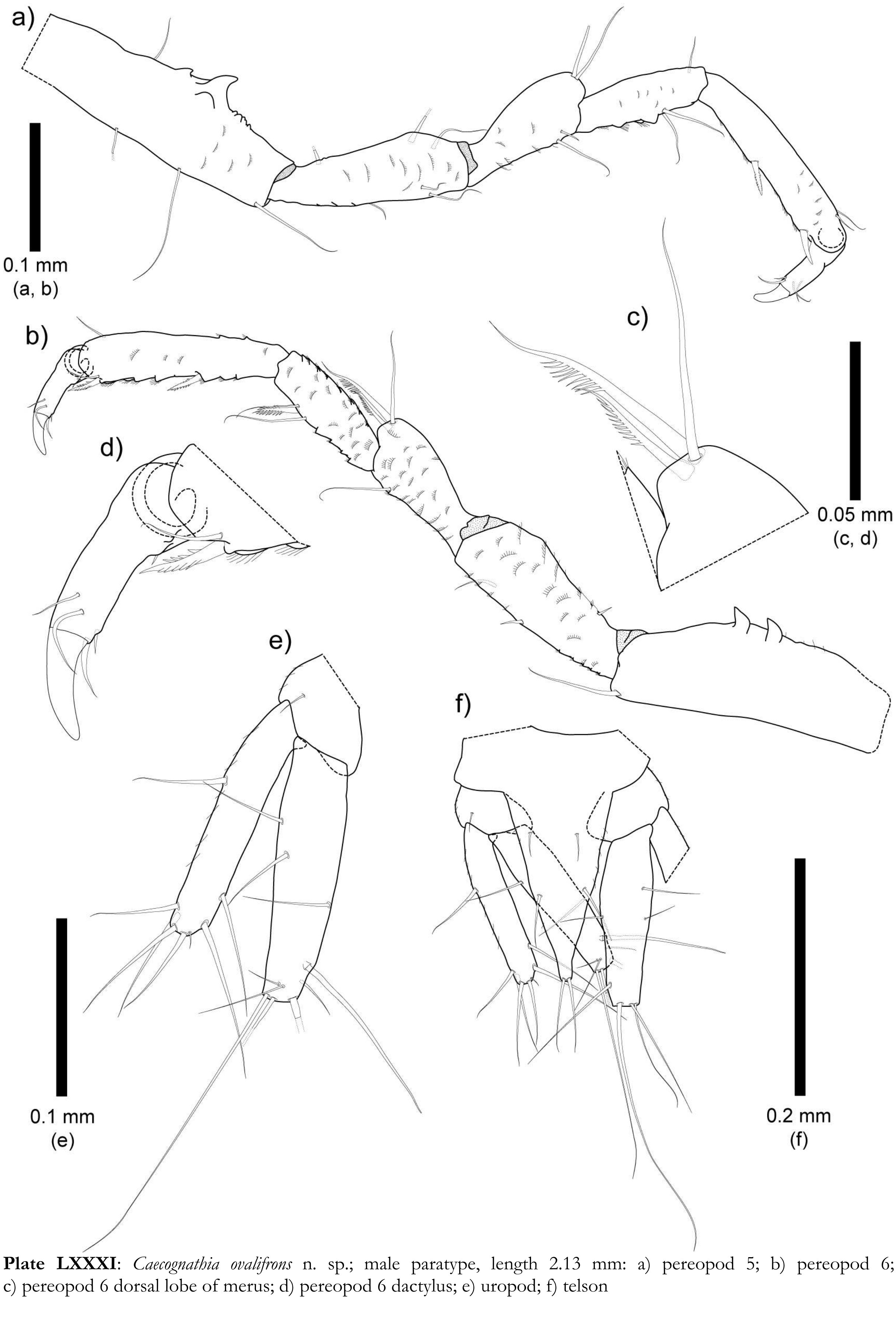

Plate LXXXI: *Caecognathia ovalifrons* n. sp.; male paratype, length 2.13 mm: a) pereopod 5; b) pereopod 6; c) pereopod 6 dorsal lobe of merus; d) pereopod 6 dactylus; e) uropod; f) telson

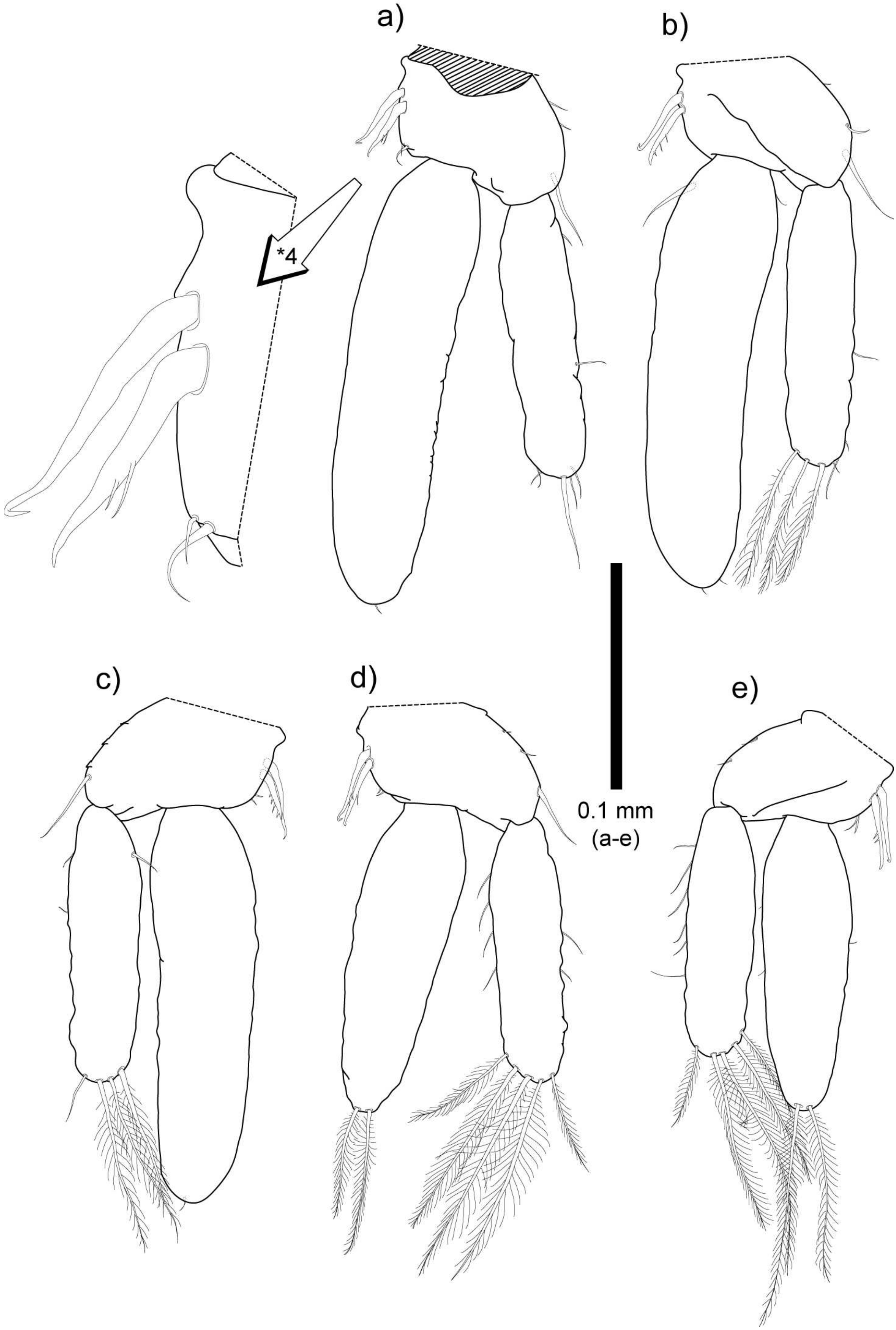

Plate LXXXII: *Caecognathia ovalifrons* n. sp.; male paratype, length 2.13 mm: a) pleopod 1; b) pleopod 2; c) pleopod 3; d) pleopod 4; e) pleopod 5. Numbers in arrows indicate relative factor of magnification

Genus *Gnathia* LEACH, 1814

Type species: *Gnathia maxillaris* (MONTAGU, 1804)

Species included: *G. africana* BARNARD, 1914; *G. albescens* HANSEN, 1916; *G. alces* MONOD, 1926; *G. andrei* PIRES, 1996; *G. arabica* SCHOTTE, 1995; *G. arctica* GURJANOVA, 1929; *G. asperifrons* HOLDICH & HARRISON, 1980; *G. aureola* STEBBING, 1900; *G. barnardi* SMIT & BASSON, 2002; *G. beethoveni* PAUL & MENZIES, 1971; *G. bengalensis* JALAJA KUMARI, HANUMANTHA RAO & SHYAMASUNDARI, 1993; *G. biorbis* HOLDICH & HARRISON, 1980; *G. brachyuropus* MONOD, 1926; *G. brucei* GEORGE, 2003; *G. bungoensis* NUNOMURA, 1982; *G. calamitosa* MONOD, 1926; *G. calmani* MONOD, 1926; *G. calsi* MÜLLER, 1993; *G. camponotus* COHEN & POORE, 1994; *G. capillata* NUNOMURA, 2004; *G. cerina* (STIMPSON, 1853); *G. clementensis* SCHULTZ, 1966; *G. cooki* MÜLLER, 1989; *G. cornuta* HOLDICH & HARRISON, 1980; *G. coronadoensis* SCHULTZ, 1966; *G. cryptopais* BARNARD, 1925; *G. dentata* (SARS, 1872); *G. derzhavini* GURJANOVA, 1933; *G. disjuncta* BARNARD, 1920; *G. epopstruma* COHEN & POORE, 1994; *G. falcipenis* HOLDICH & HARRISON, 1980; *G. fallax* MONOD, 1926; *G. firingae* MÜLLER, 1991; *G. fragilis* SCHULTZ, 1977; *G. gonzalezi* MÜLLER, 1988; *G. halei* CALS, 1973; *G. hemingwayi* ORTIZ & LALANA, 1997; *G. hirayamai* NUNOMURA, 1992; *G. illepida* MONOD, 1923; *G. incana* MENZIES & GEORGE, 1972; *G. indoinsularis* SVAVARSSON & JORUNDSDOTTIR, 2004; *G. inopinata* MONOD, 1925; *G. iridomyrmex* COHEN & POORE, 1994; *G. johanna* MONOD, 1926; *G. lacunacapitalis* MENZIES & GEORGE, 1972; *G. latidens* (BEDDARD, 1886); *G. lignophila* MÜLLER, 1993; *G. magdalenensis* MÜLLER, 1988; *G. malaysiensis* MÜLLER, 1993A; *G. margaritarum* MONOD, 1926; *G. maxillaris* (MONTAGU, 1804); *G. meticola* HOLDICH & HARRISON, 1980; *G. mulieraria* HALE, 1924; *G. mutsuensis* NUNOMURA, 2004; *G. mystrium* COHEN & POORE, 1994; *G. nicembola* MÜLLER, 1989; *G. nkulu* SMIT & VAN AS, 2000; *G. notostigma* COHEN & POORE, 1994; *G. odontomachus* COHEN & POORE, 1994; *G. oxyuraea* (LILLJEBORG, 1855); *G. panousei* DAGUERRE DE HUREAUX, 1971; *G. pantherina* SMIT & BASSON, 2002; *G. perimulica* MONOD, 1926; *G. phallonajopsis* MONOD, 1925; *G. philogona* MONOD, 1926; *G. piscivora* PAPERNA & POR, 1977; *G. productatridens* MENZIES & BARNARD, 1959; *G. prolasius* COHEN & POORE, 1994; *G. puertoricensis* MENZIES & GLYNN, 1968; *G. rathi* KENSLEY, 1984; *G. rectifrons* GURJANOVA, 1933; *G. rhytidoponera* COHEN & POORE, 1994; *G. ricardoi* PIRES, 1996; *G. samariensis* MÜLLER, 1988; *G. sanrikuensis* NUNOMURA, 1998; *G. schmidti* GURJANOVA, 1933; *G. serrulatifrons* MONOD, 1926; *G. sifae* SVAVARSSON, 2006; *G. spongicola* BARNARD, 1920; *G. steveni* MENZIES, 1962; *G. stigmacros* COHEN & POORE, 1994; *G. taprobanensis* MONOD, 1926; *G. teissieri* CALS, 1972; *G. tridens* MENZIES & BARNARD, 1959; *G. trilobata* SCHULTZ, 1966; *G. triospathiona* BOONE, 1918; *G. tuberculata* RICHARDSON, 1909; *G. tuberculosa* (BEDDARD, 1886); *G. ubatuba* PIRES, 1996; *G. variobranchia* HOLDICH & HARRISON, 1980; *G. vellosa* MÜLLER, 1988; *G. venusta* MONOD, 1925; *G. virginalis* MONOD, 1926; *G. vorax* (LUCAS, 1849)

Diagnosis

The diagnosis of COHEN & POORE (1994) is followed here.

3.1.10.2 *Gnathia dentata* (SARS, 1872)

Anceus dentatus G.O. SARS, 1872: 275 – 276, 286; GERSTAECKER, 1882 – 1883: 221, 252.
Gnathia dentata G.O. SARS, 1897: 54, Pl. XXII, Fig. 2; BRIAN, 1909: 18; TATTERSALL, 1911: 197; MONOD, 1926: 516 – 517, Fig. 230; WAHRBERG, 1929; COHEN & POORE, 1994: 288.
Not *Gnathia dentata* DE BEAUCHAMP, 1914: 230 (= *Paragnathia formica*).

Material examined: male (4.96 mm), Continental slope off Ría de Ferrol, Galicia, Spain, 43°53.457' N, 08°48.461' W – 43°54.000' N, 08°48.524' W, 630 m, station: "AT 600-02".

Additional material: 6 males from same locality as examined material, 1 male from same region, 43°47.188' N, 08°53.053' W – 43°55.312' N – 08°53.101' W, 810 m, station: "AT 800-02".

Distribution

North East Atlantic: British Isles (Lough Hyne: DEGRAVE & HOLMES 1998; Plymouth, Isle of Man: NAYLOR, 1972), North Sea (Helgoländer Tiefe Rinne, CASPERS 1939), Skagerrak, Norway (Hardanger Fjord, Trondheim Fjord, MONOD 1926; SARS 1899; WAHRBERG 1929), continental slope of northern Galicia (this study) South West Iberian Peninsula (RODRÍGUEZ-SANCHEZ *et al.* 2001); eastern Mediterranean Sea (material from expedition M25/1).

Diagnosis

Moderately sized *Gnathia* with well developed eyes. Cephalosome subrectangular, wider than long, supraocular lobes conspicuous. Superiolateral frontal processes truncate, surpassing mediofrontal process. Dorsal sulcus short, paraocular ornamentation pronounced, strongly granulose. Posterior median tubercle absent. Pereonite 1 dorsolaterally concealed only at lateralmost tenth of its width. Pereonite 3 with convex posterior margin. Pereonite 5 with clearly defined dorsal sulcus, antenna 2 peduncular article 4 longest and swollen. Telson with a dorsal pair of proximolateral bulges. Mandible with a pointed lateral incisor and mandibular seta.

Redescription of male

Body (Plate LXXXIII a, e – g) 4.96 mm long, about 3.4 times as long as wide. Cephalosome and pereonites 1 – 3 strongly calcified and dorsally granulose, dorsolaterally with many long, simple setae. Cephalosome (Plate LXXXIII a) subrectangular, about 1.4 times wider than long, about as wide as pereonite 2, with almost parallel lateral margins. Eyes well developed, about 0.25 times cephalosome length, sessile, consisting of about 60 ocelli. Superiolateral frontal processes truncate, with acute, slightly projecting lateral angle, dorsally with 1, distomesially with 3 simple setae. Mediofrontal process slightly shorter than superiolateral frontal process, with irregularly denticulate margin, laterally with 3 simple setae. Dorsal sulcus shallow, about 0.25 times as wide and about 0.3 times as long as cephalosome. Paraocular ornamentation pronounced to a strongly granulose tubercle almost as large as eye. Supraocular lobe conspicuous, granulose, projecting dorsolaterally. Posterior median tubercle absent. Pereon subparallel, widest at pereonite 3, narrowest at pereonite 6, ventrally flexible between pereonites 3 and 4, the latter with well developed anterior constriction. Pereonite 1 dorsolaterally concealed at lateralmost tenth of its width. Pereonite 2 medially about 1.5 times longer than pereonite 1. Pereonite 3 about 1.5 times longer than pereonite 2. Pereonite 4 with strongly developed anterior constriction, about as long as pereonite 3. Pereonite 5 posterior margin concave, areae laterales covering most of pereonites dorsal surface. Dorsal sulcus narrow, conspicuous by membranose, uncalcified cuticle. Pereonite 6 with lobi laterales and short lobuii. Pleon about 0.25 times body length and 0.5 times body width, *in situ* ventrally enrolled. Pleonites subequally wide, pleonal epimeria prominent and acute on pleonites 2 – 5, less pronounced on pleonite 1.

Antenna 1 (Plate LXXXIV a) about 0.7 times cephalosome length, peduncular articles 1 and 2 stout, strongly granulose. Article 1 distally with 1 simple and 1 broom seta. Article 2 distally with 3 simple and 3 broom setae. Article 3 as long as article 1 and 2 together, cuticle sculptured by irregular, subparallel grooves, distally with 2 simple and 4 broom setae. Flagellum with 5 articles, about 1.1 times as long as peduncular article 3. Article 1 small, with 1 broom seta. Article 2 – 4 subequally long, article 5 about 0.5 times as long as article 4. Articles 3 – 5 distally with 1 aesthetasc.

Antenna 2 (Plate LXXXIV b) about 1.5 times as long as antenna 1. Peduncular articles 1 and 2 short, strongly granulose. Article 1 laterally with 5 irregular tubercles. Article 3 about 2 times as long as article 2, laterally granulose, mesially with 1 broom, distally with 7 simple setae. Article 4 swollen, about 1.5 times as long as article 3, about 3.5 times as long as wide, 8 transverse cuticular grooves, mesial margin with 15, lateral margin with 5 simple setae, distally with 4 simple and 3 broom setae. Flagellum with 8 articles, about 1.2 times as long as peduncular article 4. Flagellum articles subequally long, progressively narrower, distally with 1 – 3 simple setae.

Mandible (Plate LXXXIV c) about 0.5 times as long as cephalosome width, laterally granulose, with pronounced lateral incisor and long mandibular seta. Mandibular blade dentate with 9 denticles on left, 11 on rigth mandible, apex curved dorsally.

Maxilliped (Plate LXXXIV d) with inconspicuous, square coxa and 5 articles (basis and 4-articled palp), basis semicircular, with lateral fringe of fine, simple setae and mesial fringe of small, simple setae. Endite reaching palp article 2, distally rounded, entire margin fringed with very small setae, 1 coupling hook. Lateral margins of palp articles 1 – 4 with 4, 6, 8 and 7 plumose setae, article 4 apically with 4 simple setae.

Pylopod (Plate LXXXV a) with 3 articles, article 1 1.6 times as long as wide, dorsolaterally with several spine-like setae, distal two thirds of mesial margin with 29 plumose setae, posteriorly uninterruptedly replaced by fringe of simple setae, lateral margin with fringe of simple setae. posterior and posteriolateral margin with interrupted fringe of short, simple setae. Article 2 0.17 times as long as article 1, dorsally with several spine-like setae, mesial and lateral margin with fringe of long, simple setae. Article 3 minute, fused to article 2.

Pereopods 2 – 6 robust, bases swollen, similar in shape. Bases, ischia, meri and carpi granulose. Propodi ventrally irregularly serrate, ventrally and distoventrally with 1 serrate, spine-like seta.

Dactyli about a third as long as propodi. Pereopod 2 (Plate LXXXV b) basis dorsally with longitudinal row of 6 acute tubercles and 15 plumose setae, proximoventrally with 2 plumose, ventrally with 7 shorter, simple setae. Merus with distolateral lobe bearing 3 spine-like setae. Carpus ventrally with 3 acute tubercles and 1 pectinate, spine-like seta. Pereopod 3 (Plate LXXXV c) basis dorsally with longitudinal row of 7 acute tubercles and 11 plumose setae, ventrally and laterally with several long, simple setae. Merus with distolateral lobe bearing 2 slender, spine-like setae, distoventrally with acute tubercle. Propodus distodorsally with 1 broom seta. Pereopod 4 (Plate LXXXVI a) basis distoventrally bulged, wider than on other pereopods, proximodorsally with domed projection, dorsally with 2 broom and 2 plumose setae, ventrally and laterally with 7 plumose and 4 simple setae. Ischium proximoventrally with large, granulose tubercle, ventrally with longitudinal row of 9 blunt tubercles. Merus with distolateral lobe bearing 4 spine-like setae, distoventrally with blut tubercle. Carpus ventrally with 3 acute tubercles, distodorsally with 1 broom seta. Pereopod 5 (Plate LXXXVI b) basis dorsally with longitudinal row of 6 tubercles, 1 plumose and 4 broom setae, ventrally with 4 plumose and 3 simple setae. Merus with distolateral lobe bearing 3 spine-like setae. Carpus ventrally with 2 acute tubercles, distodorsally with 1 broom seta. Propodus distodorsally with 1 broom seta. Pereopod 6 (Plate LXXXVI c) basis dorsally with longitudinal row of 8 acute tubercles, 5 broom, 1 plumose and 2 simple setae, ventrally with 6 plumose and 3 simple setae. Ischium proximoventrally with large, granulose tubercle, ventrally with longitudinal row of 9 blunt tubercles. Merus with distolateral lobe bearing 4 spine-like setae. Carpus ventrally with 1 serrate, spine-like seta, distodorsally with 1 broom seta. Propodus distodorsally with 1 broom seta.

Pleopods 1 – 5 (Plate LXXXVII b – f) sympods mesially with 2 coupling hooks, laterally with transverse groups of fine setae, distolaterally with 1 spine-like seta. Endopods progressively smaller from pleopod 1 to 5, about 1.1 to 1.3 times longer than exopods. Endopod of pleopod 1 asetose. Endopods of pleopods 2 – 5 distally with 7 – 8 plumose setae (8, 8, 7, 8). Exopods of pleopods 1 – 5 distally with 7 – 9 plumose setae (7, 9, 9, 9, 9).

Pleotelson (Plate LXXXII b) 1.1 times longer than wide, with small tubercle and shallow notch near insertion of uropods, distally evenly tapering. Shortly posterior to midlength 1 lateral and 1 dorsolateral long, simple seta, apically a pair of long, simple setae.

Uropod endopod (Plate LXXXII c) slightly surpassing exopod, about 2.7 times longer than wide. Lateral margin nearly straight, with 2 denticles, each bearing a simple seta. Mesial margin convex, distal half with 7 denticles, each bearing a plumose seta with short setules. Exopod (Plate LXXXII d) about 4 times as long as wide, laterally with 10 simple setae, distomesially with 5 plumose setae with short setules.

Remarks

Although *Gnathia dentata* has been frequently recorded, all existing descriptions are outdated and do not reflect the significant chracters of the cephalosome. *G. dentata* is most similar to *G. maxillaris* (MONTAGU, 1804). Both species have a wide geographical distribution in the north east Atlantic and are known to occur at sublittoral depths. However, the latter species has also been recorded from intertidal waters. *G. dentata* can be distinguished from *G. maxillaris* by a more pronounced supraocular lobe, pereonite 3 with convex posterior margin (concave in *G. maxillaris*), pereonite 5 with clearly defined dorsal sulcus (absent in *G. maxillaris*), pleonites stouter and wider, antenna 2 peduncular article 4 longest and swollen (shorter than article 3 and slender in *G. maxillaris*), mandible with a stronger pointed lateral incisor, uropod endopod wider, distally pointed.

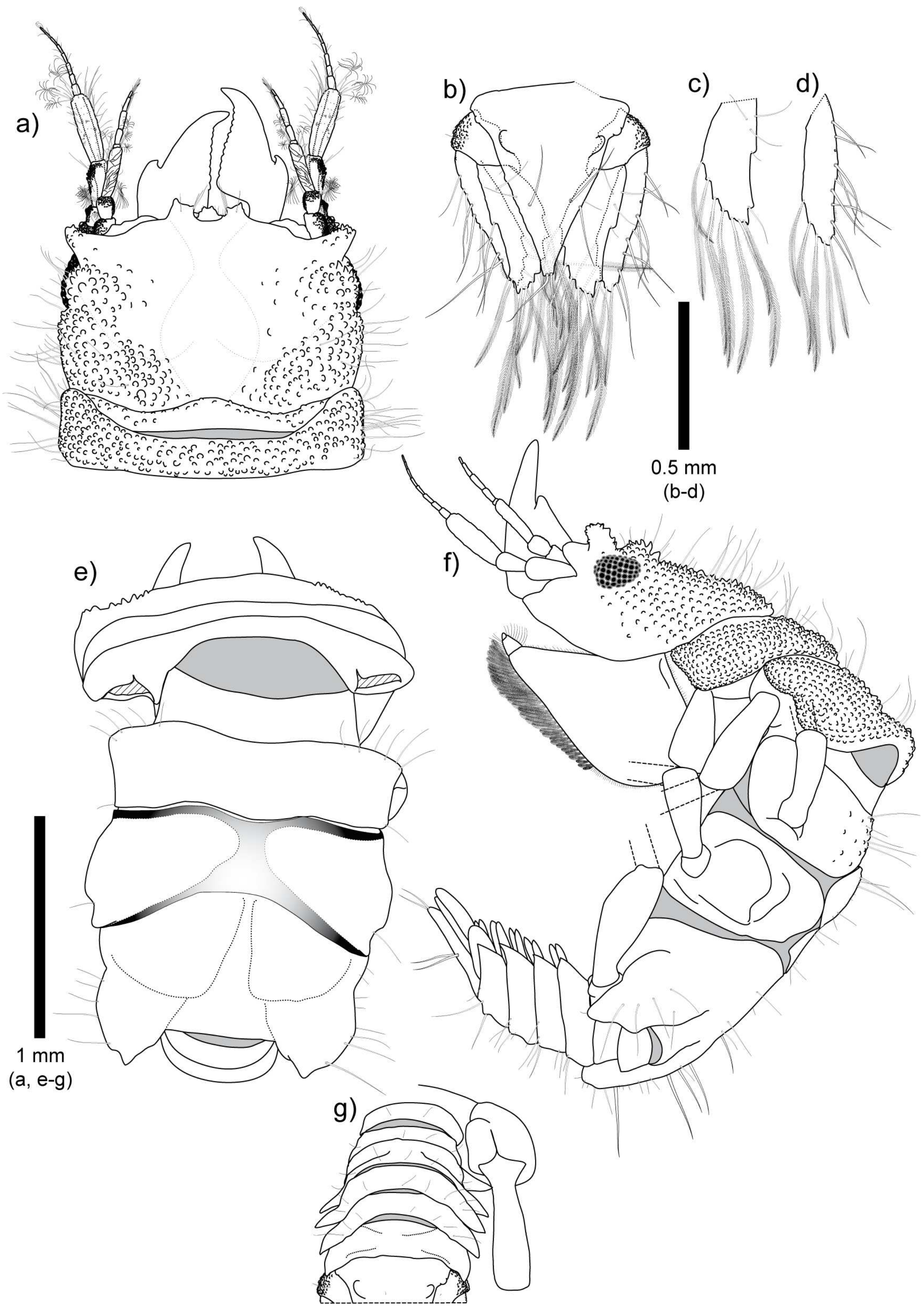

Plate LXXXIII: *Gnathia dentata* (SARS, 1872); male, length 4.96 mm: a) cephalosome, dorsal aspect; b) telson with uropods; c) left uropod endopod; d) left uropod exopod; e) habitus, dorsal aspect; f) habitus, lateral aspect; g) pleon

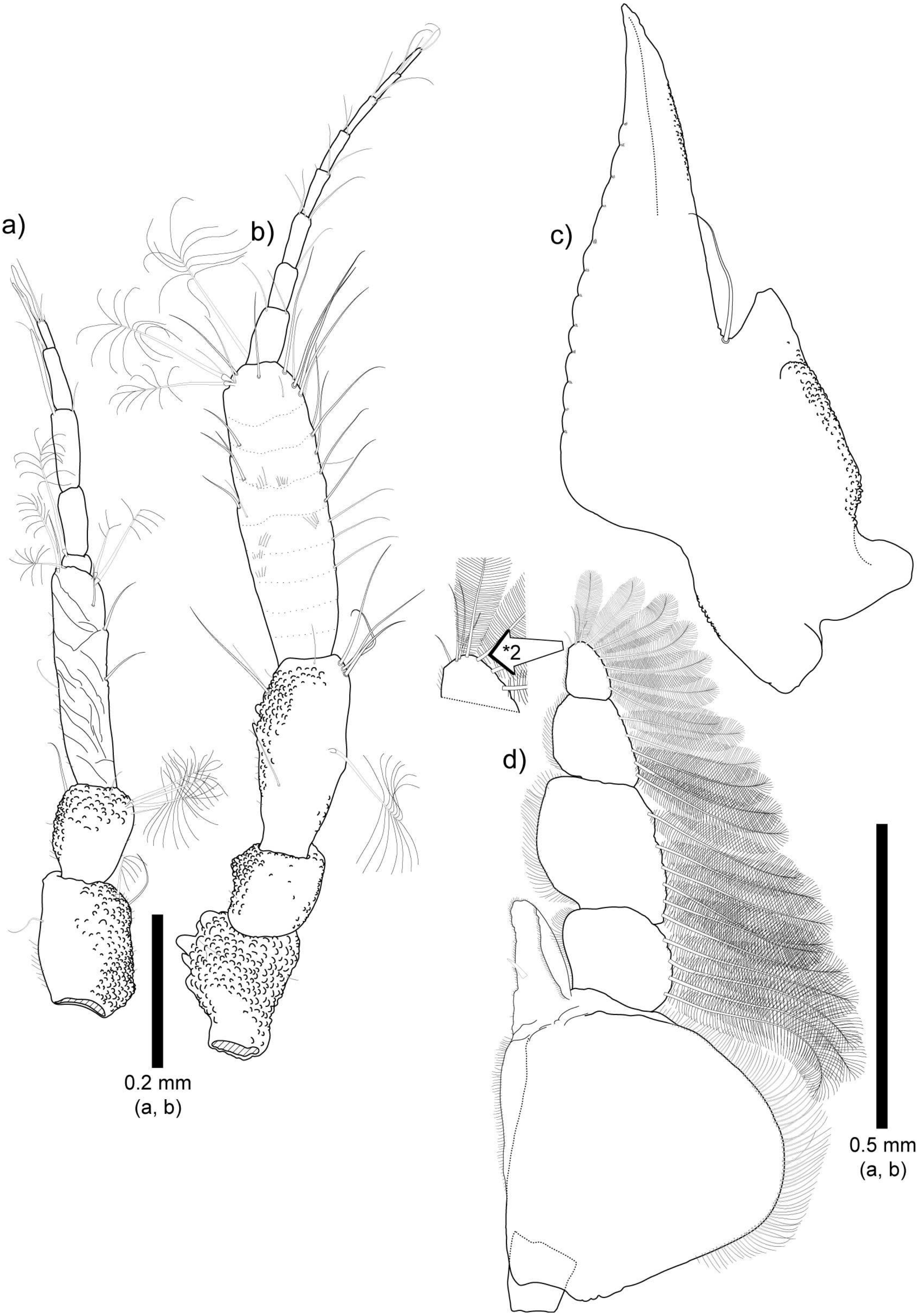

Plate LXXXIV: *Gnathia dentata* (SARS, 1872); male, length 4.96 mm: a) antenna 1; b) antenna 2; c) right mandible; d) maxilliped. Numbers in arrows indicate relative factor of magnification

