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## *Subeucalanus flemingeri* sp. n. from the Arabian Gulf (Copepoda: Eucalanidae)

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*Subeucalanus flemingeri* sp. n. is described from females and males collected from Kuwait's waters in the northwestern Arabian Gulf. The new species is similar to *S. pileatus* (Giesbrecht, 1888) and *S. subcrassus* (Giesbrecht, 1888), but is clearly distinguished by the shape of the forehead and seminal receptacles pattern in female, and by the cask-shaped second urosomal segment and details of P5 in male.

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### Introduction

A new calanoid copepod was found in zooplankton samples collected by the oceanography staff from the Mariculture and Fisheries Department of Kuwait Institute for Scientific Research as part of routine monthly oceanographic sampling conducted at selected stations in Kuwaiti waters. Oblique net hauls, typically 5 min in duration, were employed to collect zooplankton samples using a 1-meter net made of 110 µm NITEX mesh and fitted with a General Oceanics flowmeter. The descriptions presented in this paper are from specimens collected on April 21, 1999, at station 3 (29°25'N, 48°30'E; mean station depth of 15 meters) east of Kuwait's island of Failaka in the northwestern region of the Arabian Gulf.

Michel et al. (1986a) reported four Eucalanidae species from the Arabian Gulf: *Subeucalanus crassus* (Giesbrecht, 1888) (= *Eucalanus crassus*), *Eucalanus elongatus* (Dana, 1849), *Subeucalanus mucronatus* (Giesbrecht, 1888) (= *Eucalanus mucronatus*), *Subeucalanus subcrassus* (Giesbrecht, 1888) (= *Eucalanus subcrassus*). The latter species was reported also by Michel et al. (1986b) from Kuwait's waters in the northwestern Arabian Gulf. As part of a recent reassessment of the copepod community structure of Kuwait's waters, specimens whose identification was in doubt were carefully examined and analyzed. It was noticed that the species previously identified as *S. subcrassus* from Kuwait's waters might be a different spe-

cies as yet undescribed. This paper presents the description of this new species, including both sexes, using specimens gathered at one station. However, this new species appears to be widespread and common in Kuwait's waters and may be the dominant Eucalanidae species of the northwestern Gulf region.

The following abbreviations are used in the description: *A1*, antennule; *A2*, antenna; *Enp*, endopod; *Exp*, exopod; *Gns*, genital somite; *Gn*, gnathobase; *Md*, mandible; *Mdp*, mandibular palp; *Mx1*, maxillule; *Mx1 Li1*, praecoxal arthrite (= first inner lobe); *Mx1 Li2*, coxal endite (= second inner lobe); *Mx1 Le1*, coxal endite (= first outer lobe); *Mx2*, maxilla; *Mx2 Li1-2*, praecoxal endites (= first and second lobes); *Mx2 Li3-4*, coxal endites (= third and fourth lobes); *Mx2 Li5*, basal endite (= fifth lobe); *Mxp*, maxilliped; *P1-P4*, swimming legs 1-4; *Pd1-5*, pedigerous somites 1-5; *Pr*, prosome; *Ur*, urosome. Drawings and measurements were made on specimens immersed in glycerine.

