

## ***Monopseudocuma* a new genus from the North East Atlantic and redescription of *Pseudocuma gilsoni* Băcescu, 1950 (Cumacea: Pseudocumatidae)**

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### **Abstract**

The validity of *Pseudocuma gilsoni* Băcescu 1950 has been questioned in the past. The recent discovery of material in Irish waters, and in the North Sea, confirms the presence of the species in the North East Atlantic and provides the opportunity to present a full redescription. A new genus, *Monopseudocuma*, is erected to accommodate the species. A neotype is designated from the West coast of Ireland.

**Key words:** Cumacea, Pseudocumatidae, *Monopseudocuma*, *Pseudocuma gilsoni*, North East Atlantic

### **Introduction**

The family Pseudocumatidae G.O. Sars, 1878 is the second smallest of the eight cumacean families. Băcescu (1992) catalogued 28 species and five subspecies in twelve genera. The majority of species were described by the early 20<sup>th</sup> century by G.O. Sars primarily (e.g. G.O. Sars 1879; G.O. Sars 1894; G.O. Sars 1897; G.O. Sars 1900; Baker 1912; Derzhavin 1912; G.O. Sars 1914). Most of these were from the Ponto–Caspian region, which includes the Caspian Sea, Black Sea, Sea of Azov, and their associated rivers. Up to the 1980s, only a small number of species were described intermittently (Fage 1928; Băcescu 1950;

Băcescu 1951; Jones 1973; Mordukhai-Boltovskoi & Romanova 1973; Ledoyer 1977; Băcescu & Muradian 1978; Gamô 1986). There has been no further work on the family since 1986, aside from the catalogue compiled by Băcescu (1992) and a redescription of *Fontainella mediterranea* Băcescu & Muradian, 1978 by Lopez-Gonzalez *et al.* (1996).

The Pseudocumatidae are characterised primarily by a relatively small body size, and reduction of some morphological characters. They have a reduced and unarmed telson (except in *Kerguelenica platycephala* Ledoyer, 1977 which has 2 terminal setae) and the accessory flagellum of the first antenna is reduced and sometimes tiny. The female second antenna has 1–2 articles (when the primitive state is four articles). The male has only 1–2 pairs of pleopods, one or both can be rudimentary, and exopods on pereopods 1–4 (except in the genus *Fontainella* Băcescu & Muradian, 1978 which has no exopods on pereopods 3–4 in either sex). The female has fully developed exopods on pereopods 1–2 and rudimentary exopods on pereopods 3–4, though these are sometimes minute or absent.

The first record of a pseudocumatid, *Pseudocuma* (= *Cyrianassa*) *longicorne* (Bate, 1858) was from the south west coast of Ireland. The description was based on a single male collected by J. Vaughan Thompson. It was later (Stebbing, 1893) synonymised with *P. longicorne* (= *P. longicornis*) which had been described by G.O. Sars from Norwegian and Mediterranean waters (G.O. Sars 1865; G.O. Sars 1879; G.O. Sars 1900). *Leucon cercaria* described by Van Beneden (1861) from Belgian waters, and *Cuma bella* Meinert, 1877 from Danish waters, were also synonymised with *P. longicorne*, in this case by G.O. Sars (1879). Sars' male *P. longicorne* has two pairs of pleopods and a long antenna 2. When Gilson (1906) found a number of specimens of *Pseudocuma* from the Belgian coast, including *P. longicorne*, he noticed that some were different from those described by Sars. He described these as a variety of *P. longicorne* with a shorter second antenna in the male. He noted other differences such as a brush of aesthetasc setae on antenna 1, a hook-like terminal seta and thick lateral seta on the pereopod 2 dactylus, and a long uropod peduncle with only one simple seta medially. Gilson's (1906) description is very limited, providing only three illustrations of the male, including the telson and uropods, the dactylus of pereopod 2, and a dorsal view of the body. There is no lateral view of the body or details of mouthparts or pereopods. In particular, there is no reference to or description of the number of pleopods in the male. Băcescu (1950) elevated Gilson's variety to species level, naming it *P. gilsoni*, although he did not augment the description or comment on pleopod number.

Since the original designation of the species by Băcescu (1950), there have been few records of *P. gilsoni* in the literature and some doubts about the validity of the species. In a study of cumacean behaviour and development Foxon (1936) remarks on a male *P. longicorne* with a short antenna 2 and with a single pair of pleopods (Fig. 6a, p. 386). He does not agree with Gilson that this represents a variety of *P. longicorne* but instead suggests it represents a male *P. longicorne* at a different degree of development. At that time this was not unreasonable, as very little was known about cumacean reproduction, but

various life history studies have since revealed that the adult male is a terminal moult (e.g. Corey 1969). However, in his crustacean catalogue, Băcescu (1992) places Foxon's males with *P. gilsoni*. Jones (1957) reports the species from the Bristol Channel, the Irish Sea and South West Scotland. Later, in a key to the British cumaceans, Jones (1976) refers to *P. gilsoni* but is doubtful about its validity and remarks that it is perhaps a neotenous form of *P. longicorne*. There are no species in which males have been reported to have multiple forms, thus a neotenous form is exceedingly unlikely. Toulmond & Truchot (1964) recorded what they thought was possibly *P. gilsoni* from the north of France, and Kurian & Radhadevi (1985) have recorded it from the southern part of the North Sea. None of the above records enhanced the original description.

In October 2003, several specimens of a pseudocumatid cumacean were found in deep water in the North East Atlantic during a benthic survey. The species was found on the slope to the north east of the Porcupine Bank from 2200–2765 m. These agreed in most respects with *P. gilsoni* Băcescu but bear a single pleopod on the male. Examination of museum collections and benthic survey material from the West coast of Ireland found further material similar to the deep water specimens. The museum specimens were collected in shallow water in Galway Bay in the late 1970s. The benthic survey material was collected at 34 m in North West Mayo in 2000. These specimens were originally identified as *Pseudocuma gilsoni* (?) Băcescu. Material was also found at the Zoological Museum, University of Copenhagen from the Kattegat in the North Sea at 20 m in 1935. They were originally labelled as *P. simile* and later re-identified as *P. gilsoni*. Other material from the North Sea was found at the Zoological Museum, University of Copenhagen and the Museum für Naturkunde Berlin, labelled as either *P. longicornis* or *P. cercaria*.

The discovery of this material provides the opportunity to clarify the taxonomic position of Gilson's material and to provide a full redescription of the species. The genus *Pseudocuma* is characterised by having two pairs of pleopods in the male, the second of which is rudimentary. The males found in this study have only one pair of pleopods. Thus, *Pseudocuma gilsoni* is here transferred from *Pseudocuma* to the new genus *Monopseudocuma*. The types of *P. gilsoni* could not be located at the Royal Belgian Institute of Natural Sciences, the Natural History Museum, Oslo, the Muséum national d'histoire naturelle, Paris, the Museum für Naturkunde, Berlin, the Zoological Museum, University of Copenhagen, the Natural History Museum, London, or the "Grigore Antipa" National Museum of Natural History, Romania. As the type material is lost or destroyed, and in the interest of stability of nomenclature, an adult male from North West Mayo is designated as neotype.

