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ORIGINAL ARTICLE

Frisia gen. nov., a new Cerviniinae Sars (Copepoda: Harpacticoida: Aegisthidae Giesbrecht) from Tierra del Fuego (Chile), with description of a new species

Kai Horst George[a] and Lennard Viertel[b,c]

[a]Senckenberg am Meer Wilhelmshaven, Abt. Deutsches Zentrum für Marine Biodiversitätsforschung, Wilhelmshaven, Germany; [b]Carl von Ossietzky Universität, AG Biodiversität und Evolution der Tiere, Institut für Biologie und Umweltwissenschaften, Oldenburg, Germany; [c]MNF/Institut für Biowissenschaften, Meeresbiologie, Universität Rostock, Rostock, Germany

ABSTRACT

A new species of Aegisthidae (Copepoda, Harpacticoida) is described from the upper subtidal of the western coast of the Isla Grande de Tierra del Fuego (Chile). *Frisia magellanica* gen. et sp. nov. is allocated into the subfamily Cerviniinae because of the comparatively short and divergent furcal rami. However, an assignment to any of the six known cerviniin genera is not possible, as *Frisia magellanica* gen. et sp. nov. does not share the respective autapomorphies of *Cervinia, Cerviniella, Eucanuella*, *Expansicervinia*, *Hase*, and *Paracerviniella*. Instead, the new species provides a number of deviations , e.g. a 5-segmented antennule in the female and the male, the presence of a peculiar, large and inflated seta on the fourth antennular segment, the reduction of 1 seta on the mandibular basis, and a remarkable elongation of both the female P5 exopod and the P6. These deviations are hypothesized as autapomorphies of *F. magellanica* gen. et sp. nov., justifying its allocation in a new genus *Frisia* gen. nov.

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Introduction

As pointed out by several authors (e.g.; Seifried & Schminke 2003; Kihara & Martínez Arbizu 2012; Corgosinho et al. 2018; Mercado-Salas et al. 2019), the systematic relations within the Aegisthidae Giesbrecht, 1893 are far from being resolved. The family comprises four subfamilies (Walter & Boxshall 2020), i.e. the Aegisthinae Giesbrecht, 1893, Cerviniinae Sars, 1903, Cerviniopseinae Brodskaya 1963, and Pontostrationinae A. Scott, 1909. When discussing the systematic position of *Hase* Corgosinho, Kihara, Schizas, Ostmann, Martínez Arbizu & Ivanenko, 2018, Corgosinho et al. (2018) provided a brief summary of the systematic relationships within the Aegisthidae, basing on the argumentation given by Seifried and Schminke (2003) and pointing in particular to the paraphyletic status of both the Cerviniinae and Cerviniopseinae that inhibited an unambiguous allocation of *Hase* into one of these benthic subfamilies because of the lack of apomorphies.

Moreover, besides the phylogenetic uncertainties, nomenclatural confusion also takes place: the subfamily Cerviniopseinae, which encloses among others the genus *Pontostratiotes* Brady, 1883 (cf. Wells 2007; Corgosinho et al. 2018; Walter & Boxshall 2020), was still maintained by Seifried and Schminke (2003), Corgosinho et al. (2018), and Mercado-Salas et al. (2019), despite the assessment of Huys (2009) that the name has to be replaced by Pontostrationinae, which takes priority over 'Cerviniopseinae.' In recent studies, only Kihara and Martínez Arbizu (2012) adopted Huys (2009) reinstatement. Confusion increases as Walter and Boxshall (2020) retain *Pontostratiotes* as type taxon within the Cerviniopseinae but at the same time list the Pontostrationinae also with *Pontostratiotes* as type taxon. Instead, Mercado-Salas et al. (2019) ignored that genus in their list of genera assigned to the Cerviniopseinae. Unfortunately, none of the named authors provide any justification for their respective courses of action. Here, we follow Huys (2009) and adopt the taxon name Pontostrationinae.

The above given brief summary illustrates that any further description and assignment of a new species to the Pontostrationinae or the Cerviniinae must follow the procedure undertaken by Corgosinho et al. (2018, p. 31): ' … its taxonomic position must be typological

CONTACT Kai Horst George Kai.George@senckenberg.de

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and on account of the close proximity to one of the taxa composing a given subfamily.'

The paper describes a new species in a newly established genus of the Cerviniinae. It was collected at Punta Yartou on the western coast of the Isla Grande de Tierra del Fuego (Chile). *Frisia magellanica* gen. et sp. nov. is one of the rare cerviniin representatives inhabiting shallow waters, whilst the Cerviniinae is usually considered as typical deep-sea taxon (cf. Boxshall & Halsey 2004; Kihara & Martínez Arbizu 2012; Corgosinho et al. 2018; Mercado-Salas et al. 2019). Besides the species description, a brief discussion on the presumed systematic relationships of *F. magellanica* gen. et sp. nov. in the Cerviniinae is given.

Material and methods

The sampling site Punta Yartou is situated on the western coast of the Isla Grande de Tierra del Fuego (Chile), south of Bahía Inútil, at the shores of Canal Whiteside (Figure 1). Samples were taken in Chilean summer 2003 under the supervision of Dr. Matthias Gorny (Santiago, Chile), who kindly provided the copepod material to KHG for further studies. Altogether, 27 stations were sampled, eight of which containing specimens of the here described new species (Table 1). Unfortunately, no abiotic data except the sampling depth and a rough characterization of the sediment (Table 1) are available. *[Table 1 near here]*

Qualitative samples were taken by SCUBA divers using push cores to get material from the uppermost 5 cm of sediment (Gorny pers. comm.). The material was immediately fixed with formalin (final concentration ~4%) and sent to the German Center for Marine Biodiversity Research DZMB (Wilhelmshaven, Germany). There, the samples were centrifuged three times with 4,000 rpm for 6 min, using Levasil® as floating medium and Kaolin to separate the sediment from the organisms. The centrifuged material was subsequently stained with Rose Bengal and then sorted under a Leica MDG 33 stereo microscope. For the here presented study, specimens of *Frisia magellanica* gen. et sp. nov. were separated and embedded into glycerin for further processing. Species identification and drawings were made with the use of a camera lucida on a Leica DMR compound microscope equipped with differential interference contrast. In addition, dorsal, lateral, and ventral images of both 1 female and 1 male were made using Confocal Laser Scanning Microscopy (CLSM) following the procedure described by Michels and Büntzow (2010) and further established by, e.g. Kihara and Martínez Arbizu (2012) and Kihara and Rocha (2013).

For the identification of the species, the keys provided by Lang (1948), Boxshall and Halsey (2004), Wells (2007) as well as original descriptions were used. General terminology follows Lang (1948), Huys and Boxshall (1991) and

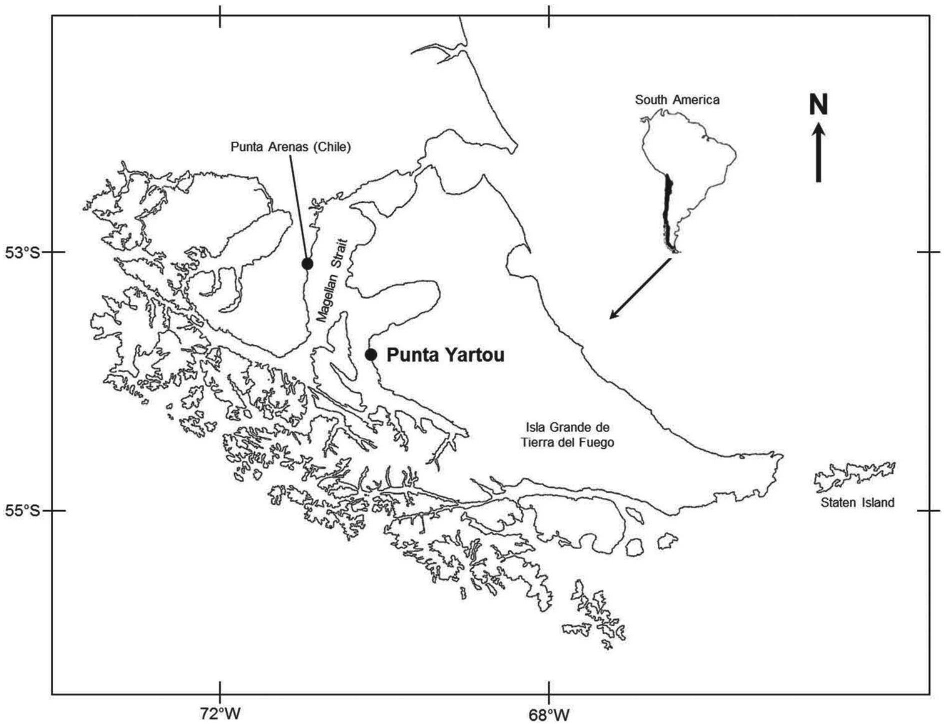

Figure 1. Map of the Isla Grande de Tierra del Fuego, located at the southern tip of South America, and the sampling site Punta Yartou (Chile).