Plate LXXXV: *Gnathia dentata* (SARS, 1872); male, length 4.96 mm: a) pylopod; b) pereopod 2; c) pereopod 3. Numbers in arrows indicate relative factor of magnification

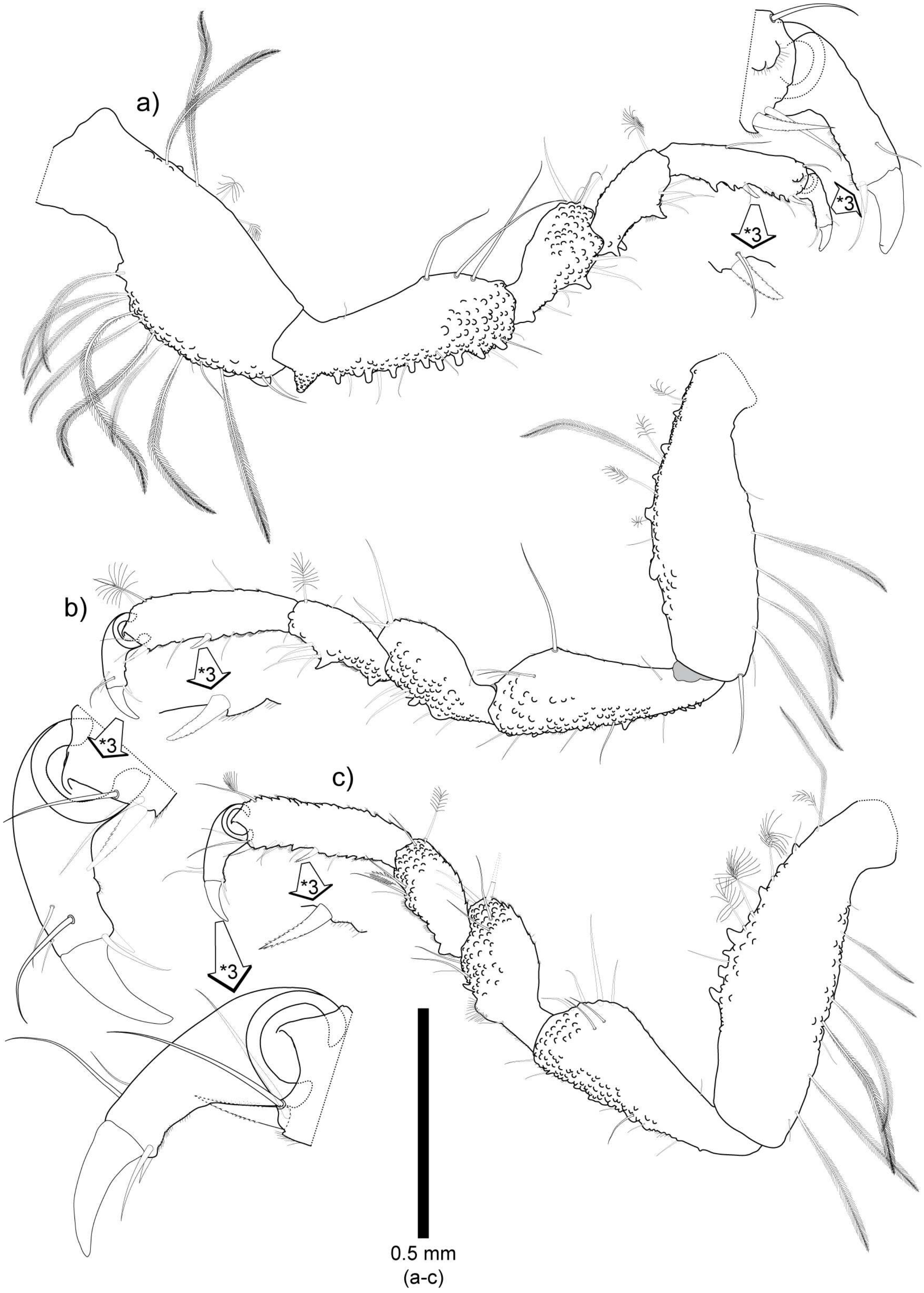

Plate LXXXVI: *Gnathia dentata* (SARS, 1872); male, length 4.96 mm: a) pereopod 4; b) pereopod 5; c) pereopod 6. Numbers in arrows indicate relative factor of magnification

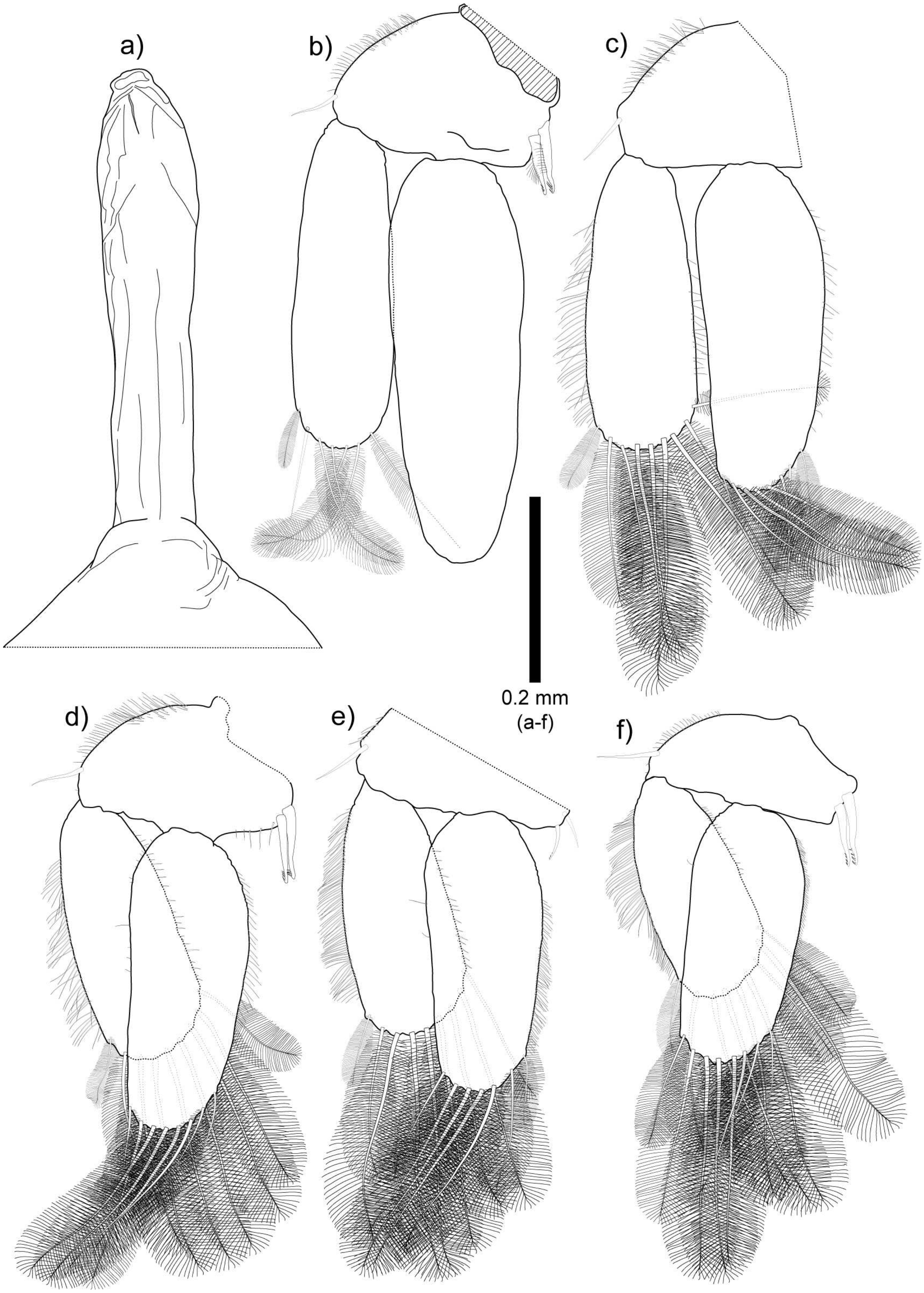

Plate LXXXVII: *Gnathia dentata* (SARS, 1872); male, length 4.96 mm: a) penis; b) pleopod 1; c) pleopod 2; d) pleopod 3; e) pleopod 4; f) pleopod 5

3.2 Zoogeographical aspects of the isopod fauna of the Galician continental slope

All isopods that could be identified to species level and that were not new to science are included here. A map with previous records of geographic distribution is given for each of these 23 species (Figs. 9 – 31). The source data for the coordinates are taken from literature (quotations are given in the figure captions), supplemented by new records from the Great Meteor Seamount (cruise M42/3 with RV "Meteor", for exact station coordinates see PFANNKUCHE *et al.* 2000), from previously undetermined material from the Mediterranean Sea (cruises M25/1 and M40/3 with RV "Meteor", for exact station coordinates see HIEKE *et al.* 1994, 1999), and material from the expedition "DIVA-Artabria 1". Table 3 summarizes the geographical distribution of these species in the world oceans, their previously known bathymetric distribution and their bathymetric range recorded from the expedition "DIVA-Artabria 1".

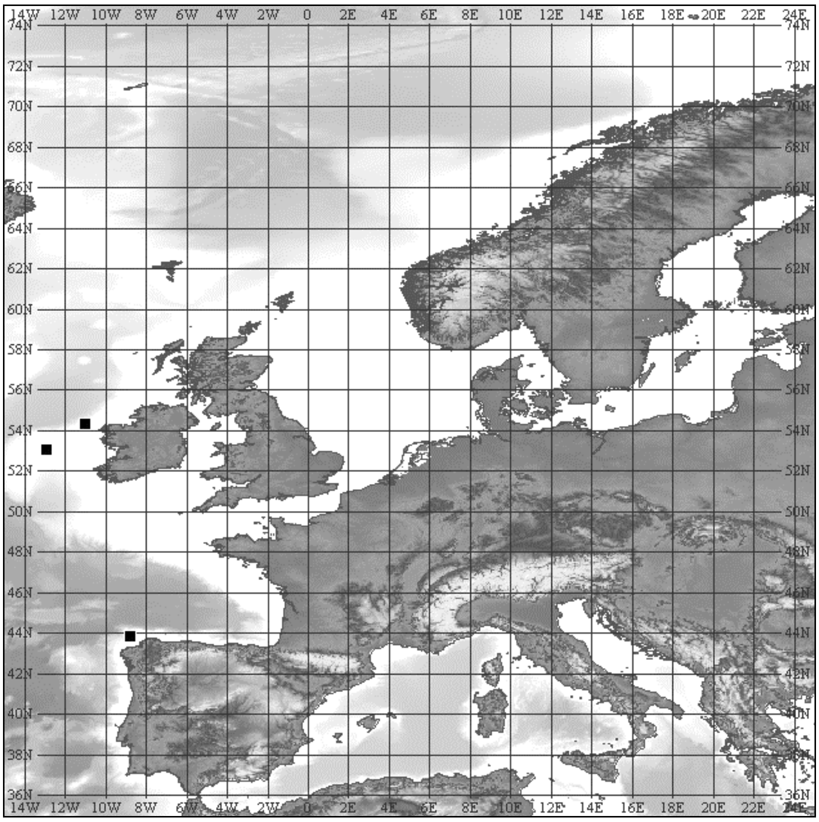

Fig. 11: World wide records and geographical distribution of ***Metamunna typica*** **TATTERSALL, 1905** (Asellota: Paramunnidae). Source data from: TATTERSALL 1905; material from expedition "DIVA-Artabria 1". Bathymetric chart: GEBCO.

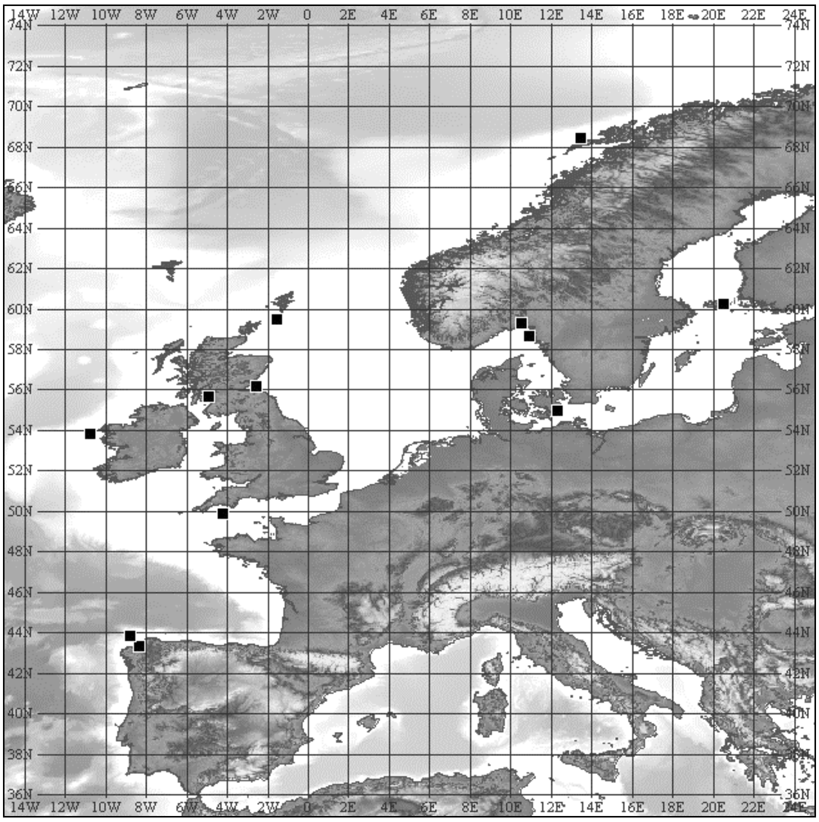

Fig. 12: World wide records and geographical distribution of ***Paramunna bilobata*** **(SARS, 1866)** (Asellota: Paramunnidae). Source data from: HULT 1937, 1941; REBOREDA & URGORRI 1996; SARS 1877, 1899; SPOONER 1959; TATTERSALL 1905; material from expedition "DIVA-Artabria 1". Bathymetric chart: GEBCO.

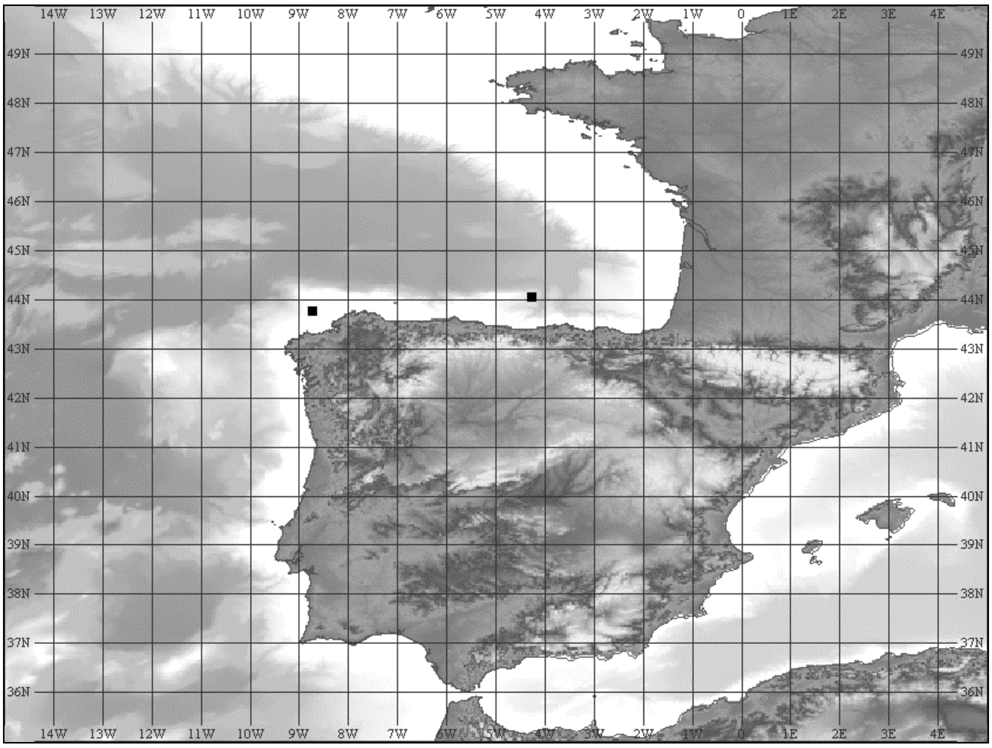

Fig. 13: World wide records and geographical distribution of ***Janirella hessleri* CHARDY, 1975** (Asellota: Janirellidae). Source data from: CHARDY 1975; material from expedition "DIVA-Artabria 1". Bathymetric chart: GEBCO.

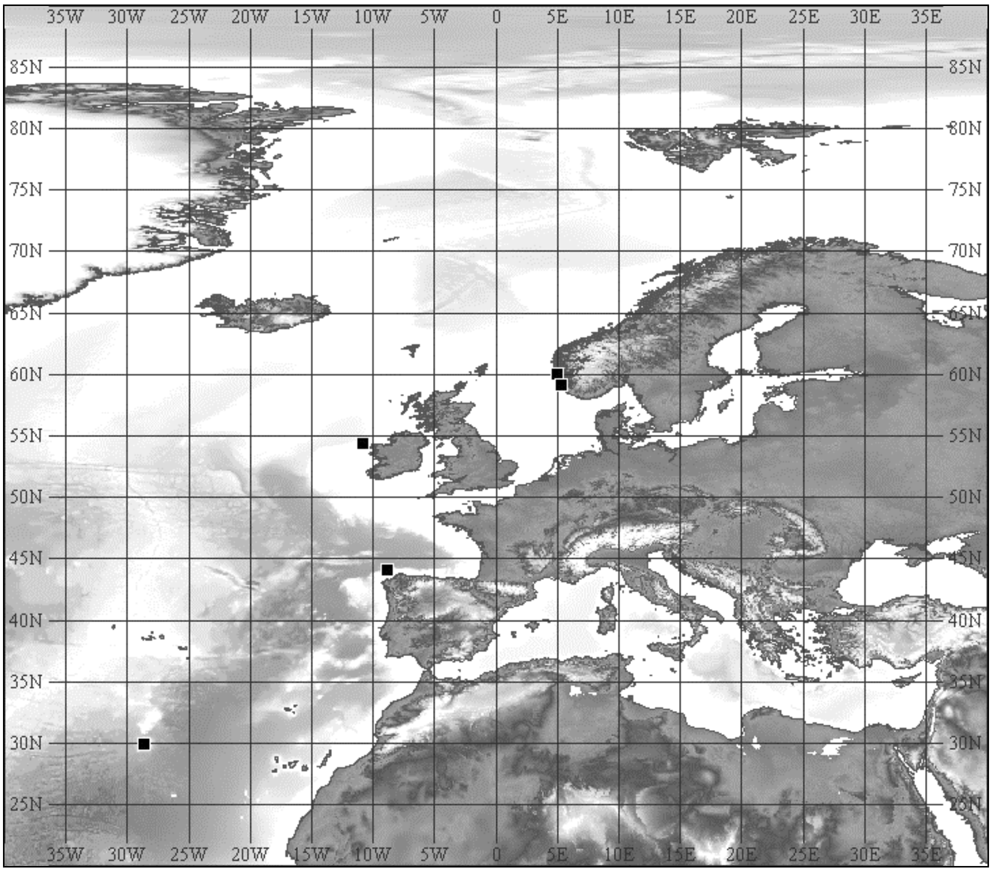

Fig. 14: World wide records and geographical distribution of ***Disconectes latirostris* (SARS, 1882)** (Asellota: Munnopsidae). Source data from: SARS 1882, 1899; TATTERSALL 1905; material from expeditions M42/3 and "DIVA-Artabria 1". Bathymetric chart: GEBCO.

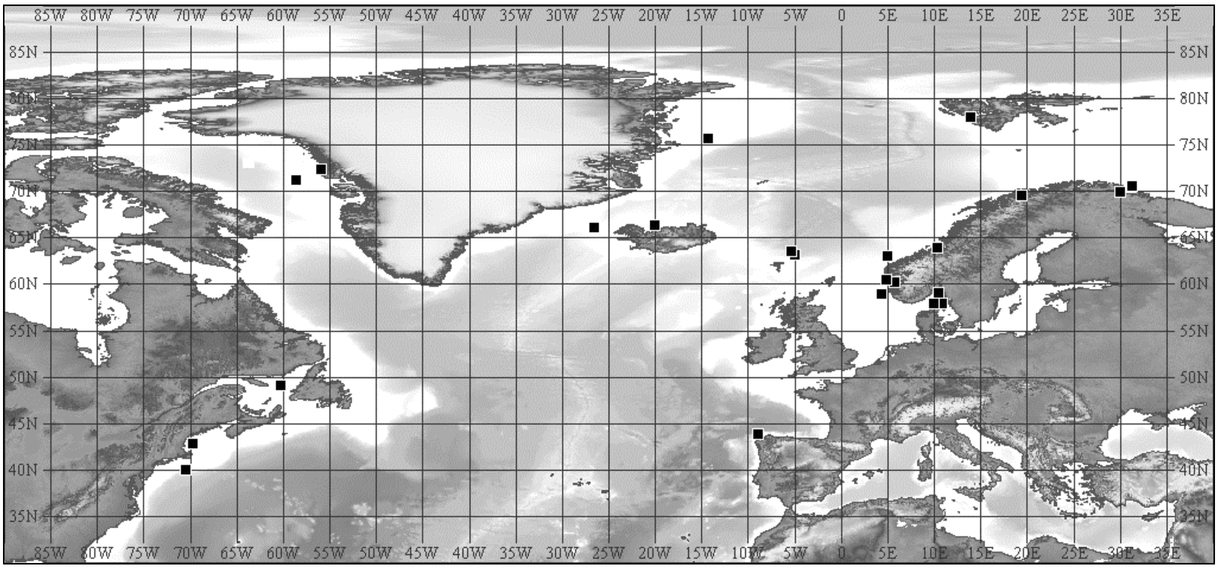

Fig. 15: World wide records and geographical distribution of ***Eurycope cornuta*** **SARS, 1864** (Asellota, Munnopsidae). Source data from: GURJANOVA 1964; HANSEN 1880, 1910, 1916; HARGER 1880; HULT 1941; NORMAN 1894; OLDEVIG 1917; RICHARDSON 1901, 1905; SARS 1877, 1899; STEPHENSEN 1943; SVAVARSSON *et al.* 1990; WAHRBERG 1929; WILSON & HESSLER 1980; YASHNOV 1948; material from expedition "DIVA-Artabria 1". Bathymetric chart: GEBCO. Records appearing to be on mainland are from the fjords of Norway.

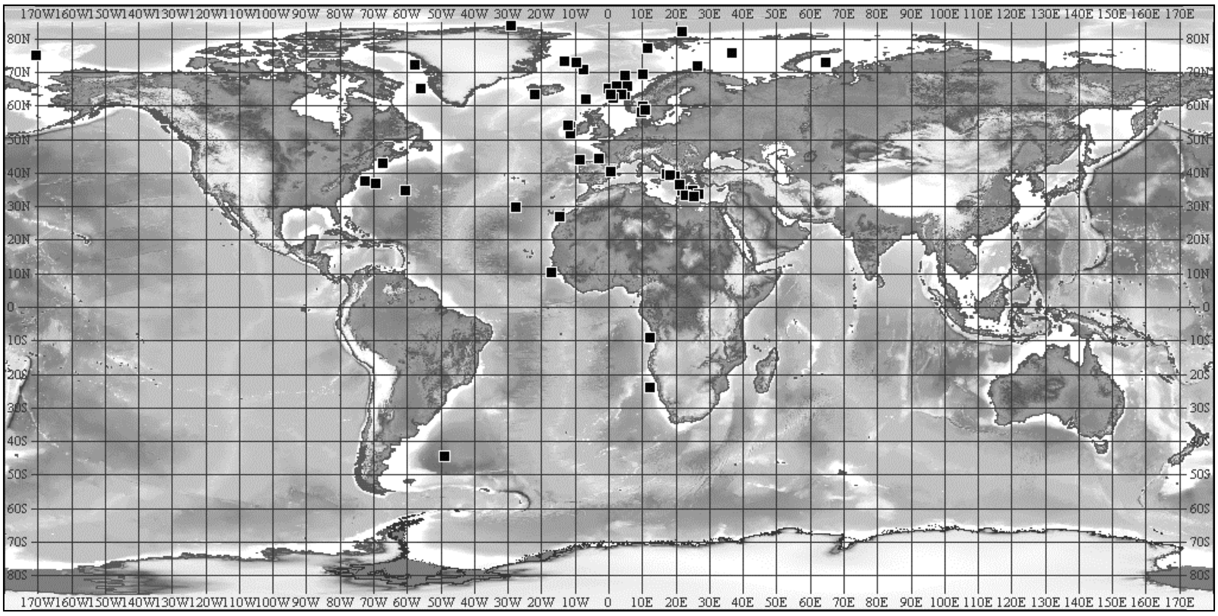

Fig. 16: World wide records and geographical distribution of ***Ilyarachna longicornis*** **(SARS, 1864)** (Asellota: Munnopsidae). Source data from: CARTES & SORBE 1993; HANSEN 1910; HULT 1937, 1941; JUST 1970; MALYUTINA & KUSSAKIN 1996; SARS 1899; STEPHENSEN 1937; SVAVARSSON 1988; TATTERSALL 1905; THISTLE 1980; WOLFF 1962; material from expeditions M25/1, M40/3, M42/3, and "DIVA-Artabria 1". Bathymetric chart: GEBCO. Records appearing to be on mainland are from the fjords of Norway.

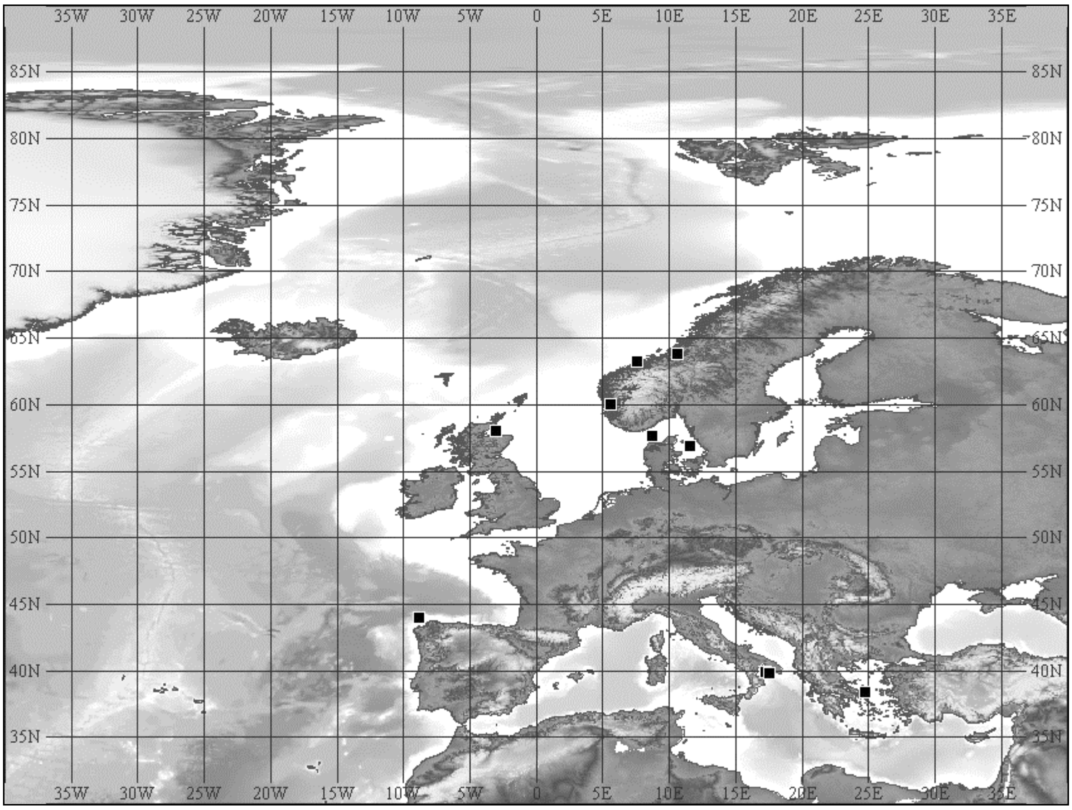

Fig. 17: World wide records and geographical distribution of ***Pseudarachna hirsuta* (SARS, 1864)** (Asellota: Munnopsidae). Source data from: HANSEN 1910; HULT 1937, 1941; SARS 1899; material from expeditions M40/3 and "DIVA-Artabria 1". Bathymetric chart: GEBCO. Records appearing to be on mainland are from the fjords of Norway.

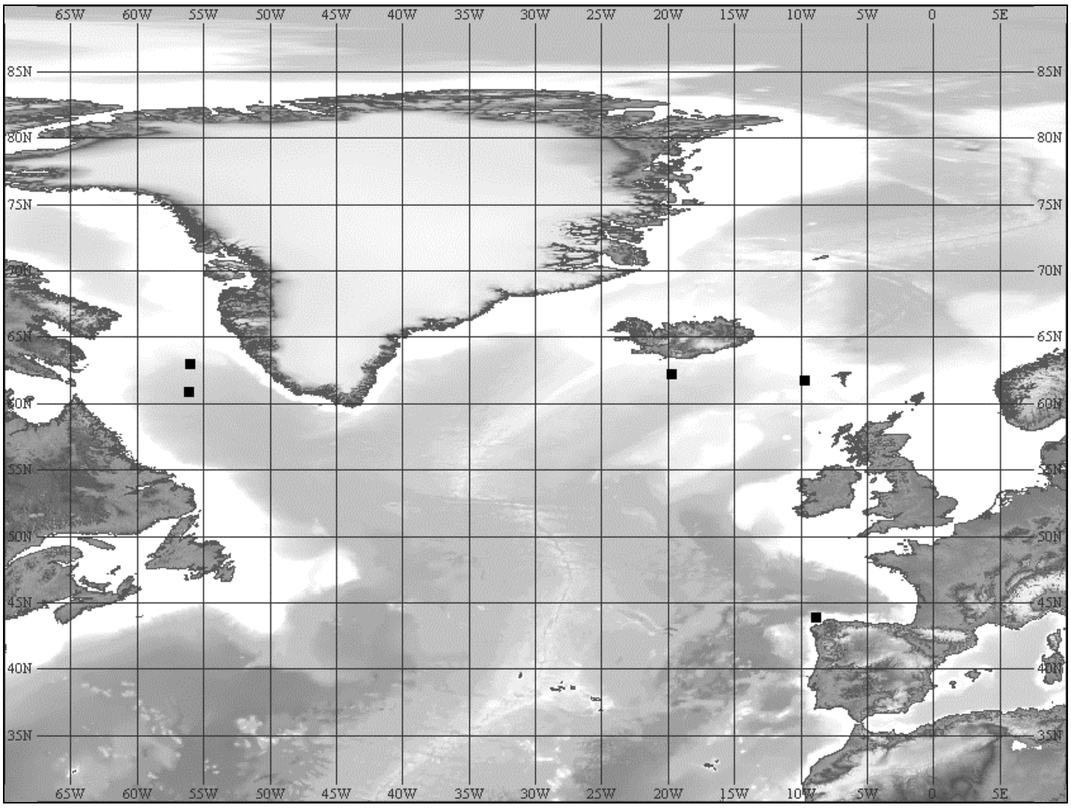

Fig. 18: World wide records and geographical distribution of ***Munnopsoides eximius* HANSEN, 1916** (Asellota: Munnopsidae). Source data from: HANSEN 1916; material from expedition "DIVA-Artabria 1". Bathymetric chart: GEBCO.