## Methods

Benthic sampling in the North East Atlantic was conducted aboard the Irish research

vessel, the *RV Celtic Explorer* in October 2003. A double-spaded box core with a surface area of 0.25 m<sup>2</sup> was used. Specimens were preserved in 10% buffered formalin and later transferred to 70% industrial methylated spirits. Benthic survey material from North West Mayo was donated by Aquafact International Services Ltd. This material was collected in Broadhaven Bay, at 34 m depth, using a 0.1 m<sup>2</sup> Day grab. The samples were fixed in 4% buffered formalin. They were identified by Dr. D. McGrath from the Galway-Mayo Institute of Technology. Museum specimens were obtained from the Natural History Museum, Dublin. They were collected and identified by Dr. D. McGrath in shallow water in Galway Bay on the West of Ireland in the late 1970s. Museum specimens were also obtained from the Zoological Museum, University of Copenhagen and the Museum für Naturkunde Berlin.

Specimens were mounted in a mixture of 80% glycerin, 5% ethanol and 5% H<sub>2</sub>O. Museum mounts were prepared using glycerin jelly. Drawings were prepared using a *camera lucida* and a Nikon phase contrast microscope. The drawings were completed using a Wacom Intuos 3 digitizer tablet (203 x 152 mm), and Adobe Illustrator Version 10.0.3 and Photoshop Version 7.0. Total body length was measured from the tip of the pseudorostral lobe to the posterior border of pleonite 6. The exopod setae were not drawn on the full body illustrations.

#### **Pseudocumatidae G.O. Sars, 1878**

##### ***Monopseudocuma* McCarthy and Gerken, gen. nov.**

Diagnosis: The genus *Monopseudocuma* gen. nov. can be distinguished from all others by the combination of 1 pair of pleopods in the male, and the normal structure of pereopod 1. There are fully developed exopods on pereopods 1–4 in the male, and on pereopods 1–2 in the female. There are bi-articulate rudimentary exopods on pereopods 3–4 in the female. The female antenna 2 is uni-articulate. The uropods are long and slender.

Type species: *Monopseudocuma gilsoni*, by monotypy.

Etymology: The genus is named *Monopseudocuma* because of the single pair of pleopods in the male and overall similarity to the genus *Pseudocuma* G.O. Sars.

Remarks: *Monopseudocuma* is similar to *Pseudocuma* in overall form, carapace morphology, the exopods on the pereopods and the uni-articulate antenna 2 in the female. *Pseudocuma* differs in having 2 pairs of pleopods in the male, the second of which is rudimentary. The only other pseudocumatid which possesses a single pair of pleopods in the male is *Petalosarsia longirostris* Jones, 1973, and the new genus can be differentiated from *Petalosarsia* Stebbing 1893 by its slender, non-chelate first pereopod.

***Monopseudocuma gilsoni* (Gilson, 1906), new combination**

*Pseudocuma longicornis* Gilson, 1906: 1–20, figs 8, 9, 11

*Pseudocuma gilsoni* Băcescu, 1950: 431–434, 466

Neotype: Adult male (Fig 1 A–B) (NHM 2006.318) Broadhaven Bay, North West Mayo, Ireland, 34 m, 54°17'5" N, 9°52'27" W.

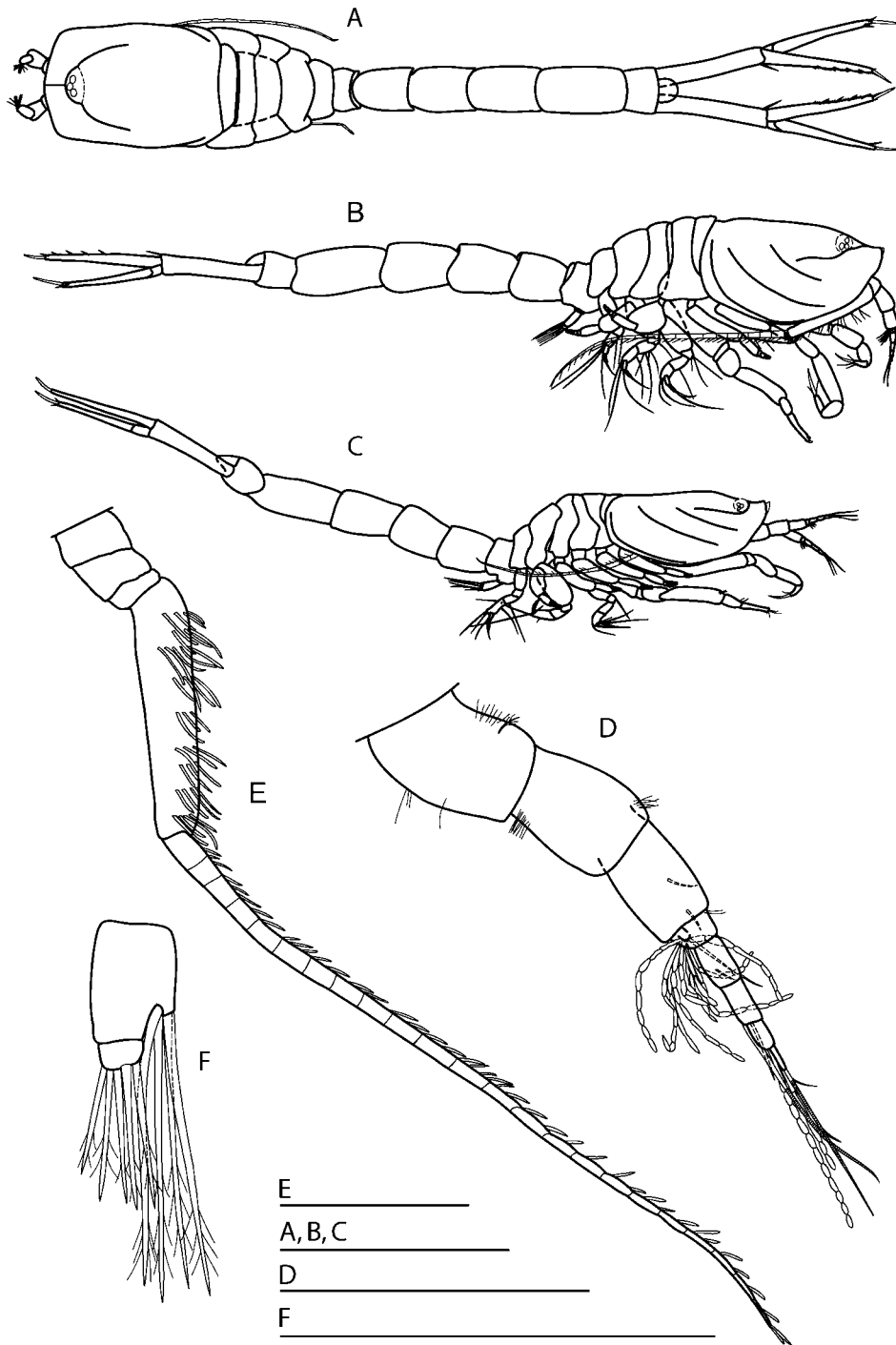
Other material examined: Adult male (Fig 1 C–E) (NHM 2006.319), north east of Porcupine Bank, on slope, 2765 m, 54°08'00" N, 13°59'01" W. Adult male (dissected, Fig 1 F, Fig 2 A–E, Fig 3 A–E) (NHM 2006.320), adult female (dissected, Fig 4 A–G, Fig 5 A–F) (NHM 2006.323), 2 adult females (NHM 2006.321–322) north east of Porcupine Bank, on slope, 2200 m, 54° 08'01" N, 13°59'02" W. 6 males, 9 females (NHM 2006.324–333), 9 males, 7 females (NMINH.2006.17–32), Broadhaven Bay, North West Mayo, 34 m, 54°17'5" N, 9°52'27" W, originally labelled *Pseudocuma gilsoni* (?). Adult male (NMINH.1998.22.1), Silverstrand, Co. Galway, low water springtide, originally labelled *Pseudocuma gilsoni* (?) Băcescu. Adult male (NMINH.1998.22.2), Barna, Co. Galway, night plankton haul, originally labelled *Pseudocuma gilsoni* (?). 45 males, 20 females (ZMUC-CRU-4967) taken near Anholt, in the Kattegat in 1935 at 20 m, labelled *Pseudocuma gilsoni*. 7 males, 7 females (ZMUC-CRU-4947), Frederikshavn, Denmark, 1893, labelled *Pseudocuma cercaria*. 1 female (ZMUC-CRU-4963), Samsø, Denmark 1986, labelled *Pseudocuma longicornis*. Males and females from Helgoland (MNHU No. 19638, No. 19639, No. 8825) and Kieler Bucht (MNHU No. 23325, No. 23327), Germany, labelled *Pseudocuma longicorne*.