Table 1. List of the eight stations at Punta Yartou (Isla Grande de Tierra del Fuego, Chile) containing *Frisia magellanica* gen. et sp. nov.

Sampling date	Stations no.	Depth (m)	Substrate
14.02.2003	#M11	15	Muddy sand
	#M12	15	Muddy sand
	#M13	30	Sandy mud
	#M14	15	Muddy sand
	#M18	15	Muddy sand
	#M22	30	Sandy mud
15.02.2003	#M15	15	Muddy sand
	#M21	15	Muddy sand

Huys et al. (1996). Terminology referring to phylogenetic aspects follows Ax (1984); the terms 'telson' and 'furca' are adopted from Schminke (1976). Differentiation between the body sections is as follows: cephalothorax (including A1–P1); thorax (P2–P6-bearing somites); abdomen (genital somite–telson); prosoma (cephalothorax and P2–P4-bearing thoracic somites); urosoma (P5-bearing thoracic somite–telson).

The complete type material is kept in the collection of the Senckenberg Forschungsinstitut und Naturmuseum, Frankfurt (Germany).

Abbreviations used in the text: A1: antennule, A2: antenna, aes: aesthetasc, CI–CV: copepodid stages I–V, cphth: cephalothorax, enp-1/enp-2/enp-3: endopodal segments 1–3, exp-1/exp-2/exp-3: exopodal segments 1–3, FR: furcal ramus/rami, GDS: genital double somite, GF: genital field, md: mandible, mxl: maxillule, mx: maxilla, mxp: maxilliped, n: number of specimens, P1–P6: swimming legs 1–6, STE: subapical tubular extensions, TE: tubular extensions.

Results

Systematics

Subclass: Copepoda Milne-Edwards, 1840
Order Harpacticoida Sars, 1903
Family: Aegisthidae Giesbrecht, 1893
Subfamily: Cerviniinae Sars, 1903
Genus: *Frisia* gen. nov., monotypic
Type and only species: *Frisia magellanica* gen. et sp. nov.

Etymology

The generic name *Frisia* refers to the county Friesland (Germany), where LV originates from.

Generic diagnosis

As the newly established genus is monotypic, the generic diagnosis corresponds to here presented description of *Frisia magellanica* gen. et sp. nov.

Frisia magellanica gen. et sp. nov.

Type material consisting of 13 specimens: Female holotype, distributed over 17 slides, coll. no. SMF 37224/1–17; paratype 1: female, distributed over 16 slides, coll. no. SMF 37225/1–16; paratype 2: female, embedded on 1 slide, coll. no. SMF 37226/1; paratype 3: female, placed on 2 slides, coll. no. SMF 37227/1–2; paratype 4: male (allotype), embedded on 1 slide, coll. no. SMF 37228/1; paratype 5: male, distributed over 2 slides, coll. no. SMF 37229/1–2. Additionally, 7 individuals are deposited in ethanol (76%): 1 CV, coll. no. SMF 37230/1; 1 male, coll. no. SMF 37231/1; 1 male and 1 CV, coll. no. SMF 37232/1; 1 CV, coll. no. SMF 37233/1; 1 female and 1 CII, coll. no. SMF 37234/1.
Locus typicus: Punta Yartou, Isla Grande de Tierra del Fuego (Chile), geographic location 53°53.723'S/70° 09.132′W, upper subtidal.

Etymology

The epitheton *magellanica* points to the Chilean Magellan Region, where the new species was discovered.

Description of the female

Habitus (Figures 2 and 3a) fusiform-compressed (cf. Hicks and Coull 1983) tapering distally. Boundary between prosoma (cphth–P4-bearing somite) and urosoma (P5-bearing somite–telson) discernible but rather moderately defined. Body length (rostrum to the end of FR) approximately 1,130 µm (1,070–1,200 µm; n = 4); body broadest between cphth and first pedigerous somite, cphth and all free body somites except penultimate abdominal somite dorsally with several sensilla. Rostrum (Figure 3a) triangular, fused with cphth, with pair of sensilla on its tip. Cphth (Figures 2 and 3a) comprising ¼ of total body length, with several sensilla (often broken); dorsolateral posterior suture still indicating former separation of P1-bearing thoracic somite. P2–P4-bearing somites (Figures 2 and 3a) tapering posteriorly, P2- and P3-bearing somites with a row of fine spinules on posterior margin. P4–P6-bearing somites presenting lateral, backwardly directed thorn-like cuticular extensions (Figures 2 and 3a). P6-bearing somite fused with first abdominal somite, forming a large genital-double somite; former separation is still detectable dorsally (Figures 2a and 3a) and laterally (Figure 2c). Abdominal part of GDS and following somites except for telson with dentate hyaline frills on posterior margin (Figure 3a). Telson trapezoid in dorsal view, with hyaline anal operculum that is flanked by 2 sensilla (Figure 3a) Anal opening with hyaline, folded cuticle.

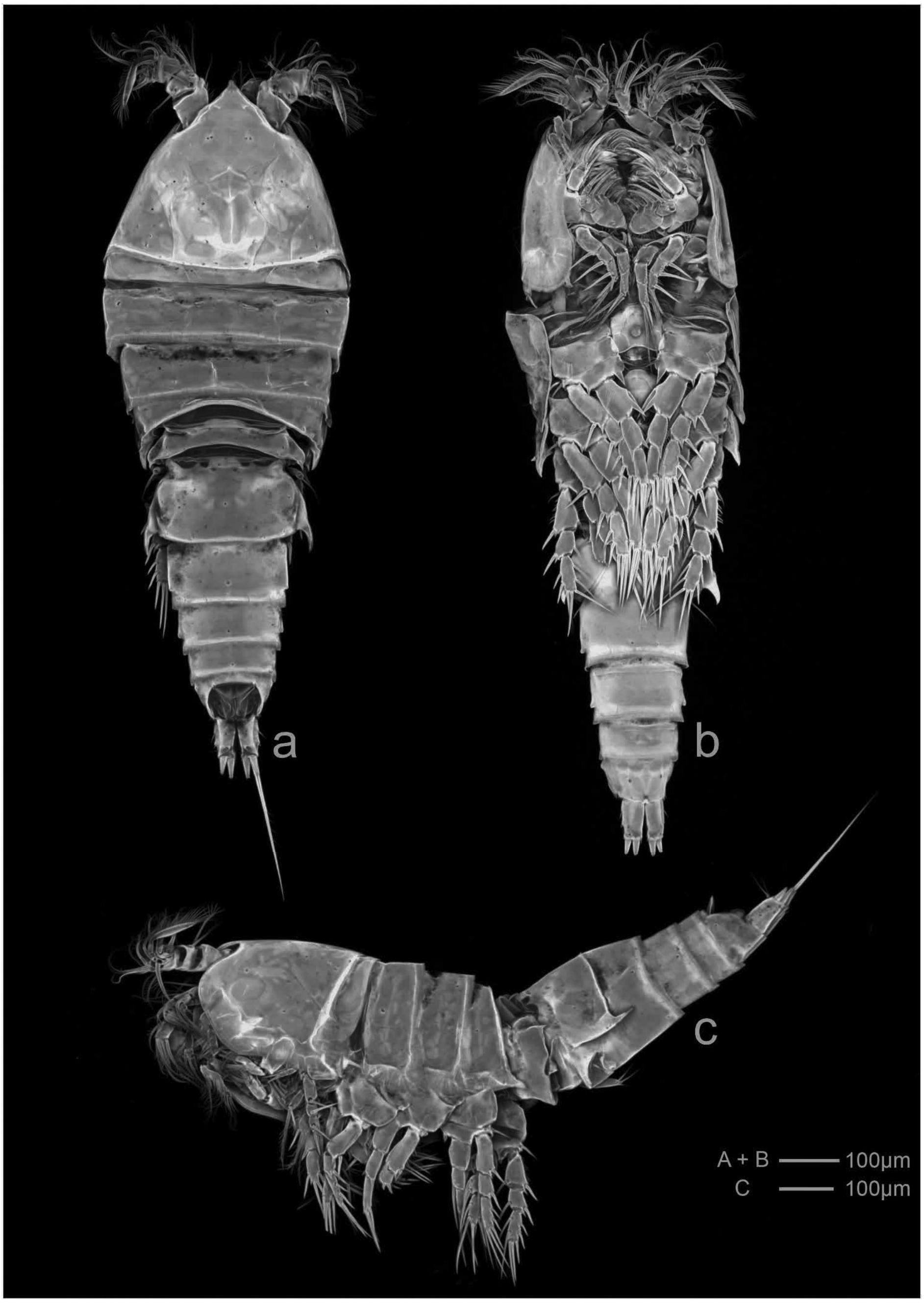

Figure 2. *Frisia magellanica* gen. et sp. nov., female, CLSM microphotography, (a). Dorsal habitus, (b). Ventral habitus, (c). Lateral habitus.