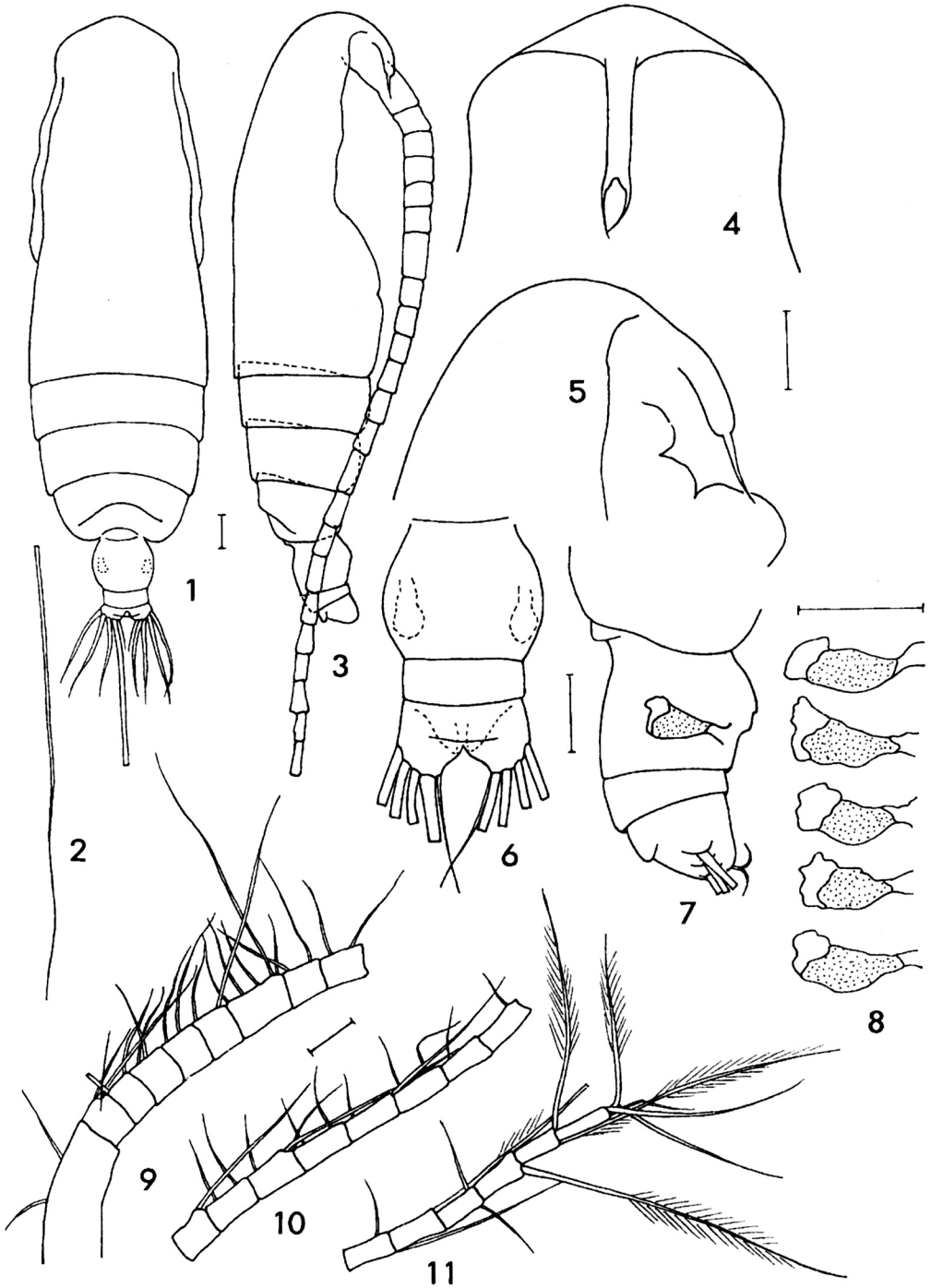
### *Subeucalanus flemingeri* sp. n.

(Figs 1-41)