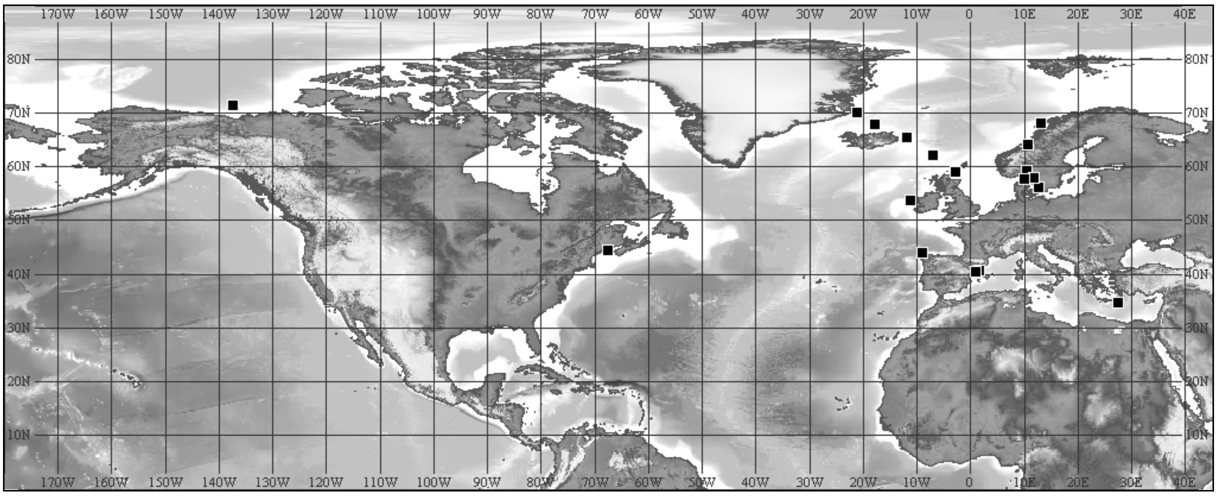

Fig. 19: World wide records and geographical distribution of ***Eugerda tenuimana*** **(SARS, 1865)** (Asellota: Desmosomatidae). Source data from: BRANDT 1993; CARTES & SORBE 1993; GURJANOVA 1933; HULT 1937, 1941; KUSSAKIN 1999; LAWRENCE & KEAST 1990; NORMAN 1894; SARS 1899; STEPHENSEN 1923; TATTERSALL 1905; WAHRBERG 1929; material from expeditions M25/1 and "DIVA-Artabria 1". Bathymetric chart: GEBCO. Records appearing to be on mainland are from the fjords of Norway.

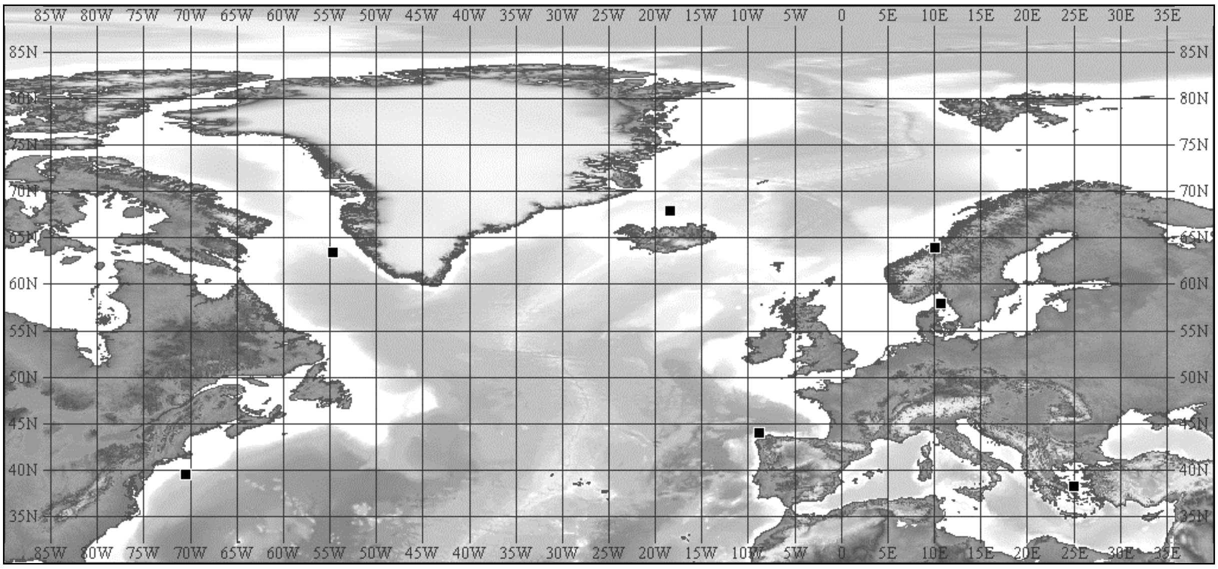

Fig. 20: World wide records and geographical distribution of ***Prochelator lateralis*** **(SARS, 1899)** (Asellota: Desmosomatidae). Source data from: BRANDT 1993; GURJANOVA 1933; HANSEN 1910; HESSLER 1970; HULT 1937, 1941; KUSSAKIN 1999; SARS 1899; material from expeditions M40/3 and "DIVA-Artabria 1". Bathymetric chart: GEBCO. Records appearing to be on mainland are from the fjords of Norway.

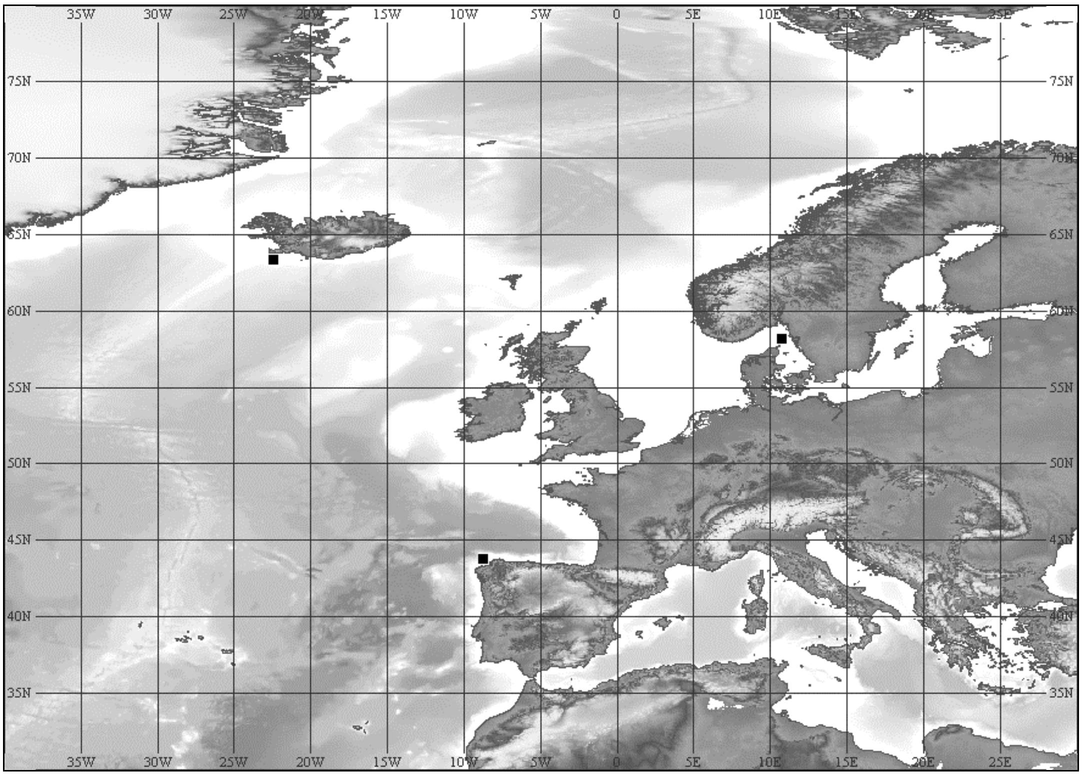

Fig. 21: World wide records and geographical distribution of ***Macrostylis longiremis*** **(MEINERT, 1890)** (Asellota: Macrostylidae). Source data from: HULT 1937, 1941; HANSEN 1910, 1916; KUSSAKIN 1999; MEINERT 1890; SARS 1899; material from expedition "DIVA-Artabria 1". Bathymetric chart: GEBCO.

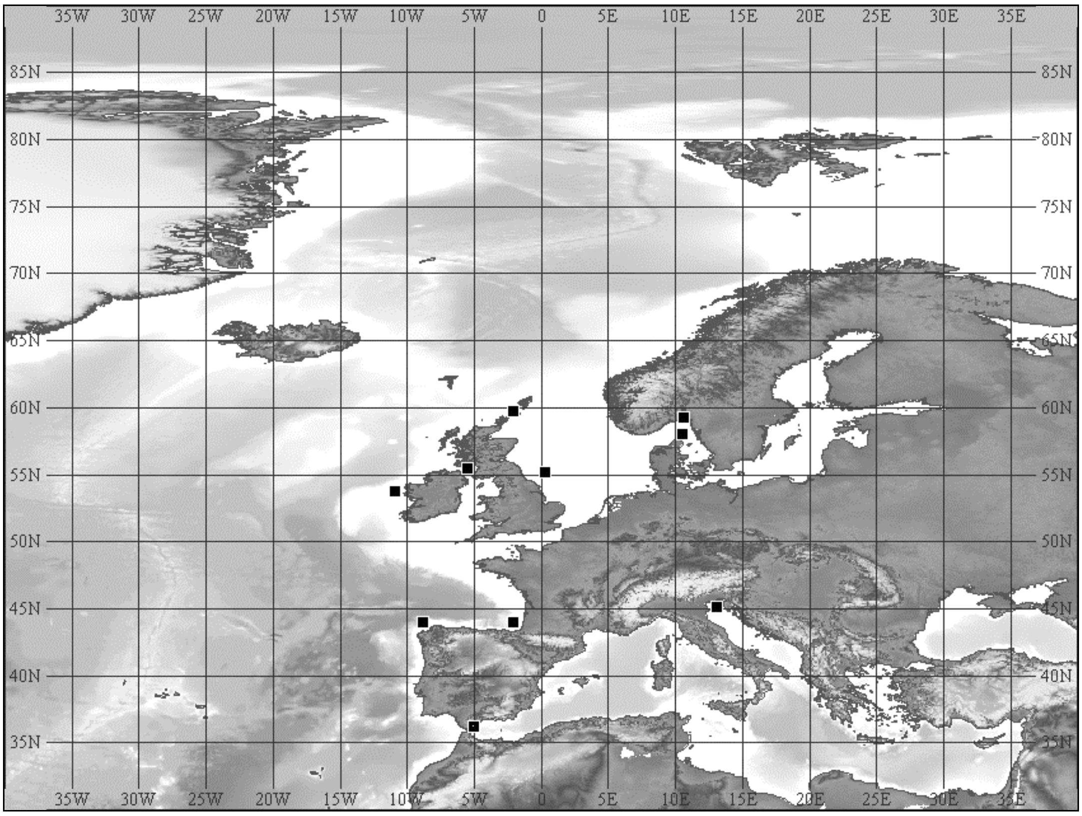

Fig. 22: World wide records and geographical distribution of ***Arcturella dilatata*** **(SARS, 1882)** (Valvifera: Arcturidae). Source data from: ADEMA & HUWAE 1982; ARRONTES & ANADÓN 1990; GRAEFE 1902; HANSEN 1910; HULT 1941; NORMAN 1904; RODRÍGUEZ-SANCHEZ *et al.* 2001; SARS 1897; WAHRBERG 1929; material from expedition "DIVA-Artabria 1". Bathymetric chart: GEBCO. Records appearing to be on mainland are from the fjords of Norway.

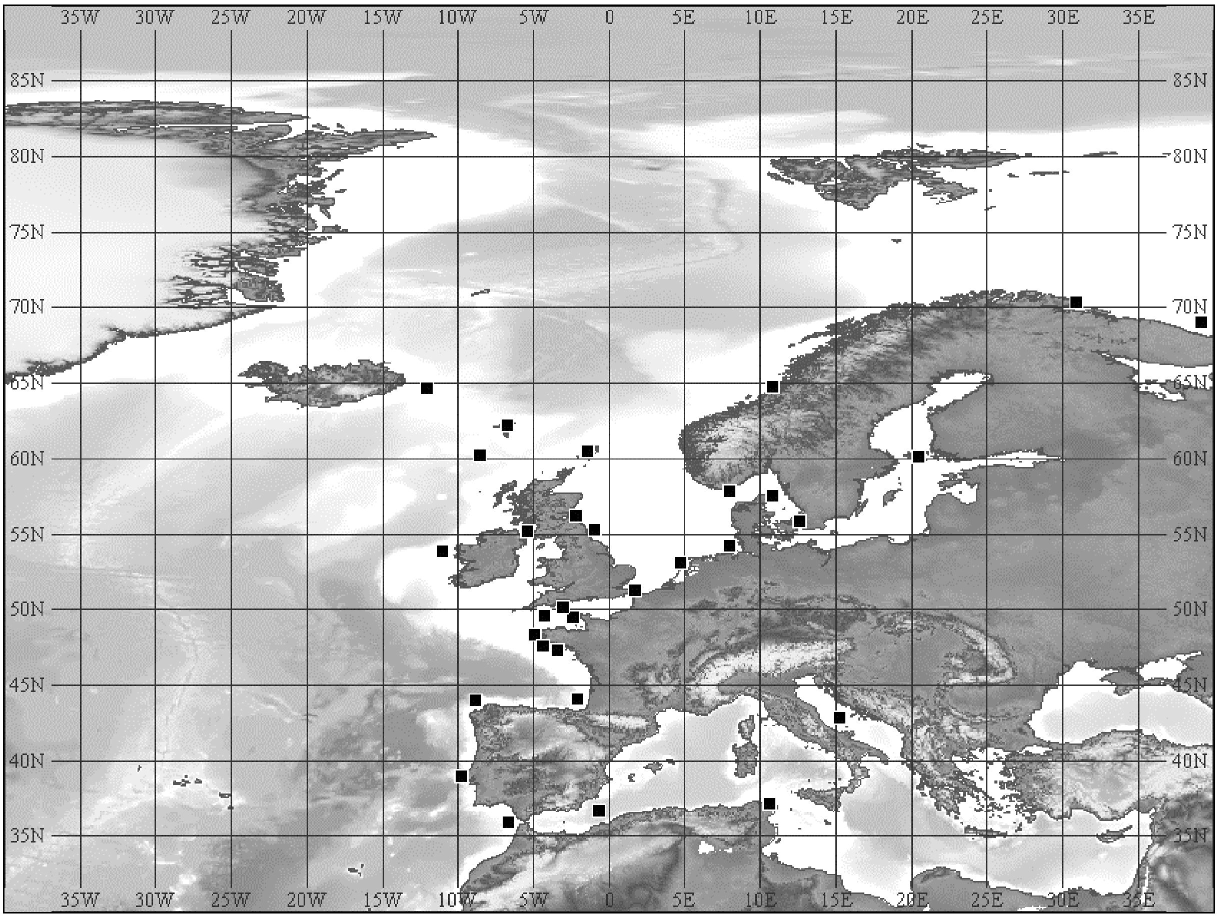

Fig. 23: World wide records and geographical distribution of ***Astacilla longicornis*** **(SOWERBY, 1806)** (Valvifera: Arcturidae). Source data from: ADEMA & HUWAE 1982; BATE & WESTWOOD 1868; BONNIER 1887; CASPERS 1939; GURJANOVA 1933; HANSEN 1916; HULT 1941; MEINERT 1880; SARS 1877, 1897; STEPHENSEN 1929; TATTERSALL 1905; WAHRBERG 1929; YASHNOV 1948; material from expedition "DIVA-Artabria 1". Bathymetric chart: GEBCO.

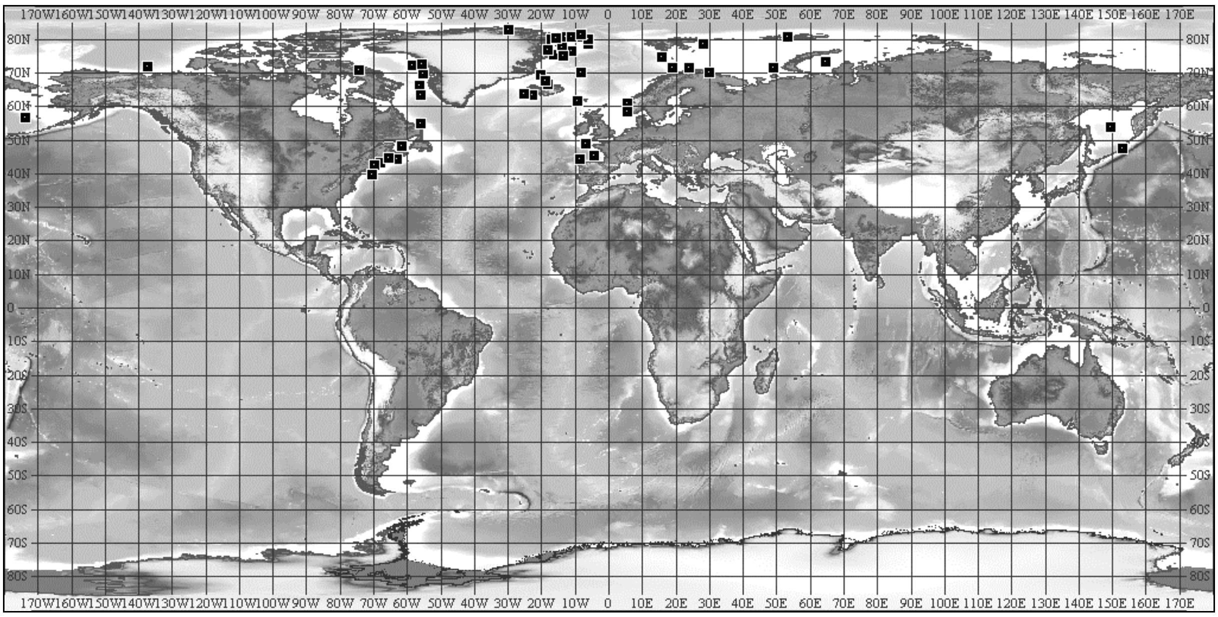

Fig. 24: World wide records and geographical distribution of ***Calathura brachiata*** **(STIMPSON, 1854)** (Anthuridea: Leptanthuridae). Source data from: BRANDT 1993; BRANDT & NEGOESCU 1997; BRANDT *et al.* 1996; GURJANOVA 1936; HANSEN 1883, 1887, 1916; HARGER, 1880; JUST 1970; KENSLEY 1982; MALYUTINA & KUSSAKIN 1996; RICHARDSON 1901; SARS 1896; STEBBING 1864, 1900; STEPHENSEN 1913, 1936, 1937, 1943; WEBER, 1884; ZIRWAS 1911; material from expedition "DIVA-Artabria 1". Bathymetric chart: GEBCO.

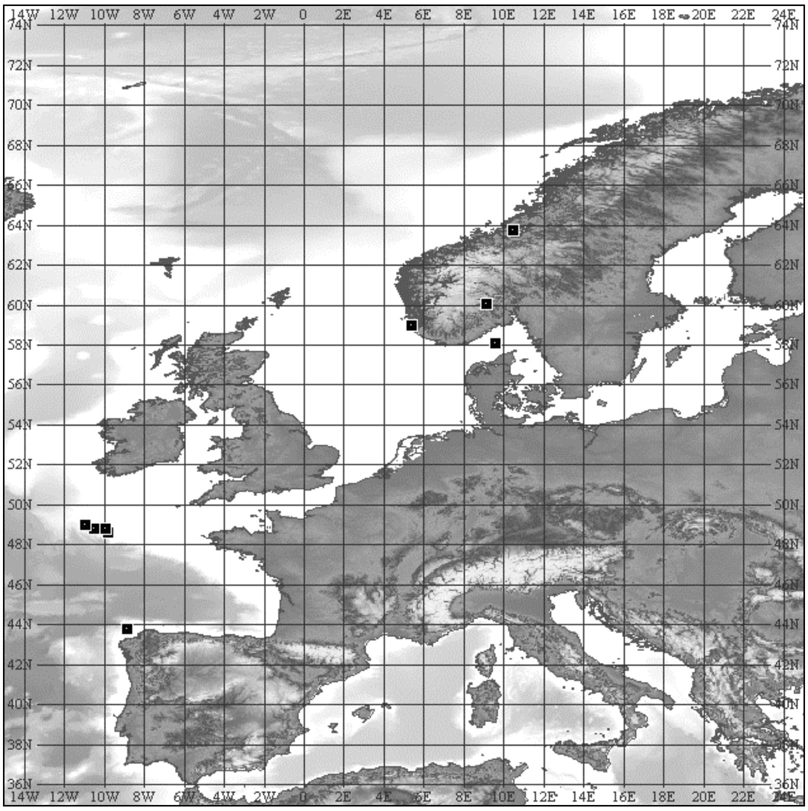

Fig. 25: World wide records and geographical distribution of ***Leptanthura tenuis*** **(SARS, 1873)** (Anthuridea: Leptanthuridae). Source data from: NEGOESCU 1984; NORMAN 1894; SARS 1896; WÄGELE 1981; material from expedition "DIVA-Artabria 1". Bathymetric chart: GEBCO. Records appearing to be on mainland are from the fjords of Norway.

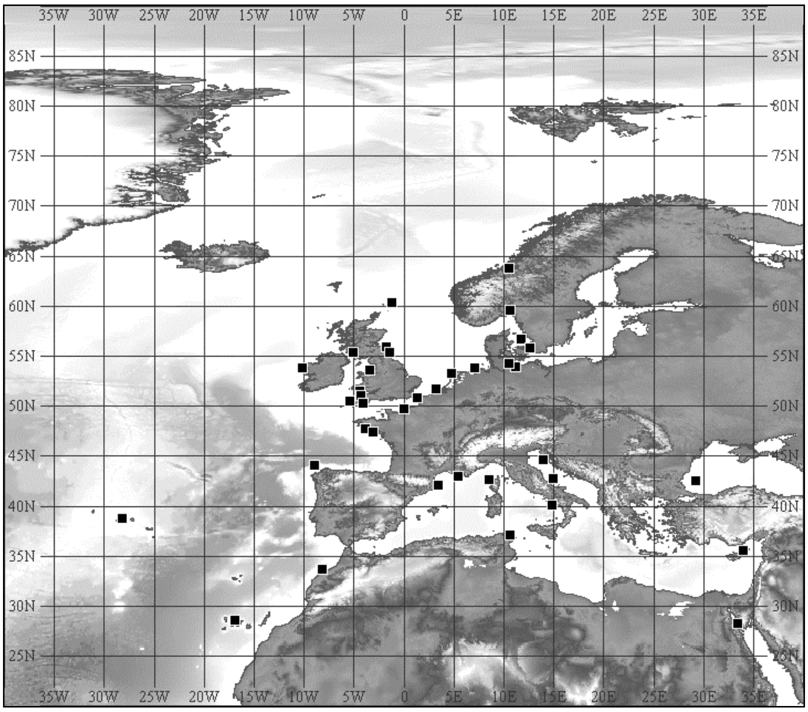

Fig. 26: World wide records and geographical distribution of ***Eurydice pulchra*** **LEACH, 1815** (Cirolanidae). Source data from: BATE & WESTWOOD 1868; BONNIER 1887; CRAWFORD 1937; DAUVIN *et al.* 1994; DONS 1933; FAGE 1933; GOURRET 1891; HANSEN 1890, 1910; KOCATAŞ *et al.* 2001; LÖWEGREN 1937; MONOD 1923; MEINERT 1890; NAYLOR 1972; NORMAN 1904; SARS 1882, 1899; SOIKA 1955; TATTERSALL 1905, 1912; WAHRBERG 1929; WHITE 1847; WOLFF 1966; material from expedition "DIVA-Artabria 1". Bathymetric chart: GEBCO. Records appearing to be on mainland are from the fjords of Norway.

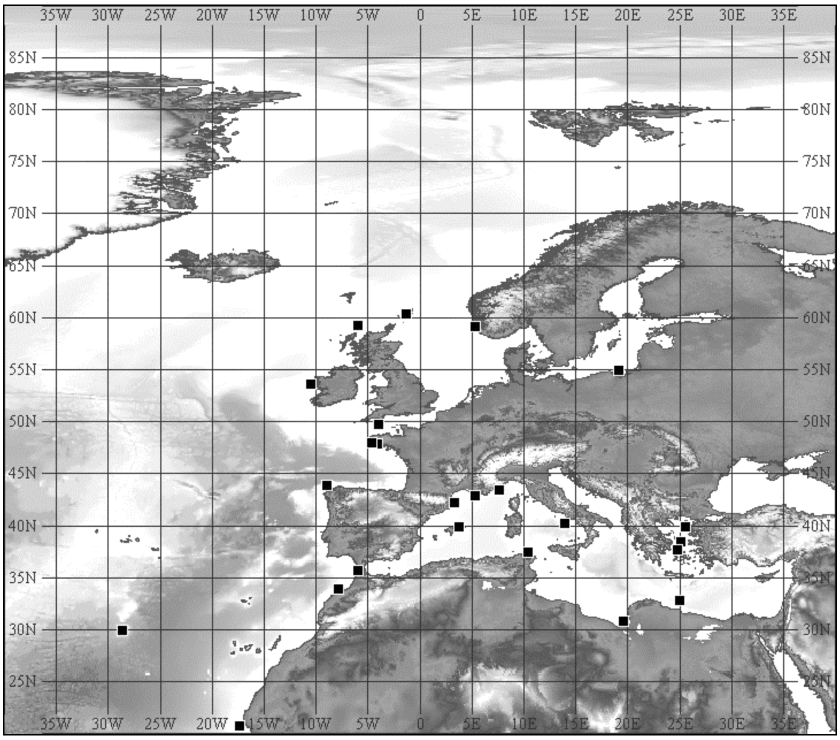

Fig. 27: World wide records and geographical distribution of ***Eurydice (Pelagonice) truncata*** **(NORMAN, 1868)** (Cirolanidae). Source data from: CRAWFORD 1937; DE GRAVE & JONES 1991; FAGE 1933; HANSEN 1895, 1905; MACQUARDT-MOULIN 1969; MONOD 1923; NIERSTRASZ 1931; NORMAN 1904; RODRÍGUEZ-SANCHEZ *et al.* 2001; STEBBING 1910; STEPHENSEN 1915; TATTERSALL 1905, 1912; material from expeditions M25/1, M40/3, M42/3, and "DIVA-Artabria 1". Bathymetric chart: GEBCO.

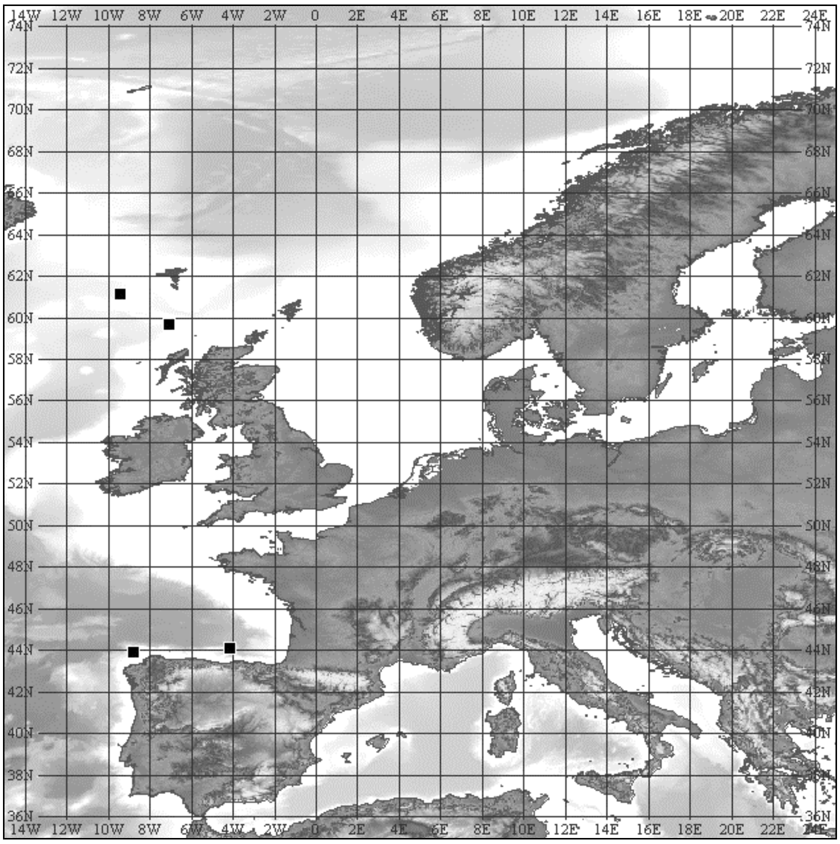

Fig. 28: World wide records and geographical distribution of ***Metacirolana hanseni*** **(BONNIER, 1896)** (Cirolanidae). Source data from: BONNIER 1896; HANSEN 1905, 1916; TATTERSALL 1905; material from expedition DIVA-Artabria 1". Bathymetric chart: GEBCO.