FR (Figure 3b) about twice as long as broad, with 7 setae: I and II laterally, being I half as long as II; III arising subapically on outer margin, longer than II; IV and V longest (V broken in all specimens), arising apically; VI subapically on inner margin, smaller than I; VII tri-articulated, ascending subapically on the dorsal side from the small projection.

A1 (Figure 4) 5-segmented, presenting a high variety of setal elements that are grouped into different types and deserve a detailed description (see below). First segment large, slightly longer than broad, with 1 seta (type T1); second segment half as long as first, bearing 9 setae (7x T2 [6 broken in Figure 4, but comparison with paratypes revealed them as belonging to that type], 1x T3, 1x T4); third segment

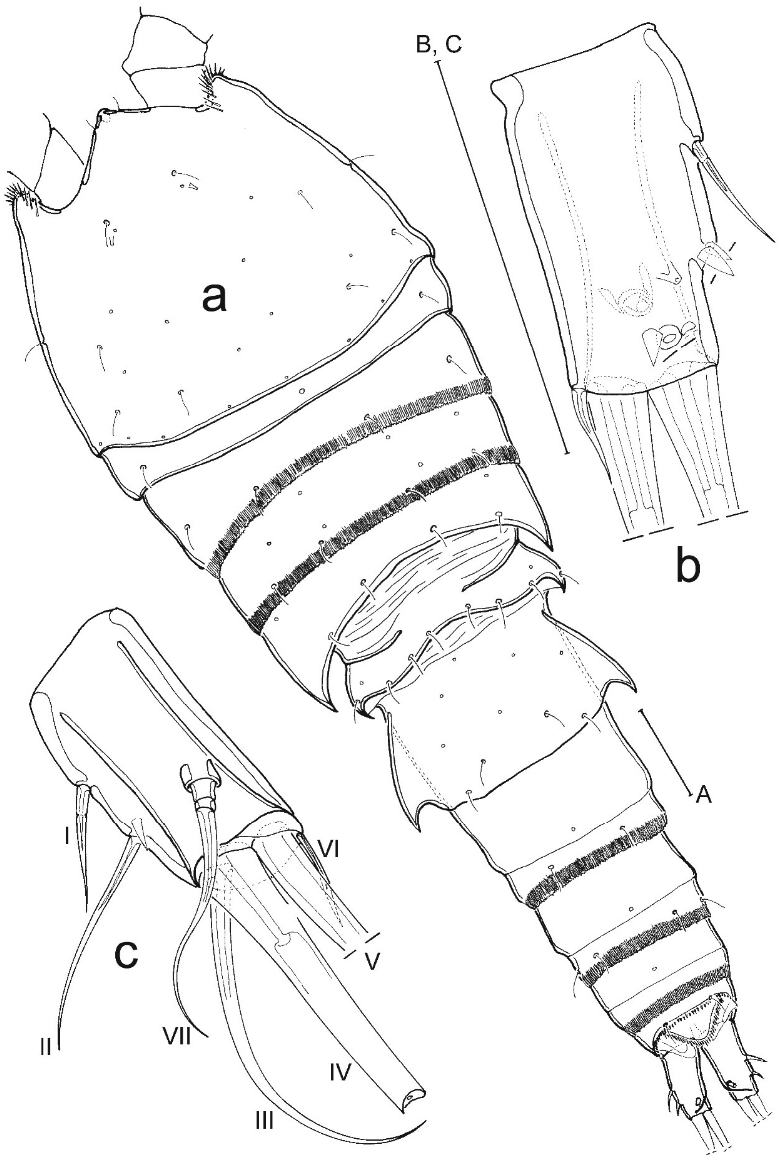

Figure 3. *Frisia magellanica* gen. et sp. nov. (a) Female, dorsal habitus, (b). Female left FR, ventral view, (c). Male left FR, dorsal view. Scales: A. 100 µm, B, C. 50 µm.

slightly smaller than first segment, trapezoid, with 1 aes and 8 setae (5x T5, 1x T6, 2x T7); fourth and fifth segments together reaching a length of preceding segment; fourth segment small, broader than long, with 4 setae (2x T5, 1x T6, 1x T8); fifth segment smallest, with 7 elements corresponding to different types (T5, T9, T10, T11, T12, 2x T13), and with small aes that is basally fused to seta T9.

Setal formula: 1/1; 2/9; 3/8 + aes; 4/4; 5/7 + aes.

Remarks. The shape of the A1, especially of the setae, is extraordinary. Only 4 setae represent a rather 'normal' shape (on segments 1, 2, and 5), whilst the remaining elements show very special characteristics. They may be assigned to 13 different types (respective appellation in Figure 4; STE and TE indicated by arrowheads in Figure 4):

Type 1 (T1): on segment 1, of normal shape, bipinnate, with STE;

Type 2 (T2): on segment 2, unipinnate, not tapering distally but ending in a blunt, rounded tip with strong pinnae that increase in size posteriorly, and with STE;

Type 3 (T3): on segment 2, of normal shape, bipinnate, small;

Type 4 (T4): on segment 2, multiplumose, long, ending in TE;

Type 5 (T5): on segments 3–5, rat-tailed, uni- or bipinnate, the tip ending in a TE;