Diagnosis: Carapace with 2 parallel oblique lateral ridges and a third oblique ridge near the posterior border of the carapace; eyelobe with 3 lenses; uropod peduncles more than twice pleonite 6; uropod rami subequal to peduncles, exopod and endopod subequal or endopod slightly longer than exopod.

Description: Neotype adult male (Fig 1 A–B). Length 2.1 mm. Carapace length 0.3 X body length, with 2 parallel oblique lateral ridges, and 1 additional ridge near posterior border of carapace; antennal notch absent; pseudorostral lobes 0.5 X carapace length; eyelobe 0.1 X carapace length, with 3 lenses; thoracic somites together 0.7 X carapace length.

Adult male (Fig 1 C–E). Length 1.9 mm.

Antenna 1 (Fig 1D) extending past pseudorostral lobes; peduncle article 1 longest, margins with fine hair-like setae and 1 plumose seta; article 2 longer than article 3 with fine hair-like setae; article 3 with small simple setae; main flagellum of 5 articles, article 1 broader than other articles with group of 10–15 aesthetasc setae, article 3 with one long multi-annulate seta, article 4 with 2 aesthetasc setae, article 5 with multi-annulate and simple setae; accessory flagellum tiny, 1 article, 0.5 X length of article 1 of main flagellum, with simple seta distally.



**FIGURE 1.** *Monopseudocuma gilsoni* (male neotype NHM 2006.318 (A–B), male north east of Porcupine Bank NHM 2006.319 (C–E), male north east of Porcupine Bank NHM 2006.320 (F)). A, dorsal view; B, lateral view; C, lateral view; D, antenna 1; E, antenna 2; F, pleopod. (Scale bars A–C, 0.8 mm; D–F, 0.2 mm).

Antenna 2 (Fig 1 E) extending to end or just beyond end of pereon; peduncle of 4 articles; articles 1 to 3 unarmed; article 5 with rows of setae along anterior margin; flagellum of 22 articles, single row of setae on each article.

Adult male (Fig 1 F, Fig 2 A–E, Fig 3 A–E). Length 2.1 mm.

Maxilla 1 (Fig 3 C) outer endite with 2 rows of setae terminally (11–12 setae); inner endite with 5 setae terminally; palp with 2 setae.

Maxilla 2 (Fig 3 D) broad endite with 8–9 setae on medial margin, distal margin with simple and pappose setae, 1 plumose seta on lateral margin; inner narrow endite with row of 3 setae; outer narrow endite with row of 3 setae.

Maxilliped 1, see female description

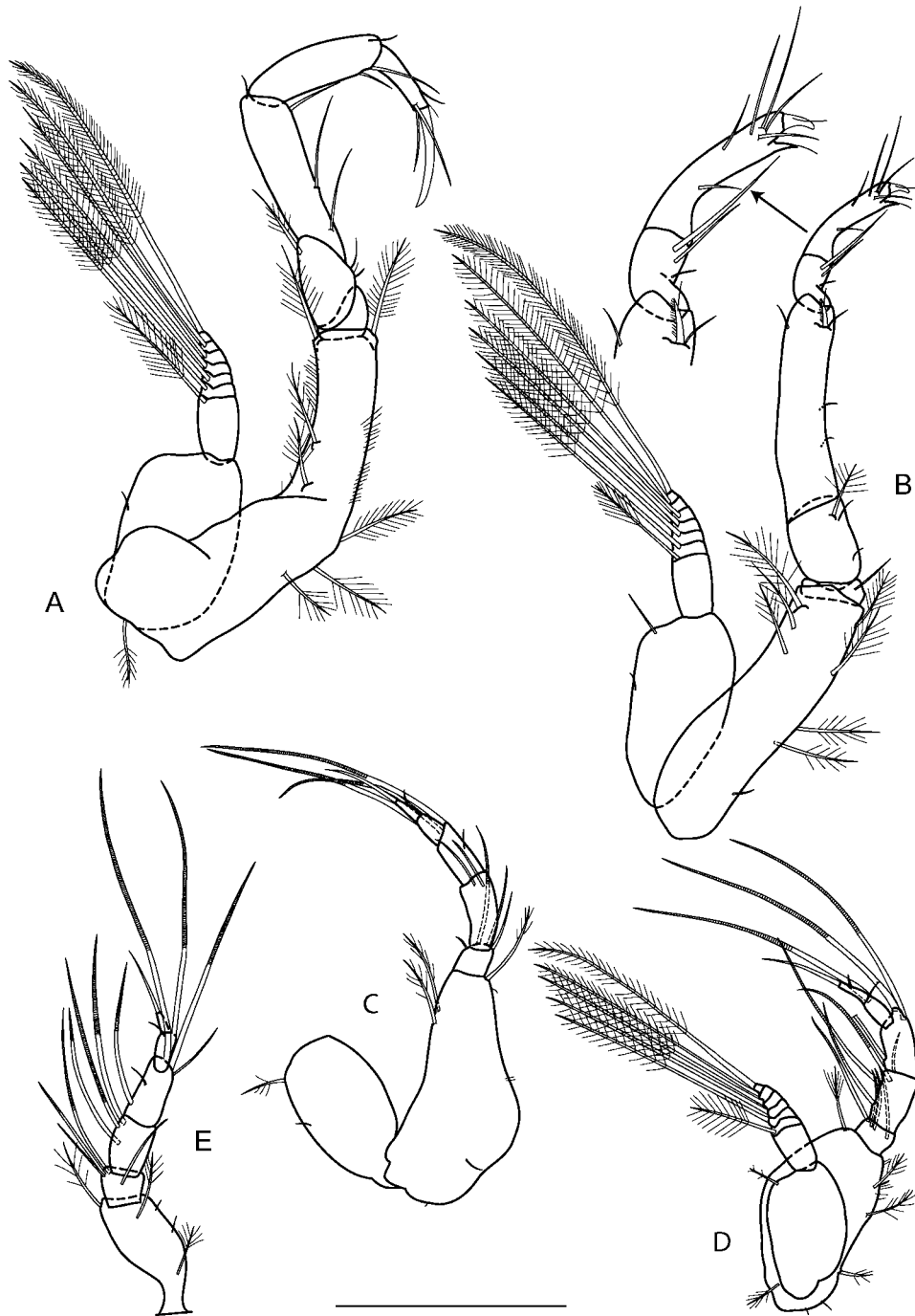
Maxilliped 2 (Fig 3 B) basis length subequal to all other articles together, with 2 medial and 1 lateral plumose setae; ischium partly covered by merus, with 1 plumose seta; merus unarmed; carpus longer than propodus, bearing 3 plumose and 3 comb setae medially; propodus subequal to dactylus, bearing 2 simple setae medially, 3 pappose and 1 simple setae distally; dactylus with 1 stout and 4 simple setae terminally.