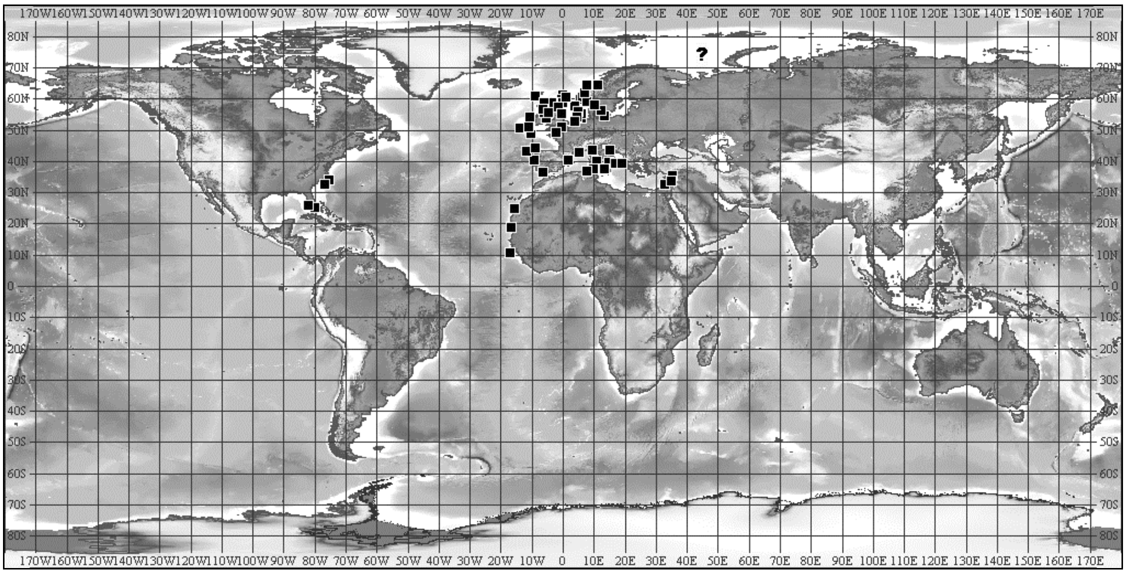

Fig. 29: World wide records and geographical distribution of ***Natatolana borealis*** **(LILLJEBORG, 1851)** (Cirolanidae). Source data from: ADEMA & HUWAE 1982; BATE & WESTWOOD 1868; CARTES & SORBE 1993; CRAWFORD 1937; DOLLFUS 1903; HANSEN 1905, 1910, 1916; HARGER 1883; HOEK 1882; KEABLE & BRUCE 1997; KEABLE 2006; KOCATAŞ *et al.* 2001; MENZIES & KRUCZYNSKI 1983; NORMAN 1904; RICHARDSON 1901, 1905; RODRÍGUEZ-SANCHEZ *et al.* 2001; SARS 1877, 1899; STEPHENSEN 1915, 1929; TATTERSALL 1905, 1912; WAHRBERG 1929; material from expeditions M25/1 and "DIVA-Artabria 1". Bathymetric chart: GEBCO.

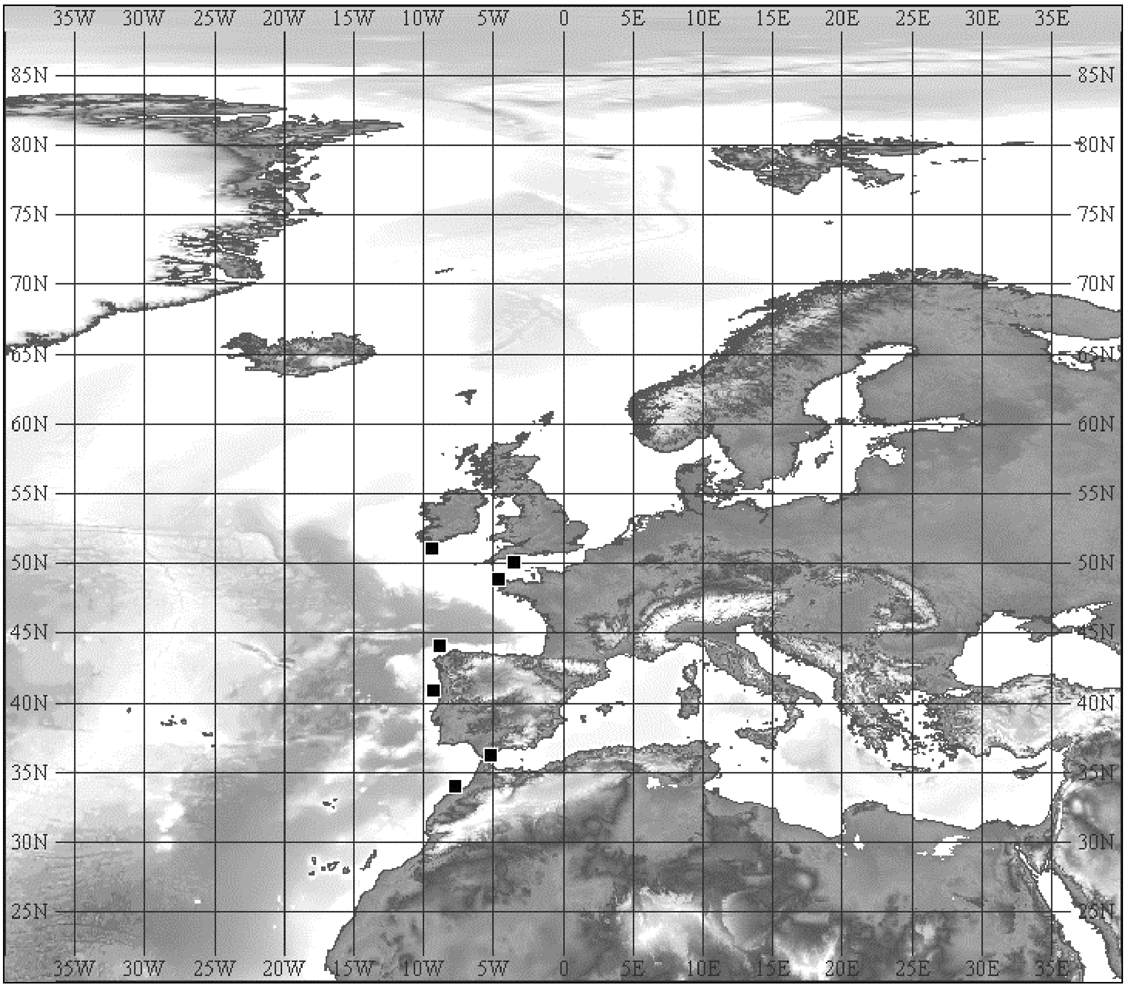

Fig. 30: World wide records and geographical distribution of ***Natatolana gallica*** **(HANSEN, 1905)** (Cirolanidae). Source data from: CASTELLÓ & CARBALLO 2001; HANSEN 1905; KEABLE & BRUCE 1997; MONOD 1924; material from expedition "DIVA-Artabria 1". Bathymetric chart: GEBCO.

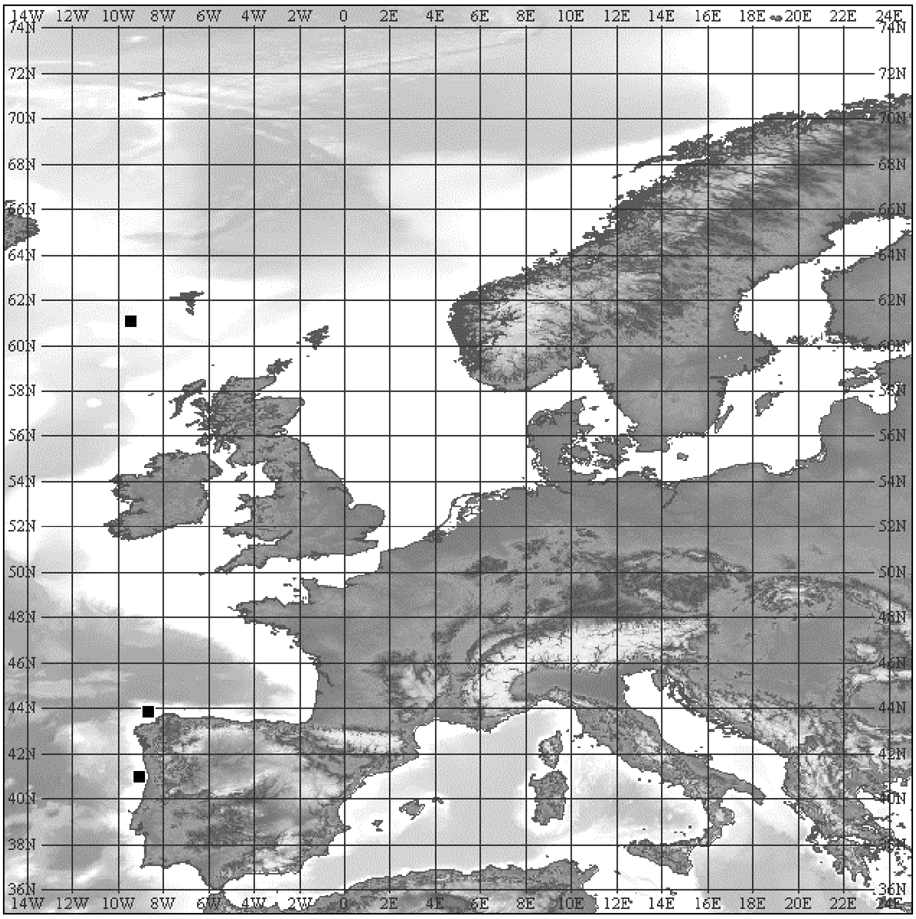

Fig. 31: World wide records and geographical distribution of ***Gnathia albescens*** **HANSEN, 1916** (Gnathiidae). Source data from: GURJANOVA 1933; HANSEN 1916; MONOD 1926; MÜLLER 1989; material from expedition "DIVA-Artabria 1". Bathymetric chart: GEBCO.

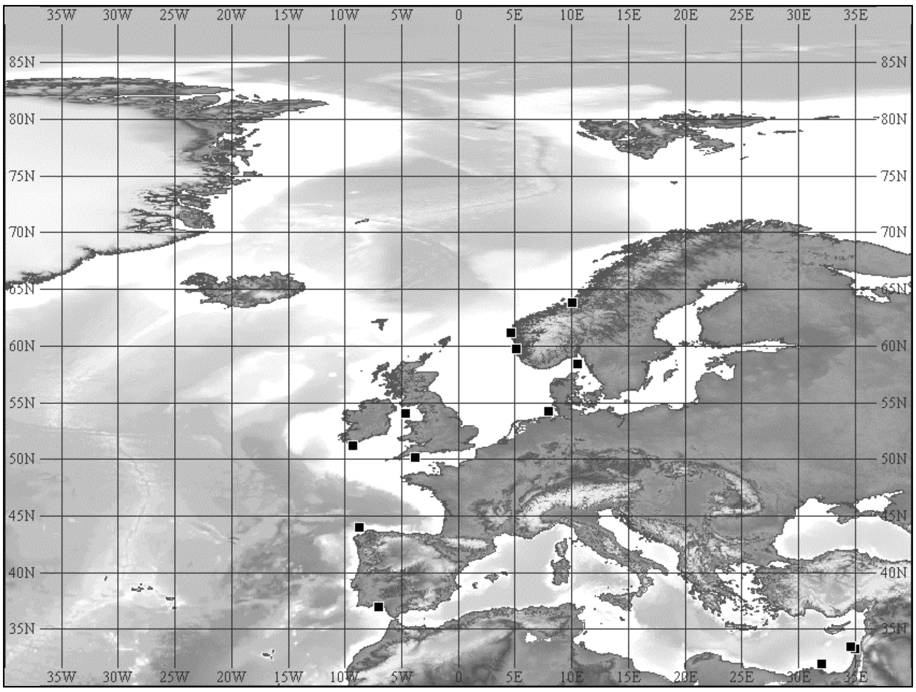

Fig. 32: World wide records and geographical distribution of ***Gnathia dentata*** **(SARS, 1872)** (Gnathiidae). Source data from: CASPERS 1939; DEGRAVE & HOLMES 1998; MONOD 1926; NAYLOR, 1972; RODRÍGUEZ-SANCHEZ *et al.* 2001; SARS 1899; WAHRBERG 1929; material from expeditions M25/1 and "DIVA-Artabria 1". Bathymetric chart: GEBCO. Records appearing to be on mainland are from the fjords of Norway.

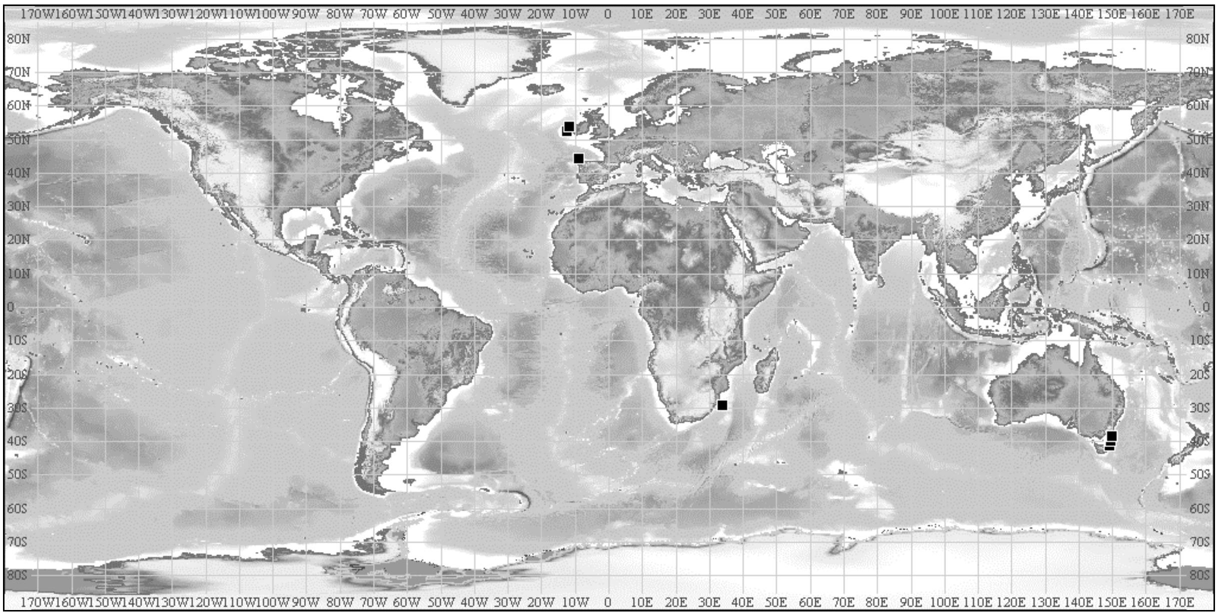

Fig. 33: World wide records and geographical distribution of ***Bathycopea typhlops*** **TATTERSALL, 1905** (Sphaeromatidea: Ancinidae). Source data from: BRUCE 1991; KENSLEY 1978; KUSSAKIN 1979; LOYOLA E SILVA 1971; POORE 2002; TATTERSALL 1905; material from expedition "DIVA-Artabria 1". Bathymetric chart: GEBCO.

Table 3: Geographic distribution and bathymetric range of isopod species of the "DIVA-Artabria 1" expedition*. Occurence in grey shade. Possible records (after KEABLE & BRUCE 1997) in question marks. New species omitted.

	Iberian Peninsula	North Sea (including Skagerrak and Kattegat, British shelf)	Baltic Sea	Boreal North East Atlantic	North Polar Sea (including adjacent seas: Baffin Bay, Barents Sea, Kara Sea)	North West African (including Canaries, Azores, Great Meteor Seamount	Western Mediterranean Sea	Eastern Mediterranean Sea (Adriatic to Levantinian)	South East Atlantic	North West Atlantic	South West Atlantic	Western Pacific and Indian Ocean	Bathymetric distribution (this study, see appendix) [m]	Bathymetric distribution (world wide records) [m]
Metamunna typica	■	■											102 – 385	300
Paramunna bilobata	■	■	■	■									149 – 209	13 – 206
Janirella hessleri	■												970 – 1140	1877
Disconectes latirostris	■	■				■							205 – 607	183 – 366
Eurycope cornuta	■	■		■	■					■			607 – 790	46 – 2187
Ilyarachna longicornis	■	■		■	■	■	■	■	■	■	■		385 – 1140	8 – 5223
Pseudarachna hirsuta	■	■		■				■					300	30 – 478
Munnopsoides eximius	■			■	■								607	847 – 2624
Eugerda tenuimana	■	■	■	■	■			■		■			257 – 607	11 – 1000
Prochelator lateralis	■	■		■	■					■			205 – 607	50 – 2021
Macrostylis longiremis	■	■		■									790	144 – 235
Arcturella dilatata	■	■					■	■					152	20 – 630
Astacilla longicornis	■	■	■	■	■		■	■					607	9 – 2250
Calathura brachiata	■	■		■	■					■		■	1140	9 – 2488
Leptanthura tenuis	■	■		■									607	7 – 1300
Eurydice pulchra	■	■	■	■		■	■	■					790	0 – 190
Eurydice truncata	■	■				■	■	■					209 – 996	1 – 1326
Metacirolana hanseni	■	■		■									970 – 1140	390 – 1000
Natatolana borealis	■	■	■	■	?	■	■	■		■			607	15 – 1479
Natatolana gallica	■	■				■							603	195 – 210
Gnathia albescens	■			■									970 – 1140	800 – 1030
Gnathia dentata	■	■		■				■					630 – 810	22 – 91
Bathycopea typhlops	■	■										■	607 – 790	135 – 1277

*: Source data: ADEMA & HUWAE 1982; ARRONTES & ANADÓN 1990; BATE & WESTWOOD 1868; BONNIER 1887, 1896; BRANDT 1993; BRANDT & NEGOESCU 1997; BRANDT *et al.* 1996; BRUCE 1991; CARTES & SORBE 1993; CASPERS 1939; CASTELLÓ & CARBALLO 2001; CHARDY 1975; CRAWFORD 1937; DAUVIN *et al.* 1994; DEGRAVE & HOLMES 1998; DEGRAVE & JONES 1991; DOLLFUS 1903; DONS 1933; FAGE 1933; GOURRET 1891; GRAEFE 1902; GURJANOVA 1933, 1936, 1964; HANSEN 1880, 1883, 1887, 1890, 1895, 1905, 1910, 1916; HARGER, 1880, 1883; HESSLER 1970; HOEK 1882; HULT 1937, 1941; JUST 1970; KEABLE 2006; KEABLE & BRUCE 1997; KENSLEY 1975, 1978, 1982; KOCATAŞ *et al.* 2001; KUSSAKIN 1979, 1999; LAWRENCE & KEAST 1990; LÖWEGREN 1937; LOYOLA E SILVA 1971; MACQUARDT-MOULIN 1969; MALYUTINA & KUSSAKIN 1996; MEINERT 1880, 1890; MENZIES & KRUCZYNSKI 1983; MONOD 1923, 1924, 1926; MÜLLER 1989; NAYLOR 1972; NEGOESCU 1984; NIERSTRASZ 1931; NORMAN 1894, 1904; OLDEVIG 1917; POORE 2002; REBOREDA & URGORRI 1996; RICHARDSON 1901, 1905; RODRÍGUEZ-SANCHEZ *et al.* 2001; SARS 1877, 1882, 1896, 1897, 1899; SOIKA 1955; SPOONER 1959; STEBBING 1864, 1900, 1910; STEPHENSEN 1913, 1915, 1923, 1929, 1936, 1937, 1943; SVAVARSSON 1988; SVAVARSSON *et al.* 1990; TATTERSALL 1905, 1912; THISTLE 1980; WÄGELE 1981; WAHRBERG 1929; WEBER, 1884; WHITE 1847; WILSON & HESSLER 1980; WOLFF 1962, 1966; YASHNOV 1948; ZIRWAS 1911; material from expeditions M25/1, M40/3, M42/3, and "DIVA-Artabria 1".

Table 3 does not list the species that were new to science, since no other records are known. Together with the previously known species that have been determined, 32 species are regarded in the following zoogeographical characterization of the fauna off Galicia. One of these species, the janirellid *Janirella hessleri* CHARDY, 1975, has been previously recorded from the Bay of Biscay, off north eastern Spain and has not been recorded outside of the Iberian Peninsula, yet. The same accounts for the 9 new species, so 10 species (31.3%) are not known outside the Iberian Peninsula.

20 species (62.5%) have been recorded from the North Sea and/or around the British Isles: *Metamunna typica*, *Paramunna bilobata*, *Disconectes latirostris*, *Eurycope cornuta*, *Ilyarachna longicornis*, *Pseudarachna hirsuta*, *Eugerda tenuimana*, *Prochelator lateralis*, *Macrostylis longiremis*, *Arcturella dilatata*, *Astacilla longicornis*, *Calathura brachiata*, *Leptanthura tenuis*, *Eurydice pulchra*, *Eurydice truncata*, *Metacirolana hanseni*, *Natatolana borealis*, *Natatolana gallica*, *Gnathia dentata*, *Bathycopea typhlops*.

Five species (15.6%) also occur in the Baltic Sea: *Paramunna bilobata*, *Eugerda tenuimana*, *Astacilla longicornis*, *Eurydice pulchra*, *Natatolana borealis*.

16 species (50.0%) have been recorded from the boreal North East Atlantic (i.e. north of the British shelf): *Paramunna bilobata*, *Eurycope cornuta*, *Ilyarachna longicornis*, *Pseudarachna hirsuta*, *Munnopsoides eximius*, *Eugerda tenuimana*, *Prochelator lateralis*, *Macrostylis longiremis*, *Astacilla longicornis*, *Calathura brachiata*, *Leptanthura tenuis*, *Eurydice pulchra*, *Metacirolana hanseni*, *Natatolana borealis*, *Gnathia albescens*, *Gnathia dentata*.

Seven species (21.9%) have been recorded from the North Polar Sea (plus a possible record of *Natatolana borealis* from the Barents Sea, see KEABLE & BRUCE, 1997): *Eurycope cornuta*, *Ilyarachna longicornis*, *Munnopsoides eximius*, *Eugerda tenuimana*, *Prochelator lateralis*, *Astacilla longicornis*, *Calathura brachiata*.

Six species (18.8%) have been recorded off North western Africa (including records from the Canary Islands, Azores and from the Great Meteor Seamount): *Disconectes latirostris*, *Ilyarachna longicornis*, *Eurydice pulchra*, *Eurydice truncata*, *Natatolana borealis*, *Natatolana gallica*.

Six species (18.8%) were recorded from the Western Mediterranean Sea (all of them are also recorded from the Eastern Mediterranean Sea): *Ilyarachna longicornis*, *Arcturella dilatata*, *Astacilla longicornis*, *Eurydice pulchra*, *Eurydice truncata*, *Natatolana borealis*.

Nine species (28.1%) have been recorded from the Eastern Mediterranean Sea: *Ilyarachna longicornis*, *Pseudarachna hirsuta*, *Eugerda tenuimana*, *Arcturella dilatata*, *Astacilla longicornis*, *Eurydice pulchra*, *Eurydice truncata*, *Natatolana borealis*, *Gnathia dentata*.

One species (3.1%), *Ilyarachna longicornis*, has been reported from South East Atlantic. Further records of *Natatolana borealis* off South Africa by KENSLEY (1975) are based on misidentified material according to KEABLE (2006).

Six species (18.8%) are known from the North West Atlantic: *Eurycope cornuta*, *Ilyarachna longicornis*, *Eugerda tenuimana*, *Prochelator lateralis*, *Calathura brachiata*, *Natatolana borealis*.

One species (3.1%), *Ilyarachna longicornis*, has been recorded from the South West Atlantic.

Two species (6.3%) have been recorded from the Western Pacific Ocean, *Calathura brachiata* from the Bering Sea and Ochotsk Sea, *Bathycopea typhlops* from the Tasman Sea, the latter has a cosmopolitic record ranging from off western Ireland, northern Galicia, Natal to the Tasman Sea off Australia.

4 Discussion

Taxonomic discussion

The taxonomic discussions for the described species have been presented in the foregoing chapter.

Sampling

The published naming of stations of the expedition "DIVA-Artabria 1" (compare PARAPAR *et al.* 2004) needs a general comment: Station names were given prior to sampling and reflect the depth that was *aimed* to reach. However, the exact depth is hard to achieve. As a consequence, the station names do *not* reflect the actual sampled depth. For example, the station "AT 1000-2002" would imply that a depth of exactly 1000 m was achieved, where in fact it was 1140 m, the station "EBS 350-2002" implies a greater depth than station "EBS 300-2002", actually the opposite is the case (300 m versus 301 m).

The 2002 part of the expedition "Diva-Artabria 1" provided 170 isopod specimens belonging to 22 species, whereas the samples taken from 2003 contain 520 individuals belonging to 34 species. The main cause for the discrepancy between both sampling years may be that in 2003 successful sampling was supported by exceptionally good weather during the late summer in that region. In 2002, part of the planned sampling had to be abandoned due to rough sea, and no samples with the epibenthic sledge were taken below a depth of 385 m. Considering the mesh size of the net of the employed epibenthic sledge (0.5 mm) compared to the nets of the Agassiz Trawl and the Naturalist Dredge (10 mm), it is obvious that inventories depending exclusively on the latter two gears would be insufficient since isopods are mostly in the range of 1 – 5 mm body length. As a consequence, the samples from the Agassiz Trawl or the Naturalist Dredge generally yielded few isopods or none. As no box corers or multi corers were employed, the data is insufficient for a quantitative analysis. It has to be considered that B.O. "*Mytilus*" is a small vessel being around 24 m long, which makes it impossible to use very heavy sampling gear like multi corers. The small size of the vessel was also the reason why a smaller version of the the epibenthic sledge had to be employed. BRENKE (2005) estimated the minimum systematic error of the epibenthic sledge to be as much as 25 %. Furthermore, the total amount of collected specimens from "Diva-Artabria 1" is low compared with isopod samples from expeditions that covered a considerably larger area like ANDEEP 1 – 3 with R.V. "*Polarstern*" or Diva-1 – 2 with R.V. "*Meteor*". This is due to the epibenthic sledge being twice as wide as the one employed in "DIVA-Artabria 1" and a slightly longer trawling distance (2191 – 4723 m in Diva-1, BRENKE 2005 b, 1815 – 3828 m in "DIVA-

Artabria 1", for exact coordinates see appendix) resulting in a larger sampled area. In "DIVA-Artabria 1" sampling was done at stations along a bathymetric gradient which makes the stations less comparable to each other as if they were taken from a more or less even abyssal plain where stations are more similar in depth. The sites along the transect showed great differences in overall faunal composition. In 2003 the samples from depths around 600 m depths were exceptional as all contained large amounts of scleractinian corals, which – regarding the associated fauna – may explain a higher diversity in species: Station EBS 600-2003 (607 m) yielded 254 isopod specimens belonging to 18 species, i.e. 36.8% of all individuals and 48.7% of the species represented in the entire campaign "DIVA-Artabria 1". All quantitative analyses were therefore dismissed in this work. BRENKE'S (2005) suggestion to combine the contents from both nets of the epibenthic sledge (the upper "supra net" and the lower "epi net") to be treated as a single sample was followed here, as it can be confirmed that there are no differences in the faunal communities caught with both nets.

Zoogeography, faunal composition and bathymetric range

There are significant changes in the regional isopod faunal composition with changing water depth (compare Table 1, appendix). The overall isopod species richness increases with depth.

The stations that belong to the continental shelf yield many individuals of *Metamunna typica* (88 from 102 – 203 m depth), but only three identifiabe species out of two families were found (a fourth species is represented by a single gnathiid Praniza larva that cannot be determined to species level). These are apparently restricted to the lower continental shelf: *Arcturella dilatata* (Arcturidae, 150 m), *Metamunna typica* (Paramunnidae, 102 – 385 m, most numerous at 102 m), *Paramunna bilobata* (Paramunnidae, 152 – 209 m). These are the only isopod species found at depths of less than 205 m in the samples from "DIVA-Artabria 1".

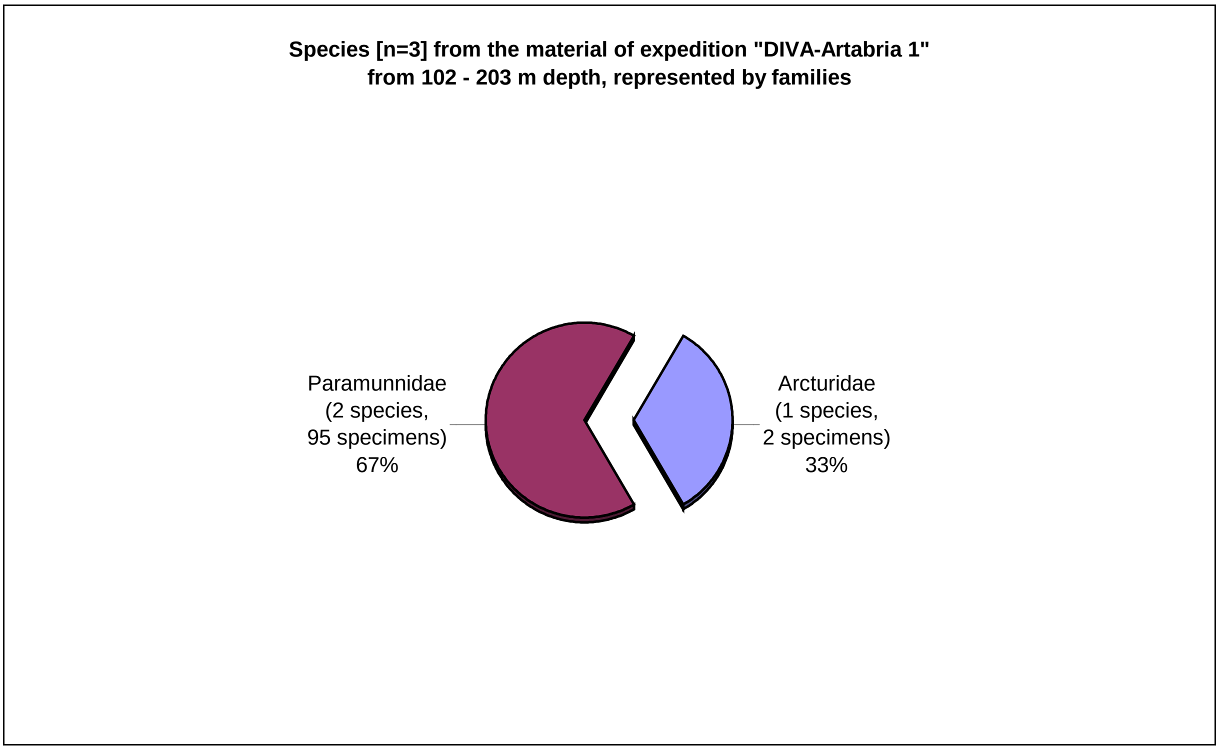

Fig. 34: Species and family composition of isopods from the lower continental shelf stations (102 – 203 m depth) of the expedition "DIVA-Artabria 1". Unidentifiable species omitted.

Below, at depths between 205 and 603 m, the faunal composition appears to be transitional between shelf fauna and a true deep-water fauna: The Munnopsidae appear with *Disconectes latirostris*, *Ilyarachna longicornis*, *Bathybadistes penthesilea* n. sp., *Pseudarachna hirsuta* and *Lipomera (Lipomera) celtica* n. sp., the Desmosomatidae are represented by *Eugerda tenuimana* and *Prochelator lateralis*. Some species have a wider bathymetric range (e.g. *Arcturopsis mammifer* n. sp., Arcturidae). There are 12 species altogether within this bathymetric range belonging to five families (the Gnathiidae represent a sixth family but no stages were found here that would allow a determination to species level).