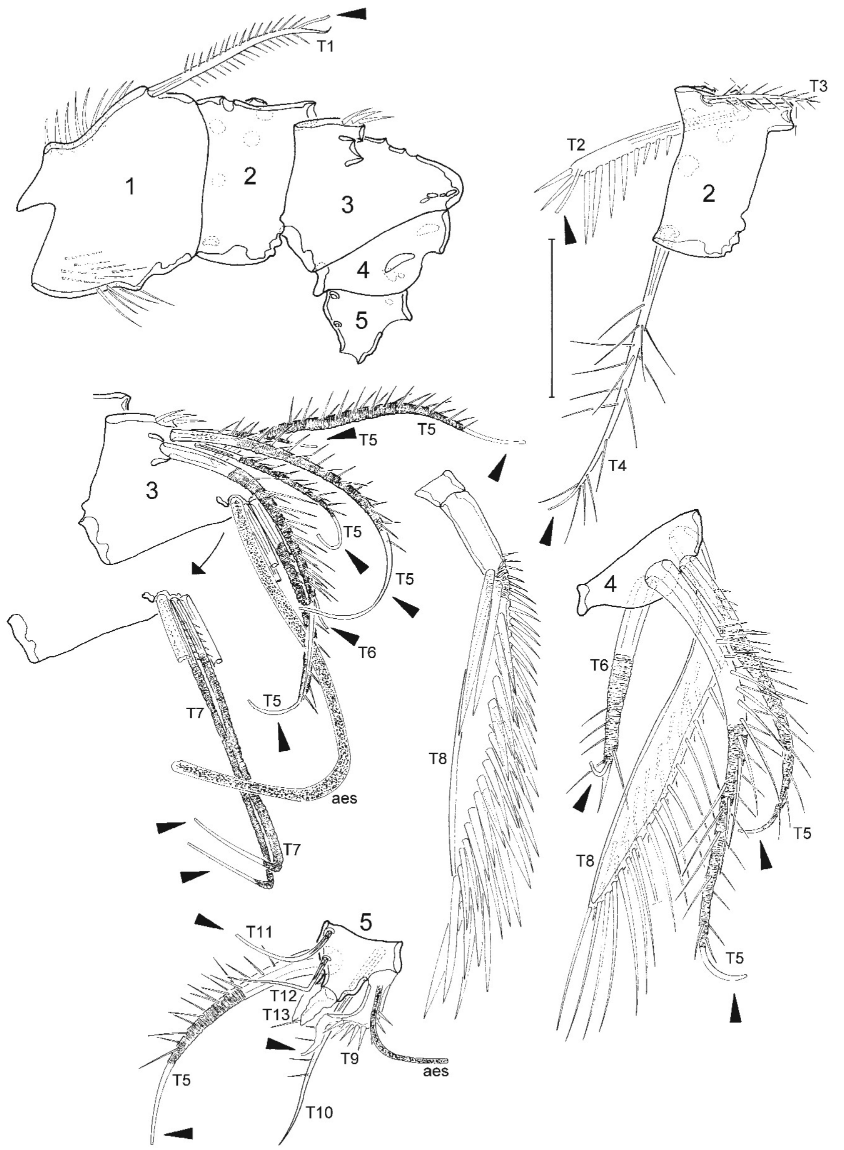

Figure 4. *Frisia magellanica* gen. et sp. nov., female A1. Scale: 50 µm. T1–T13 name the different types of setal elements, arrowheads point to (sub)terminal extensions. Explanations in the text.

Type 6 (T6): on segments 3 and 4, Rat-tailed, uni- or bipinnate, the tip forming a stiletto-like, strongly cuspidate tip; additionally with an STE;

Type 7 (T7): on segment 3, similar to the T5 type, but bare;

Type 8 (T8): on segment 4, largest antennular seta, of an inflated appearance and showing a kind of strong geniculation at the end of the proximal quarter, resulting in a strong bending of that element. Moreover, it is equipped with 3 rows of long pinnae that increase in strength and length toward the tip; because of its size that seta allows a quick and unambiguous diagnostic characterization of *F. magellanica* gen. et sp. nov.;

Type 9 (T9): on segment 5, arising subapically together with a small aes, showing a characteristic bending of almost 90°; its tip ends in a TE. Comparison revealed that the shape of that seta, including the 90°-bending, is almost identical in all paratypes;

Type 10 (T10): on segment 5, of normal shape, unipinnate;

Type 11 (T11): on segment 5, bare, short, ending in TE;

Type 12 (T12): on segment 5, a quite normal short, bare seta;

Type 13 (T13): on segment 5, short hyaline elements that are located apically on segment 5; they have a broad base and taper posteriorly. As not comparable with aesthetascs, the authors hypothesize that these smooth and hyaline elements may form derived and specialized setae. It has to be noted that the number of these elements seems to vary; while the here illustrated A1 clearly bears 2 hyaline setae, other individuals clearly show 3 hyaline setae.

A2 (Figure 5a) with allobasis that bears 2 long abexopodal setae, the proximal one biplumose, the distal one unipinnate at distal half; exopod 4-segmented, arising from pedestal, segments 1–4 equipped with 2, 1, 1, 2 setae, respectively. Endopod 1-segmented, with 1 bipinnate and 1 smaller geniculate seta proximally on inner margin, and with 5 apical setae, basally accompanied by row of spinules: 2 apical setae uni-, 1 apical seta biplumose, all three ending in TE (arrowheads in Figure 5a); fourth apical seta unipinnate, fifth apical seta bare; moreover, endopod subapically with a pseudo-segmented spine that is ornamented with 2 rows of strong pinnules, rounded at its tip and equipped apically with long spinules; additionally, endopod with some long spinules on surface (dotted in Figure 5a).

Md (Figure 5b) strong; gnathobase apically with 6 strong multicuspidate teeth, and with 1 unipinnate seta (partly broken in Figure 5b). Palp with basis carrying 3 setae, two of which with STE (arrowheads in Figure 5b), and with several long and fine spinules; endopod

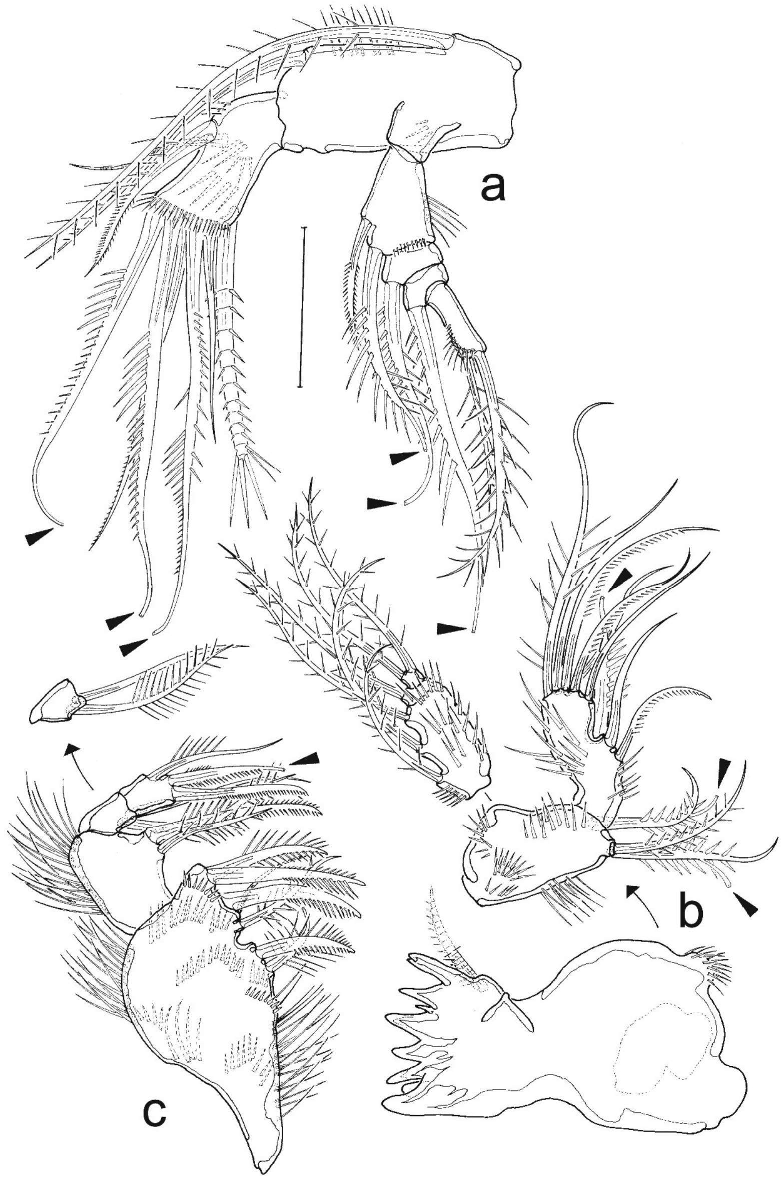

Figure 5. *Frisia magellanica* gen. et sp. nov., female. (a). A2, (b). Md, (c). Mxp. Scale: 20 µm. Arrowheads point to (sub)terminal extensions. Explanations in the text.

1-segmented, with long spinules and 8 setae, 1 seta unipinnate and ending in TE (arrowhead in Figure 5b); exopod 3-segmented, exp-1 longest, covered with spinules and laterally equipped with 3 long bipinnate setae; exp-2 small, bearing 1 long bipinnate seta; exp-3 smallest, apically with 2 long bipinnate setae.

Mxl (Figure 6a–A''') precoxal arthite with 3 rows of spinules, apically with 5 strong spines, 2 of which with pinnae medially, and with 4 bare setae; subapically with 3 bare setae; additionally with 2 bare surface setae. Coxal surface with 2 rows of spinules (Figure 6A'''), coxal endite apically with 6 setae, epipodite represented by 1 seta (Figure 6a). Basis end endopod fused (Figure 6a, A'), with few spinules and 11 apical setae (Figure 6A', A''), two of which of rat-tailed shape; exopod represented by 2 setae (Figure 6a, A').