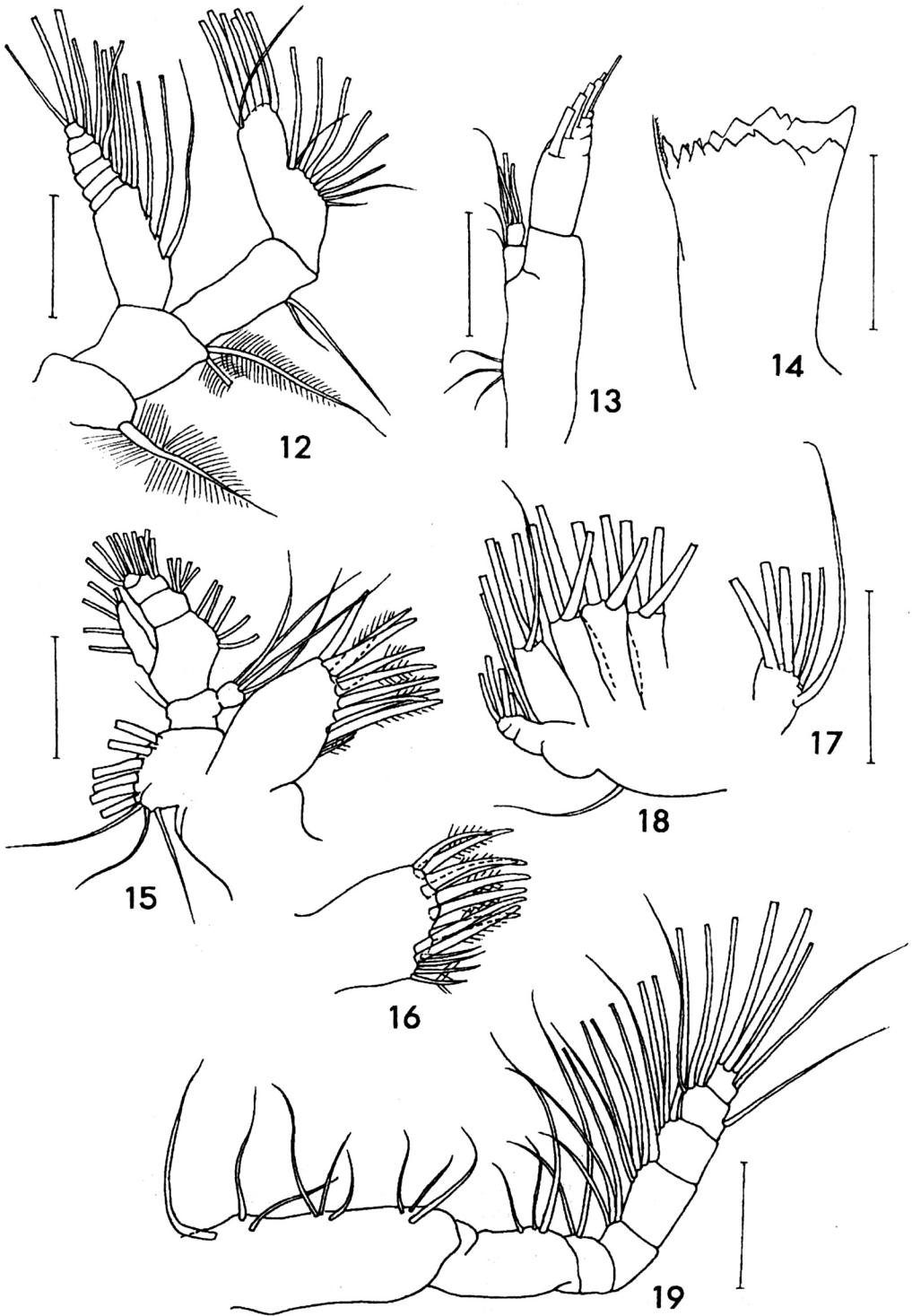
*Holotype*. ♀ (total length 2.01 mm), ZIN 90701, collected on April 21, 1999, by 110 µm plankton net at station 3 (29°25'N, 48°30'E) in the northern waters off Kuwait.

*Allotype*. ♂ (total length 2.07 mm), ZIN 90702, the same locality as holotype.