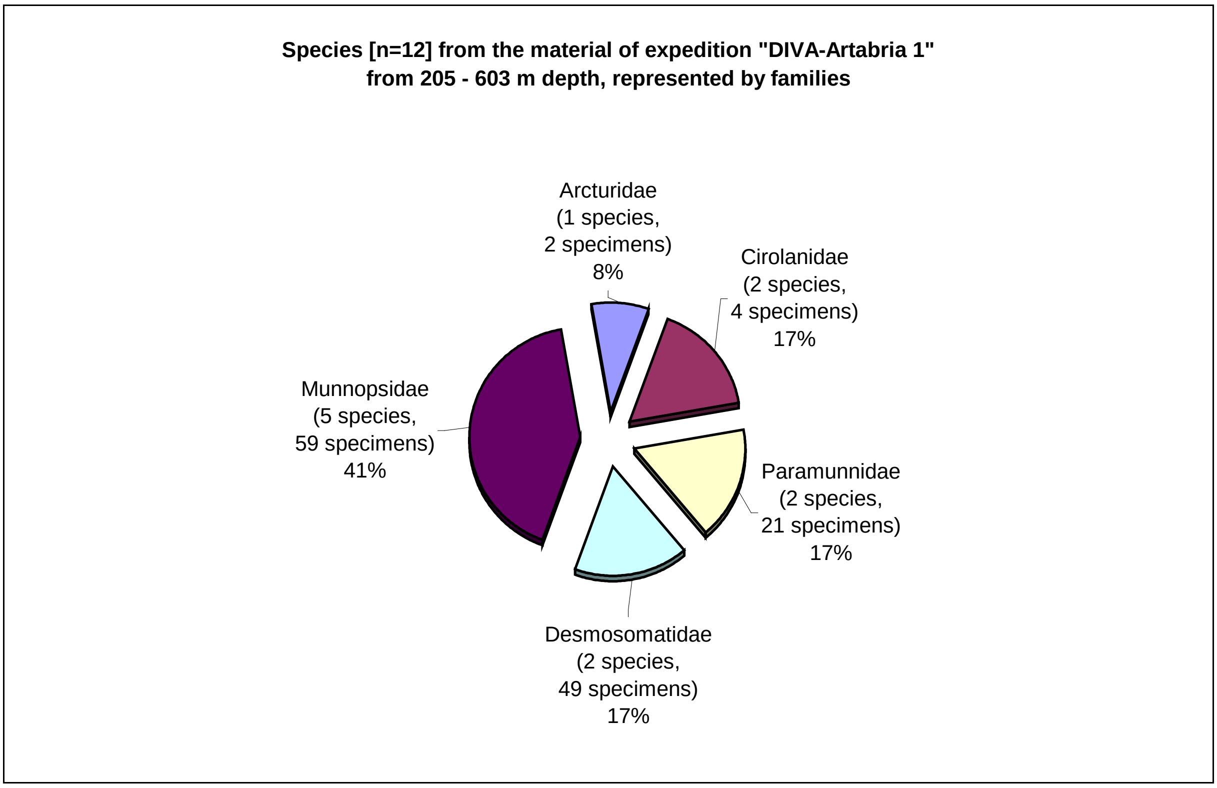

Fig. 35: Species and family composition of isopods from the uppermost continental slope stations, between 205 – 603 m depth, of the expedition "DIVA-Artabria 1". Unidentifiable species omitted.

From 607 m (the station with the most sampled specimens and species) downwards, characteristic deep water species appear and the overall number of identified species increases. It has to be considered that the number of identified species is depending on the size of the sampled area. However, the station at 607 m depth (EBS-600-03) is – despite the highest amount of species and specimens contained – also the one with the shortest trawling distance with this gear (0.98 nautic miles = 1815 m, the maximum is 2.067 nm = 3828 for station EBS-100-03, see appendix for station coordinates) and consequently represents the smallest area sampled with the epibenthic sledge. 30 of the recognized species of the material were found at depths of 607 m and deeper. 24 of these were found between 607 and 960 m depth and represent 14 families (the Bopyridae are represented by Cryptoniscium larvae and are indeterminable, yet their occurence proves that in fact 15 families were found within this interval). Of these, *Bathycopea typhlops* (Ancinidae), *Caecognathia ovalifrons* n. sp. (Gnathiidae), *Ianthopsis maximi* n. sp. (Acanthaspidiidae) and *Austrofilius teiresias* n. sp. ("Janiridae") are typical, eyeless deep water species with relatives that usually have eyes and occur at shallower depths. Munnopsidae are deep-sea inhabitants and generally eyeless, regardless of the depth they live at, whereas other deep water species as *Metacirolana hanseni* have well developed eyes).

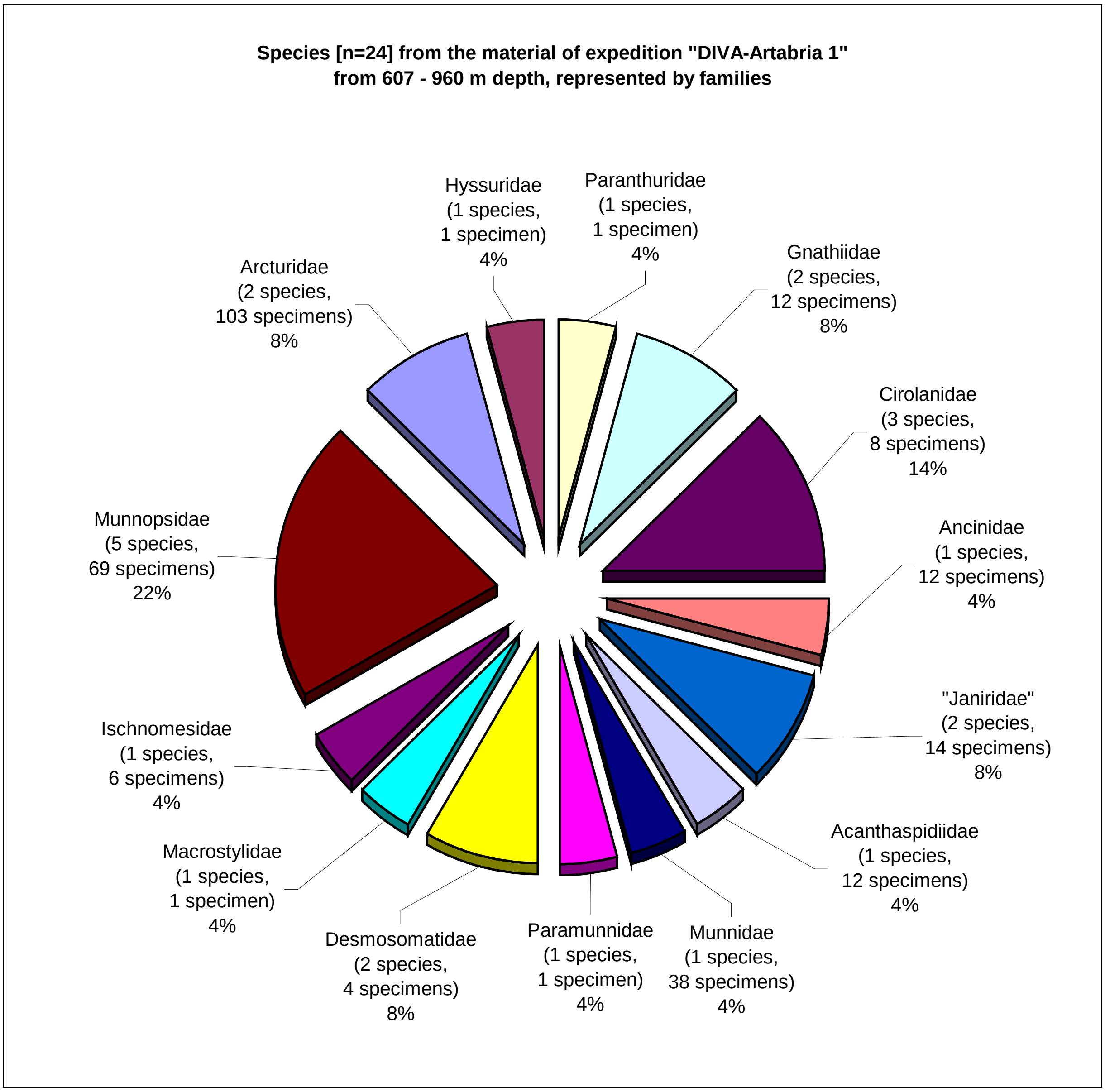

Fig. 36: Species and family composition of isopods from the continental slope stations between 607 – 960 m depth of the expedition "DIVA-Artabria 1". Unidentifiable species omitted.

Close to a depth of 1000 m (970 m and deeper) the faunal composition seems to change again: *Metacirolana hanseni* (Cirolanidae), an indeterminable fragment of Cirolanidae, *Gnathia albescens* (Gnathiidae), *Calathura brachiata* (Paranthuridae) and *Janirella hessleri* (Janirellidae) were not found at stations from shallower waters and the number of species again goes down to 11, representing nine families. It seems therefore reasonable to assume that the transect examined in the expedition only reflects a part of the species that are present on the Galician continental slope, as the faunal composition apparently changes close to the very deepest station and the continental slope falls down approximately further 2000 m until it reaches the Biscayan Abyssal Plain.

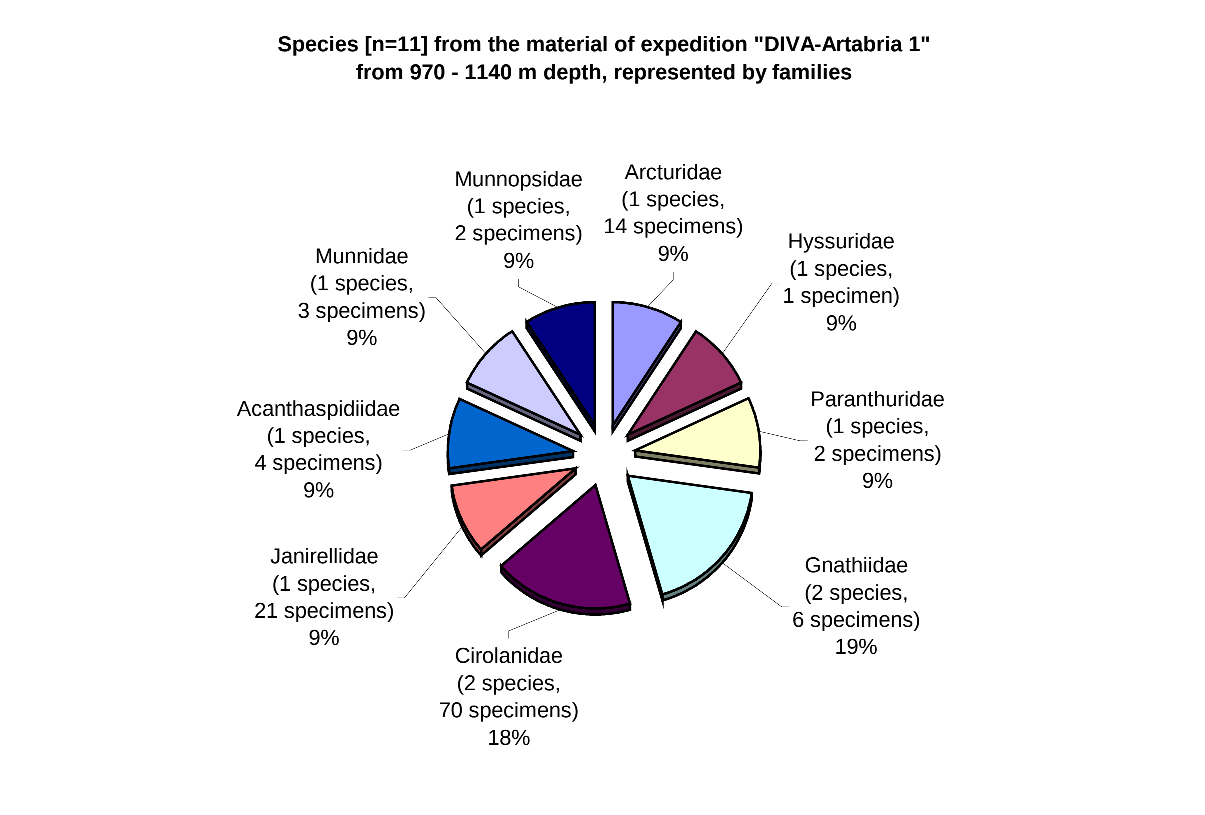

Fig. 37: Species and family composition of isopods from the continental slope stations between 970 – 1140 m depth of the expedition "DIVA-Artabria 1". Unidentifiable species omitted.

It may be that the high number of species from depths between 607 and 960 m compared with other depths is distorted by the single station at 607 m depth that went through a colony of scleractinian corals and may have caught these together with their associated fauna that would otherwise not have been obtained. However, the absence of the species recorded only from 970 m and deeper is still significant for a general faunal change that is not obscured by distorting effects of this single station.

Absence of eyes is – despite its little taxonomic value – an indicator for species that are at least adapted to the aphotic zone. Eyeless isopod species were not found at the stations that represent the continental shelf. The first appearance of Desmosomatidae and Munnopsidae (which are exclusively eyeless) is from 205 m depth downwards. However, those species being *adapted* to bathyal depths do not necessarily have to be *dependent* on a narrow bathymetric range. Table 3 demonstrates that the bathymetric distribution for many species that occur at bathyal depths off Galicia in fact is much wider: the paranthurids *Leptanthura tenuis* and *Calathura brachiata*, the macrostylid *Macrostylis longiremis*, the two species of Desmosomatidae and all previously known Munnopsidae (*Disconectes latirostris*, *Eurycope cornuta*, *Ilyarachna longicornis*, *Pseudarachna hirsuta*) except for *Munnopsoides eximius* have been recorded from the continental shelf, mostly at higher latitudes (often in the Norwegian fjords). Even the ancinid *Bathycopea typhlops* is not completely absent on the continental shelf (POORE 2002). The cirolanid *Metacirolana hanseni*, the gnathiid *Gnathia* *albescens*, the janirellid *Janirella hessleri* and the munnopsid *Munnopsoides eximius* seem to be restricted to bathyal depths. With the exception of *M. hanseni*, these species are all eyeless.

Regarding the adaptations to the aphotic zone represented by absence of eyes, deep-sea species appear in the material from a depth of 205 m downwards. Species that are *apparently* restricted to bathyal depths (with no records from the continental shelf either from the literature or from the examined material) were found at depths of 607 m or deeper. However, the absence of records from the shelf does not prove yet that these species are exclusively deep-sea species. The previous records are too fragmentary to guarantee a complete absence from the shelf. Even if this was the case, it is possible that these species are absent on the shelf due to the presence of more competitive shallow-water isopods. It is e.g. likely that the deep-water cirolanid *Metacirolana hanseni* is unable to compete with the other identified cirolanids *Eurydice pulchra*, *E. truncata*, *Natatolana borealis* and *N. gallica* on the shelf and is therefore restricted to depths were these latter four species do not occur any more.

As stated in the introduction, the record of the european marine fauna, especially of species that are not occuring on the continental shelf, is fragmentary. Considerations on endemism are therefore tentative. The janirellid *Janirella hessleri* was previously known only from the type locality off the north eastern coast of Spain. This species may tentatively be regarded as endemic for the continental slope of Northern Spain. The nine species that were new to science may as well be endemic to the northern Iberian Peninsula. None of them was found on the shelf, the shallowest record is that of *Arcturopsis mammifer* n. sp. from 350 m depth. If all these species are in fact endemic, the percentage of endemites in the material would be 31.3%. The percentage of new species is 28.1%. This is a low percentage compared with samples from e.g. the deep sea of the South East Atlantic or the Antarctic (BRANDT *et al.* 2005, 2007), but still demonstrates that nearly one third of the isopod species from the lower continental shelf and upper continental slope of a western European coast were new to science.

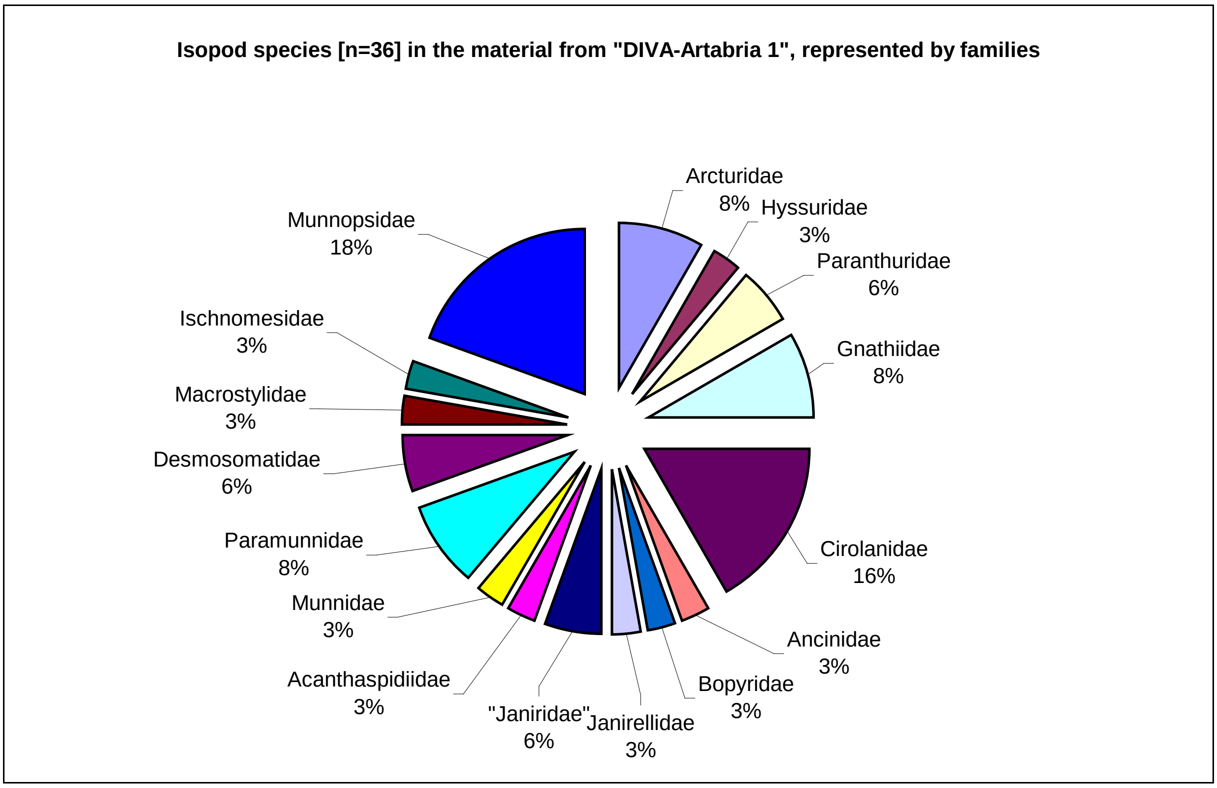

Fig. 38: Species and family composition of isopods from all stations of the expedition "DIVA-Artabria 1". In this case, unidentified species that are not conspecific with other ones are also considered (e.g. Bopyridae).

The geographical distribution of the species identified in the samples from Diva-Artabria 1 along with their previously recorded bathymetric range suggests that most of them are North East Atlantic species, predominantly from the North Sea and British shelf (62.5%), often also extending to the boreal North East Atlantic (50% of the sampled species are also known from here). 31.3% of the species may be endemites (nine new species and *Janirella hessleri*). Less than a third (28.1%) of the determined species are known from the Mediterranean Sea, despite the presence of *uNADW* between 800 and 1400 m. 21.9% of the species have been previously recorded from the North Polar Sea. 18.8% of the recognized species in the material have an amphiatlantic distribution, as they have been recorded from the North West Atlantic as well. The same percentage of species is also known from the meridional North East Atlantic (i.e. off North Africa, including the Azores and Canaries and the Great Meteor Seamount). 15.6% of the species are also recorded from the Baltic Sea. One species (i.e. 3.1%), the paranthurid *Calathura brachiata*, is also known from the North Pacific Ocean.

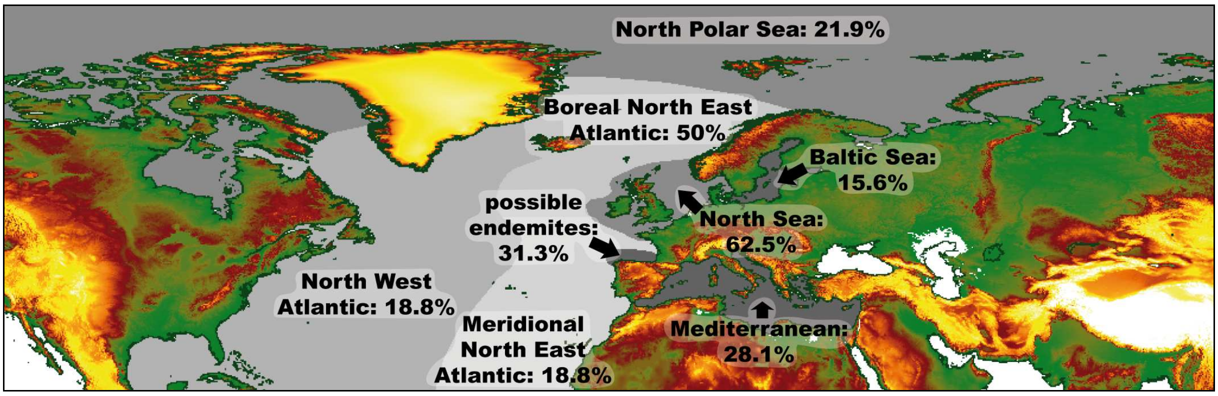

Fig. 39: Simplified geographical distribution of the isopod species from expedition "DIVA-Artabria 1" in the Northern Hemisphere. South Atlantic and Pacific distribution omitted. Chart: GEBCO.

Another single species, the ancinid *Bathycopea typhlops*, is apparently cosmopolitic as the world wide records suggest. If actually the records do not represent several cryptic species that are phenotypically indistinguishable, it must probably have existed since the Mesozoic, prior to the existence of the Atlantic Ocean, which is very unlikely. Recent work proved that cryptic, reproductively isolated species exist in different groups of Isopoda, e.g. Phreatoicidea (GOUWS *et al.* 2004), Cirolanidae (BARATTI *et al.* 2004), Sphaeromatidae (BARATTI *et al.* 2005), Serolidae (HELD 2003), Chaetiliidae (HELD & WÄGELE 2005) and Acanthaspidiidae (RAUPACH & WÄGELE 2006) and it is possible that cryptic species will be recognized within *B. typhlops* in the future.

An occurrence of species in the North Polar Sea may explain records of the same species from the North Pacific ocean assuming a continuous distribution. However, the paranthurid *Calathura brachiata* is the only species from the material that has been recorded from the North Pacific.

The geographical distribution of *Natatolana borealis* is apparently discontinuous, with records from the Eastern United States but with a distinct gap as the species has never been recorded from Greenland or Iceland which have been extensively studied (KEABLE & BRUCE 1997). This is especially puzzling as Cirolanids are certainly more vagile than most other isopods. However, the species has been reported from the Barents Sea (listed as "possible record" in KEABLE & BRUCE 1997) which, if it could be confirmed, may be a trace of connection between eastern and western Atlantic populations via the North Polar Sea. If there is no connection between populations from the East and West Atlantic, it may be that a continuous distribution had previously existed and the species became extinct in the northernmost part of its geographical range, possibly by glacioeustatic fall of the coast line. However, the reasons for the discontinuous distribution remain unclear, as *N. borealis* is not restricted to the shelf but has been recorded from up to 1479 m depth (Keable & Bruce 1997). It is also possible that the distribution had been continuous during warmer interglacial periods and the species became extinct in the northernmost part due to temperature falling below its physical optimum.

For a better understanding of the regional faunal composition of the Galician Continental slope, the fauna was compared with isopods collected from the Great Meteor Seamount (cruise M42/3 with RV "*Meteor*", approximately 700 specimens) and from the Mediterranean Sea (cruise M71 with RV "*Meteor*", LEVAR expedition, 55 specimens) as well as additional material from the Mediterranean Sea (cruise M25/1 with RV "*Meteor*", 946 specimens; cruise M40/3 with RV "*Meteor*", 109 specimens) that was loaned from the Senckenberg Research Institute, Frankfurt am Main, Germany.

In the mediterranean material from cruise M25/1 six species were recognized that are also present in samples from "DIVA-Artabria 1": *Gnathia dentata*, *Ilyarachna longicornis*, *Pseudarachna hirsuta*, *Natatolana borealis*, *Eurydice truncata*, *Eugerda tenuimana*. Furthermore, the samples contain a possibly new species of *Disconectes*, similar to *D. latirostris* but with stronger cleft anterior margin of the rostrum.

In the mediterranean material from cruise M40/3 there were four species that were also present in material from "DIVA-Artabria 1": *Prochelator lateralis*, *Ilyarachna longicornis*, *Pseudarachna hirsuta*, *Eurydice truncata*. There is an additional species of *Disconectes* with a rostrum without anteromedian depression which is neither conspecific with *D. latirostris* nor with the *Disconectes sp.* from cruise M25/1 (pers. observ.).

The material from cruise M42/3 (Great Meteor Seamount) yielded three species that were also present in samples from "DIVA-Artabria 1": *Eurydice truncata*, *Ilyarachna longicornis* and *Disconectes latirostris*. The samples from the Great Meteor Seamount contain many Joeropsidae which are completely absent in the Galician material, as well as a new species of *Katianira* (Katianiridae SVAVARSSON, 1987).

The material from the Mediterranean Sea and the Great Meteor Seamount provided further records of the geographical distribution of isopod species recognized in the material from "DIVA-Artabria 1". There are no species that are exclusively restricted to a combination of e.g. the Atlantic coast of Spain and the Mediterranean Sea or the Great Meteor Seamount. On the contrary, all above mentioned species from "DIVA-Artabria 1" are more or less widely distributed.

The main abiotic factors known to limit the geographical range of marine species below 200 m depth are temperature, pressure, geomorphology and substrate conditions (HOMBOHM 2000). Some of the species have been previously recorded from higher geographic latitudes but from shallower waters. It is assumed that water temperature is the main obstacle for the dispersal of most of the species discussed here, so that stenothermic species that occur at only a few metres depth in the northernmost part of their distribution will be present at considerably greater depths further south where the water temperature is more comparable to polar waters. This implies that for these species bathymetric depth is no independent limiting factor for their geographic distribution, at least not for the depths of the "DIVA-Artabria 1" transect. An extreme example of the possible extent of bathymetric range is *Ilyarachna longicornis* with records ranging from 8 – 5223 m depths (MALYUTINA & KUSSAKIN 1996; THISTLE 1980). On the other hand, the species found on the continental shelf are apparently more or less restricted to it. These species are assumed to be more sensitive to water pressure than to temperature changes that are greater close to the water surface. Nutrition and habitat or substrate preferences are other important factors: Sphaeromatidae often inhabit barnacles or sponges (HOLDICH 1968, SHUSTER 1989), Idoteidae are mostly restricted to the intertidal zone and the occurence of algae (NAYLOR 1955). However, nutrition content or quality cannot be regarded here due to the lack of data from the samples. Sponge-dwelling isopods may have been captured together with sponges and may therefore be found inside them in the future.

The presence of *uNADW* (or Levantinian Central Water, originating from the Mediterranean Sea) at 800 to 1400 m depth (DIETRICH *et al.* 1975) with its higher salinity could imply an increased percentage of mediterranean species at these depths. However, this is not the case. On the contrary, there were no species found that have exclusively been recorded from the Iberian Peninsula *and* the Mediterranean Sea. On the other hand, there are three non-endemic species predominantly or exclusively present at these depths that are unknown from the Mediterranean Sea; these are *Metacirolana hanseni* (Cirolanidae), *Gnathia albescens* (Gnathiidae) and *Calathura brachiata* (Paranthuridae). It is therefore assumed that at least for the previously known species that have been recorded from the North Atlantic and the Mediterranean Sea, the different salinities of both seas are no obstacle for their dispersal. However, in some of these species it would not be justified to regard them as stenothermic either: As the water temperature in the Mediterranean Sea falls nowhere below 13° C (TÜRKAY 2002) and the material contains species that were recorded from the Mediterranean Sea as well as from the boreal North Atlantic or from the North Polar Sea, these must be either more or less eurythermic or at least must have evolved different adaptations to water temperature within different populations. These species are: *Astacilla longicornis* (also recorded from the Barents Sea), *Gnathia dentata*, *Eurydice pulchra*, *Natatolana borealis* and *Pseudarachna hirsuta* (also from Trondheim Fjord, Norway), *Eugerda tenuimana* (also from eastern Greenland and from the Canada Basin), *Prochelator lateralis* (also from Kolbeinsey Ridge and Davis Strait) and *Ilyarachna longicornis* (also Kara Sea, North Greenland, North of Spitsbergen, with two records North of 80° N). Other species that show a wide geographical distribution are apparently missing in the Mediterranean Sea, these are *Calathura brachiata*, *Bathycopea typhlops*, *Disconectes latirostris* and *Eurycope cornuta*. It is assumed that these species are either more stenothermic with a physiological temperature optimum below 13° C or their absence in the Mediterranean Sea is due to the Gibraltar Sill (280 m) being an obstacle for the dispersal of these species. Even though all of these species have also been recorded from depths less than 280 m (Table 3), these records come from the northern parts of their geographical distribution.

On the other hand, there were only 15.6% of the species recorded from the Baltic Sea compared to 62.5% from the North Sea and 50% from the boreal Nort East Atlantic. This may suggest that the low salinity of the Baltic Sea is an obstacle for the dispersal of Atlantic species as most marine species are sensitive to low salinity.

Geomorphology and substrate conditions that may influence the presence of isopod species on the Galician continental slope cannot be regarded here, as no data is available from the expedition.

As a consequence, water temperature may be the predominant abiotic factor to influence the local isopod faunal composition. For deep-water species, stenothermy combined with eurybathy is possible. For the species on the shelf, stenobathy is likely. However, this has to remain speculative, since no environmental parameters have been recorded.

Nutrition as one important biotic factor to influence the isopod fauna cannot be regarded here, since no data nutrient content of the substrates are available, yet.

Interspecific influences are poorly understood in all deep-water species. Certainly, interspecific competition or predator-prey relationship will have a major influence on the local presence of isopod species. But to what extent remains unresolved, yet. At least it is likely that often the isopod species occurring on the shelf are more competitive than deep-water species and are only replaced by the latter where the pressure of the water column limits their occurrence. It is assumed that shelf species are more competitive than deep-water species and not vice-versa because shelf environments are characterized by less stable abiotic parameters as deeper waters.

In summary, the isopod species of the expedition "DIVA-Artabria 1" are predominantly North East Atlantic, mostly with a considerably wide geographical distribution. The species sampled from the continental shelf are assumed to be more or less but stenobathic. The deep-water species are considered to be eurybathic but stenothermic and it is assumed that their uppermost bathymetric range is influenced by the presence of more competitive shelf species. The endemites of the region can be tentatively estimated to compose close to one third of the isopod fauna, which is a low value compared with deep-sea samples from the South East Atlantic and Antarctica but still remarkably high for a western European coast at depths mostly not deeper than 1000 m.