Mx (Figure 6b) syncoxa with 4 endites (numbered 1.–4. in Figure 6b) and several long and short spinules, proximal (first) endite distinct, with a row of spinules, apically with 5 uni- and multipinnate/-plumose setae; second to fourth endites fused with syncoxa, second endite very small, apically with 3 bare setae; third endite (*) with 3 apical bare setae; fourth (distal) endite (*) longer than preceding ones, apically with 3 setae, one of which biplumose and rat-tailed; allobasis distinct, basal endite with a row of

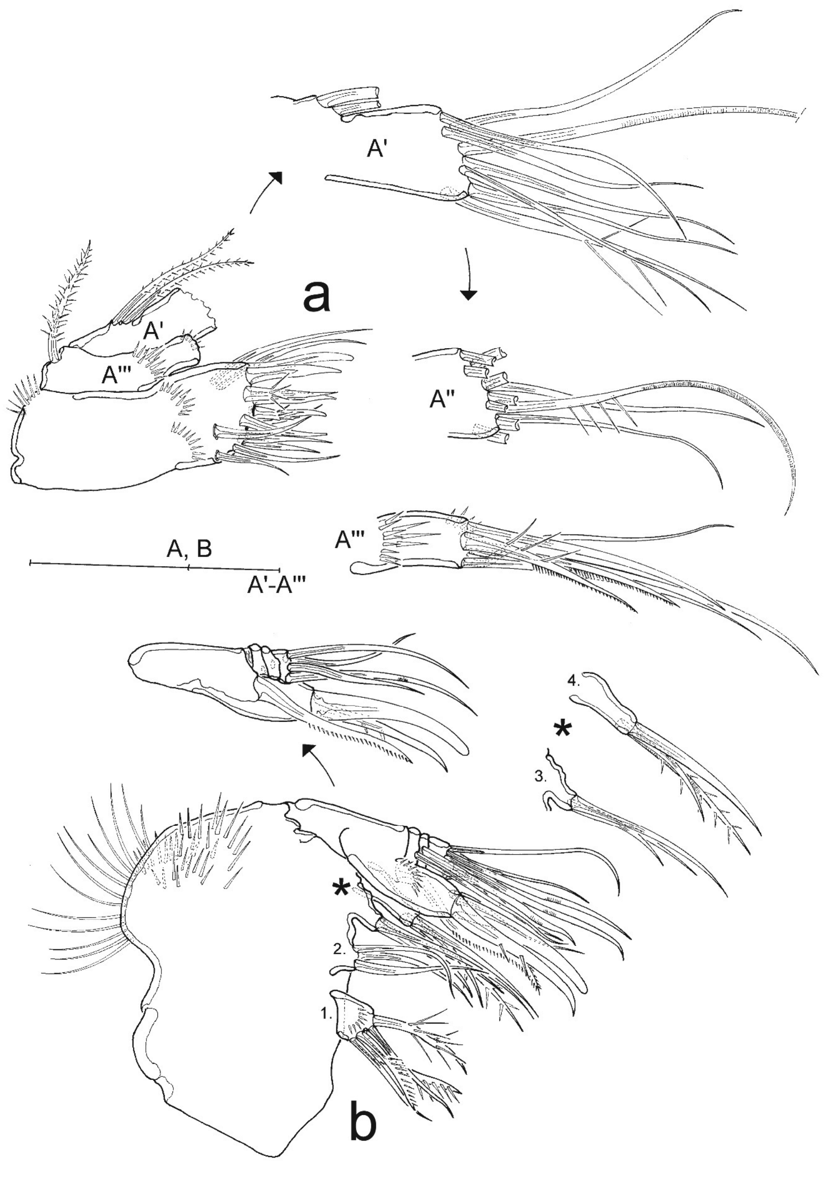

Figure 6. *Frisia magellanica* gen. et sp. nov., female. (a) (+A', A'', A'''). Mxl, (b). Mx. Scale: 50 µm. Asterisk * referring to posterior endites 3 and 4.

spinules, apically with 1 seta and 2 spines, laterally with 1 strong unipinnate seta; endopod 3-segmented, enp-1 and enp-2 each laterally with 1 seta, enp-3 apically with 4 setae, one of which geniculate.

Mxp (Figure 5c) weakly prehensile. Syncoxa twice as long as basis, with several spinules of different length, with a row of long setules on inner and outer margin, and with 7 biplumose/bipinnate setae on inner margin; basis also with fine setules on outer margin, and with 1 short and 1 long bipinnate seta; endopod 2-segmented, enp-1 with 2 inner setae, one of which biplumose; enp-2 as long as enp-1, with 1 lateral unipinnate seta and 2 apical uni/bipinnate setae, one of which ending in TE (arrowhead in Figure 5c).

P1 (Figure 7a,b) much smaller than P2–P4, apical endopodal and exopodal segments barely reaching apical margin of P2 coxa (Figures 2b and 9b,c). Intercoxal sclerite (Figure 7a) trapezoid, with 2 setulose tufts on posterior margin; coxa (Figure 7b) broader than long and broader than basis, with few fine spinules on outer half, and with row of minute spinules on the posterior margin; basis with several strong spinules of different length, and with 1 inner bipinnate spine and 1 outer spine (broken in Figure 7b). Endo- and exopod 3-segmented, all segments with long outer spinules; exp-1 triangular in shape, with 1 inner biplumose seta and 1 bipinnate outer spine, exp-2 and exp-3 half as long as exp-1, exp-2 with 1 inner biplumose seta and 1

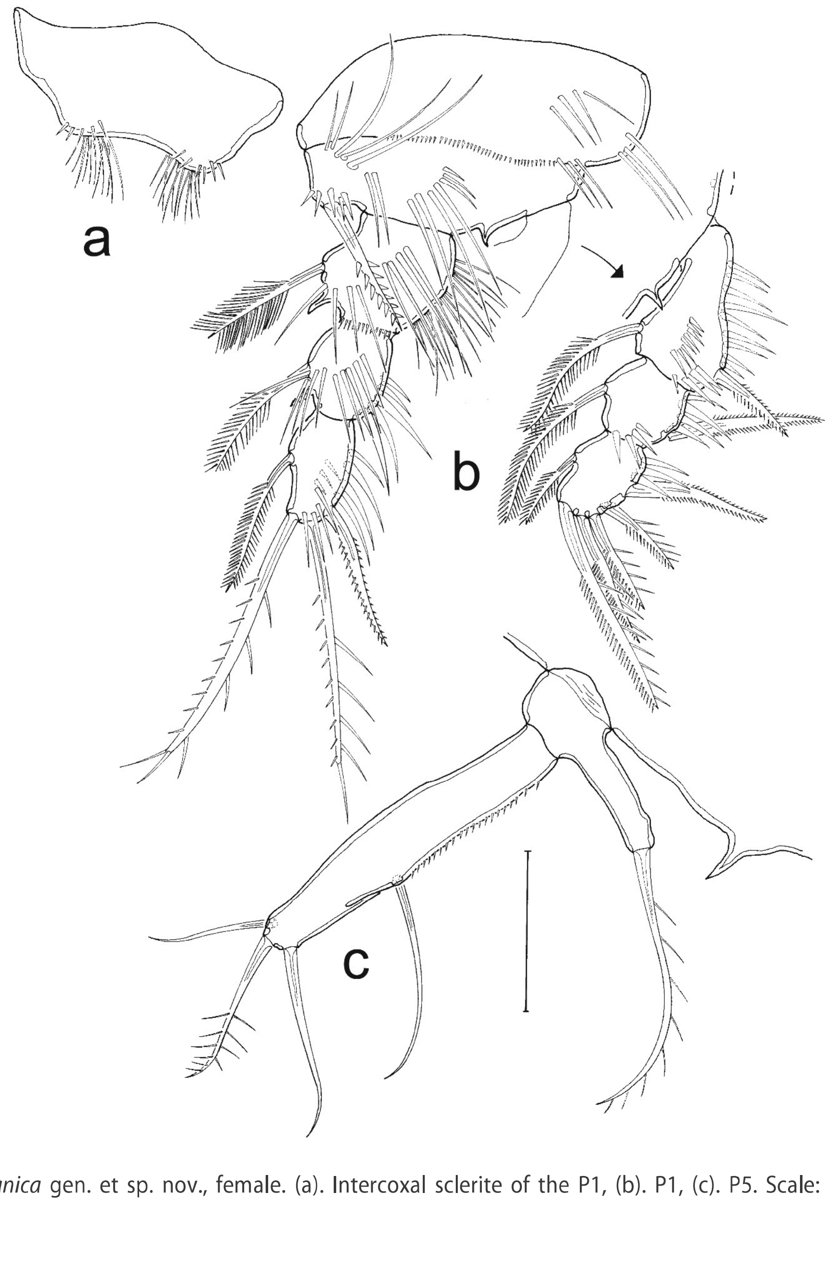

Figure 7. *Frisia magellanica* gen. et sp. nov., female. (a). Intercoxal sclerite of the P1, (b). P1, (c). P5. Scale: 50 µm.

bipinnate outer spine, exp-3 with short biplumose inner seta, and with 3 outer and 2 apical spines, all bipinnate; however, all except first outer spine with different size of pinnae, being the outer ones less dense but stronger than the inner pinnae; enp-1 broadest, anterior surface with long spinules, inner subapical margin turned into apophysis and bearing 1 biplumose seta medially, enp-2 narrower than enp-1, with long spinules on anterior surface and 1 biplumose inner seta, enp-3 longer than broad, with few surface spinules, 1 inner biplumose seta, 2 apical setae bearing fine pinnae on inner, and stronger but less dense pinnae on outer margin, and 1 outer bipinnate spine.