Maxilliped 3 (Fig 3 A) basis length subequal to all other articles together, with 3 plumose setae medially, and 1 long plumose seta on disto-lateral corner; ischium unarmed; merus 0.5 X carpus with 2 plumose setae; carpus longer than propodus, with 3 comb and 2 simple setae medially, and 2 plumose setae laterally; propodus longer than dactylus with 5 simple setae medially and 1 laterally; dactylus bearing a few simple setae and a stout terminal seta; exopod shorter than basis, flagellum bearing plumo-annulate setae.

Pereopod 1 (Fig 2 A) basis length shorter than all other articles together, bearing 4 plumose setae medially and 3 laterally; ischium unarmed; merus with 1 plumose seta laterally; carpus longer than propodus, with 3 simple setae medially; propodus longer than dactylus with 3 simple setae; dactylus with 3 simple setae, stout terminal seta longer than dactylus; exopod shorter than basis, flagellum bearing plumo-annulate setae.

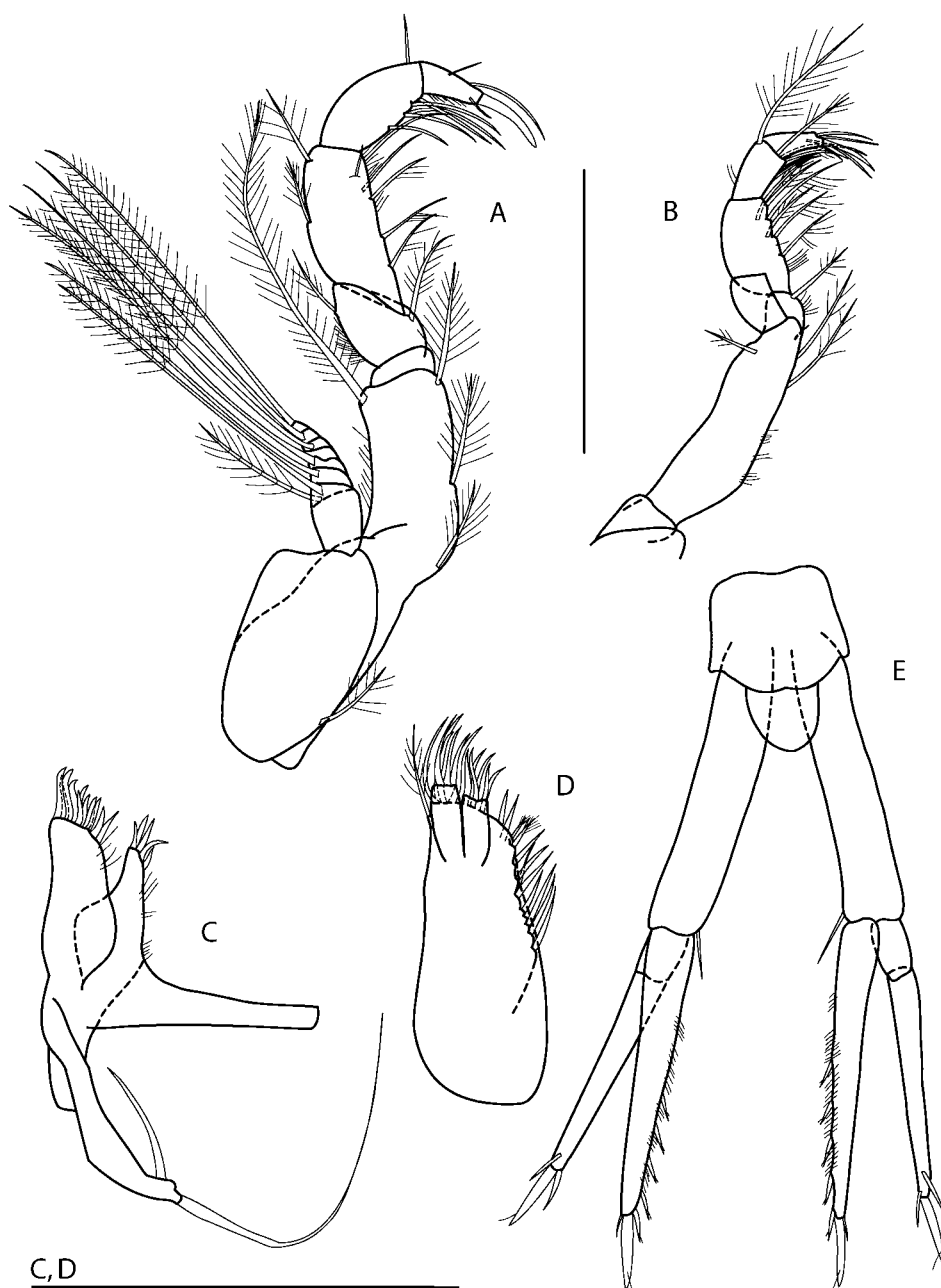
Pereopod 2 (Fig 2 B) basis length shorter than all other articles together, bearing 4 plumose setae medially and 3 laterally; ischium present with simple seta medially; merus with 1 plumose and 2 simple setae medially; carpus 0.7 X basis, with simple setae and 1 micro-serrate seta with subterminal setule distally; propodus 0.5 X dactylus, with simple setae medially; dactylus with 6 simple setae and short, stout hook-like terminal seta, distal medial margin produced as small thumb-like process; exopod longer than basis, flagellum bearing plumo-annulate setae.

Pereopod 3 (Fig 2 C) basis length longer than all other articles together bearing 2 plumose setae medially and 1 disto-laterally; ischium present, with 3 multi-annulate setae distally; merus longer than carpus, with 2 simple setae; carpus subequal to dactylus and propodus together, with 2 long multi-annulae setae on disto-lateral corner; propodus equal to dactylus, with 1 long multi-annulate seta distally; dactylus with 1 stout seta terminally and 1 slender simple seta medially; exopod flagellum missing.



**FIGURE 2.** *Monopseudocuma gilsoni* (male, north east of Porcupine Bank NHM 2006.320). A, pereopod 1; B, pereopod 2; C, pereopod 3; D, pereopod 4; E, pereopod 5 (Scale bar 0.2 mm).





**FIGURE 3.** *Monopseudocuma gilsoni* (male, north east of Porcupine Bank NHM 2006.320) A, maxilliped 3; B, maxilliped 2; C, maxilla 1; D, maxilla 2; E, pleonite 6, telson and uropods (Scale bars A–D, 0.2 mm; E, 0.4 mm).

Pereopod 4 (Fig 2 D) basis length subequal to all other articles together, bearing 2 plumose setae medially and 3 laterally; ischium present, with 1 simple and 3 multi-annulate setae distally; merus subequal to carpus, with 3 multi-annulate setae medially and 1 simple setae distally; carpus with 2 long multi-annulate setae distally and 1 broken seta

medially; propodus subequal to dactylus with 1 long multi-annulate seta; dactylus with complex pedunculate seta and stout terminal seta; exopod longer than basis, flagellum bearing plumo-annulate setae.