Drawing technique

The "digital inking" method described by COLEMAN (2003, 2006) proved to be a good alternative for the conventional drawings in ink. The main advantages are that every drawing is made only once (conventional drawings are usually first done with a pencil and afterwards transferred into ink drawings) and that the arrangement of single drawings to plates is much easier, as they are infinitely scaleable and can be quickly rotated, rearranged and labelled as desired. The predefined brush tools for drawing setae considerably speed up the drawing process especially of densely setose objects. However, scientific drawing remains the most time consuming factor in taxonomic descriptions as all technical support cannot replace the taxonomist's investigation and recognition of details. It is emphasized that the conventional ink drawing techniques should still be fundamentally trained because they have proven to educate the taxonomist's perception. If this prerequesite is fulfilled, the digital drawing method certainly is a technique suitable to make illustrations easier after some training.

5a Summary

The Isopoda from the Spanish Expedition "DIVA-Artabria 1" along a bathymetric transect with stations between 102 and 1140 m depth off northern Galicia were comprehensively investigated taxonomically and zoogeographically. The material of two consecutive years of sampling yielded 690 specimens belonging to at least 36 species from 14 families. 32 species could be identified. The others were indeterminable stages (Cryptoniscium larvae of Bopyridae, isolated females and Praniza larvae of Gnathiidae) or too poorly preserved to allow a determination at species level. The material contained 9 species that are new to science (*Munna heikeae* n. sp.; *Notoxenoides nudicollis* n. sp.; *Austrofilius teiresias* n. sp.; *Ianthopsis maximi* n. sp.; *Lipomera (Lipomera) celtica* n. sp.; *Bathybadistes penthesilea* n. sp.; *Ischnomesus brenkei* n. sp.; *Caecognathia ovalifrons* n. sp.). The new species are described in this work and 5 previously insufficiently documented species are redescribed (*Pseudarachna hirsuta* (SARS, 1864); *Munnopsoides eximius* HANSEN, 1916; *Macrostylis longiremis* (MEINERT, 1890); *Metacirolana hanseni* BONNIER, 1896; *Gnathia dentata* SARS, 1882). The scientific illustrations of the described species were prepared with a new digital drawing method (COLEMAN 2003, 2006) which was further improved by the implementation of brush tool libraries for various setae. The zoogeography of all Isopoda determined to species level is summarized with distribution maps using source data from literature. Furthermore, the species composition of the examined area off northern Galicia is compared with previously undetermined additional material from the Great Meteor Seamount (expedition M42/3) and the Mediterranean Sea (expeditions M25/1; M40/3). The isopod faunal composition mostly corresponds to a typical North East Atlantic faunal community. 63% of the species have been recorded from the North Sea or from the shelf around the British Isles. Species occuring also in the West or South Atlantic or in the Pacific Ocean generally have a wide geographical range with distribution areas that are supposed to be more or less continuous (exception: *Natatolana borealis*). The ancinid *Bathycopea typhlops* is the only species with a cosmopolitic distribution in the material. Reliable statements on endemism are not possible due to the fragmentary nature of the data, yet it is possible that the new species and the janirellid *Janirella hessleri* CHARDY, 1975 (previously recorded only from North East Spain) are endemic for the coast of northern Spain. 28% of the species are also present in the eastern Mediterranean Sea, which is of higher salinity, 16% of the species have been recorded from the Baltic Sea with low salinity. This and the bathymetric distribution of the species lead to the assumption that neither differences in salinity nor pressure of the water column but instead stenothermy and interspecific competition are the main limiting factors for the horizontal and vertical distribution of the deep-water species examined herein.

5b Zusammenfassung

Die Isopoda der spanischen Expedition "DIVA-Artabria 1" aus Proben entlang eines bathymetrischen Transekts mit Stationen von 102 bis 1140 m Tiefe vor Nord-Galizien wurden umfassend taxonomisch und zoogeographisch bearbeitet. Das Material der in zwei aufeinanderfolgenden Jahren durchgeführten Beprobung ergab 690 Individuen aus mindestens 36 Arten und 14 Familien, von denen 32 Arten eindeutig zugeordnet werden konnten. Weitere Exemplare waren nicht bestimmbare Stadien (Cryptoniscien von Bopyridae, isolierte Weibchen und Pranizae von Gnathiidae) oder zu fragmentarisch erhalten, um eine Bestimmung auf Art-Ebene zu erlauben. Das Material enthielt 9 Arten, die der Wissenschaft bisher unbekannt waren (*Munna heikeae* n. sp.; *Notoxenoides nudicollis* n. sp.; *Austrofilius teiresias* n. sp.; *Ianthopsis maximi* n. sp.; *Lipomera (Lipomera) celtica* n. sp.; *Bathybadistes penthesilea* n. sp.; *Ischnomesus brenkei* n. sp.; *Caecognathia ovalifrons* n. sp.). Die neuen Arten werden in dieser Arbeit beschrieben, des weiteren werden 5 bisher unzureichend dokumentierte Arten nachbeschrieben (*Pseudarachna hirsuta* (SARS, 1864); *Munnopsoides eximius* HANSEN, 1916; *Macrostylis longiremis* (MEINERT, 1890); *Metacirolana hanseni* BONNIER, 1896; *Gnathia dentata* SARS, 1882). Die wissenschaftlichen Zeichnungen der behandelten Arten wurden nach einem neuen digitalen Verfahren (COLEMAN 2003, 2006) angefertigt, dieses konnte durch die Implementierung von Pinsel-Bibliotheken für die vielfältigen Setae wesentlich optimiert werden. Die Verbreitung der Arten wurde anhand von Literaturdaten ermittelt. Desweiteren wurden die Artenzusammensetzung des Nord-Galizischen Untersuchungsgebietes noch mit Vergleichsmaterial von der Großen Meteorbank im Ost-Atlantik (Expedition M42/3) und dem Mittelmeer (Expeditionen M25/1; M40/3) verglichen. Die Zusammensetzung der Isopodenfauna des untersuchten Gebietes entspricht weitestgehend einer typischen nordost-atlantischen Faunengemeinschaft. 63% der Arten sind auch aus der Nordsee bzw. vom Schelf der Britischen Inseln bekannt. Arten, deren geographische Verbreitung den West- oder Südatlantik oder den Pazifik einschließen sind generell weit verbreitet, ihre Verbreitungsgebiete sind offenbar nicht disjunkt (Ausnahme: *Natatolana borealis*). Die Ancinidae-Art *Bathycopea typhlops* zeigt als einzige eine kosmopolitische Verbreitung. Zuverlässige Aussagen über Endemiten sind aufgrund der lückenhaften Datengrundlage nicht möglich, jedoch kommen als Endemiten für die nordspanische Küste die neuen Arten sowie die bisher nur von Nordost-Spanien bekannte Janirellidae-Art *Janirella hessleri* CHARDY, 1975 infrage. 28% der Arten sind auch im salzreichen östlichen Mittelmeer nachgewiesen, 16% auch aus der salzarmen Ostsee. Dies und die bathymetrische Verteilung der Arten lassen folgern, dass weder Salinitätsunterschiede noch Druck der Wassersäule, sondern Stenothermie und interspezifische Konkurrenz die horizontale und vertikale Verbreitung der behandelten Tiefwasser-Arten limitieren.

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7 Appendix

Station coordinates of "DIVA-Artabria 1" 2002 and 2003

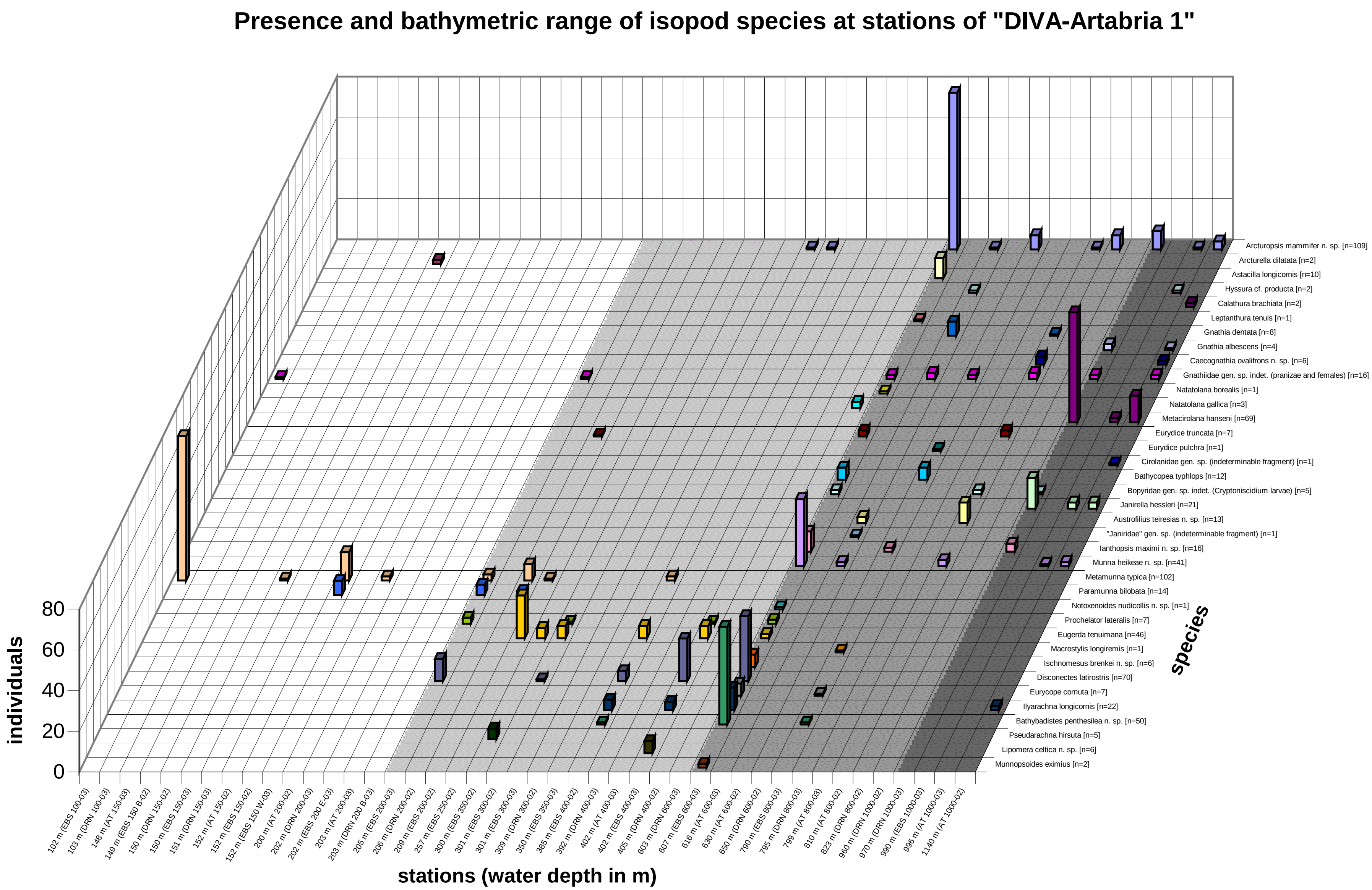
"DIVA-Artabria 1" 2002

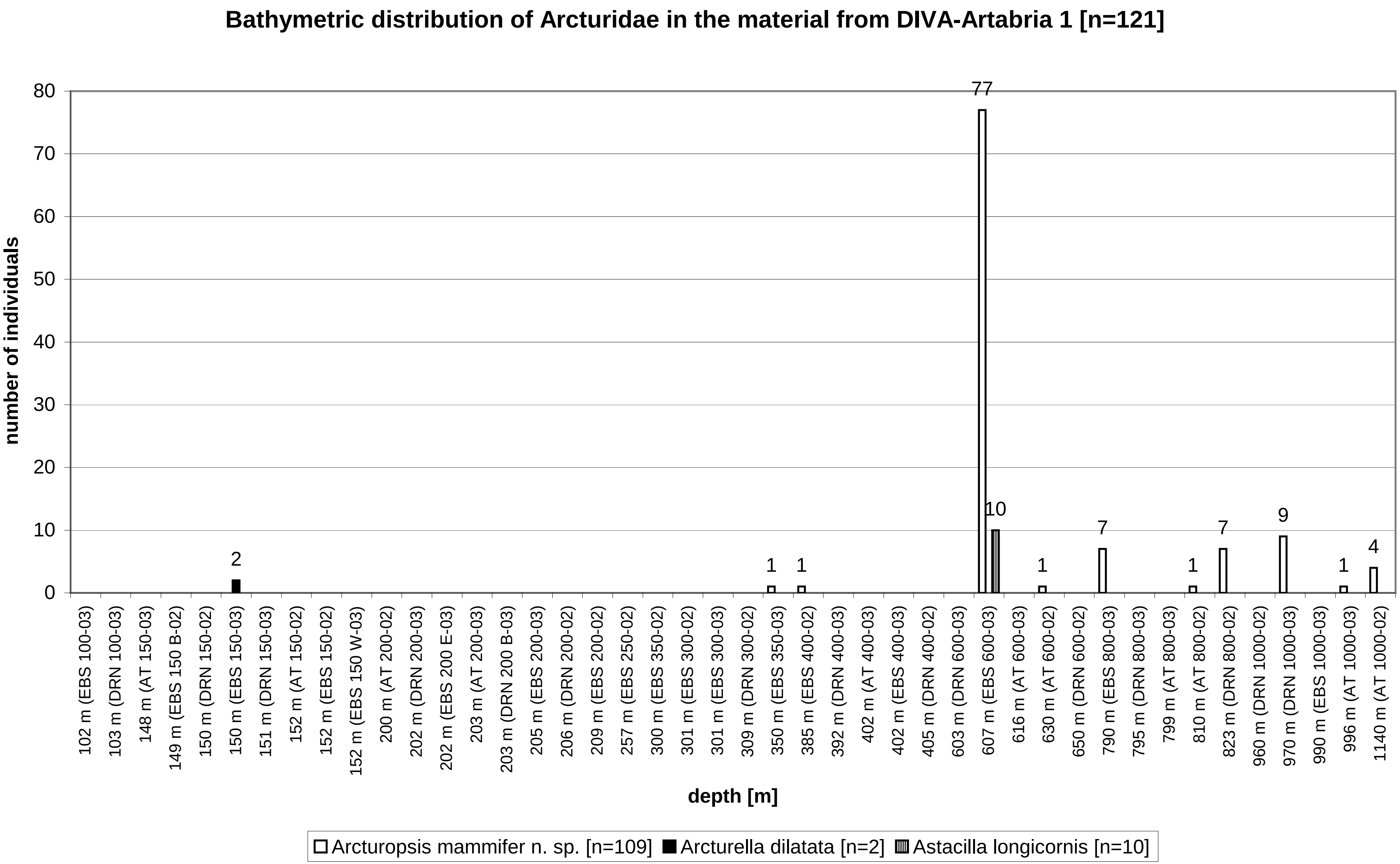
DRN: Small Dredge
AT: Agassiz Trawl
EBS: Epibenthic Sledge

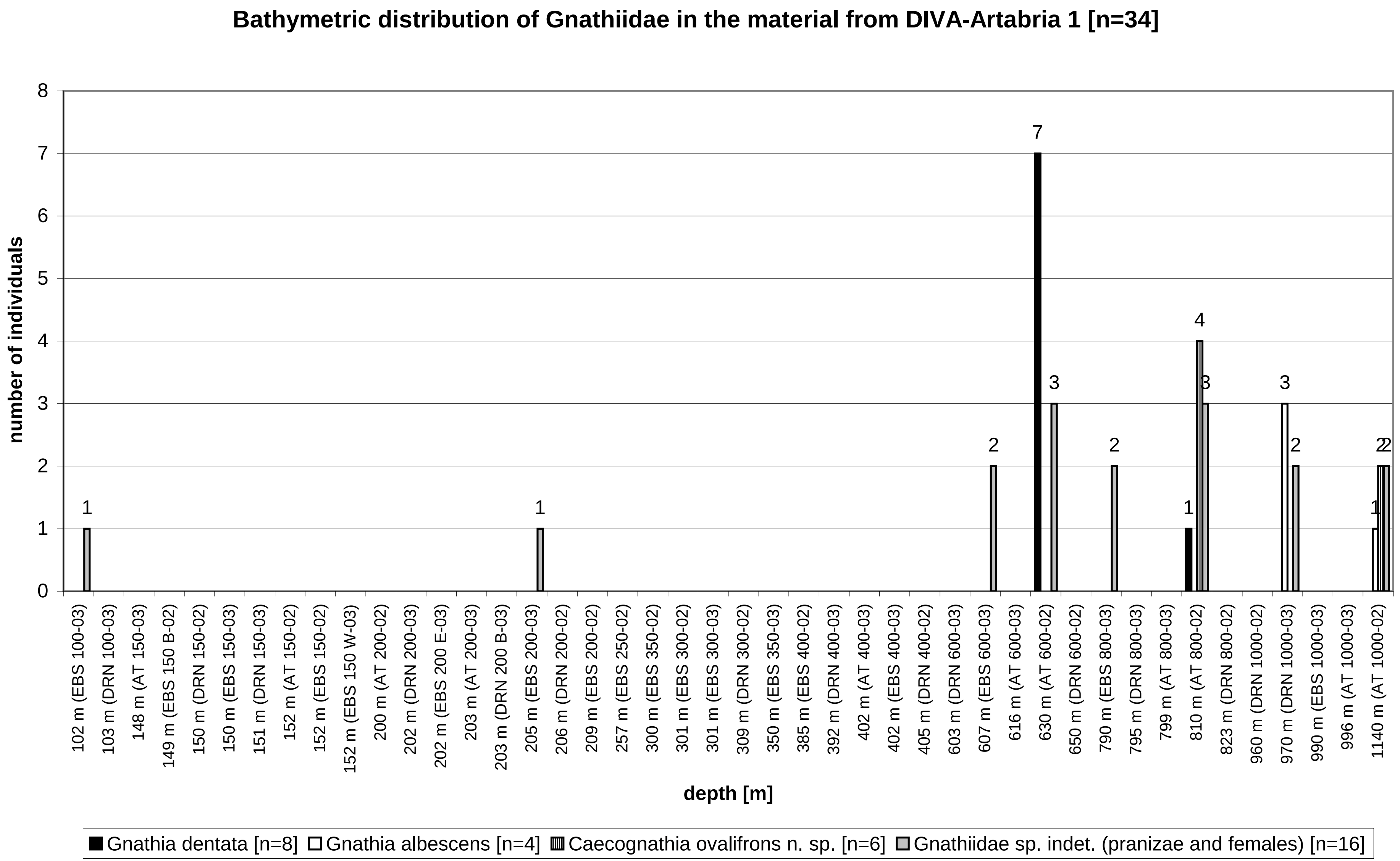
Station	Date	Gear	Position	Depth [m]
EBS 150-02	14-09-02	EBS	43° 33.852 N, 08° 36.830 W 43° 34.765 N, 08° 35.277 W	149
DRN 150-02	08-09-02	DRN	43° 33.960 N, 08° 36.709 W 43° 34.329 N, 08° 36.411 W	150
AT 150-02	08-09-02	AT	43° 34.937 N, 08° 35.386 W 43° 35.378 N, 08° 34.817 W	152
EBS 150-02	08-09-02	EBS	43° 35.451 N, 08° 34.432 W 43° 34.810 N, 08° 35.407 W	152
AT 200-02	08-09-02	AT	43° 40.036 N, 08° 43.789 W 43° 39.706 N, 08° 44.610 W	200
DRN 200-02	14-09-02	DRN	43° 40.165 N, 08° 43.697 W 43° 40.513 N, 08° 43.159 W	206
EBS 200-02	08-09-02	EBS	43° 40.192 N, 08° 43.760 W 43° 40.943 N, 08° 42.366 W	209
EBS 250-02	14-09-02	EBS	43° 41.113 N, 08° 44.297 W 43° 41.905 N, 08° 43.078 W	257
EBS 350-02	13-09-02	EBS	43° 42.427 N, 08° 45.921 W 43° 43.253 N, 08° 44.818 W	300
EBS 300-02	13-09-02	EBS	43° 41.689 N, 08° 45.195 W 43° 42.556 N, 08° 44.226 W	301
DRN 300-02	13-09-02	DRN	43° 43.444 N, 08° 43.121 W 43° 46.963 N, 08° 42.677 W	309
EBS 400-02	13-09-02	EBS	43° 45.892 N, 08° 44.301 W 43° 46.966 N, 08° 43.766 W	385
DRN 400-02	13-09-02	DRN	43° 43.571 N, 08° 46.508 W 43° 44.125 N, 08° 46.203 W	405
AT 600-02	11-09-02	AT	43° 53.457 N, 08° 48.461 W 43° 54.000 N, 08° 48.524 W	630
DRN 600-02	11-09-02	DRN	43° 48.340 N, 08° 51.485 W 43° 48.819 N, 08° 51.602 W	650
AT 800-02	11-09-02	AT	43° 47.188 N, 08° 53.053 W 43° 55.312 N, 08° 53.101 W	810
DRN 800-02	11-09-02	DRN	43° 51.265 N, 08° 54.480 W 43° 51.498 N, 08° 54.103 W	823
DRN 1000-02	09-09-02	DRN	43° 52.823 N, 08° 56.151 W 43° 52.837 N, 08° 55.597 W	960
AT 1000-02	09-09-02	AT	43° 57.03 N, 08° 54.795 W 43° 57.248 N, 08° 54.133 W	1140

"DIVA-Artabria 1" 2003

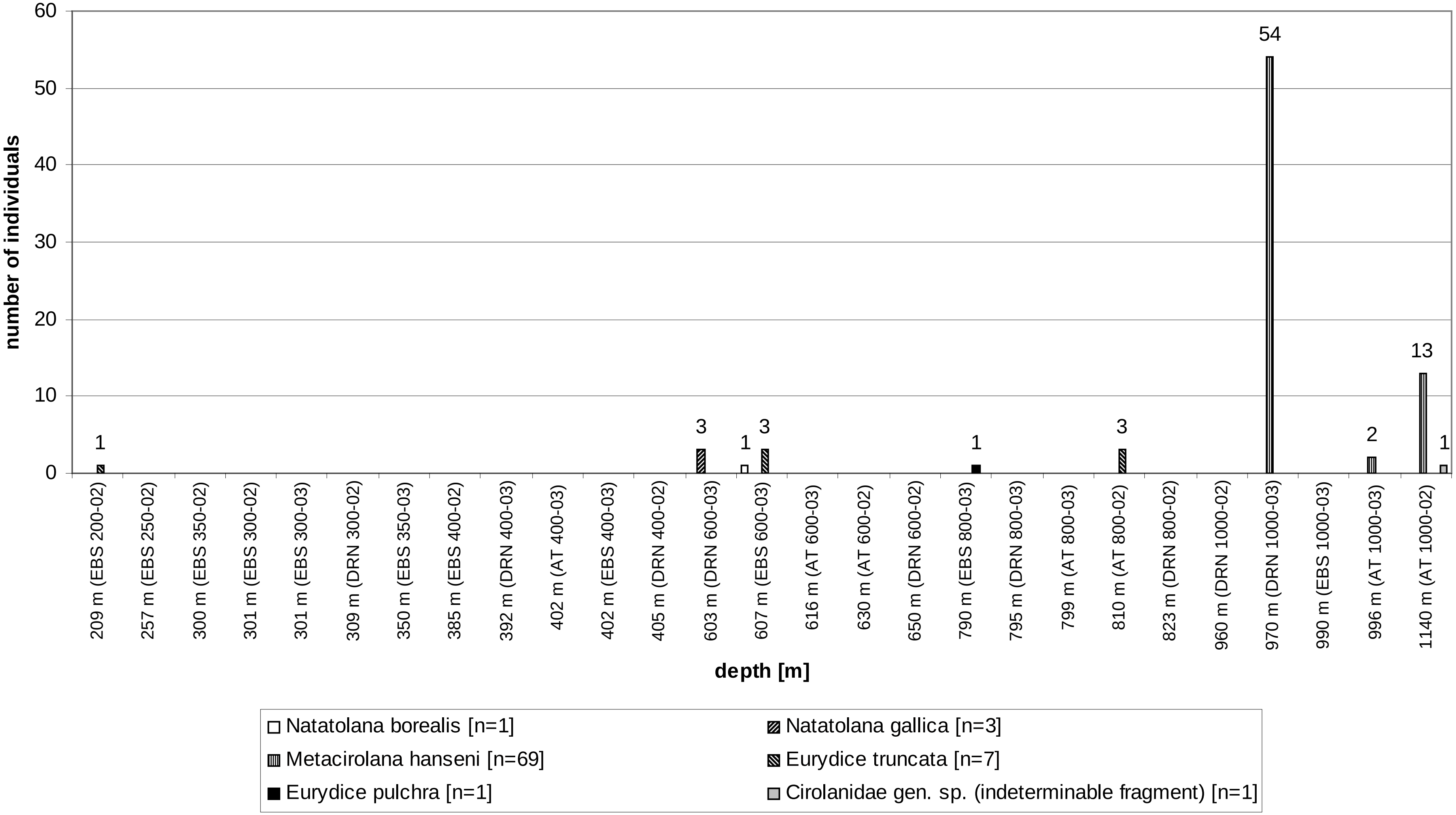
Station	Date	Gear	Position	Depth [m]
EBS 100-03	11-9-03	EBS	43º 26.703 N, 08º 30.669 W 43º 27.452 N, 08º 29.612 W	102
DRN 100-03	11-9-03	DRN	43º 26.958 N, 08º 30.688 W 43º 27.288 N, 08º 29.989 W	103
AT 150-03	14-09-03	AT	43º 34.116 N, 08º 36.535 W 43º 34.699 N, 08º 35.589 W	148
EBS 150-03	14-09-03	EBS	43º 34.127 N, 08º 36.562 W 43º 34.820 N, 08º 35.585 W	150
DRN 150-03	14-09-03	DRN	43º 34.074 N, 08º 36.571 W 43º 34.411 N, 08º 35.858 W	151
EBS 150W-03	14-09-03	EBS	43º 31.512 N, 08º43.470 W 43º 31.992 N, 08º 42.019 W	152
DRN 200-03	12-09-03	DRN	43º 40.225 N, 08º 43.531 W 43º 40.602 N, 08º 42.565 W	202
EBS 200E-03	12-09-03	DRN	43º 43.545 N, 08º 36.301 W 43º 44.532 N, 08º 35.093 W	202
DRN 200-03	12-09-03	DRN	43º 40.206 N, 08º 43.049 W 43º 40.595 N, 08º 42.537 W	203
AT 200-03	12-09-03	AT	43º 40.190 N, 08º 43.791 W 43º 40.569 N, 08º 42.692 W	203
EBS 200-03	12-09-03	EBS	43º 40.250 N, 08º 43.755 W 43º 40.760 N, 08º 42.120 W	205
EBS 300-03	19-09-03	EBS	43º 41.590 N, 08º 45.328 W 43º 42.386 N, 08º 44.286 W	301
EBS 350-03	19-09-03	EBS	43º 42.348 N, 08º 45.889 W 43º 43.269 N, 08º 45.289 W	350
DRN 400-03	13-09-03	DRN	43º 43.593 N, 08º 46.310 W 43º 44.150 N, 08º 45.726 W	392
AT 400-03	13-09-03	AT	43º 43.844 N, 08º 46.364 W 43º 44.677 N, 08º 45.607 W	402
EBS 400-03	13-09-03	EBS	43º 43.781 N, 08º 46.450 W 43º 44.960 N, 08º 45.490 W	402
DRN 600-03	18-09-03	DRN	43º 48.421 N, 08º51.453 W 43º 49.160 N, 08º 51.091 W	603
EBS 600-03	18-09-03	EBS	43º 48.587 N, 08º 51.402 W 43º 49.545 N, 08º 51.197 W	607
AT 600-03	18-09-03	AT	43º 48.514 N, 08º 51.439 W 43º 49.163 N, 08º 51.157 W	616
DRN 800-03	15-09-03	DRN	43º 51.299 N, 08º 53.595 W 43º 51.935 N, 08º 53.633 W	795
AT 800-03	15-09-03	AT	43º 51.774 N, 08º 53.640 W 43º 52.516 N, 08º 53.478 W	799
EBS 800-03	15-09-03	EBS	43º 51.873 N, 08º 53.683 W 43º 53.120 N, 08º 53.301 W	790
DRN 1000-03	16-09-03	DRN	43º 53.575 N, 08º 56.868 W 43º 54.015 N, 08º 56.959 W	970
AT 1000-03	16-09-03	AT	43º 53.847 N, 08º 57.324 W 43º 54.621 N, 08º 57.261 W	996
EBS 1000-03	16-09-03	EBS	43º 54.112 N, 08º 57.142 W 43º 55.891 N, 08º 56.089 W	990

