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A new species of marine cave copepod, *Peltidium penyu* (Copepoda: Harpacticoida: Peltidiidae) from the Turtle Tomb, Sipadan Island, Sabah, Malaysia

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Abstract. A new species of harpacticoid copepod, *Peltidium penyu,* is described from a marine cave (Turtle Tomb) in Sabah, Malaysia. The Malaysian *Peltidium* is characterised by a combination of the following characters: the skeletal pattern of chitin struts; the armaments of the maxilliped; and the construction of the maxilla. The new species seems to be related to *P. exiguum*, sharing the characteristics of skeletal pattern of chitin struts and armature formula of P1–P5, but differs from the Arafuran species based on segmentation of antennule, as well as the construction and armament of the maxilla and maxilliped.

Key words. new species, first record, marine cave, Sipadan, Malaysia, Southeast Asia

INTRODUCTION

The copepod genus *Peltidium* was established in 1839 by August Philippi to accommodate a new species, *P. purpureum*, for which the type locality and the sampling method were not clearly stated in the original description (Philippi, 1839). This marine species is characterised by a broadened and dorsoventrally flattened body, with a specific pattern of strongly chitinised struts on the body integument. Claus (1860) provided a brief diagnosis for the family Peltidiidae, and Claus (1863) subsequently included *Porcellidium* Claus, 1860 and *Zaus* Goodsir, 1845, in the family Peltidiidae as well. The family currently contains twelve genera (Walter & Boxshall, 2025). Wells (2007) reported 24 species of *Peltidium*, excluding *Peltidium proximus* Varela, 2005. Since then, four more species have been discovered and described (see Suárez-Morales & Jarquín-González, 2013; Varela & Gómez, 2013, 2018; Song et al., 2015).

Ecologically, the genus is benthic, having been primarily recorded from the phytal zone worldwide (Song et al., 2015). Except for *P. falcatum* Scott, 1909, which has been recorded from a depth of about 1,595 metres (Scott, 1909), most species were collected in the littoral zone (Pesta, 1935), from sandy or rocky substrates and algal washings (Lang, 1948). Among the 29 species, six species are distributed in the Neotropical region; eight species in the western Pacific and two in Oahu (Hawaii); ten species along the coast of the Indian Ocean; four species in the eastern Atlantic and Mediterranean; and three species in South Australia (Song et al., 2015; Varela & Gómez, 2018). So far only seven species have been documented in Southeast Asian waters, namely: *P. angulatum* Thompson & Scott, 1903, *P. exiguum* Scott, 1909, *P. falcatum* Scott, 1909, *P. intermedium* Scott, 1909, *P. minutum* Scott, 1909, *P. ovale* Thompson & Scott, 1903, and *P. purpureum* Philippi, 1839.

Ongoing faunistic investigations in Sipadan Island, especially in marine caves (Turtle Tomb), have yielded one remarkable new genus of calanoid copepod (*Sipadantonius roihani* Boonyanusith, Wongkamhaeng & Azman, 2024). Now, the present study is the first to report the occurrence of a harpacticoid copepod from the genus *Peltidium* in Malaysian waters. In this paper, morphological descriptions and illustrations of the new species are provided.

MATERIAL AND METHODS

Specimens were collected in the Turtle Tomb cave, of Sipadan Island, Sabah, Malaysia (Fig. 1), on 3–4 August 2023. Collections were made in the vicinity of turtle remains in the cave's dark zone, approximately 200 m from the main entrance (Fig 2A). A modified light trap was placed at a depth of 20–24 m (Fig 2B), which was deployed at the bottom substrate for ~ 24 hours. Samples were then preserved in 10% buffered formalin. In the laboratory, copepod samples were sorted under a stereomicroscope, followed by storage in 70% ethanol. A few specimens were subsequently soaked

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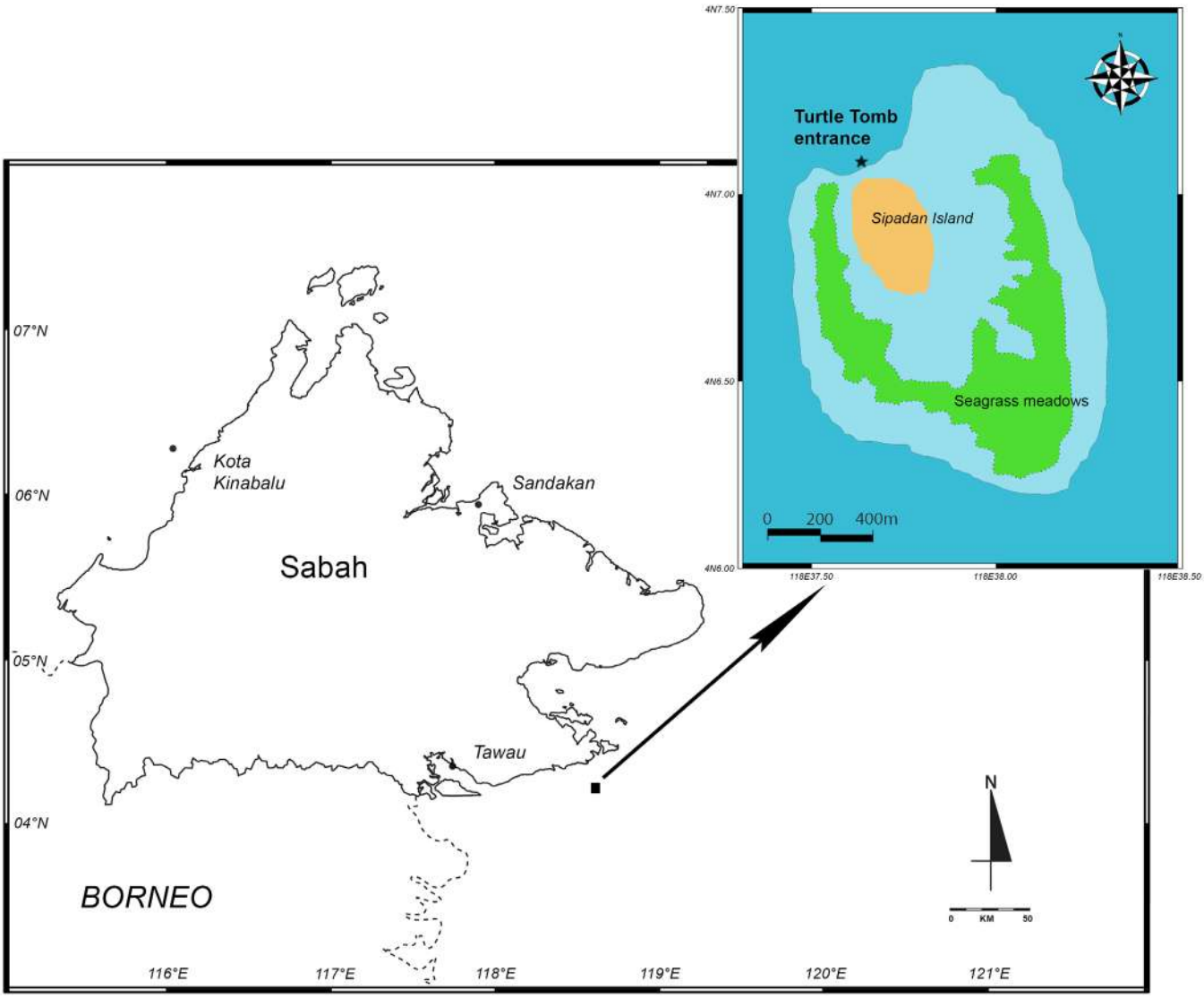