Pereopod 5 (Fig 2 E) basis length shorter than all other articles together, with 3 plumose setae; ischium present, with 2 simple and 2 multi-annulate setae distally; merus shorter than carpus, with 3 multi-annulate setae medially; carpus with 1 simple and 1 multi-annulate seta medially and 1 simple and 2 long multi-annulate setae distally; propodus longer than dactylus with 1 long multi-annulate and 1 simple setae distally; dactylus with one stout simple seta.

Pleopod (Fig 1 F) basal article with 4 plumose setae; rami reduced to single article with 5 shorter plumose setae.

Telson (Fig 3 E) 0.6 X pleonite 6, unarmed.

Uropod (Fig 3 E) peduncle more than twice pleonite 6, with simple seta medially; endopod 1.1 X peduncle, uniarticulate, with 5–6 simple setae medially and lined with fine hair-like setae, 2 terminal setae, stout terminal seta 0.2 X endopod, with single subterminal setule; exopod biarticulate, 0.9 X endopod, article 1 0.2 X article 2, unarmed, article 2 with 2 subterminal simple setae, stout terminal seta 0.2 X exopod with single subterminal setule.

Adult female (Fig 4 A–B). Length 2.3 mm. Carapace 0.3 X body length, with two well-defined parallel oblique lateral ridges, and one additional ridge near posterior border of carapace, slight antennal notch present; pseudorostral lobes 0.4 X carapace length; eyelobe 0.1 x carapace length, with 3 lenses; thoracic somites together 0.7 X carapace length.

Antenna 1 (Fig 4 C) extending past pseudorostral lobes; peduncle article 1 longest, medial margin with fine hair-like setae and 1 plumose seta; article 2 shorter than article 3 with 1 small simple seta distally; article 3 with simple seta distally; main flagellum of 3 articles, article 1 longer than articles 2 and 3 together, article 2 with simple and aesthetasc setae distally, article 3 with simple setae distally; accessory flagellum tiny, uniarticulate, with 2 simple setae distally.

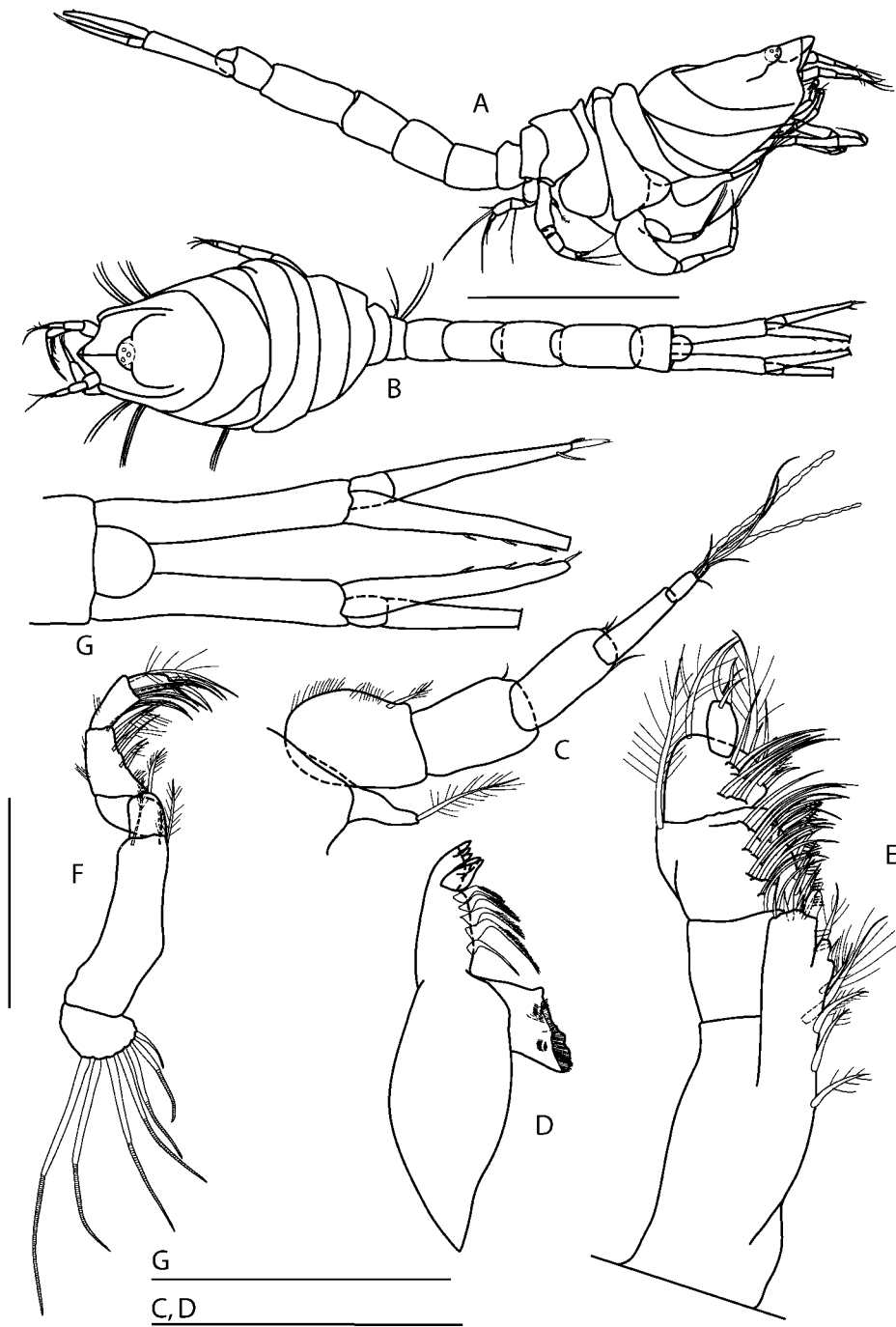
Antenna 2 (Fig 4 C) small, of 1 article, with 1 long plumose seta terminally.

Mandible (Fig 4 D) navicular, with row of 5 lifting setae; left mandible with lacinia mobilis; molar process with rows of fine hair-like setae.

Maxilla 1, see male description

Maxilla 2, see male description

Maxilliped 1 (Fig 4 E) basis length shorter than all other articles together, produced as broad endite disto-medially, endite medial margin with 6 plumose, 1 simple and 2 hook setae, endite distal margin with 5 simple setae, and 1 rounded tubercle with fine hair-like setae at tip; ischium absent; merus with 2 simple setae distally; carpus slightly longer than merus, with long plumose seta on distal lateral corner, with 8 comb and 14 simple setae on medial face; propodus shorter than carpus with 2 plumose setae distally, 1 pappose, 1 comb and 11 simple setae on medial face; dactylus with 1 stout and 3 simple setae distally.



**FIGURE 4.** *Monopseudocuma gilsoni* (female, north east of Porcupine Bank NHM 2006.323). A, lateral view; B, dorsal view; C, antenna 1 and 2; D, left mandible; E, maxilliped 1; F, maxilliped 2; G, Telson and uropods (Scale bars A–B, 0.8 mm; C–D, 0.2 mm; E, 0.08 mm; F, 0.2 mm; G, 0.4 mm).

Maxilliped 2 (Fig 4 F) basis length subequal to all other articles together, with 3 plumose setae distally; ischium partly covered by merus, with 1 plumose seta; merus unarmed; carpus longer than propodus, bearing 6 comb setae medially and 1 simple seta distally; propodus subequal to dactylus, bearing 2 simple setae medially, 2 plumose and 3 simple setae distally; dactylus with 1 stout and 4 simple setae terminally; rudimentary oostegite with 7 setae.