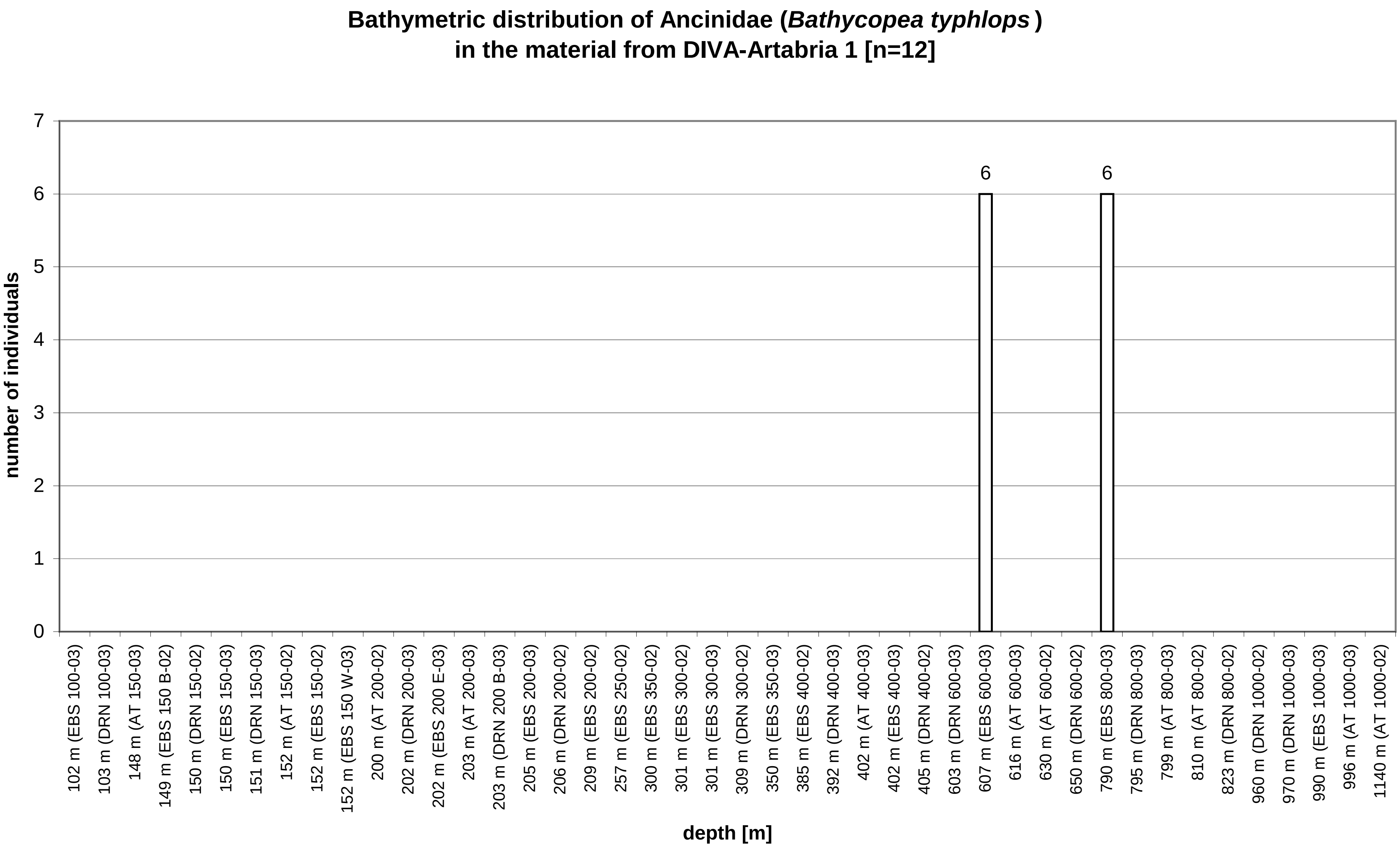

Presence and bathymetric range of isopod species at stations of "DIVA-Artabria 1"
individuals
0
20
40
60
80
stations (water depth in m)
102 m (EBS 100-03)
103 m (DRN 100-03)
148 m (AT 150-03)
149 m (EBS 150 B-02)
150 m (DRN 150-02)
150 m (EBS 150-03)
151 m (DRN 150-03)
152 m (AT 150-02)
152 m (EBS 150-02)
152 m (EBS 150 W-03)
200 m (AT 200-02)
202 m (DRN 200-03)
202 m (EBS 200 E-03)
203 m (AT 200-03)
203 m (DRN 200 B-03)
205 m (EBS 200-03)
206 m (DRN 200-02)
209 m (EBS 200-02)
257 m (EBS 250-02)
300 m (EBS 350-02)
301 m (EBS 300-02)
301 m (EBS 300-03)
309 m (DRN 300-02)
350 m (EBS 350-03)
385 m (EBS 400-02)
392 m (DRN 400-03)
402 m (AT 400-03)
402 m (EBS 400-03)
405 m (DRN 400-02)
603 m (DRN 600-03)
607 m (EBS 600-03)
616 m (AT 600-03)
630 m (AT 600-02)
650 m (DRN 600-02)
790 m (EBS 800-03)
795 m (DRN 800-03)
799 m (AT 800-03)
810 m (AT 800-02)
823 m (DRN 800-02)
960 m (DRN 1000-02)
970 m (DRN 1000-03)
990 m (EBS 1000-03)
996 m (AT 1000-03)
1140 m (AT 1000-02)
species
Arcturopsis mammifer n. sp. [n=109]
Arcturella dilatata [n=2]
Astacilla longicornis [n=10]
Hyssura cf. producta [n=2]
Calathura brachiata [n=2]
Leptanthura tenuis [n=1]
Gnathia dentata [n=8]
Gnathia albescens [n=4]
Caecognathia ovalifrons n. sp. [n=6]
Gnathiidae gen. sp. indet. (pranizae and females) [n=16]
Natatolana borealis [n=1]
Natatolana gallica [n=3]
Metacirolana hanseni [n=69]
Eurydice truncata [n=7]
Eurydice pulchra [n=1]
Cirolanidae gen. sp. (indeterminable fragment) [n=1]
Bathycopea typhlops [n=12]
Bopyridae gen. sp. indet. (Cryptoniscidium larvae) [n=5]
Janirella hessleri [n=21]
Austrofilius teiresias n. sp. [n=13]
"Janiridae" gen. sp. (indeterminable fragment) [n=1]
Ianthopsis maximi n. sp. [n=16]
Munna heikeae n. sp. [n=41]
Metamunna typica [n=102]
Paramunna bilobata [n=14]
Notoxenoides nudicollis n. sp. [n=1]
Prochelator lateralis [n=7]
Eugerda tenuimana [n=46]
Macrostylis longiremis [n=1]
Ischnomesus brenkei n. sp. [n=6]
Disconectes latirostris [n=70]
Eurycope cornuta [n=7]
Ilyarachna longicornis [n=22]
Bathybadistes penthesilea n. sp. [n=50]
Pseudarachna hirsuta [n=5]
Lipomera celtica n. sp. [n=6]
Munnopsoides eximius [n=2]

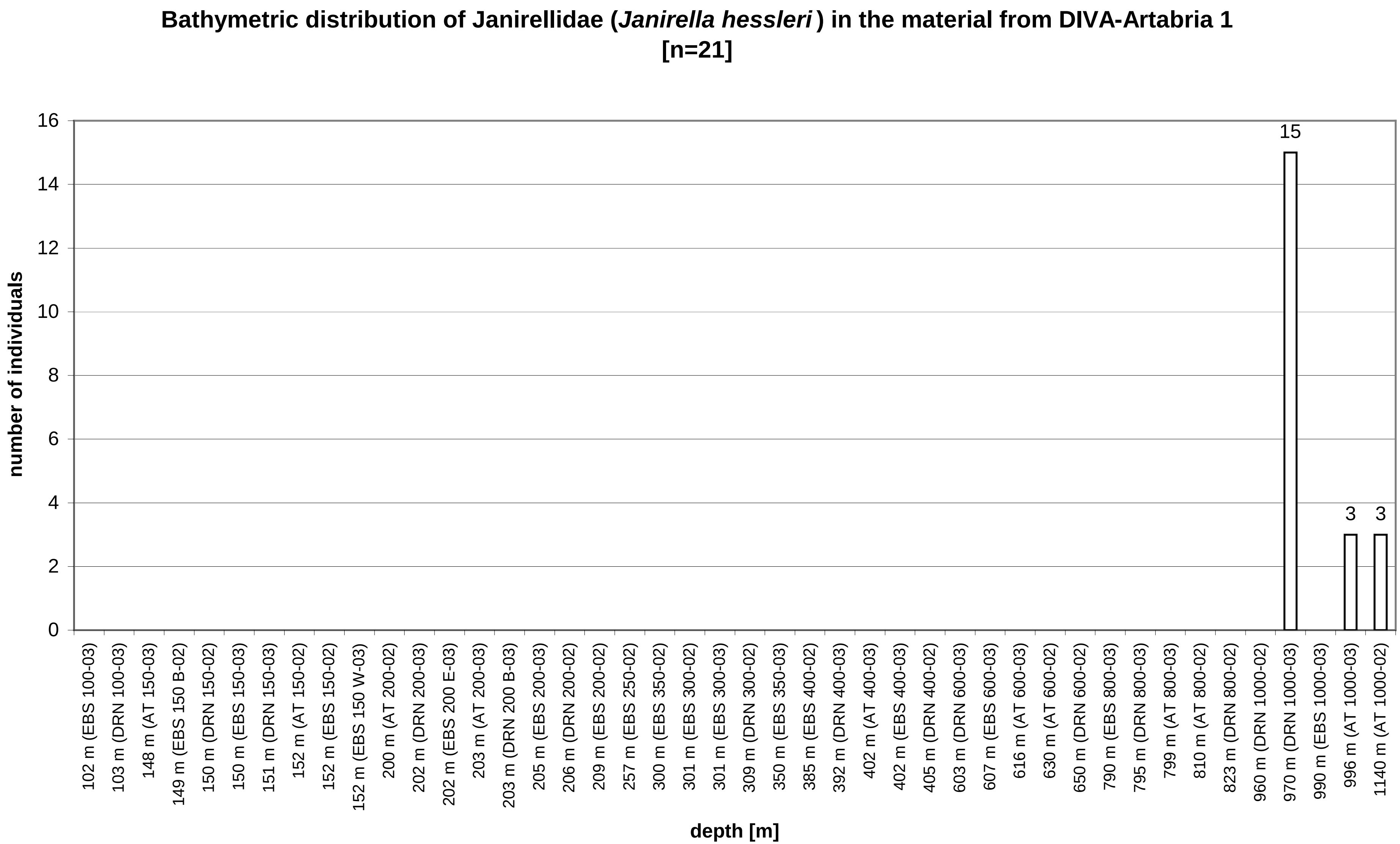

Bathymetric distribution of Arcturidae in the material from DIVA-Artabria 1 [n=121]
number of individuals
depth [m]
0
10
20
30
40
50
60
70
80
2
1
1
77
10
1
7
1
7
9
1
4
102 m (EBS 100-03)
103 m (DRN 100-03)
148 m (AT 150-03)
149 m (EBS 150 B-02)
150 m (DRN 150-02)
150 m (EBS 150-03)
151 m (DRN 150-03)
152 m (AT 150-02)
152 m (EBS 150-02)
152 m (EBS 150 W-03)
200 m (AT 200-02)
202 m (DRN 200-03)
202 m (EBS 200 E-03)
203 m (AT 200-03)
203 m (DRN 200 B-03)
205 m (EBS 200-03)
206 m (DRN 200-02)
209 m (EBS 200-02)
257 m (EBS 250-02)
300 m (EBS 350-02)
301 m (EBS 300-02)
301 m (EBS 300-03)
309 m (DRN 300-02)
350 m (EBS 350-03)
385 m (EBS 400-02)
392 m (DRN 400-03)
402 m (AT 400-03)
402 m (EBS 400-03)
405 m (DRN 400-02)
603 m (DRN 600-03)
607 m (EBS 600-03)
616 m (AT 600-03)
630 m (AT 600-02)
650 m (DRN 600-02)
790 m (EBS 800-03)
795 m (DRN 800-03)
799 m (AT 800-03)
810 m (AT 800-02)
823 m (DRN 800-02)
960 m (DRN 1000-02)
970 m (DRN 1000-03)
990 m (EBS 1000-03)
996 m (AT 1000-03)
1140 m (AT 1000-02)
Arcturopsis mammifer n. sp. [n=109]
Arcturella dilatata [n=2]
Astacilla longicornis [n=10]


Bathymetric distribution of Gnathiidae in the material from DIVA-Artabria 1 [n=34]
number of individuals
depth [m]
102 m (EBS 100-03)
103 m (DRN 100-03)
148 m (AT 150-03)
149 m (EBS 150 B-02)
150 m (DRN 150-02)
150 m (EBS 150-03)
151 m (DRN 150-03)
152 m (AT 150-02)
152 m (EBS 150-02)
152 m (EBS 150 W-03)
200 m (AT 200-02)
202 m (DRN 200-03)
202 m (EBS 200 E-03)
203 m (AT 200-03)
203 m (DRN 200 B-03)
205 m (EBS 200-03)
206 m (DRN 200-02)
209 m (EBS 200-02)
257 m (EBS 250-02)
300 m (EBS 350-02)
301 m (EBS 300-02)
301 m (EBS 300-03)
309 m (DRN 300-02)
350 m (EBS 350-03)
385 m (EBS 400-02)
392 m (DRN 400-03)
402 m (AT 400-03)
402 m (EBS 400-03)
405 m (DRN 400-02)
603 m (DRN 600-03)
607 m (EBS 600-03)
616 m (AT 600-03)
630 m (AT 600-02)
650 m (DRN 600-02)
790 m (EBS 800-03)
795 m (DRN 800-03)
799 m (AT 800-03)
810 m (AT 800-02)
823 m (DRN 800-02)
960 m (DRN 1000-02)
970 m (DRN 1000-03)
990 m (EBS 1000-03)
996 m (AT 1000-03)
1140 m (AT 1000-02)
Gnathia dentata [n=8]
Gnathia albescens [n=4]
Caecognathia ovalifrons n. sp. [n=6]
Gnathiidae sp. indet. (pranizae and females) [n=16]

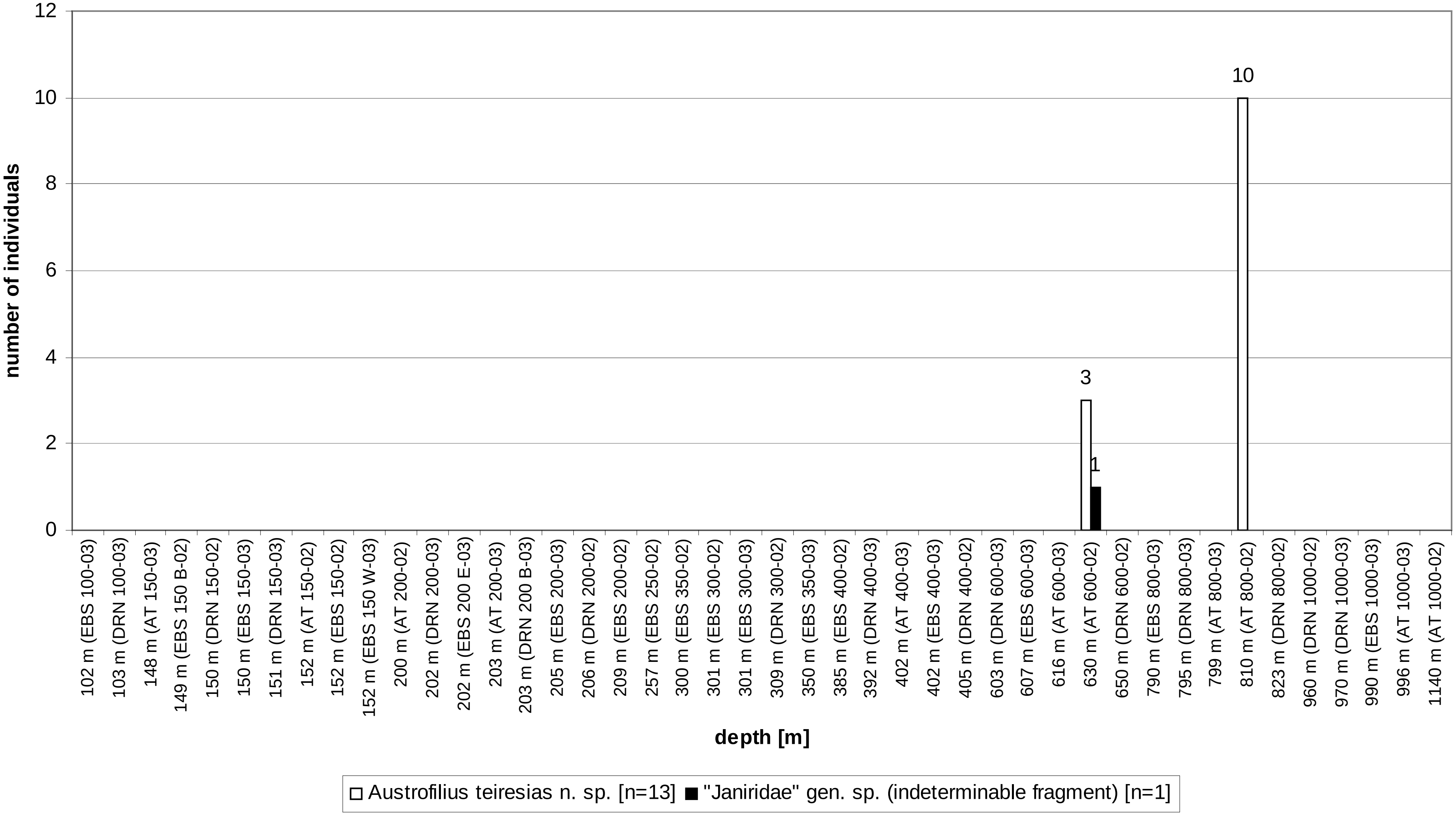
Bathymetric distribution of Cirolanidae in the material from DIVA-Artabria 1 [n=82]

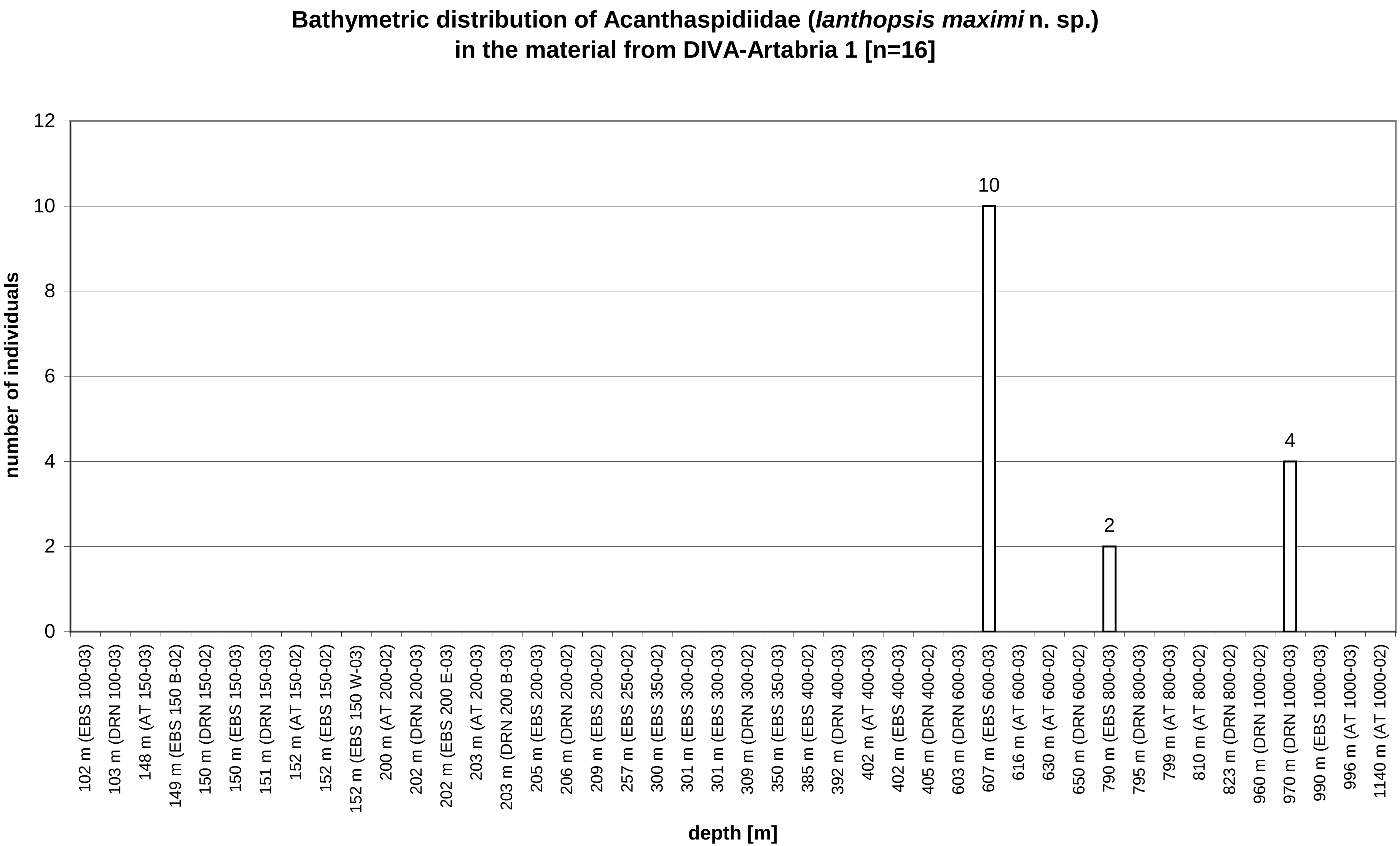



Bathymetric distribution of Ancinidae (Bathycopea typhlops)
in the material from DIVA-Artabria 1 [n=12]
number of individuals
0
1
2
3
4
5
6
7
6
6
102 m (EBS 100-03)
103 m (DRN 100-03)
148 m (AT 150-03)
149 m (EBS 150 B-02)
150 m (DRN 150-02)
150 m (EBS 150-03)
151 m (DRN 150-03)
152 m (AT 150-02)
152 m (EBS 150-02)
152 m (EBS 150 W-03)
200 m (AT 200-02)
202 m (DRN 200-03)
202 m (EBS 200 E-03)
203 m (AT 200-03)
203 m (DRN 200 B-03)
205 m (EBS 200-03)
206 m (DRN 200-02)
209 m (EBS 200-02)
257 m (EBS 250-02)
300 m (EBS 350-02)
301 m (EBS 300-02)
301 m (EBS 300-03)
309 m (DRN 300-02)
350 m (EBS 350-03)
385 m (EBS 400-02)
392 m (DRN 400-03)
402 m (AT 400-03)
402 m (EBS 400-03)
405 m (DRN 400-02)
603 m (DRN 600-03)
607 m (EBS 600-03)
616 m (AT 600-03)
630 m (AT 600-02)
650 m (DRN 600-02)
790 m (EBS 800-03)
795 m (DRN 800-03)
799 m (AT 800-03)
810 m (AT 800-02)
823 m (DRN 800-02)
960 m (DRN 1000-02)
970 m (DRN 1000-03)
990 m (EBS 1000-03)
996 m (AT 1000-03)
1140 m (AT 1000-02)
depth [m]

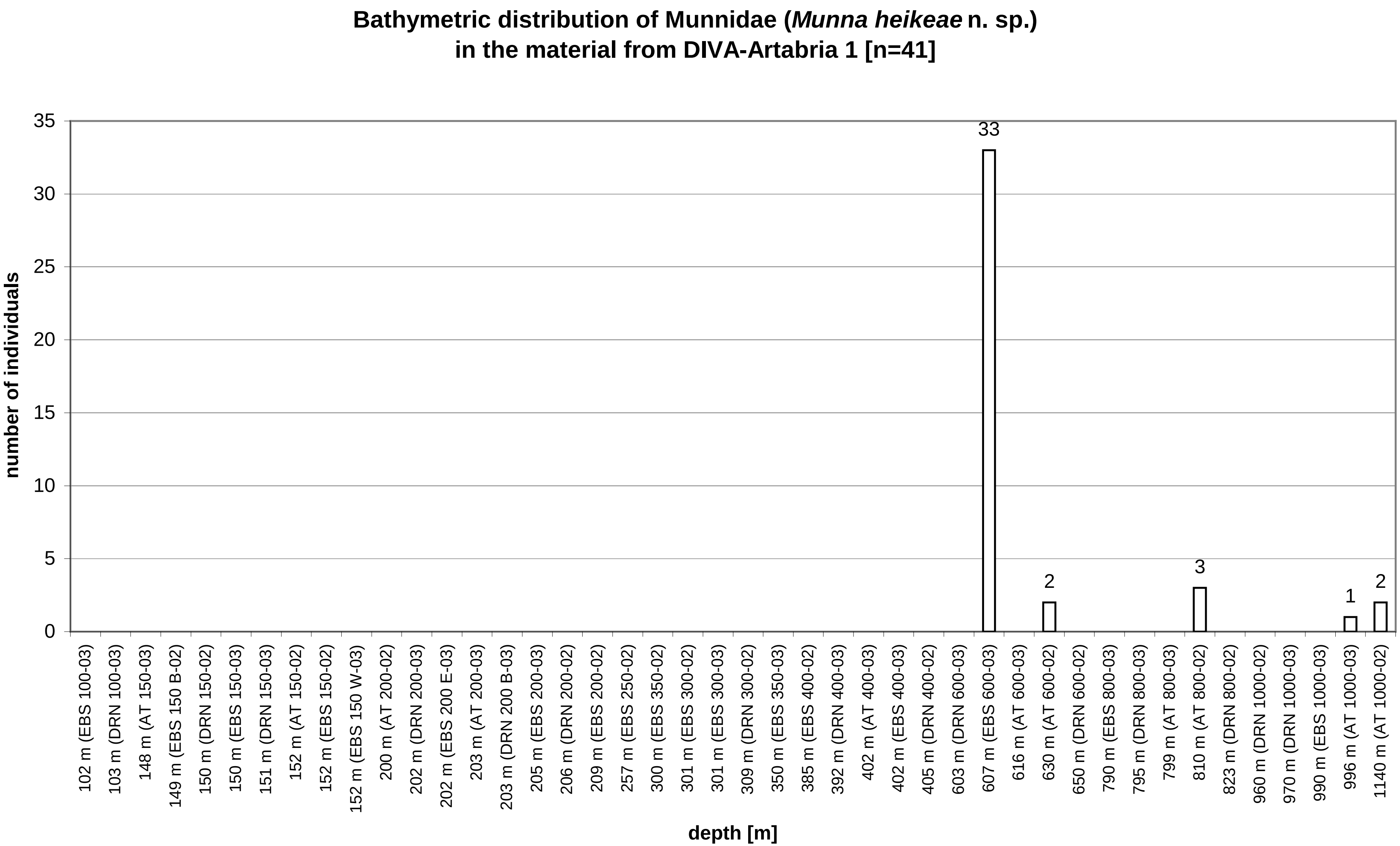

Bathymetric distribution of Janirellidae (*Janirella hessleri*) in the material from DIVA-Artabria 1 [n=21]
number of individuals
0
2
4
6
8
10
12
14
16
15
3
3
102 m (EBS 100-03)
103 m (DRN 100-03)
148 m (AT 150-03)
149 m (EBS 150 B-02)
150 m (DRN 150-02)
150 m (EBS 150-03)
151 m (DRN 150-03)
152 m (AT 150-02)
152 m (EBS 150-02)
152 m (EBS 150 W-03)
200 m (AT 200-02)
202 m (DRN 200-03)
202 m (EBS 200 E-03)
203 m (AT 200-03)
203 m (DRN 200 B-03)
205 m (EBS 200-03)
206 m (DRN 200-02)
209 m (EBS 200-02)
257 m (EBS 250-02)
300 m (EBS 350-02)
301 m (EBS 300-02)
301 m (EBS 300-03)
309 m (DRN 300-02)
350 m (EBS 350-03)
385 m (EBS 400-02)
392 m (DRN 400-03)
402 m (AT 400-03)
402 m (EBS 400-03)
405 m (DRN 400-02)
603 m (DRN 600-03)
607 m (EBS 600-03)
616 m (AT 600-03)
630 m (AT 600-02)
650 m (DRN 600-02)
790 m (EBS 800-03)
795 m (DRN 800-03)
799 m (AT 800-03)
810 m (AT 800-02)
823 m (DRN 800-02)
960 m (DRN 1000-02)
970 m (DRN 1000-03)
990 m (EBS 1000-03)
996 m (AT 1000-03)
1140 m (AT 1000-02)
depth [m]

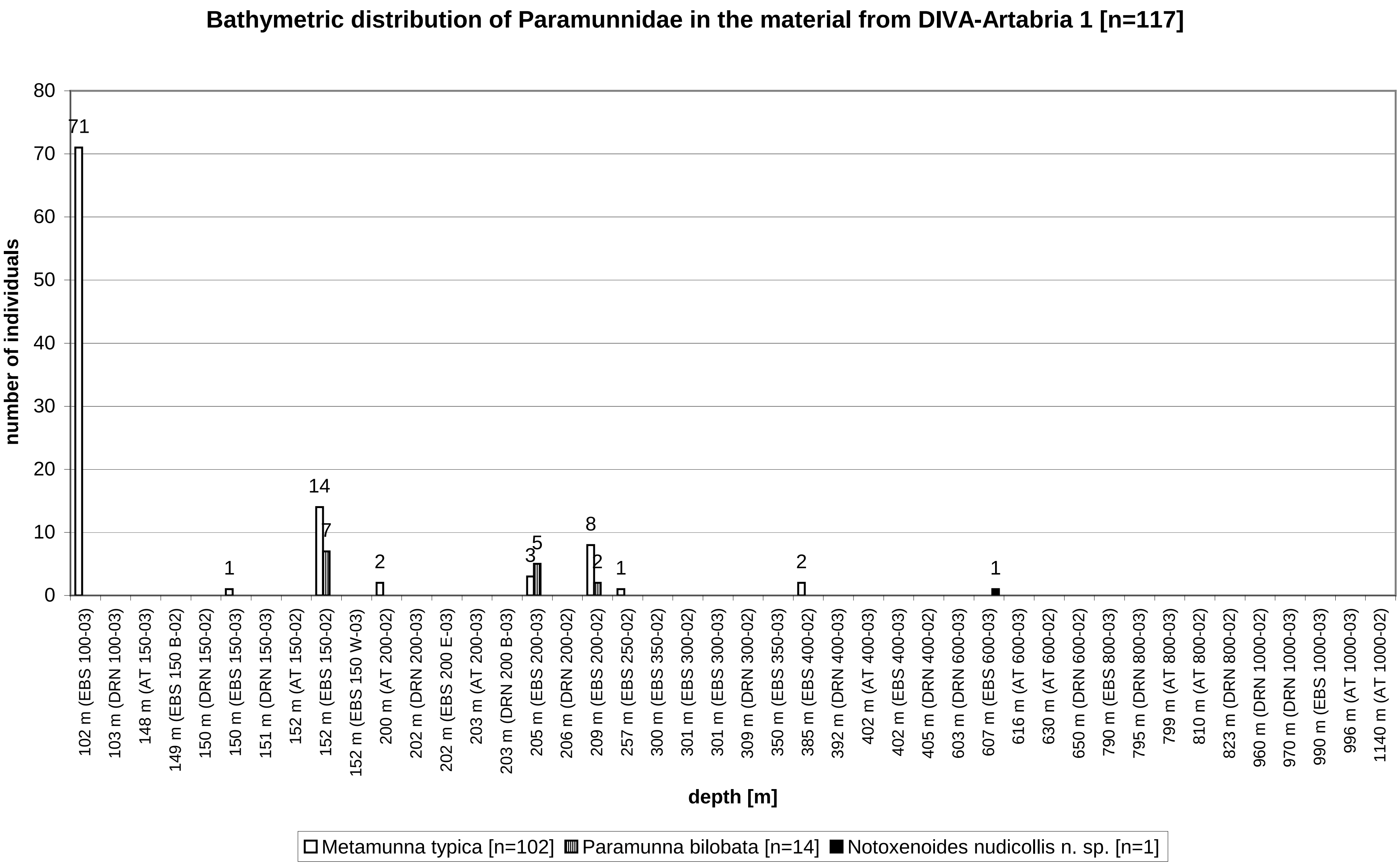
Bathymetric distribution of "Janiridae" in the material from DIVA-Artabria 1 [n=14]