P2–P4 (Figure 8a–c) with square intercoxal sclerites (Figure 8a) bearing few spinules on distal margins; precoxae triangular, small, coxae large, squarish, with several long spinules on anterior surface and row of small spinules on distal margin (Figure 8a); bases at most half as long as coxae, not reaching width of the latter, inner margin with long spinules and long apophysis, outer margin with smaller apophysis and outer unipinnate seta, posterior margin with row of spinules (Figure 8a); endo- and exopods 3-segmented; P2–P4 exopods of same size and shape, exp-1 as long as exp-2 and exp-3 combined, outer margin with spinules, 1 inner biplumose seta and 1 outer bipinnate spine; exp-2 without spinules, with inner biplumose seta and outer bipinnate spine; exp-3 slightly longer than exp-2, with 3 bipinnate outer spines, 2 apical setae, the outermost

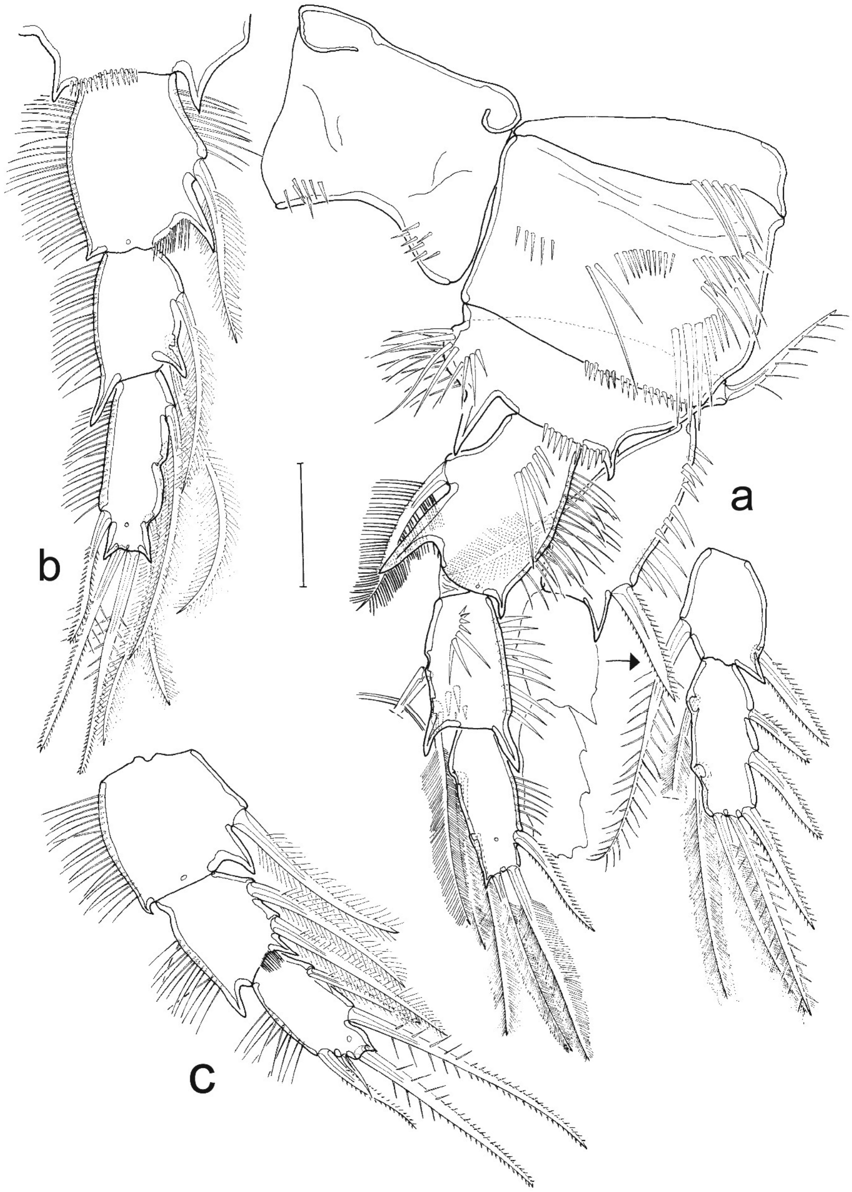

Figure 8. *Frisia magellanica* gen. et sp. nov., female. (a). P2, (b). P3 endopod, (c). P4 endopod. Scale: 50 µm.

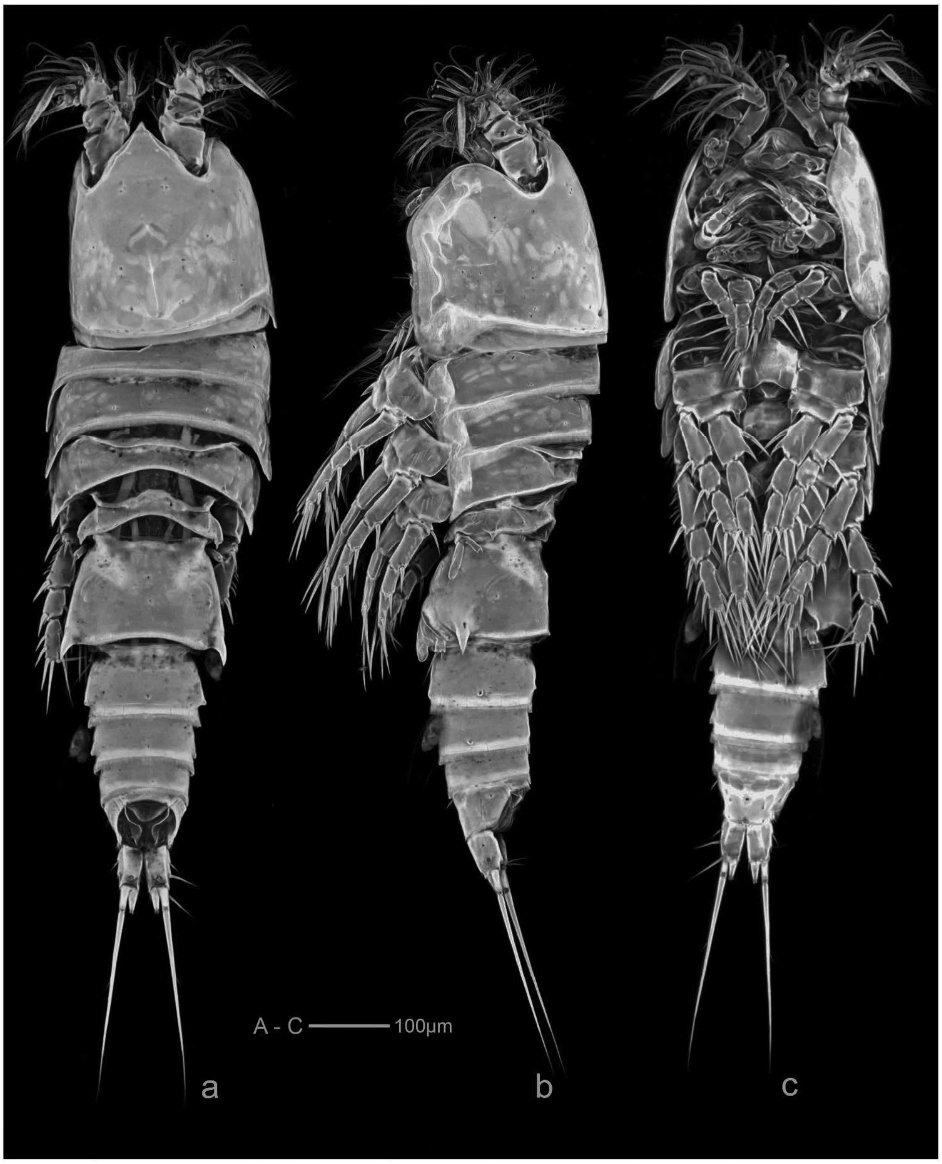

Figure 9. *Frisia magellanica* gen. et sp. nov., male, CLSM microphotography, (a). Dorsal habitus, (b). Lateral habitus, (c). Ventral habitus.