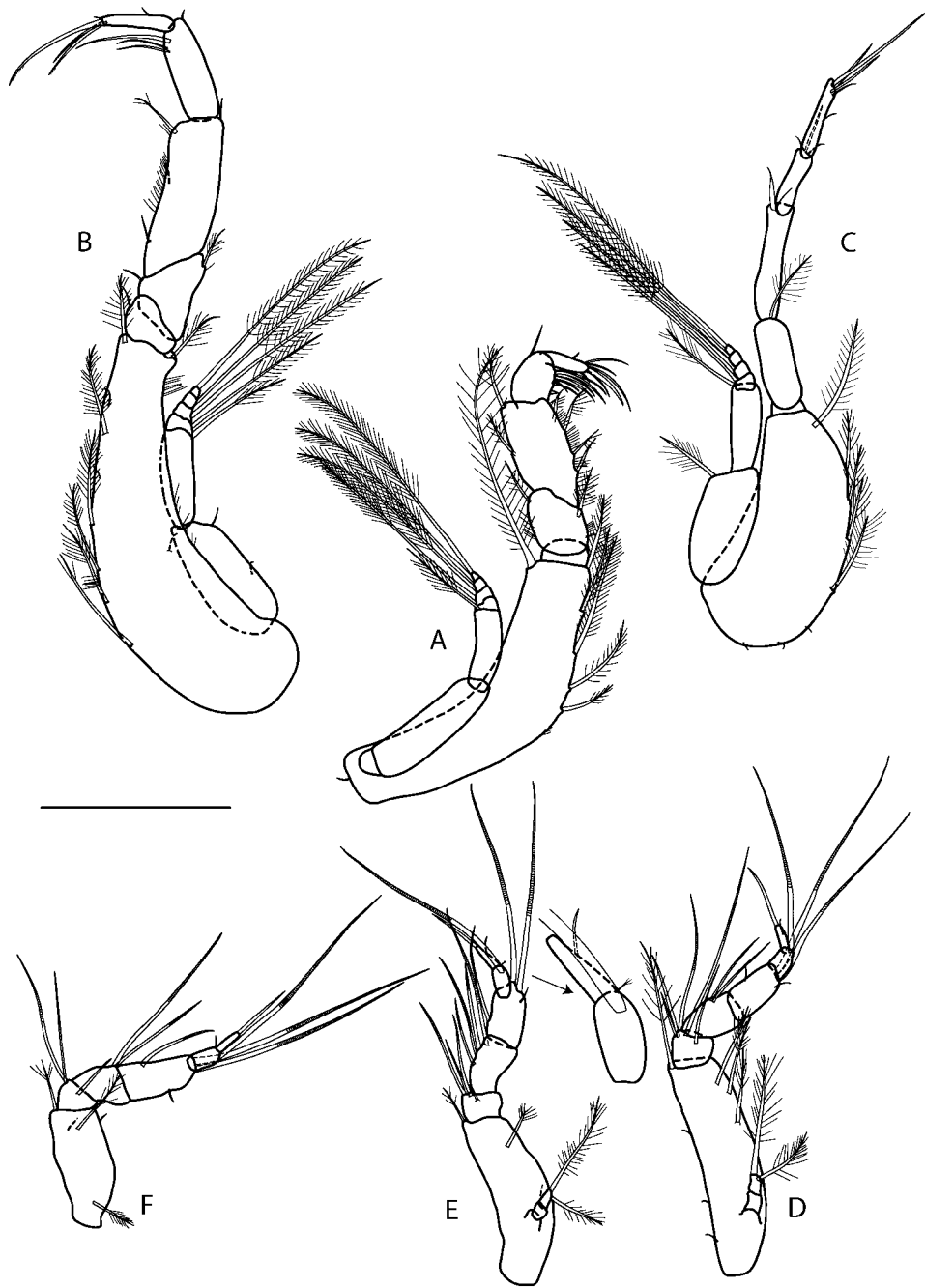
Maxilliped 3 (Fig 5 A) basis length subequal to all other articles together, with 5 plumose setae medially, and 1 long plumose seta disto-laterally; ischium unarmed; merus 0.5 X carpus with 2 plumose setae; carpus longer than propodus, with 4 comb setae medially and 2 plumose setae laterally; propodus longer than dactylus with 9 simple setae medially and 1 laterally; dactylus bearing a few simple setae and a stout terminal seta; exopod shorter than basis, flagellum bearing plumo-annulate setae.

Pereopod 1 (Fig 5 B) basis length subequal to all other articles together, bearing 6 plumose setae medially and 1 disto-laterally; ischium with 1 simple seta; merus with 1 plumose seta laterally and 1 simple seta medially; carpus longer than propodus, with 3 simple setae and 1 plumose seta medially; propodus longer than dactylus with 4 simple setae; dactylus with 3 simple and 1 micro-serrate setae distally, stout terminal seta micro-serrate and longer than dactylus; exopod shorter than basis, flagellum bearing plumo-annulate setae.

Pereopod 2 (Fig 5 C) basis length shorter than all other articles together, broad, bearing 5 plumose setae medially; ischium small and unarmed; merus with 1 distal plumose seta; carpus 0.5 X basis, with 1 simple seta and 1 stout seta with subterminal setule distally; propodus 0.5 X carpus, with 3 simple setae distally; dactylus with 1 medial and 3 distal simple setae, terminal seta longer than dactylus; exopod subequal to basis, flagellum bearing plumo-annulate setae.

Pereopod 3 (Fig 5 D) basis length longer than all other articles together, with 3 plumose setae laterally, and 1 distally; ischium with 2 long multi-annulate and 3 simple setae distally; merus subequal to carpus, with 2 multi-annulate setae medially; carpus subequal to dactylus and propodus together, with 2 long multi-annulate setae distally; propodus equal to dactylus, with 1 long multi-annulate seta distally; dactylus with 1 stout and 1 slender simple setae; exopod rudimentary, of 2 articles, with 1 distal and 1 terminal plumose setae.

Pereopod 4 (Fig 5 E) basis length subequal to all other articles together, with 1 distal and 1 lateral plumose seta; ischium with 3 distal multi-annulate setae, and 1 broken seta; merus subequal to carpus, with 4 multi-annulate setae medially; carpus subequal to propodus and dactylus together, with 1 multi-annulate seta medially and 2 disto-laterally; propodus subequal to dactylus with 1 long multi-annulate seta distally; dactylus with complex pedunculate seta and stout terminal seta; exopod rudimentary, of 2 articles, with 1 terminal and 1 distal plumose seta.



**FIGURE 5.** *Monopseudocuma gilsoni* (female, north east of Porcupine Bank NHM 2006.323). A, maxilliped 3; B, pereopod 1; C, pereopod 2; D, pereopod 3; E, pereopod 4; F, pereopod 5 (Scale bar A–F, 0.2 mm).

Pereopod 5 (Fig 5 F) basis length shorter than all other articles together, with 3 plumose setae and 2 small simple sub-distal setae; ischium with 1 simple and 2 multi-annulate setae distally; merus shorter than carpus, with 2 multi-annulate setae distally;

carpus with 1 multi-annulate seta medially and 2 long multi-annulate setae disto-laterally; propodus subequal to dactylus with 1 multi-annulate and 1 simple setae distally; dactylus with 1 stout simple seta.

Telson (Fig 4 G) 0.5 X pleonite 6, unarmed.