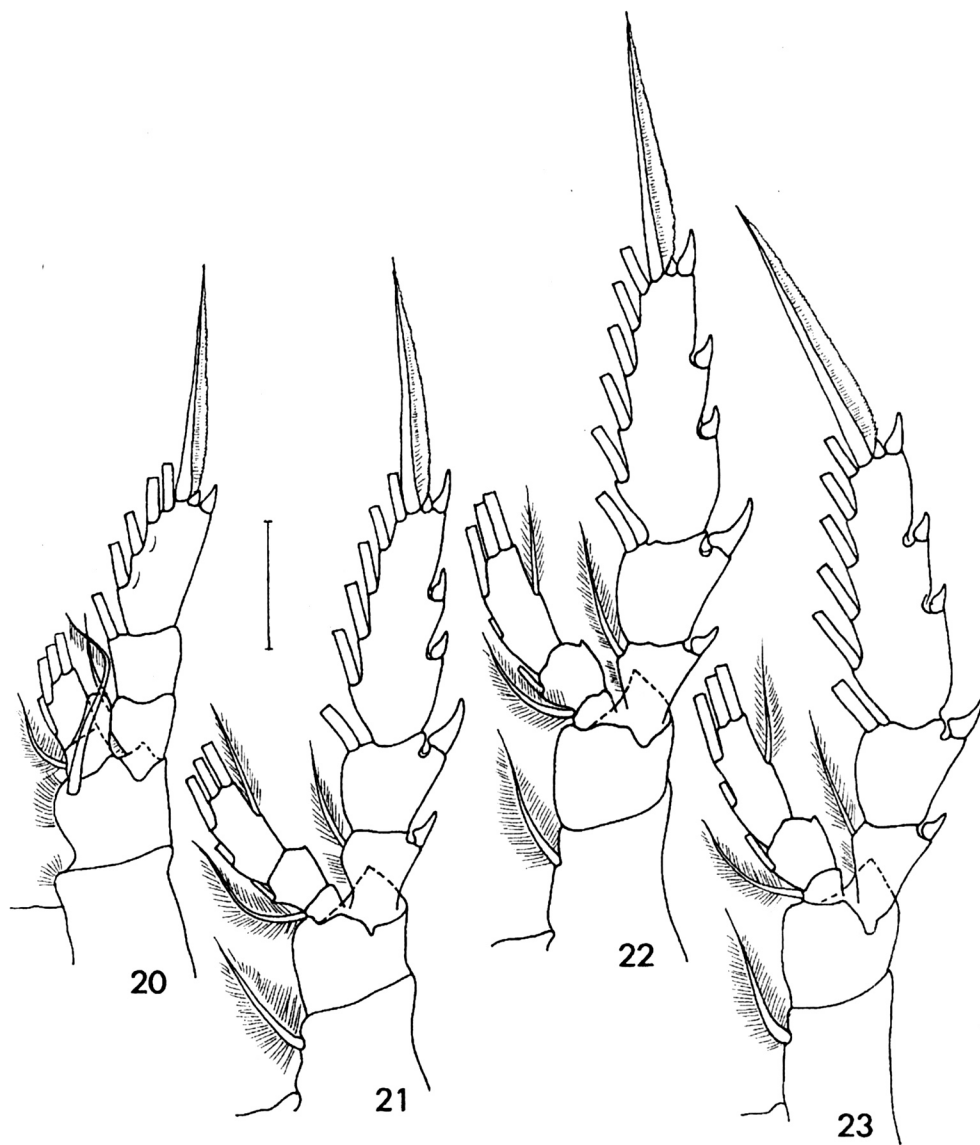
*Paratypes*. 2 ♀ (total length 2.08 and 2.14 mm), ZIN 90703, 1 ♂ (total length 2.14 mm), ZIN 90704, the same locality as holotype. Holotype, allotype and paratypes in the Zoological Institute RAS (St.Petersburg).



**Figs 1-11.** *Subeucalanus flemingeri* sp. n., female (1-7, 9-11, holotype; 8a-e, paratypes). 1, habitus, dorsal view; 2, distal part of the second inner seta on the left caudal ramus; 3, habitus, right lateral view; 4, cephalon and rostrum, ventral view; 5, cephalon, right lateral view; 6, Ur, dorsal view; 7, Ur, right lateral view; 8a-e, seminal receptacles, right lateral view; 9, A1, articulated segments 1-9; 10, A1, articulated segments 10-17; 11, A1, articulated segments 18-23. Scale bars 0.1 mm.