Fig. 1. Map of Sipadan Island, Sabah, Malaysia with the location of the collecting site: Turtle Tomb.

in a mixture of glycerol and 70% ethanol (approximately 1/10 v/v) for 30 minutes and were individually transferred into a drop of 40% glycerol on a glass slide. Dissection was then performed under a stereomicroscope. The material was then mounted by a coverslip and examined under a Nikon ECLIPSE E200 compound light microscope at 1000 × magnification.

Habitus and appendages were drawn using a drawing tube attached to a compound microscope at 400 × and 1000 × magnification, respectively, and description was later made, based on the terminology in Huys & Boxshall (1991) and the abbreviations used are as follows: ae, aesthetasc; I, spine; Enp, endopod; Exp, exopod; Enp-1 (2, 3), proximal (middle, distal) article of the endopod of the swimming legs; Exp-1 (2, 3), proximal (middle, distal) article of the exopod of the swimming legs; P1–P6, first to sixth swimming legs.

The type materials have been deposited at the Universiti Kebangsaan Malaysia Muzium Zoologi (UKMMZ), Malaysia and the Sabah Parks Zoological Collection in Semporna (SPZC) (in accordance with the requirements stated in the Sabah Biodiversity Council – License for Transfer Ref. No. JKM/MBS.1000-2/3 JLD.5 [41]).

TAXONOMY

Order Harpactioida G.O. Sars, 1903

Family Peltidiidae Claus, 1860

Genus *Peltidium* Philippi, 1839

Peltidium penyu, new species

(Figs. 2–6)

Material examined. Holotype: adult female, 1.1 mm long, excluding caudal seta [completely dissected and mounted in glycerol on a slide, and sealed with nail polish] (UKMMZ-1638), Turtle Tomb, 4°07′04.8″N, 118°37′41.0″E, Sipadan Island, Sabah, Malaysia, light trap, depth 21 meters, coll. BAR Azman, 3–4 August 2023. Paratype: 1 adult female, same data as for holotype, preserved in 70% ethanol (UKMMZ-1639).

Table 1. Geographical distribution of *Peltidium*.

Species group and taxa	Localities (Continents/Oceans/Seas: Countries/ Islands)	References
Group A		
P. byungwooi	**East Asia:** South Korea	Song et al. (2015)
P. gracile	**Europe:** France, Italy	Lang (1948)
P. purpureum	**Pacific Ocean:** Caroline Islands (Micronesia); **Africa:** Algeria, Mozambique; **Europe:** Norway, Sweden, Scotland, England, France, Ireland, Italy; **Mediterranean Sea:** Malta; **West Asia:** Israel	Lang (1948), Por (1964), Vervoort (1964), Wells (1967)
P. robustum	**Africa:** Algeria; **Europe:** England, France, Italy	Lang (1948)
P. sacesphorum	**Europe:** France; **Africa:** Algeria	Lang (1948)
Group B		
P. angulatum	**South Asia:** Sri Lanka; **Indian Ocean:** Andaman Islands (India)	Lang (1948); Wells & Rao (1987)
P. camilae	**North America:** Florida (USA)	Varela & Gómez (2018)
P. cinereum	**Africa:** Durban Bay (South Africa)	Lang (1948)
P. exiguum	**Indian Ocean:** Maldives; **Arafura Sea**: Aru Islands (Indonesia); **Pacific Ocean:** Caroline Islands (Micronesia)	Sewell (1940), Lang (1948), Vervoort (1964)
P. falcatum	**Banda Sea:** east of Lucipara Islands (Indonesia); **South China Sea:** Paracel Islands	Lang (1948), Zhang & Li (1976)
P. hawaiiense	**Pacific Ocean:** Hawaiian Islands (USA)	Pesta (1935), Lang (1948),
P. intermedium	**Arafura Sea:** Aru Islands (Indonesia); **Indian Ocean:** Maldives; **Pacific Ocean:** Caroline Islands (Micronesia)	Sewell (1940), Lang (1948), Vervoort (1964)
P. laudatum	**East Asia:** Japan	Tanaka & Hue (1968)
P lerneri	**Atlantic Ocean:** Bahamas	Geddes (1968)
P. maldivianum	**Indian Ocean:** Maldives	Sewell (1940)
P. monardi	**Pacific Ocean:** Hawaiian Islands (USA)	Lang (1948), Pesta (1935)
P. nayarit	**Central America:** Mexico	Suárez-Morales & Jarquín-González (2013)
P. nichollsi	**Atlantic Ocean:** Bahamas	Geddes (1968)
P. penyu	**Celebes Sea:** Sipadan Island (Malaysia)	This study
P. perplexum	**South Asia:** Sri Lanka	Lang (1948)
P. proximum	**Australia:** South Australia	Nicholls (1941)
P quinquesetosum	**East Asia:** South Korea	Song & Yun (1999)
P. speciosum	**South Asia:** Sri Lanka; **Indian Ocean:** Maldives; **Arafura Sea:** Aru Islands (Indonesia); **Australia:** South Australia	Sewell (1940), Nicholls (1941), Lang (1948)
Group C		
P. antillensis	**Atlantic Ocean:** Cuba	Varela & Gómez (2013)
P. perturbatum	**Atlantic Ocean:** Bahamas	Geddes (1968)
P. proximus	**Atlantic Ocean:** Cuba	Varela (2005)
P. ovale	**South Asia:** Sri Lanka; **East Asia:** Japan; **Indian Ocean:** Maldives, Andaman Islands (India); **South China Sea:** Paracel Islands	Sewell (1940), Nicholls (1941), Lang (1948), Gamo (1969), Zhang & Li (1976), Wells & Rao (1987)
P. simplex	**Australia:** South Australia	Nicholls (1941)
Group D		
P. fenestratum	**Atlantic Ocean:** Bahamas	Geddes (1968)
P. defreitasi	**Africa:** Mozambique	Wells (1967)