Uropod (Fig 4 G) peduncle more than twice as long as pleonite 6; endopod subequal to peduncle, uniarticulate, with 4 simple setae medially, terminal seta missing (terminal seta 0.2 X endopod in shallow specimens); exopod subequal to endopod, article 1 0.2 X article 2, unarmed, article 2 with 2 subterminal simple setae, stout terminal seta 0.2 X exopod.

Remarks: *Monopseudocuma gilsoni* is most similar to *Pseudocuma* in overall structure. *P. longicorne*, *P. simile* G.O. Sars, 1900 and *P. ciliatum* G.O. Sars, 1879 all have two oblique lateral ridges and a further ridge towards the posterior of the carapace. The peduncle of the uropod is long and slender in *P. longicorne*, *P. simile* and *P. chevreuxi* Fage, 1928. The brush of aesthetasc setae on the male antenna 1 is also present in *P. simile*.

Males are more easily differentiated than females from *Pseudocuma* by the presence of one pair of pleopods, rather than two as in *Pseudocuma*. Different forms of *P. longicorne* have been described in the past (eg. G.O. Sars 1865; G.O. Sars 1879; G.O. Sars 1900; Gilson 1906; Foxon 1936; Băcescu 1950; Fage 1951; Lomakina 1958) and various sub-species have been created (Băcescu 1950). In some descriptions, there is one hook-like seta on the dactylus of pereopod 2, and 12–14 setae on the uropod endopod (G.O. Sars 1900). In others, there are two hook-like setae on the pereopod 2 dactylus, and 10 setae on the uropod endopod (Băcescu 1950; Fage 1951). The female *P. longicorne* has between 5 (G.O. Sars 1879; Băcescu 1950) and 10 (G.O. Sars 1900) setae on the uropod endopod, and the uropod peduncle is shorter than the endopod. *P. simile* differs in having denticles on the carapace antero-lateral angle in both sexes, and in having three hook-like setae on the dactylus of pereopod 2 in the males. In *P. ciliatum* the endopod of the uropod is lined with long cilia and the peduncle is short relative to the rami.

## Discussion

Of the marine genera, *Monopseudocuma* is most closely related to *Pseudocuma* in overall structure. In the genus *Fontainella* Băcescu & Muradian 1978 there are no exopods on pereopods 3–4 in either sex. In *Kerguelenica* Ledoyer 1977 the females have uniarticulate rudimentary exopods on pereopod 3 and only a slight protuberance on pereopod 4. The male of this genus is not known. In *Petalosarsia* the female rudimentary exopods are minute and difficult to see. The uropod peduncles in *M. gilsoni* are long and slender and almost the length of the rami, while in *Fontainella*, *Kerguelenica* and *Petalosarsia* the peduncles are short in comparison with the rami. *Fontainella* and *Petalosarsia* have a bi-articulate antenna 2 in the female, while in *Kerguelenica* it has three articles.

Most genera, apart from *Petalosarsia*, have two pairs of pleopods in the male, the first pair fully developed and the second rudimentary. *Petalosarsia longirostris* has only one

pair of pleopods but is placed in the genus *Petalosarsia* due to the unusual structure of pereopod 1. The merus and ischium are firmly connected and the carpus is broad and lamelliform Jones, (1973). *Petalosarsia declivis* G.O. Sars, 1865 and *P. brevirostre* Gamô, 1986 both have two pairs of pleopods, the second rudimentary. Gamô (1986) has also considered the ventral setae on pleonites 3–5 of *P. brevirostre* as rudimentary pleopods, although setae in place of pleopods is a relatively common feature in the pleopod bearing groups, and these setae are not interpreted as rudimentary pleopods by the vast majority of authors. The males of *Fontainella* have two rudimentary pairs of pleopods.

It is possible that *P. gilsoni* has been confused with *P. longicorne* in the past. The male of Bate (1858) has only one pair of pleopods and a short antenna 2. Thus it is probably closer to *P. gilsoni* than to *P. longicorne*. However, Bate's description is lacking essential details such as the structure of antenna 1 and the pereopods, and the presence or absence of exopods. There are no lateral ridges indicated on the carapace. Hence an accurate species determination cannot be made. The short antenna 2 and single pair of pleopods is also present in *L. cercaria*. However, the description and figures (Van Beneden 1861, p. 85, pl. XIV) are of insufficient detail to determine the species. The second antenna is drawn with three flagella indicating that both the first and second antennae were drawn together as one. The uropod is shown with two rami, of three articles each, without a clear peduncle. Thus it is clear that Van Beneden was not carefully observing the specimen, or was viewing it at an insufficient magnification to describe species level characters. The type specimens of *C. longicornis* could not be located at the Natural History Museum, Dublin or the Natural History Museum, London. The type specimen of *L. cercaria* could not be located at the Royal Belgian Institute of Natural Sciences, at the Katholieke Universiteit Leuven, Belgium (where Van Beneden was Professor), at their sister university Louvain la Neuve Belgium, the Natural History Museum, Oslo or at the Museum für Naturkunde, Berlin.

Most records of Pseudocumatidae are from shallow waters and records from the deep-sea are scant. However, in the North East Atlantic, *P. longirostris*, has been recorded from 1624–2185 m (Jones 1973) and *P. declivis* from 2078 m (Băcescu & Muradian 1974). *Pseudocuma simile* has been reported from shallow water to the upper continental slope (Jones 1976). The discovery of *M. gilsoni* from 0–2765 m extends the depth range of the family and also extends the range of depth distribution for a pseudocumatid species. Members of other cumacean families can display such a depth range, for example, *Diastylis serrata* from 7–3000 m (Reyss 1974) and *Eudorella truncatula* from 0–2826 m (Gerken & Watling 1999). This is also the case with some members of the isopod genus *Ilyarachna*, for example, *Ilyarachna hirticeps* G.O. Sars, 1870 is recorded from 20–2496 m and *I. longicornis* (G.O. Sars) from 50–5223 m (Thistle 1980). The small body size, 1–6 mm, of the marine species of the Pseudocumatidae may be responsible for the scarce records from deep-sea surveys.

Cumaceans brood their young and have limited powers of dispersal, thus it seems

likely that there may be genetic divergence between the shallow and deep populations, and that they may represent cryptic species. Significant morphological divergence between the shallow and deep species is not evident from this study. However, the shallow males from Galway Bay are the largest of the males examined and one has 8 setae on the uropod endopod. Further research with more deep-sea and shallow representatives may reveal morphological and/or genetic divergence.

There is clearly a need for a unified body of work representing the Pseudocumatidae, with updated generic definitions. The last complete guide to the family was in Stebbing (1913), although it appears in guides to the Caspian Cumacea (G.O. Sars 1914), the Cumacea of the USSR (Lomakina 1958) and the British Isles (Jones 1976). There is much confusion surrounding *P. longicorne*, and descriptions vary between the Mediterranean (G.O. Sars 1879), Norway (G.O. Sars 1900), France (Fage 1951) and the Black Sea (Băcescu 1950). Sub-species were erected to accommodate these differences (Băcescu 1950), however with increased knowledge of cumacean distribution, further research may reveal the presence of distinct species. Jones (1976) recommends that the systematics of the group would repay further investigation.