**Figs 12-19.** *Subeucalanus flemingeri* sp. n., female (12-15, 17-19, holotype; 16, paratype). 12, A2; 13, Md p; 14, Md Gn; 15, Mx1; 16, Lil of Mx1, another view; 17, Lil of Mx2, detached; 18, Mx2 without Lil; 19, Mxp. Scale bars 0.1 mm.



Figs 20-23. *Subeucalanus flemingeri* sp. n., female (paratype). 20, P1; 21, P2; 22, P3; 23, P4. Scale bars 0.1 mm.

**Description.** Female (Figs 1-23). Total length 2.01-2.14 mm, based on 7 specimens. Pr nearly 5.7 times as long as Ur and 3.1 times as long as wide (Fig. 1). Forehead rounded (Figs 4-5). Head and Pd1 completely fused. Rostrum robust, elongated, and ending in fine filaments slightly swollen at their bases (Figs 4-5). Pd4 and Pd5 partly fused (Figs 1, 3). Ur consists of 3 somites. Gns broader than long, with widest part in dorsal view on posterior half of the somite (Fig. 6); second inner seta on left caudal

ramus greatly elongated (Figs 1-2). A1 of 23 articulated segments, extending beyond tips of caudal rami by last 5-6 segments (Fig. 3), with stout plumose setae on last segments and all the other setae filiform (Figs 9-11). A2 Exp of 7 articulated segments; Exp1 with 4 setae; Exp2 to Exp6 with 1 seta each and Exp7 with 3 terminal setae, the two inner ones much elongated. Enp of A2 2-segmented; Enp1 with 2 setae; Enp2 with two sets of 9 medial and 7 terminal setae (Fig. 12). Mdp with 3 setae on in-

ner margin of baseopod; Exp 5-segmented, with 1 seta at each of the indistinctly separated Exp1-4 segments and 2 terminal setae at Exp5; Enp1 with 2, Enp2 with 4 setae (Fig. 13). Masticatory edge of Md Gn with 2 rows of medium-sized teeth (Fig. 14). Mx1 Le1 with 6 long and stout and 3 short and thin setae; Li1 with 9 well developed and 4 small apical spines; Li2 with 4 long, thin distal setae; baseopod with 5 setae; Exp with 5 setae; Enp 3-segmented; Enp1 and Enp2 with 4 setae each; Enp3 with 5 apical setae (Fig. 15). Mx2 with 6 setae at Li1 and 3 setae at each of Li2-Li4; Li5 with 4 setae; distal part of Mx2 with 2 and 4 setae (Figs 17-18). Coxa of Mxp with a posterior seta close to proximal end and 3 groups of setae along medial margin, with 2, 3, and 3 setae respectively in order from proximal; basis with a distal group of 3 setae; Enp 6-segmented, with 2, 3, 4, 4, 4, and 4 setae; 2 inner setae at distal segment stout and elongated (Fig. 19). Coxa and basis of P1 with inner marginal hair and 1 long curved inner seta on distal part of basis; Exp 3-segmented; Exp1 and Exp2 with 1 inner seta each, without outer spines; Exp3 with 4 inner setae and 1 distal spine; Enp 2-segmented; Enp1 with 1 inner seta; Enp2 with 4 setae in total (Fig. 20). P2-P4 with 1 inner seta each on coxa. Exp and Enp of P2-P4 3-segmented. Exp 1-2 of P2-P4 with 1, 1 outer spines and 1, 1 inner setae each; Exp 3 of P2-P4 with 2 outer spines and 5 inner setae; Enp 1-2 of P2-P4 with 1, 1 inner setae each; medial part of outer margin of P2-P4 Enp 2 with acute projection (Figs 21-23); Enp 3 of P2-P4 with 5 setae in total. P5 lacking.