Description of the female holotype. Preserved specimen whitish and opaque; body dorsoventrally flattened, broadly ovate, with maximum width at posterior margin of cephalothorax (0.75 mm) and tapering posteriorly; total body length, excluding caudal setae, 1.1 mm; integument strongly chitinised with complex network of chitin struts; body surface predominated with integumental pores and circular craters with a raised rim and a setule inside, and accompanied by few sensilla on each prosomite (Fig. 3A, B). Prosome comprising cephalothorax and three free pedigerous somites, ca. 70% of body length; cephalothorax ca. 35% of the body length, ca. 0.75 × as long as wide and ca. 0.5 × as long as the length of prosome, with sensilla and cuticular pores as illustrated (Fig. 3A). Three free pedigerous somites with laterally expanded epimeral plates, and a medial triangular fenestra in the mid-line; distribution of sensilla and cuticular pores as illustrated (Fig. 3A).

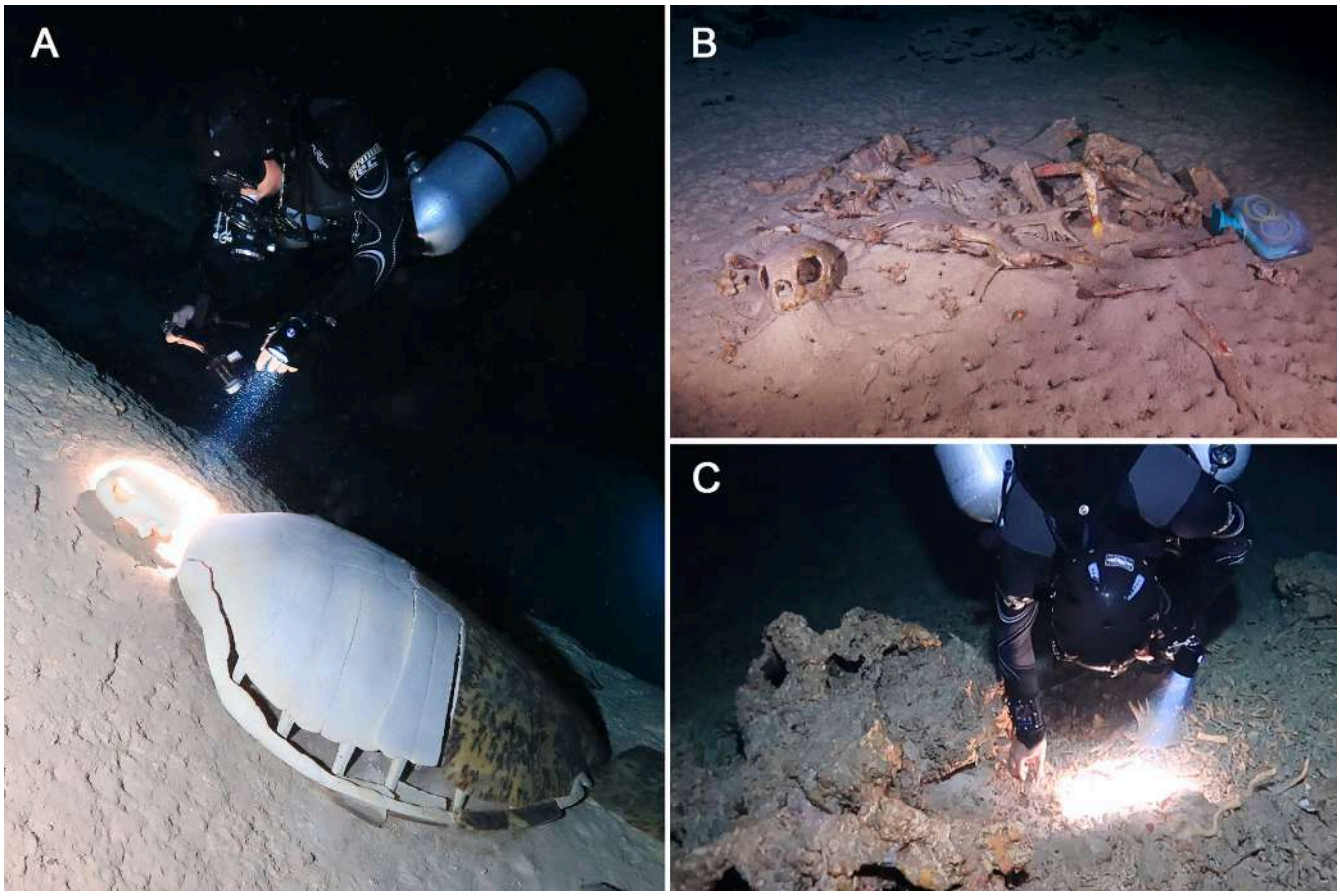

Fig. 2. Characteristic of the Turtle Tomb and condition of the sampling point. A, photograph of a diver examining the skeletal remains of a green turtle, which possibly died from drowning, showing the conditions present at the site known as the Turtle Tomb; B, placement of portable light trap (right of photo) near the turtle remains in Turtle Tomb; C, water samples being taken by a diver for biological analysis.