bipinnate, the innermost densely biplumose, additionally with 2 densely biplumose inner setae (Figure 8a); P2 enp-1 (Figure 8a) with strong apophysis subapically on inner margin and small apophysis on outer corner, and with 1 densely biplumose inner seta and long spinules on outer margin; enp-2 with moderate apophysis each on inner and outer corner, few surface spinules and 2 densely biplumose inner setae (proximalt seta broken in Figure 8a); enp-3 narrower than previous segments, with row of spinules on outer margin, and with 2 inner and 2 apical densely biplumose setae and 1 bipinnate outer spine; P3 endopod (Figure 8b) similar to that of P2, but without surface spinules, whilst enp-1 with row of fine spinules between inner apophysis and distal margin, and with 3 inner setae on enp-3; P4 endopod (Figure 8c) smaller and more compact than in previous legs, and with spinulose row between apophysis and distal margin in enp-2; enp-3 with 2 inner bipinnate setae, 2 apical setae, the outermost minute and bare, and with 1 outer bipinnate spine. Setal formula for P1–P4 given in Table 2.

P5 (Figure 7c) baseoendopod small, with endopodal lobe completely incorporated, and with 1 unipinnate seta arising from big setophore. Exopod distinct, long and slender, about 4.5x longer than baseoendopod, and 5.8x longer than broad; with outer row of minute spinules and 1 outer bare seta; apically with 2 bare and 1 biplumose seta.

Table 2. *Frisia magellanica* gen. et sp. nov., setation of P1–P4. Roman numerals indicate outer spines, Arabic numerals refer to apical and inner setae.

	Exp-1	Exp-2	Exp-3	Enp-1	Enp-2	Enp-3
P1	I-1	I-1	III-2-1	0–1	0–1	I-2-1
P2	I-1	I-1	III-2-2	0–1	0–2	I-2-2
P3	I-1	I-1	III-2-2	0–1	0–2	I-2-3
P4	I-1	I-1	III-2-2	0–1	0–2	I-2-2

GF and P6 (Figure 10a). Small, with single copulatory pore; P6 limbs fused to a single plate carrying 2 long and slender lobes that bear 1 short bare and 1 long unipinnate seta.

Description of the male

The male resembles the female in almost all aspects. The FR are as in the female, Figure 3c shows the male FR to give the dorsal view. Sexual dimorphism was observed neither in the A1 nor in P1–P4. Nevertheless, the body size (Figure 9) is slightly smaller (body length of rostrum to the end of FR approximately 941 µm (929–953 µm; n = 3)), a GDS is not developed, and P5 and P6 are deviating from those of the female.

P5 (Figure 10b) baseoendopod smaller than in the female, but of the same shape, with strong setophore that carries 1 uniplumose seta; exopod much shorter than in female, about 2.3x longer than baseoendopod and about 2.1x longer than its broadest width, equipped with 1 bare outer and 1 apical bipinnate seta.

P6 (Figure 10b) forming a rounded lappet that is basally fused with its counterpart; exopod small, nearly squarish, with 2 bare apical setae.

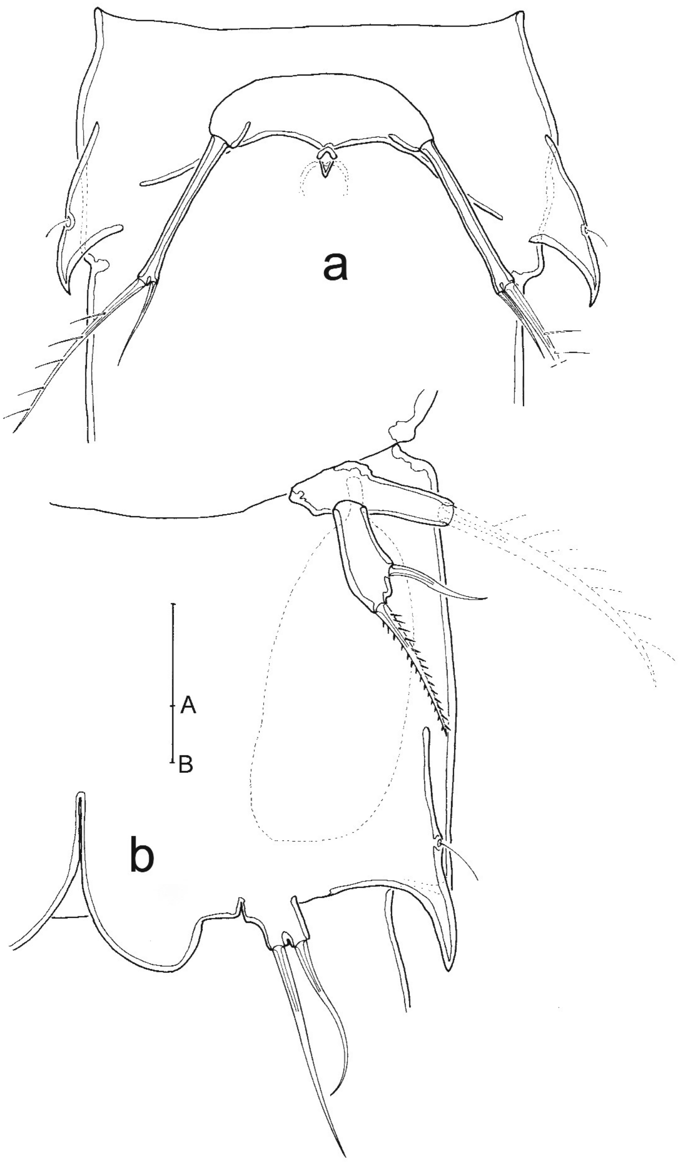

Figure 10. *Frisia magellanica* gen. et sp. nov., (a). Female genital field with P6, (b). Male P5 and P6. Scales: 50 µm.

Discussion

Allocation of **Frisia magellanica** *gen. et sp. nov. to Aegisthidae Giesbrecht, 1893*

According to Seifried (2003) and Seifried and Schminke (2003), and being widely accepted (e.g. Corgosinho et al. 2018), the Aegisthidae are characterized by the following female autapomorphies:

(1) Telson elongated, tapering posteriorly;
(2) FR more than twice as long as broad;
(3) A1 8-segmented, fusion of Harpacticoida segments 3 and 4;
(4) A2 with allobasis or incomplete basis;
(5) A2 enp-2 without 1 lateral spine;
(6) Md endopod 1-segmented, twice as long as broad;
(7) Md exp-1 remarkably elongated, much longer than following segments;
(8) Mxl coxal epipodite represented by 2 setae;
(9) Mxl exopod small, with 3 setae;
(10) Mx endopodal element 11 developed into large, strong spine, arising from the posterior surface;
(11) P5 without endopodal lobe.

Frisia magellanica gen. et sp. nov. shares autapomorphies 1, 2, 4–7, 10, and 11. With respect to characters 3, 8, and 9 *Frisia magellanica* gen. et sp. nov. shows further deviations, with a 5-segmented female A1 (3), the coxal epipodit of the md being represented by 1 seta only, and with the maxillular exopod being completely lost and represented by 2 setae (9). Thus, an assignment of the new species into the Aegisthidae is doubtless.

Assignment of **Frisia magellanica** *gen. et sp. nov. to the Cerviniinae Sars, 1903*

An allocation of the new species to the Aegisthinae was unsubstantiated because that subfamily evolved a hyperbenthic and planktonic lifestyle (cf. Mercado-Salas et al. 2019 and references therein), often combined with a complete loss of the mouthparts at least in the males. Nonetheless, the males' mouthparts in *Frisia magellanica* gen. et sp. nov. are as well developed as in the females, and the species was found in the sediment, which suggests, in combination with the body shape and the structure of the appendages, a strictly benthic lifestyle. Therefore, a possible allocation of the new species to the Cerviniinae or Pontostrationinae was checked. However, as none of these subfamilies can yet be characterized as monophylum (Seifried & Schminke 2003), an allocation had to base on the typological comparison. One major difference between the two subfamilies consists in the shape and inclination of the FR (cf. Boxshall & Halsey, Corgosinho et al. 2018): in the Pontostrationinae the FR are without exception slender, remarkably elongate, and strictly confluent, whereas in the Cerviniinae the FR are much shorter and divergent, except for individual species, e.g. *Cerviniella danae* Kihara & Martínez Arbizu, 2012, *C. hitoshii* Kihara & Martínez Arbizu, 2012, and *Eucanuella longirostrata* Itô, 1983, which bear slender confluent FR (cf. Itô 1983; Kihara & Martínez Arbizu 2012). As *Frisia magellanica* gen. et sp. nov. presents short and slightly divergent FR, it is assigned to the Cerviniinae.