Male (Figs 24-41). Total length 1.97-2.14 mm, based on 5 specimens. Pr nearly 4.1 times as long as Ur and 3.1 times as long as wide (Fig. 24). Forehead rounded (Figs 24-25). Head and Pd1 fused. Ur of 5 somites; Gns slightly asymmetrical, with genital aperture located on the left side; 2nd somite the largest and cask-shaped (Figs 26-27). A1 consists of 23 articulated segments, extending beyond end of Ur by last 5-6 segments; all segments with fine setules and aesthetascs, mostly 2 aesthetascs on each segment (Figs 28-30). Base of A2 more robust than that of female; setae on coxa, base and Enp1 far smaller than in female; segmentation and setation of Exp as in female; Enp2 with two groups of 7 medial and 6 terminal setae (Fig. 31). Mdp (Fig. 32) more robust than in female, with 3 setae on inner margin; segmentation and setation of Exp and Enp as in female. Mx1 (Fig. 34) and Mx2 (Fig. 35) as in female. Mxp shorter than in female; Enp 6-segmented, with 2, 3, 3, 4, 3, and 5 setae; larger

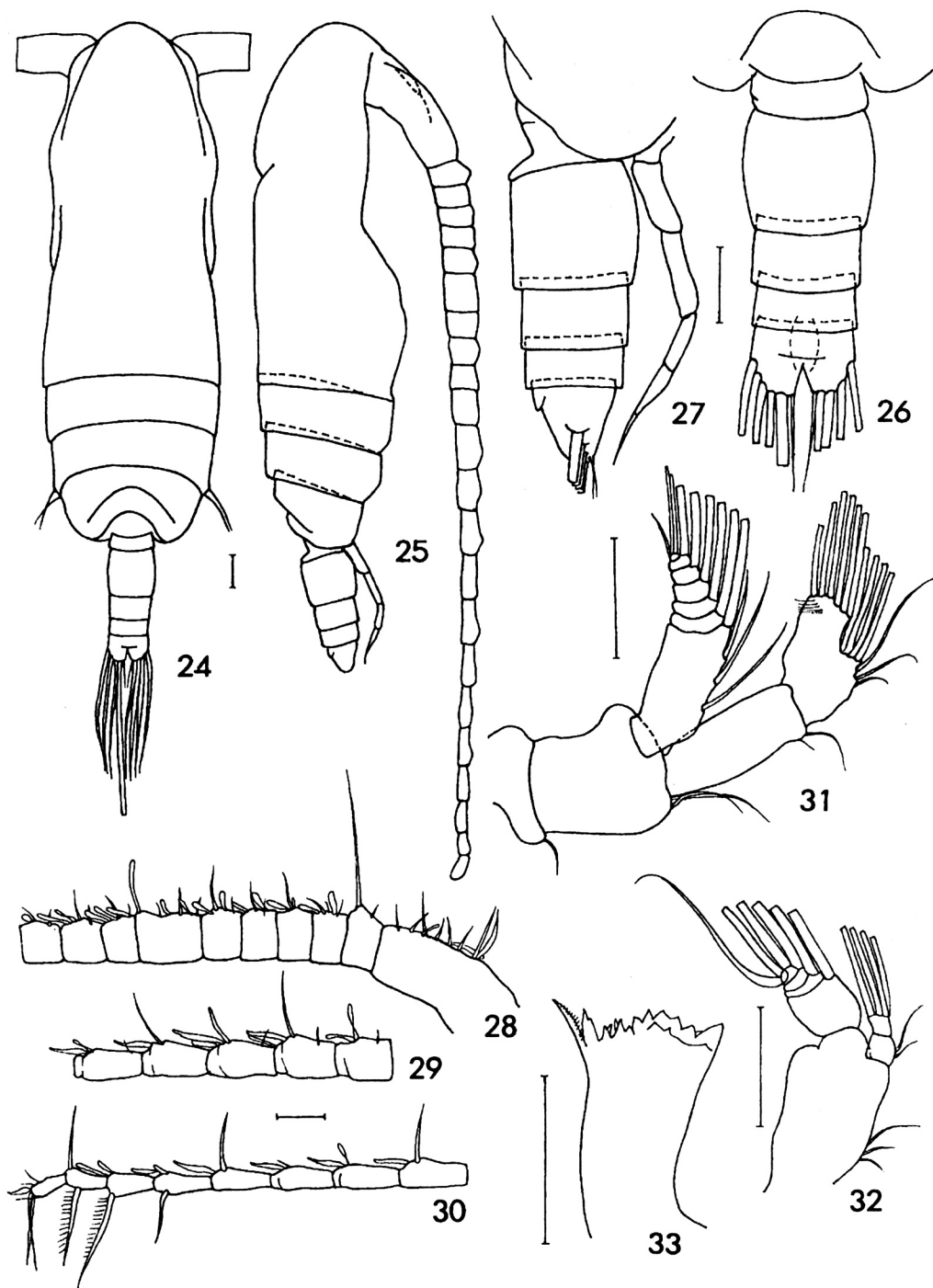
setae of Enp 2-6 curved; 2 of 5 distal setae stout, greatly elongated and heavily plumosed (Fig. 36). P1-P4 (Figs 37-40) resemble those of female, but the acute projection at medial part of outer margin of P2-P4 Enp more developed than in female. P5 uniramous, 4-segmented, ending with distal spine nearly as long as the last segment (Fig. 41). Distal segment with fine hairs at outer edge.