Rostrum well developed, broadly rounded, completely fused to anterior margin of cephalic shield and tapering to rounded tip, directed downward.

Urosome comprising P5-bearing somite, genital double-somite, two free urosomites, and anal somite (Fig. 3A, B). P5-bearing somite and genital double-somite strongly chitinised with laterally expanded epimeral plates and a medial triangular fenestra in the mid-line; distribution of sensilla and cuticular pores as illustrated (Fig. 3A, B). P5-bearing somite expanded postero-laterally, reaching mid-length of the subsequent somite. Genital double-somite wider than long, ca. 0.45 × as long as wide, with posterolateral corners reaching well beyond posterior margin of caudal rami; dorsal surface with medio-distal margin slightly produced posteriorly; ventral surface with setulae along posterior margin. Genital complex (Fig. 3C) with large and crescent copulatory pore; seminal receptacle small, sclerotised; a pair of pores located distal to the genital complex. Two free subsequent urosomites very short. Anal somite short, with a pair of pores on ventral surface; short spinules along the medial cleft ventrally.

Caudal rami (Fig. 3D) parallel, ca. twice as long as wide; each with one pore near its insertion; armament with seven smooth setae. Lateral accessory seta (I) short, inserted at mid-length of rami (Fig. 3C). Lateral seta (II) inserted on a knob subapically. Outermost apical seta (III) shorter than seta II, about 4 times as long as seta I. Outer apical seta (IV) slim, about 7 times as long as seta I. Inner apical seta (V) well developed, without breaking plane. Innermost apical seta (VI) short, as long as seta I. Dorsal seta (VII) triarticulate, as long as seta IV.

Antennule (Fig. 4A–C) seven-segmented. Armature formula: I-[1], II-[11], III-[8+(1+ae)], IV-[7+ae)], V-[1], VI-[3], VII-[12]. Segment I with three rows of long spinules in front of the seta. Segment II longest, about twice as long as wide, positioned perpendicular to segment I, with a pore on dorsal surface. Aesthetasc on segment III and IV elongate, positioned on peduncle; aesthetasc of segment III fused basally with the neighbouring seta, but aesthetasc of segment IV free. Two apical setae on ultimate segment fused basally with each another.

Antenna (Fig. 5A, B) biramous. Coxa short, unornamented. Basis and proximal endopodal segment incompletely incorporated, with remnant of ancestral articulation. Basis unornamented, with abexopodal seta. Exp two-segmented; proximal segment with short, slender inner seta; distal segment ca. 4.0 × as long as wide and ca. 1.5 × the proximal segment, with three elements: one outer apical seta pectinate, one inner apical seta spiniform and spinulose, and one inner spinulose seta subapically. Enp two-segmented. Proximal endopodal segment with inner smooth seta at distal third of inner margin. Distal endopodal segment club-shaped, ca. 4.0