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### References

- Băcescu, M. (1950) Cumacei Mediteraneeni modificați de mediul pontic. *Analele Academiei Republicii Populare Române. Seria: Geologie, Geografie, Biologie, Științe Tehnice Și Agricol*, 3, 11, 423–460.
- Băcescu, M. (1951) *Fauna Republicii Populare Române, IV Crustacea, 1 Cumacea*. Academiei Republicii Populare Române, Bucharest, 96 pp.
- Băcescu, M. & Muradian, Z. (1974) New cumacea from the North-Western Atlantic: *Ceratocuma panamensis* n. sp., *Cimmerius costlowi* n. sp. and some comments upon *Petalosarsia declivis* (G. O. Sars). *Revue Roumaine de Biologie*, 19, 4, 217–227.
- Băcescu, M. & Muradian, Z. (1978) *Fontainella mediterranea* gen. n., sp. n., Cumacé (Pseudocumatidae) trouvé en Méditerranée orientale. *Revue Roumaine de Biologie. Série de Biologie Ani-*



- male, 23, 1, 3–7.
- Băcescu, M. (1992) Cumacea II (Fam. Nannastacidae, Diastylidae, Pseudocumatidae, Gynodiastylidae et Ceratocumatidae). In : Gruner, H.-E. & Holthuis, L.B. (Eds.), *Crustaceorum Catalogus, Pars 8*. SPB Academic Publishing The Hague, 175–468 pp.
- Baker, C.F. (1912) Notes on the Crustacea of Laguna Beach. *First Annual Report of the Laguna Marine Laboratory*, 1, 100–117.
- Bate, C.S. (1858) On a new genus and new species of Diastylidae. *Journal of the Royal Dublin Society*, 2, 101–104.
- Corey, S. (1969) The comparative life histories of three Cumacea (Crustacea): *Cumopsis goodsiri* (Van Beneden), *Iphinöe trispinosa* (Goodsir), and *Pseudocuma longicornis* (Bate). *Canadian Journal of Zoology*, 47, 695–704.
- Derzhavin, V.A. (1912) Neue Cumaceen aus dem Kaspischen Meere. *Zoologischen Anzeiger*, 39, 8/9, 26, 273–284.
- Page, L. (1928) Voyage de la Goëlette <<Melita>> au Sénégal (1889-1890). *Bulletin Societe Zoologique de France*, 53, 331–339.
- Page, L. (1951) *Faune de France, 54. Cumacés*. P. Lechevalier, Paris, 136 pp.
- Foxon, G. E. H. (1936) Notes on the natural history of certain sand-dwelling cumacea. *Annals and Magazine of Natural History*, 10, 17, 377–393.
- Gamô, S. (1986) *Bodotria spinifera* and *Petalosarsia brevisrostris*, two new cumacean crustaceans from Japan. *Science Reports Yokohama National University, Section II*, 33, 1–11.
- Gerken, S. & Watling, L. (1999) Cumacea (Crustacea) of the Faroe Island Region. *Fróðskaparrit*, 47, 199–227.
- Gilson, G. (1906) Recherches sur les deux Pseudocuma de la Mer Flamande *P. longicornis* Spence Bate et *P. similis* G.-O. Sars. *Mémoires de la Société entomologique de Belgique*, 12, 1–20.
- Jones, N.S. (1957) Cumacea, Families: Nannastacidae, Lampropidae, Pseudocumatidae. *Conseil international pour l'exploration de la mer. Zooplankton*, 75, 1–3.
- Jones, N.S. (1973) Some new Cumacea from deep water in the Atlantic. *Crustaceana*, 25, 3, 297–319.
- Jones, N.S. (1976) *British Cumaceans. Synopses of the British Fauna, No. 7*. Academic Press, London, 66 pp.
- Kurian, C.V. & Radhadevi, A. (1985) Cumacea from the North Sea. *Indian Journal of Marine Sciences*, 14, 42–43.
- Ledoyer, M. (1977) Cumacés (Crustacea) des Iles Kerguelen recueillis par le N.O. “*La Japonaise*” en 1972 et 1974 et par le M.S. “*Marion-Dufresne*” en 1974. *Comite National Français des Recherches Antarctiques*, 42, 193–213.
- López-González, P.J., Bandera, M.E., Alfonso, M.I. & García-Gómez, J.C. (1996) A rare mediterranean cumacean, *Fontainella mediterranea* (Crustacea), at the threshold of the Atlantic Ocean. *Cahiers de Biologie Marine*, 37, 2, 113–120.
- Lomakina, N.B. (1958) *Cumacea of the seas of the U.S.S.R.* USSR Publication of the Academy of Sciences, Moscow, USSR, 66, 302 pp.
- Meinert, F. (1877) Crustacea Isopoda, Amphipoda et Decapoda Daniae: Fortegnelse over Danmarks isopode, amphipode og decapode Krebsdyr. *Naturhistorisk Tidsskrift Kjøbenhavn*, 3, 11, 57–248.
- Mordukhai-Boltovskoi, F.D. & Romanova, N.N. (1973) Novyi vid i rod kumovyh rakov (Cumacea) iz Kaspijskogo Morija. *Zoologicheskii zhurnal*, 52, 3, 429–432.
- Reyss, D. (1974) Contribution a l'étude des cumacés de profondeur en Atlantique: le genre *Diastylodes* Sars, 1900. *Crustaceana*, 27, 3, 285–293.
- Sars, G.O. (1865) Om den aberrante Krebsdyrgruppe Cumacea og dens nordiske Arter. *Forhandlinger i Videnskabs-Selskabet i Christiania*, 1864, 128–208.
- Sars, G.O. (1870) Nye Dybvands crustaceer fra Lofoten. *Forhandlinger i Videnskabs-Selskabet i*

- Christiania*, 1869, 205–221.
- Sars, G.O. (1878) Nye bidrag til kundskaben om middelhavets invertebratfauna. II. *Middelhavets Cumaceer*. *Archiv for Mathematik og Naturvidenskab Christiania*, 3, 4, 461–512
- Sars, G.O. (1879) Middelhavets Cumaceer. *Archiv For Mathematik og Naturvidenskab Christiania*, 4, 1–512.
- Sars, G.O. (1894) Crustacea Caspia. Part II. Cumacea. *Bulletin Academie Imperiale des Sciences de Saint Petersbourg*, 4, 36, 297–338.
- Sars, G.O. (1897) On some additional Crustacea from the Caspian Sea. *Annuaire du Musée Zoologique de l'Académie Imperiale des Sciences de St. Petersbourg*, 277–305.
- Sars, G.O. (1900) *An Account of the Crustacea of Norway. Vol. III. Cumacea*. Published by the Bergen Museum, 115 pp.
- Sars, G.O. (1914) Report on the Cumacea of the Caspian Expedition 1904. *Trudy Kaspjiskoj Ekspeditij 1904*, 4, 2, 1–32.
- Stebbing, T.R.R. (1893) A History of Crustacea, Recent Malacostraca. *The International Scientific Series*, 74, Kegan Paul, Trench, Trübner & Co. Ltd., London, 466 pp.
- Stebbing, T.R.R. (1913) Cumacea (Sympoda). *Das Tierreich*, 39, 1–210.
- Thistle, D. (1980) A revision of *Ilyarachna* (Crustacea, Isopoda) in the Atlantic with four new species. *Journal of Natural History*, 14, 111–143.
- Toulmond, A. & Truchot, J.-P. (1964) Inventaire de la faune marine de Roscoff, Amphipodes – Cumacés. *Supplément aux travaux de la station biologique de Roscoff*, 15, 1–42.
- Van Beneden, P.J. (1861) Recherches sur la faune littorale de Belgique. Crustacés. *Mémoires de l'Académie royale de Belgique*, 33, 71–87.