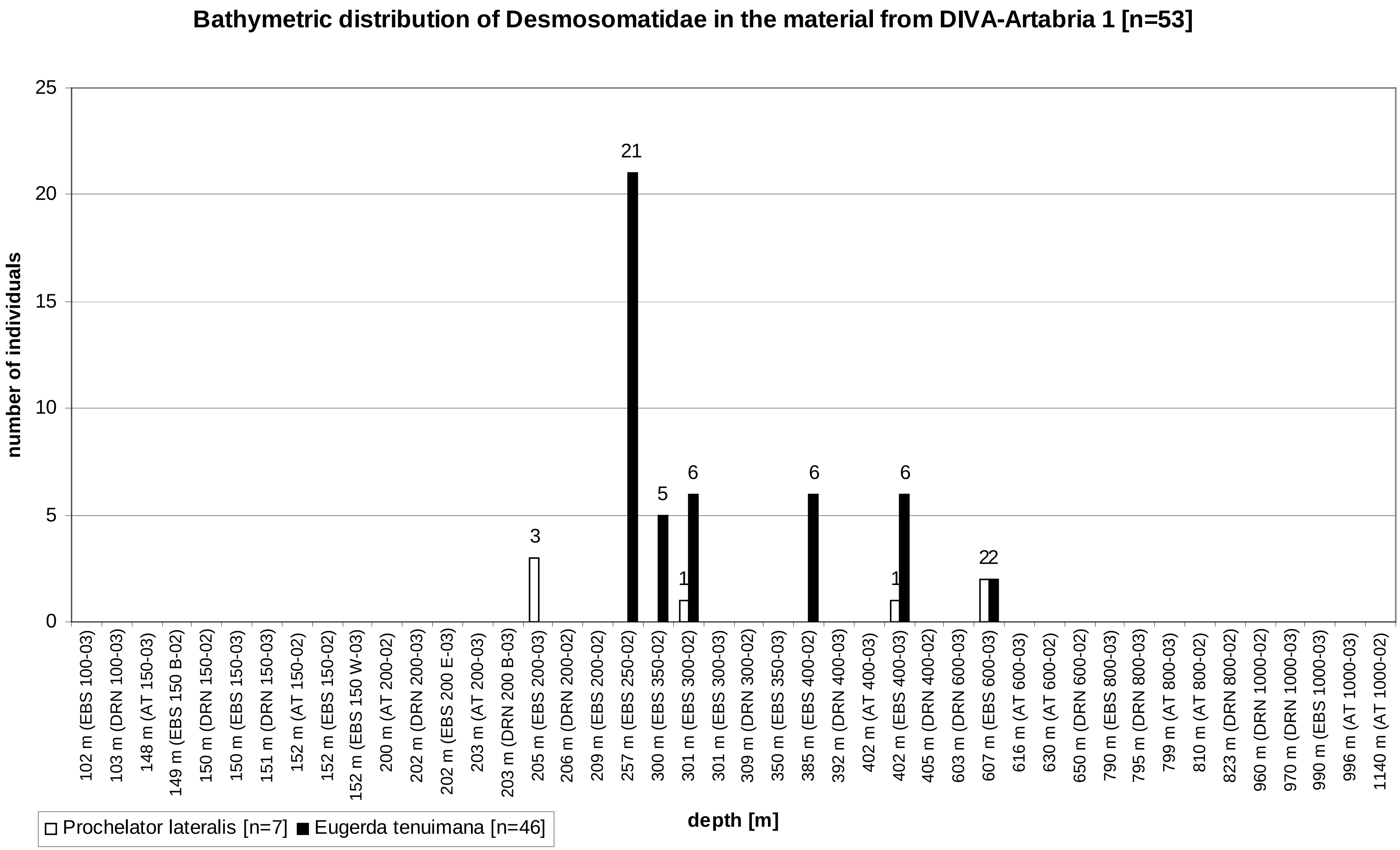


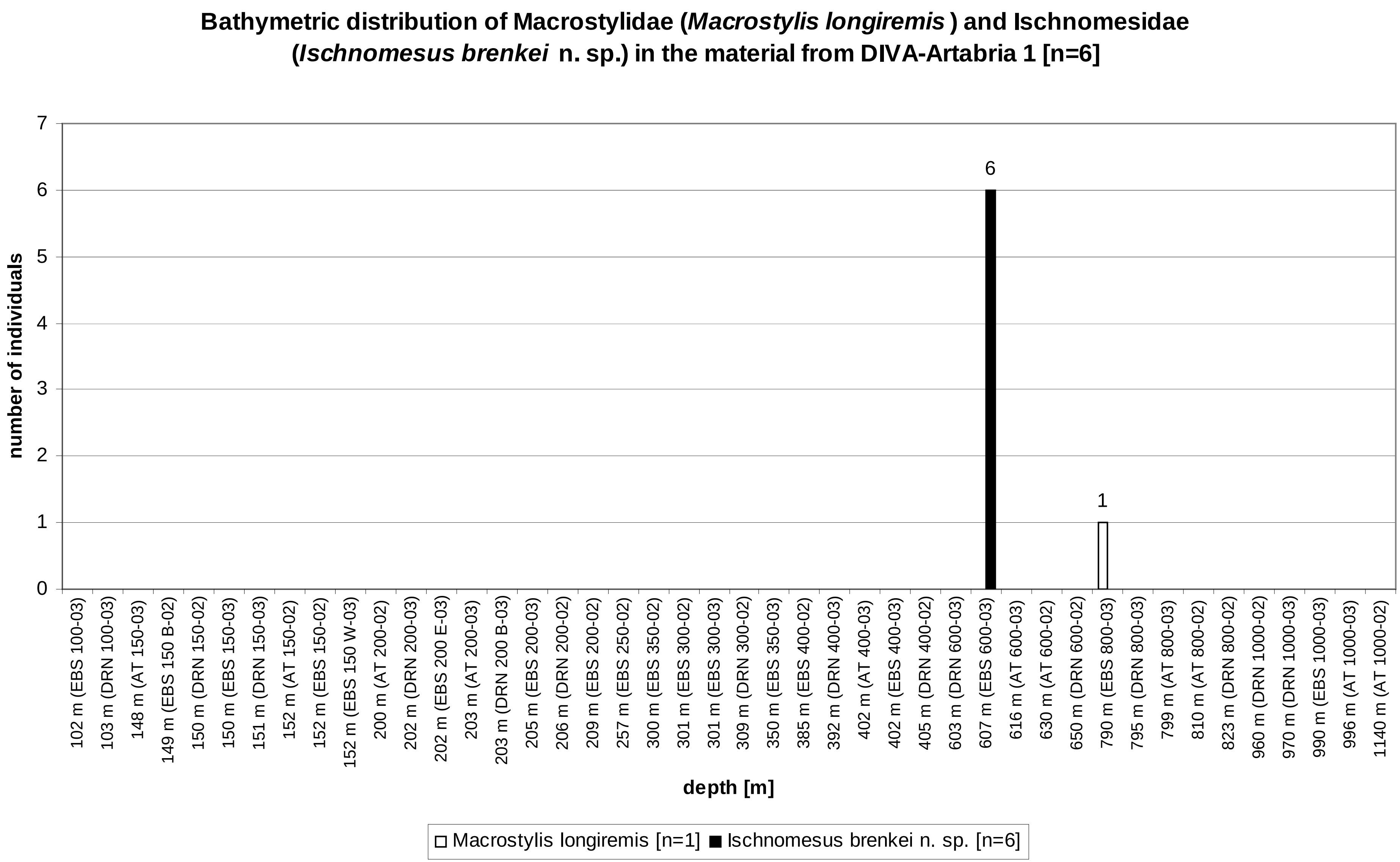


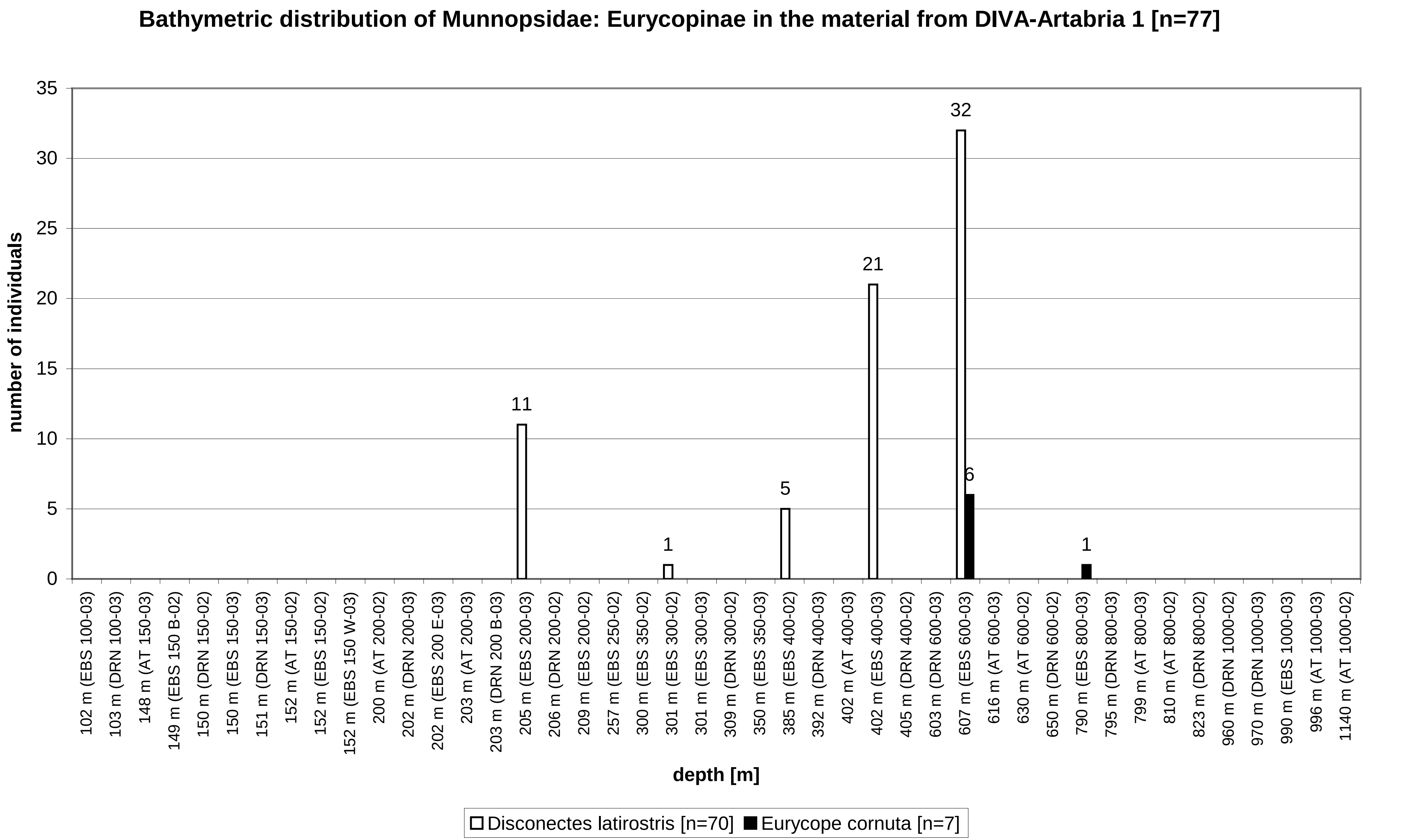
Bathymetric distribution of Acanthaspidiidae (*Ianthopsis maximi* n. sp.) in the material from DIVA-Artabria 1 [n=16]
number of individuals
depth [m]
0
2
4
6
8
10
12
10
2
4
102 m (EBS 100-03)
103 m (DRN 100-03)
148 m (AT 150-03)
149 m (EBS 150 B-02)
150 m (DRN 150-02)
150 m (EBS 150-03)
151 m (DRN 150-03)
152 m (AT 150-02)
152 m (EBS 150-02)
152 m (EBS 150 W-03)
200 m (AT 200-02)
202 m (DRN 200-03)
202 m (EBS 200 E-03)
203 m (AT 200-03)
203 m (DRN 200 B-03)
205 m (EBS 200-03)
206 m (DRN 200-02)
209 m (EBS 200-02)
257 m (EBS 250-02)
300 m (EBS 350-02)
301 m (EBS 300-02)
301 m (EBS 300-03)
309 m (DRN 300-02)
350 m (EBS 350-03)
385 m (EBS 400-02)
392 m (DRN 400-03)
402 m (AT 400-03)
402 m (EBS 400-03)
405 m (DRN 400-02)
603 m (DRN 600-03)
607 m (EBS 600-03)
616 m (AT 600-03)
630 m (AT 600-02)
650 m (DRN 600-02)
790 m (EBS 800-03)
795 m (DRN 800-03)
799 m (AT 800-03)
810 m (AT 800-02)
823 m (DRN 800-02)
960 m (DRN 1000-02)
970 m (DRN 1000-03)
990 m (EBS 1000-03)
996 m (AT 1000-03)
1140 m (AT 1000-02)


Bathymetric distribution of Munnidae (*Munna heikeae* n. sp.)
in the material from DIVA-Artabria 1 [n=41]
number of individuals
depth [m]
0
5
10
15
20
25
30
35
33
2
3
1
2
102 m (EBS 100-03)
103 m (DRN 100-03)
148 m (AT 150-03)
149 m (EBS 150 B-02)
150 m (DRN 150-02)
150 m (EBS 150-03)
151 m (DRN 150-03)
152 m (AT 150-02)
152 m (EBS 150-02)
152 m (EBS 150 W-03)
200 m (AT 200-02)
202 m (DRN 200-03)
202 m (EBS 200 E-03)
203 m (AT 200-03)
203 m (DRN 200 B-03)
205 m (EBS 200-03)
206 m (DRN 200-02)
209 m (EBS 200-02)
257 m (EBS 250-02)
300 m (EBS 350-02)
301 m (EBS 300-02)
301 m (EBS 300-03)
309 m (DRN 300-02)
350 m (EBS 350-03)
385 m (EBS 400-02)
392 m (DRN 400-03)
402 m (AT 400-03)
402 m (EBS 400-03)
405 m (DRN 400-02)
603 m (DRN 600-03)
607 m (EBS 600-03)
616 m (AT 600-03)
630 m (AT 600-02)
650 m (DRN 600-02)
790 m (EBS 800-03)
795 m (DRN 800-03)
799 m (AT 800-03)
810 m (AT 800-02)
823 m (DRN 800-02)
960 m (DRN 1000-02)
970 m (DRN 1000-03)
990 m (EBS 1000-03)
996 m (AT 1000-03)
1140 m (AT 1000-02)

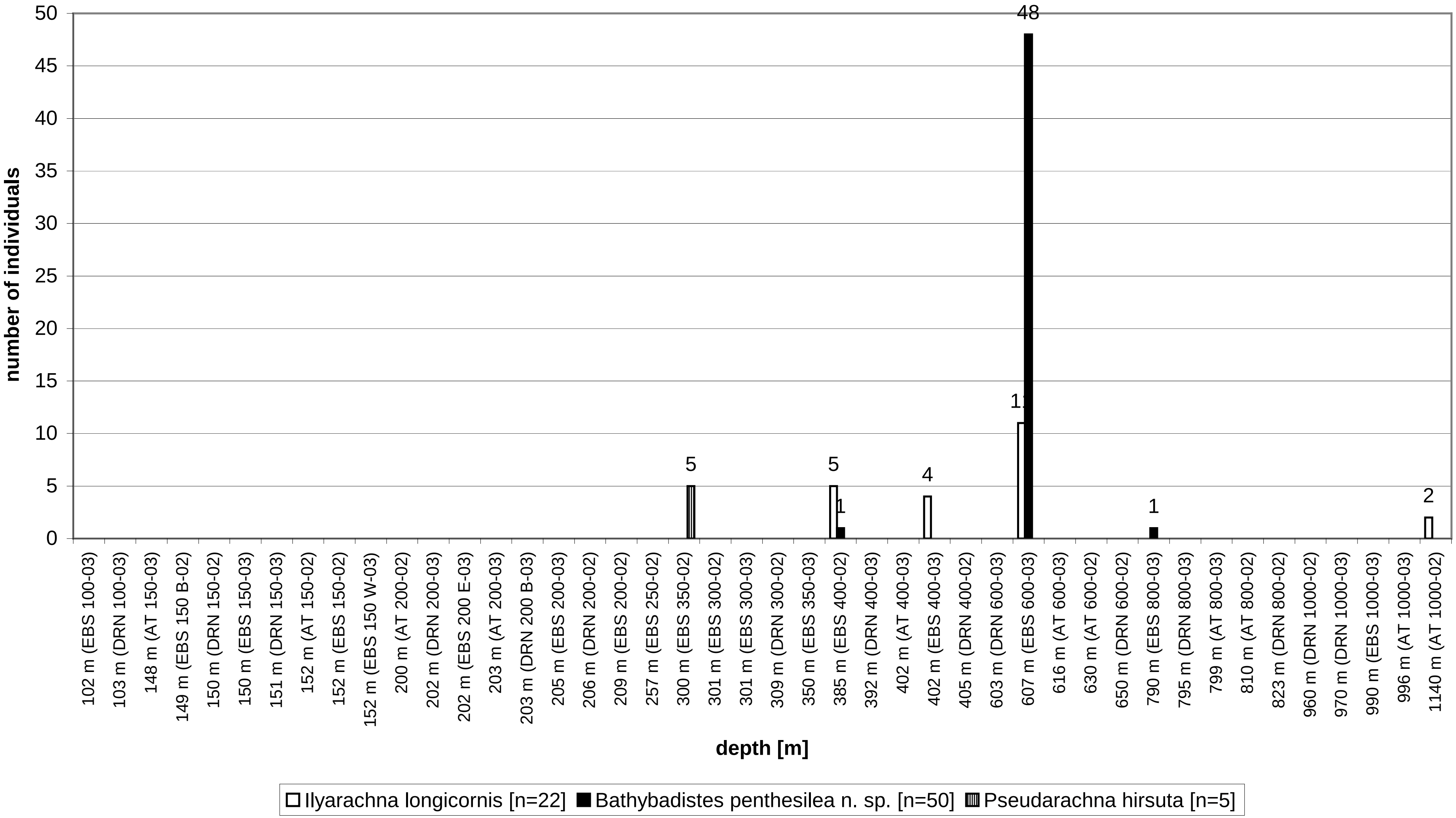

Bathymetric distribution of Paramunnidae in the material from DIVA-Artabria 1 [n=117]
number of individuals
0
10
20
30
40
50
60
70
80
71
1
14
7
2
3
5
8
2
1
2
1
102 m (EBS 100-03)
103 m (DRN 100-03)
148 m (AT 150-03)
149 m (EBS 150 B-02)
150 m (DRN 150-02)
150 m (EBS 150-03)
151 m (DRN 150-03)
152 m (AT 150-02)
152 m (EBS 150-02)
152 m (EBS 150 W-03)
200 m (AT 200-02)
202 m (DRN 200-03)
202 m (EBS 200 E-03)
203 m (AT 200-03)
203 m (DRN 200 B-03)
205 m (EBS 200-03)
206 m (DRN 200-02)
209 m (EBS 200-02)
257 m (EBS 250-02)
300 m (EBS 350-02)
301 m (EBS 300-02)
301 m (EBS 300-03)
309 m (DRN 300-02)
350 m (EBS 350-03)
385 m (EBS 400-02)
392 m (DRN 400-03)
402 m (AT 400-03)
402 m (EBS 400-03)
405 m (DRN 400-02)
603 m (DRN 600-03)
607 m (EBS 600-03)
616 m (AT 600-03)
630 m (AT 600-02)
650 m (DRN 600-02)
790 m (EBS 800-03)
795 m (DRN 800-03)
799 m (AT 800-03)
810 m (AT 800-02)
823 m (DRN 800-02)
960 m (DRN 1000-02)
970 m (DRN 1000-03)
990 m (EBS 1000-03)
996 m (AT 1000-03)
1140 m (AT 1000-02)
depth [m]
Metamunna typica [n=102]
Paramunna bilobata [n=14]
Notoxenoides nudicollis n. sp. [n=1]

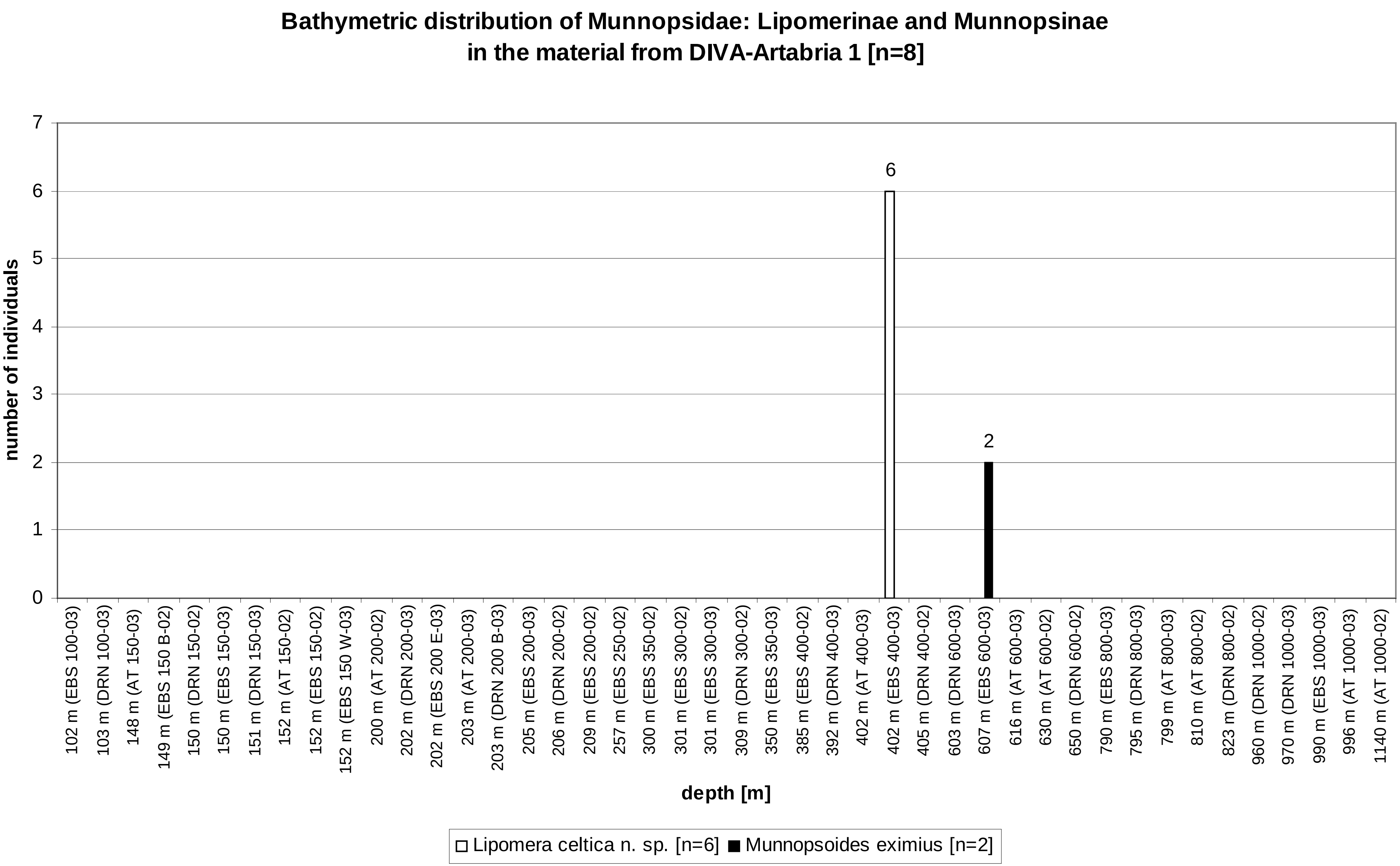

Bathymetric distribution of Desmosomatidae in the material from DIVA-Artabria 1 [n=53]
number of individuals
0
5
10
15
20
25
21
5
6
6
6
3
1
1
22
102 m (EBS 100-03)
103 m (DRN 100-03)
148 m (AT 150-03)
149 m (EBS 150 B-02)
150 m (DRN 150-02)
150 m (EBS 150-03)
151 m (DRN 150-03)
152 m (AT 150-02)
152 m (EBS 150-02)
152 m (EBS 150 W-03)
200 m (AT 200-02)
202 m (DRN 200-03)
202 m (EBS 200 E-03)
203 m (AT 200-03)
203 m (DRN 200 B-03)
205 m (EBS 200-03)
206 m (DRN 200-02)
209 m (EBS 200-02)
257 m (EBS 250-02)
300 m (EBS 350-02)
301 m (EBS 300-02)
301 m (EBS 300-03)
309 m (DRN 300-02)
350 m (EBS 350-03)
385 m (EBS 400-02)
392 m (DRN 400-03)
402 m (AT 400-03)
402 m (EBS 400-03)
405 m (DRN 400-02)
603 m (DRN 600-03)
607 m (EBS 600-03)
616 m (AT 600-03)
630 m (AT 600-02)
650 m (DRN 600-02)
790 m (EBS 800-03)
795 m (DRN 800-03)
799 m (AT 800-03)
810 m (AT 800-02)
823 m (DRN 800-02)
960 m (DRN 1000-02)
970 m (DRN 1000-03)
990 m (EBS 1000-03)
996 m (AT 1000-03)
1140 m (AT 1000-02)
depth [m]
Prochelator lateralis [n=7]
Eugerda tenuimana [n=46]


Bathymetric distribution of Macrostylidae (*Macrostylis longiremis*) and Ischnomesidae (*Ischnomesus brenkei* n. sp.) in the material from DIVA-Artabria 1 [n=6]
number of individuals
0
1
2
3
4
5
6
7
6
1
102 m (EBS 100-03)
103 m (DRN 100-03)
148 m (AT 150-03)
149 m (EBS 150 B-02)
150 m (DRN 150-02)
150 m (EBS 150-03)
151 m (DRN 150-03)
152 m (AT 150-02)
152 m (EBS 150-02)
152 m (EBS 150 W-03)
200 m (AT 200-02)
202 m (DRN 200-03)
202 m (EBS 200 E-03)
203 m (AT 200-03)
203 m (DRN 200 B-03)
205 m (EBS 200-03)
206 m (DRN 200-02)
209 m (EBS 200-02)
257 m (EBS 250-02)
300 m (EBS 350-02)
301 m (EBS 300-02)
301 m (EBS 300-03)
309 m (DRN 300-02)
350 m (EBS 350-03)
385 m (EBS 400-02)
392 m (DRN 400-03)
402 m (AT 400-03)
402 m (EBS 400-03)
405 m (DRN 400-02)
603 m (DRN 600-03)
607 m (EBS 600-03)
616 m (AT 600-03)
630 m (AT 600-02)
650 m (DRN 600-02)
790 m (EBS 800-03)
795 m (DRN 800-03)
799 m (AT 800-03)
810 m (AT 800-02)
823 m (DRN 800-02)
960 m (DRN 1000-02)
970 m (DRN 1000-03)
990 m (EBS 1000-03)
996 m (AT 1000-03)
1140 m (AT 1000-02)
depth [m]
Macrostylis longiremis [n=1]
Ischnomesus brenkei n. sp. [n=6]


Bathymetric distribution of Munnopsidae: Eurycopinae in the material from DIVA-Artabria 1 [n=77]
number of individuals
35
30
25
20
15
10
5
0
11
1
5
21
32
6
1
102 m (EBS 100-03)
103 m (DRN 100-03)
148 m (AT 150-03)
149 m (EBS 150 B-02)
150 m (DRN 150-02)
150 m (EBS 150-03)
151 m (DRN 150-03)
152 m (AT 150-02)
152 m (EBS 150-02)
152 m (EBS 150 W-03)
200 m (AT 200-02)
202 m (DRN 200-03)
202 m (EBS 200 E-03)
203 m (AT 200-03)
203 m (DRN 200 B-03)
205 m (EBS 200-03)
206 m (DRN 200-02)
209 m (EBS 200-02)
257 m (EBS 250-02)
300 m (EBS 350-02)
301 m (EBS 300-02)
301 m (EBS 300-03)
309 m (DRN 300-02)
350 m (EBS 350-03)
385 m (EBS 400-02)
392 m (DRN 400-03)
402 m (AT 400-03)
402 m (EBS 400-03)
405 m (DRN 400-02)
603 m (DRN 600-03)
607 m (EBS 600-03)
616 m (AT 600-03)
630 m (AT 600-02)
650 m (DRN 600-02)
790 m (EBS 800-03)
795 m (DRN 800-03)
799 m (AT 800-03)
810 m (AT 800-02)
823 m (DRN 800-02)
960 m (DRN 1000-02)
970 m (DRN 1000-03)
990 m (EBS 1000-03)
996 m (AT 1000-03)
1140 m (AT 1000-02)
depth [m]
Disconectes latirostris [n=70]
Eurycope cornuta [n=7]

Bathymetric distribution of Munnopsidae: Ilyarachninae in the material from DIVA-Artabria 1 [n=77]




Bathymetric distribution of Munnopsidae: Lipomerinae and Munnopsinae
in the material from DIVA-Artabria 1 [n=8]
number of individuals
0
1
2
3
4
5
6
7
6
2
102 m (EBS 100-03)
103 m (DRN 100-03)
148 m (AT 150-03)
149 m (EBS 150 B-02)
150 m (DRN 150-02)
150 m (EBS 150-03)
151 m (DRN 150-03)
152 m (AT 150-02)
152 m (EBS 150-02)
152 m (EBS 150 W-03)
200 m (AT 200-02)
202 m (DRN 200-03)
202 m (EBS 200 E-03)
203 m (AT 200-03)
203 m (DRN 200 B-03)
205 m (EBS 200-03)
206 m (DRN 200-02)
209 m (EBS 200-02)
257 m (EBS 250-02)
300 m (EBS 350-02)
301 m (EBS 300-02)
301 m (EBS 300-03)
309 m (DRN 300-02)
350 m (EBS 350-03)
385 m (EBS 400-02)
392 m (DRN 400-03)
402 m (AT 400-03)
402 m (EBS 400-03)
405 m (DRN 400-02)
603 m (DRN 600-03)
607 m (EBS 600-03)
616 m (AT 600-03)
630 m (AT 600-02)
650 m (DRN 600-02)
790 m (EBS 800-03)
795 m (DRN 800-03)
799 m (AT 800-03)
810 m (AT 800-02)
823 m (DRN 800-02)
960 m (DRN 1000-02)
970 m (DRN 1000-03)
990 m (EBS 1000-03)
996 m (AT 1000-03)
1140 m (AT 1000-02)
depth [m]
Lipomera celtica n. sp. [n=6]
Munnopsoides eximius [n=2]

8a Acknowledgements

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ERKLÄRUNG

Hiermit erkläre ich, dass ich die Arbeit selbstständig verfasst und bei keiner anderen Fakultät eingereicht und dass ich keine anderen als die angegebenen Hilfsmittel verwendet habe. Es handelt sich bei der heute von mir eingereichten Dissertation um fünf in Wort und Bild völlig übereinstimmende Exemplare.
Weiterhin erkläre ich, dass digitale Abbildungen nur die originalen Daten enthalten und in keinem Fall inhaltsverändernde Bildbearbeitung vorgenommen wurde.

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Publikationen:

- MURSCH, A.; STEFFAN, A. W. 1997: Subfossile Gliederfüßer von Salzsee-Ufern im nördlichen Namibia (Arthropoda: Solifugae, Scorpiones, Chilopoda, Diplopoda, Insecta). Verh. Westd. Entom. Tag 1996: 197-211
- MURSCH, A.; BRENKE, N.; WÄGELE, J.–W. 2008: Results of the DIVA-1 Expedition of RV "*Meteor*" (Cruise M48:1): Three new species of Munnopsidae Sars, 1864 from abyssal depths of the Angola Basin (Crustacea: Isopoda: Asellota). 493-539. In: Martínez Arbizu, P. & Brix, S. (Eds.) 2008: Bringing Light into Deep-sea Biodiversity. Zootaxa 1866: 1–574.

zusätzliche Kenntnisse:

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