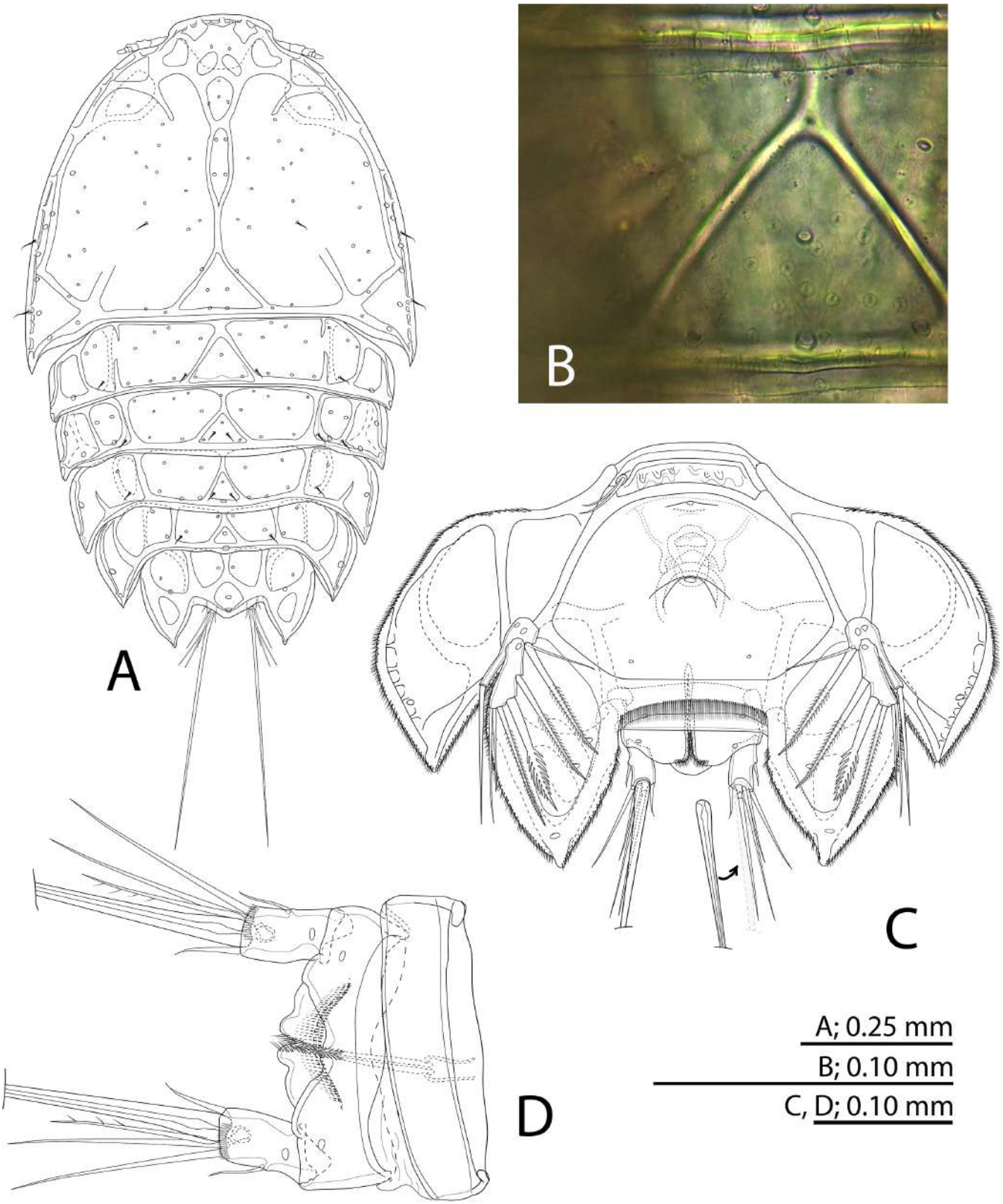

Fig. 3. *Peltidium penyu,* new species, female holotype (UKMMZ-1638). A, habitus, dorsal view; B, photomicrograph of body integument at the area of second thoracic somite; C, urosome, ventral view; D, second free abdominal somite and anal somite with caudal rami after they were exposed by slightly compressing the urosome, ventral view.

× as long as wide; ornamentation with groups of spinules at mid of medial margin and two transverse rows of spinules distal to the group of spinules; armament with two setiform spines and one pinnate spine along inner margin, and with seven apical elements of which outermost seta pinnate, dorsal seta shortest, four apical setae geniculate, and innermost element smooth and spiniform.

Mandible (Fig. 5C–E) comprising syncoxa, basis, and one-segmented Enp. Coxal gnathobase sclerotised; ornamentation

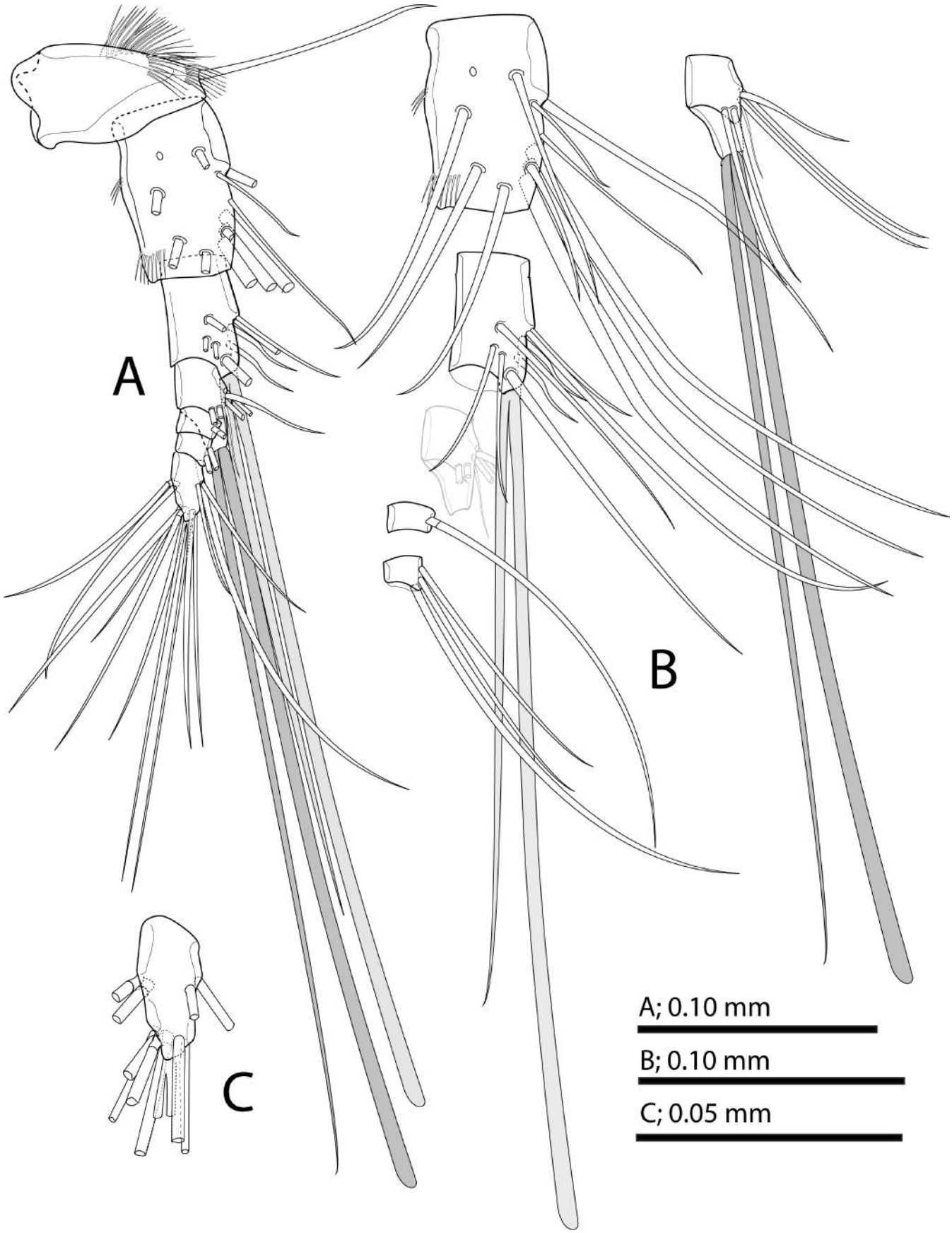

Fig. 4. *Peltidium penyu,* new species, female holotype (UKMMZ-1638). A, right antennule, dorsal view; B, segments II–VI of antennule; C, segment VII of antennule, showing insertion of the setae.