*Etymology.* The specific name honours Dr. A. Fleminger for his contributions to the phylogeny and taxonomy of calanoid copepods.

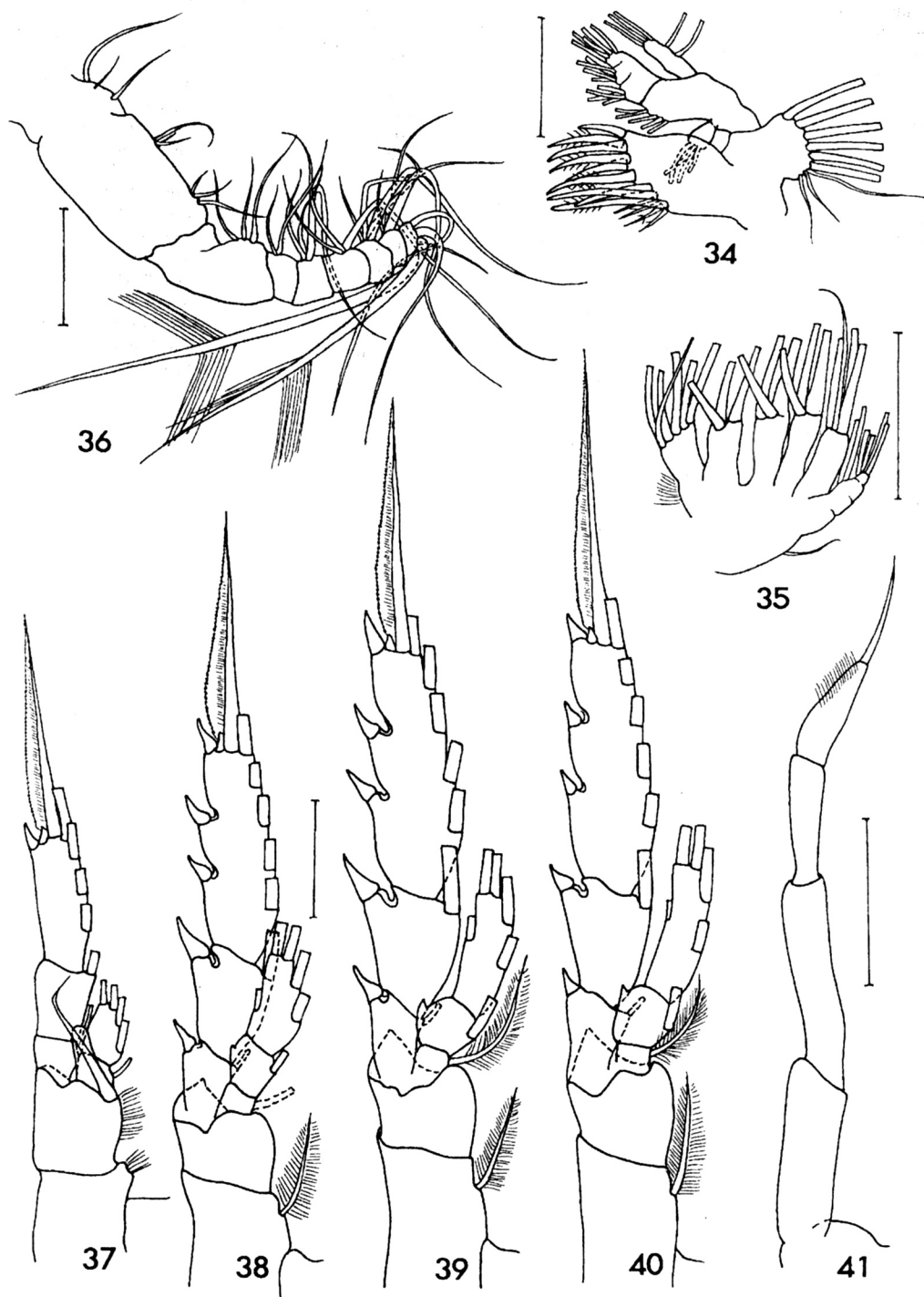
*Remarks.* Fleminger (1973) subdivided the genus *Eucalanus* Dana into four groups ("subtenis", "pileatus", "elongatus", and "attenuatus") on the basis of integumental organs, as well as the shape and arrangement of the seminal receptacles. Based on features of the urosome formation, Geletin (1976) subdivided *Eucalanus* into three genera, with two of them new: *Eucalanus*, *Pareucalanus* and *Subeucalanus*; he grouped the species comprising the original genus *Eucalanus* in a similar way with Fleminger's classification. Brodsky (1976) disagreed with Geletin's classification, however, later, taxonomists accepted it and used it in systematic accounts (Bradford-Grieve, 1994; Palomares et al., 1998; Bradford-Grieve et al., 1999). Using Geletin's classification, we refer the new species to the genus *Subeucalanus* according to its Exp1 and Exp2 of A2 fused and Mx1 with 2 inner lobes (in *Eucalanus* and *Pareucalanus*, Exp1 and Exp2 of A2 are separated, Mx1 with 3 inner lobes).