Establishment of **Frisia** *gen. nov. for the allocation of* **F. magellanica** *gen. et sp. nov.*

The Cerviniinae currently comprise six genera (Walter & Boxshall 2020): *Cervinia* Norman, 1878, *Cerviniella* Smirnov, 1946, *Eucanuella* T. Scott, 1900, *Expansicervinia* Montagna, 1981, *Hase*, and *Paracerviniella* Brodskaya, 1963. The here described new species cannot be assigned to any of them, due to several morphological differences, which are discussed in the following:

Cervinia (13 species, cf. Walter & Boxshall 2020) presents the autapomorphies of a sexual dimorphic rostrum (small in the female, but very large in the male; e.g. Lang 1948) and of atrophied mouthparts in the male, especially the mxl and mxp (Huys et al. 1996). Instead, in *Frisia magellanica* gen. et sp. nov. the rostrum is of the same shape in male and female, and the mouthparts are well developed in the male. Therefore, a placement of *Frisia magellanica* gen. et sp. nov. into *Cervinia* is rejected.

Cerviniella (15 species, cf. Walter & Boxshall 2020) is characterized by a sturdy body that can be clearly differentiated between a broad prosoma and a much narrower urosoma, and by quite robust swimming legs 1–4 that are developed as digging limbs. Moreover, they consist of 1-segmented exopods and 1–2-segmented endopods. In particular, the P2 exopod is massive, with acute cuticular projections and strong outer spines (cf. Kihara & Martínez Arbizu 2012). In contrast, the differentiation between the pro- and urosoma is less pronounced in *Frisia magellanica* gen. et sp. nov.; P1–P4 are 3-segmented and of rather 'normal' shape and not transformed into digging limbs. Thus, an allocation of the new species to *Cerviniella* is not justified.

Remarks: Within *Cerviniella* some confusion arises with respect to the allocated species: Walter and

Boxshall (2020) list, apart from the type species *C. mirabilipes* Smirnov, 1946, two additional species described by Smirnov (1946): *C. gorbunovi* Smirnov, 1946, and *C. inermis* Smirnov, 1946. Both species are, however, ignored by other authors without any justification (e.g. Bodin 1996; Wells 2007; Kihara & Martínez Arbizu 2012).

The allocation of *Frisia magellanica* gen. et sp. nov. into *Hase* (2 species), the presumed sister-taxon of *Cerviniella* (Corgosinho *et al.* 2018), must be refused, too. *Hase* presents a compact body shape that does not taper posteriorly, and a prosoma that is about twice as long as the urosoma, whose somites except the telson are much shorter than broad; moreover, the telson reaches the length of all remaining abdominal somites combined, and the FR are set widely apart (Corgosinho et al. 2018). In contrast, *Frisia magellanica* gen. et sp. nov. is characterized by a body that tapers posteriorly; its prosoma is as long as the urosoma; the urosomal somites are elongated longitudinally, being only slightly narrower than long; the telson is only slightly longer than the previous somite, tapering posteriorly and thus trapezoid in shape, with the FR standing close together.

Eucanuella (4 species, cf. Walter & Boxshall 2020) presents derived FR: apart from a sexual dimorphism (broad at the base, tapering posteriorly, and divergent in the females; confluent, slender, and much longer in the males), the females of that genus are characterized by bearing asymmetrical rami, being unequal in length (e.g. Lang 1948; Huys et al. 1996). That deviation, which is regarded here as autapomorphic for *Eucanuella*, is not present in *Frisia magellanica* gen. et sp. nov., which shows neither a sexual dimorphism in the FR (cf. Figure 3b,c) nor unequal female furcal rami. Therefore, the new species cannot be assigned to *Eucanuella*.

Expansicervinia (2 species, cf. Walter & Boxshall 2020) is characterized by five autapomorphies (Seifried 2003). The most striking ones are the size of the second pedigerous somite, due to its remarkable ventral expansion, and a knob-like expansion on the first antennular segment. *Frisia magellanica* gen. et sp. nov. lacks these and all remaining deviations of the genus, so it cannot be allocated into *Expansicervinia*.

With respect to *Paracerviniella* (monotypic, cf. Walter & Boxshall 2020), we must relegate to Corgosinho et al. (2018): the description given by Brodskaya (1963), which based on a single male, is not detailed enough for any morphological comparison. However, single features indicate against a closer relationship between *P. denticulata* Brodskaya, 1963 and *Frisia magellanica* gen. et sp. nov. For instance, the FR of the first are 1.5 times shorter than the telson (Brodskaya 1963), whilst in *Frisia magellanica* gen. et sp. nov. they are longer (Figures 2, 3a and 9). Moreover, the outer spine of the P1 and P2 enp-3 are claw-like in *P. denticulata* (Brodskaya 1963) but of the 'typical' bipinnate shape in *Frisia magellanica* gen. et sp. nov. (Figures 7b and 8a).

Characterization of **Frisia magellanica** *gen. et sp. nov.*

As demonstrated above, the here described new species cannot be allocated into any of the cerviniin genera, so its assignment into a new genus *Frisia* gen. nov. is justified. *Frisia magellanica* gen. et sp. nov. presents several derived characters. Due to the pending systematic evaluation of and within the Cerviniinae that required a careful and exhaustive morphological comparison of all cerviniin species, and thus would go beyond the scope of the study presented here, some deviations are listed exemplarily:

A1 of the female 5-segmented: at least in the groundpattern of the remaining cerviniin genera the female A1 is 7–8-segmented, which constitutes the ancestral state. Instead, the 5-segmented female (and male) A1 of *Frisia magellanica* gen. et sp. nov. is interpreted here as autapomorphy.

A1 fourth segment with a peculiar, large and inflated seta: Such striking seta (cf. Figure 4) is unique within the Cerviniinae and thus regarded as autapomorphic for *Frisia magellanica* gen. et sp. nov. It is to note that the A1 of the new species presents a set of 13 different types of setal elements (see Figure 4 and corresponding description), the most of which being of a peculiar and most probably derived shape. Future comparison with the remaining Cerviniinae may show whether these derived setae might be useful to detect closer relationships within that subfamily.

Md basis with 3 pinnate setae: in the remaining Cerviniinae (including the groundpattern of *Cervinia*) the mandibular basis bears 4 pinnate setae, whilst in *Frisia magellanica* gen. et sp. nov. one seta is reduced. This is considered as autapomorphic for the new species.

P5 exopod of the female remarkably elongated: In the remaining Cerviniinae, the female P5 exopod is small and at the most 3–4 times longer than broad. In contrast, *Frisia magellanica* gen. et sp. nov. presents a female P5 exopod that is about six times longer than broad (cf. Figure 7c), which constitutes a clear autapomorphy of the new species.

P6 exopod of the female extremely elongated: The new species presents a female P6 that is extremely elongated, with the lobe being eight times longer than its broadest width. That differs remarkably from the remaining genera of the Cerviniinae, whose females bear a quite small and short P6. The remarkable elongation is therefore interpreted as autapomorphic for *Frisia magellanica* gen. et sp. nov.

Conclusion

The here described *Frisia magellanica* gen. et sp. nov. can be assigned to the Aegisthidae, as it shares eight of the 11 autapomorphies of the family. Within that family, the new species is allocated into the Cerviniinae because of the divergent furcal rami. However, comparison with the remaining Cerviniinae revealed that the new species cannot be allocated into any of the six genera of the subfamily, because it does not share the respective generic autapomorphies. Instead, *Frisia magellanica* gen. et sp. nov. presents several autapomorphies that justify its assignment as distinct species in a newly established genus *Frisia* gen. nov.

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Disclosure statement

No potential conflict of interest was reported by the authors.

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