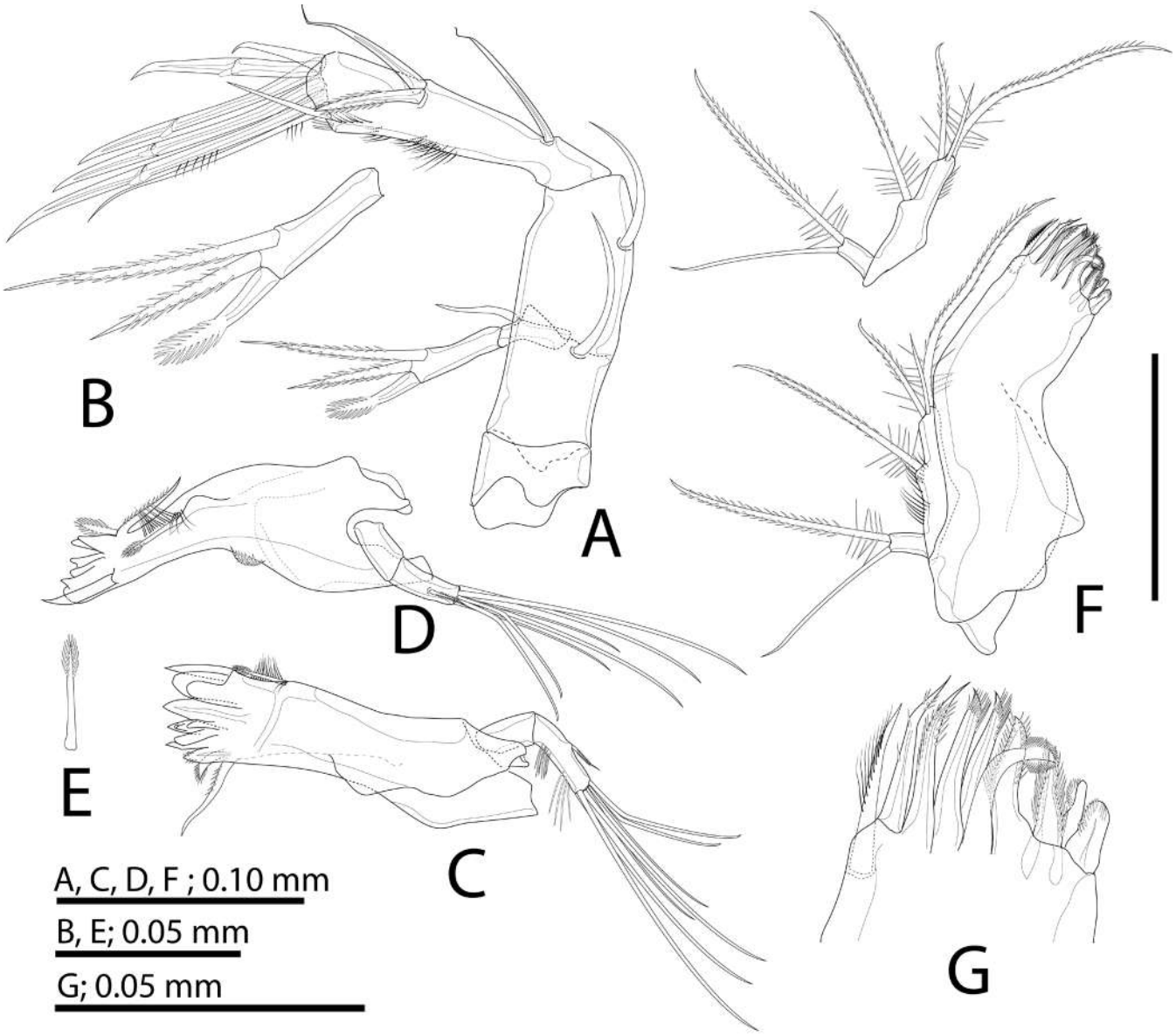

Fig. 5. *Peltidium penyu,* new species, female holotype (UKMMZ-1638). A, right antenna, inner view; B, distal segment of Exp-2 of antenna; C, right mandible, posterior view; D, left mandible, ventral view; E, ventral seta of left mandible; F, left maxillule, posterior view; G, inner margin of praecoxal arthrite of maxillule, posterior view.

with a group of thin spinules on ventral margin and a group of minute spinules on knob at mid of ventral margin; cutting edge with six teeth varied in shape and ornamentation, and two setae on distal dorsal corner, of which inner short, thin, and pectinate, while the outer pinnate; ventral margin with spiniform pectinate seta near group of spinules. Basis rectangular, bare, about twice as long as wide. Enp with two transverse rows of long spinules along inner margin, armed with one lateral and seven smooth apical setae.

Maxillule (Fig. 5F, G) with large praecoxa, coxobasis and one-segmented Enp. Praecoxal arthrite robust; cutting edge bearing ten elements varied in shape and ornamentation as shown (Fig. 5G). Coxa and basis incorporated, forming coxobasis, with one apical pinnate seta, one pinnate seta and one smooth seta subapically; lateral margin with one outer pinnate seta. Enp one-segmented, with one pinnate and one smooth seta apically.

Maxilla (Fig. 6A, B) with large syncoxa bearing three endites and allobasis. Syncoxa with arch rows of spinules laterally; proximal endite short, inserted at base of syncoxa, with one pinnate apical seta; subdistal endite cylindrical, with one pinnate apical seta; distal endite articulated, mobile, with three elements: one pectinate subapical spine proximally, one pinnate apical spine, and one bare apical seta. Allobasis drawn out to strong claw with one pinnate midventral seta. Enp incorporated to basis, forming allobasis; represented by two bare setae inserted close to each other and one smooth shorter seta.