*Comparison.* Female. The new species is very similar to *S. pileatus* (Giesbrecht, 1888) and *S. subcrassus* (Giesbrecht, 1888) in the body shape, but clearly distinguished from them by the more rounded forehead in dorsal and lateral views (Figs 1-5), and by the shape and arrangement of seminal receptacles (Figs 7, 8a-e). *S. flemingeri* sp. n. differs from *S. subcrassus* in its smaller size (2.01-2.14 mm, in contrast to the 2.6 mm average for *S. subcrassus*) and the narrower genital segment in dorsal view.

Male. The new species is distinguished from *S. pileatus* and *S. subcrassus* by the cask-shaped second segment of Ur, shape and proportion of P5 segments (the length ratio of P5 segments including distal spine in order from proximal is in *S. flemingeri* sp. n. 30 : 42 : 27 : 25 : 26; in *S. pileatus* 18 : 17 : 15 : 13 : 11; in *S. subcrassus* 28 : 27 : 15 : 20 : 25), and distal segment of P5 covered with hairs (according to Giesbrecht, 1892, these segments are naked in P5 of *S. pileatus* and *S. subcrassus*).



**Figs 24-33.** *Subeucalanus flemingeri* sp. n., male (allotype). 24, habitus, dorsal view; 25, habitus, right lateral view; 26, Ur, dorsal view; 27, Ur & P5, right lateral view; 28, A1, articulated segments 1-10; 29, A1, articulated segments 11-15; 30, A1, articulated segments 16-23; 31, A2; 32, Mdp; 33, Md Gn. Scale bars 0.1 mm.



Figs 34-41. *Subeucalanus flemingeri* sp. n., male (allotype). 34, Mx1; 35, Mx2; 36, Mxp; 37, P1; 38, P2; 39, P3; 40, P4; 41, P5. Scale bars 0.1 mm.



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