Maxilliped (Fig. 6C, D) subchelate, three-segmented, comprising syncoxa, basis, and one-segmented Enp. Syncoxa with concave outer margin; armament with one pinnate seta on distal outer corner. Basis ellipsoidal, about twice as long as syncoxa and twice as long as wide; ornamentation with a band of spinules on anterior surface near inner margin, row of spinules on posterior surface near inner margin and arch

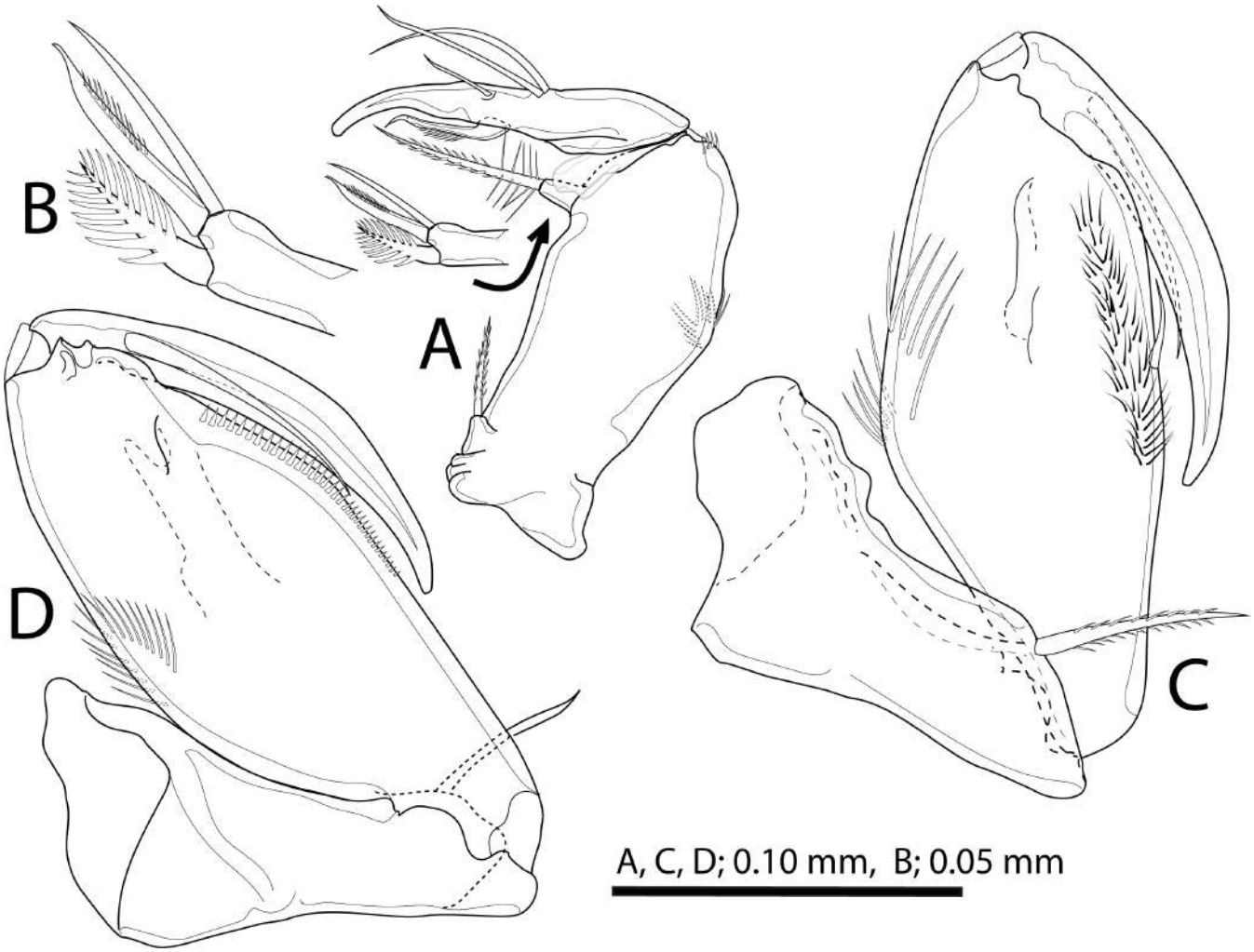

Fig. 6. *Peltidium penyu,* new species, female holotype (UKMMZ-1638). A, right maxilla, anterior view; B, distal endite of maxilla, anterior view; C, right maxilliped, anterior view; D, left maxilliped, posterior view.

row of long spinules on outer margin; armament with one minute inner seta. Enp transformed to strong claw, reaching about distal one-third of basis, with seta on posterior surface at proximal one-third of segment length.

P1 with three-segmented Exp and two-segmented Enp; P2–P4 with three-segmented Exp and Enp. Armature formula as shown in Table 2.

P1 (Fig. 7A–C). Intercoxal sclerite about three times as wide as long; distal margin slightly produced distally, with setulae. Coxa large, subquadrate, with short setulae along outer and inner margin. Basis trapezoidal, with setulae along inner margin and along the proximal half of outer margin; outer seta inserted at mid-length of outer margin. Exp-1 ca. twice as long as wide, reaching mid-length of Enp-2; Exp-2 about four times as long as wide, with outer seta inserted at the distal three-fifth of outer margin and inner pinnate seta inserted at inner distal corner; Exp-3 with one short and one longer spiniform element on inner margin, two claw-like apical spines of which the inner about half of the outer, and one articulate spiniform outer seta. Enp-1 as long as wide, with setulae along inner and outer margin; a pore on anterior surface, Enp-2 with setulae along inner and outer margin; two inner spines transformed, with comb-like outer margin; two apical setae pinnate.

P2–P3 (Fig. 7D, E). Intercoxal sclerite short and very wide, about seven times as wide as long. Coxa small, rectangular; anterior surface with cuticular pore, transverse row of spinules beside the pore, and spinules on outer distal corner. Basis transversely elongated, with band of spinules on upper margin; anterior surface with cuticular pore in P2 but absent in P3. Exp with spinules along outer margin of all segments; inner margin with setulae in Exp-1; outer spine inserted at outer distal corner in Exp-1 and Exp-2; outer apical seta of Exp-3 spiniform, with spinules along outer margin and setulae on inner one. Enp slightly shorter than Exp; Enp-3 ca. half of the length of Enp-2 in P2 but as long as Enp-2 in P3; ornamentation with setulae along outer margin of Enp-1, proximal two-thirds of Enp-2 and Enp-3, accompanied long spinules along distal one-third of Enp-2 and cuticular pore near distal margin in all endopodal segments; two apical setae of Enp-3 spiniform, both with spinules on outer margin and setulae on inner one.

P4 (Fig. 7F). Intercoxal sclerite and coxa as those of P3; Basis as those of P3 in shape, but without spinule ornamentation

Table 2. Armature formula of female P1–P4 (legend: inner-outer element; inner-apical-outer; Arabic numerals representing spines; Roman numerals representing setae).

Legs	Coxa	Basis	Exp			Enp		
			1	2	3	1	2	3
P1	0-0	1-1	0-1	1-1	II-II-I	1-0	II-2-0	
P2	0-0	0-1	1-I	1-I	2-1,I-III	1-0	2-0	1-2-0
P3	0-0	0-1	1-I	1-I	3-1,I-III	1-0	2-0	3-2-0
P4	0-0	0-1	1-I	1-I	3-1,I-III	1-0	2-0	2-2-0

on upper margin. Exp with ornamentation and armament as those of P2 and P3, plus ventral surface with patch of hairs on all segments and a group of long spinules in Exp-1. Enp with ornamentation as those of P2 and P3, plus ventral surface with group of long spinules near inner margin in all segments.

P5 (Fig. 7G) with distinct Exp and baseoendopod. Baseoendopodal segment with two large cuticular pores on anterior surface; armament with lateral seta inserted apically on long cylindrical setophore, which reaches the insertion of seta II of Exp; endopodal lobe not prominent, with one bare and slim seta and one pinnate seta which is about twice as long as the former. Exp ca. 2.5 × as long as wide, with three elements on inner margin and two apical ones; seta I bipinnate; seta II pectinate, feather-like spiniform element; seta III bipinnate but spinules shorter than those of seta I; seta IV and V slim and bare, seta IV ca. 0.7 × as long as seta V and ca. 0.6 × as long as length of three subequal setae on inner margin.

P6 (Fig. 3A) knob-like, with two apical bare setae.

Male. Unknown.

Variation. In the female holotype, the P6 is absent in the left side of the genital double-somite, but it is present in the right side of the segment. The P6 is absent on either side of genital double-somite in the paratype.

Etymology. The name "*penyu*" is the Malay word for turtle, an animal which has similar carapace structure to this new species. The name also brings to mind the iconic appeal of the Turtle Tomb. It is used here as a noun in apposition.

Distribution. The species is known *only* from the *type locality*.

DISCUSSION

Differential diagnosis and remarks. According to Geddes (1968), representatives of *Peltidium* have been separated into four groups based on the shape and chaetotaxy of the P5Exp. The new species belongs to Geddes' (1968) species group B due to the presence of two apical and three inner setae on the P5Exp. The other 17 species of group B are *P. angulatum* Thompson & Scott, 1903, *P. camilae* Varela & Gómez, 2018, *P. cinereum* Brady, 1915*, P. exiguum* Scott, 1909, *P. falcatum* Scott, 1909, *P. hawaiiense* Pesta, 1935, *P. intermedium* Scott, 1909, *P. laudatum* Tanaka & Hue, 1968, *P lerneri* Geddes, 1968, *P. maldivianum* Sewell, 1940, *P. monardi* Pesta, 1935, *P. nayarit* Suárez-Morales & Jarquín-González, 2013, *P. nichollsi* Geddes, 1968, *P. perplexum* Thompson & Scott, 1903, *P. proximum* Nicholls, 1941, *P quinquesetosum* Song & Yun, 1999 and *P. speciosum* Thompson & Scott, 1903. *P. minutum* Scott, 1909, which was included in species group B by Geddes (1968), has been synonymised with *P. speciosum* by Nicholls (1941). Another species that may be included in species group B is *P. cinereum* Brady, 1915. In this species, the P5Exp bears four spiniform setae, with two elements inserted along the inner margin and two positioned at the tip. Five other species, including *P. byungwooi* Song, Dahms, Kangtia, Chullasorn, Ryu & Khim, 2015, *P. gracile* (Claus, 1889), *P. purpureum* Philippi, 1839, *P. robustum* (Claus, 1889), and *P. sacesphorum* Monard, 1928, belong to Geddes' (1968) species group A, which has five or six elements inserted apically and on the outer margin of P5Exp. Out of these species, *P. gracile* bears five setae on P5Exp, while other species have six elements. Five species comprising *P. antillensis* Varela & Gómez, 2013, *P. perturbatum* Geddes, 1968, *P. proximus* Varela, 2005, *P. ovale* Thompson & Scott, 1903 and *P. simplex* Nicholls, 1941 belong to Geddes' (1968) third group (= species group C) in having a stilettiform and heavily chitinised P5Exp bearing four spiniform setae on the tip and the outer margin and one slim seta on inner margin. The last (= species group D) is composed of *P. defreitasi* Wells, 1967 and *P. fenestratum* Geddes, 1968, which are characterised by a P5 with a short Exp bearing elements along its distal margin.

Among representatives of the species group B, *P. camilae, P. lerneri*, *P. nayarit*, and *P. nichollsi* are known from the Neotropical region; *P. hawaiiense* and *P. monarda* have been recorded from Hawaii; and the rest have been found in the Indo-West Pacific. In Southeast and East Asia, nine species have been recorded, comprising of *P. angulatum*, *P. byungwooi, P. exiguum*, *P. falcatum*, *P. intermedium*, *P. laudatum*, *P. ovale*, *P. purpureum*, and *P. quinquesetosum* (Song et al., 2015). *P. purpureum* and *P. byungwooi* belong to Geddes' (1968) species group A in having six elements

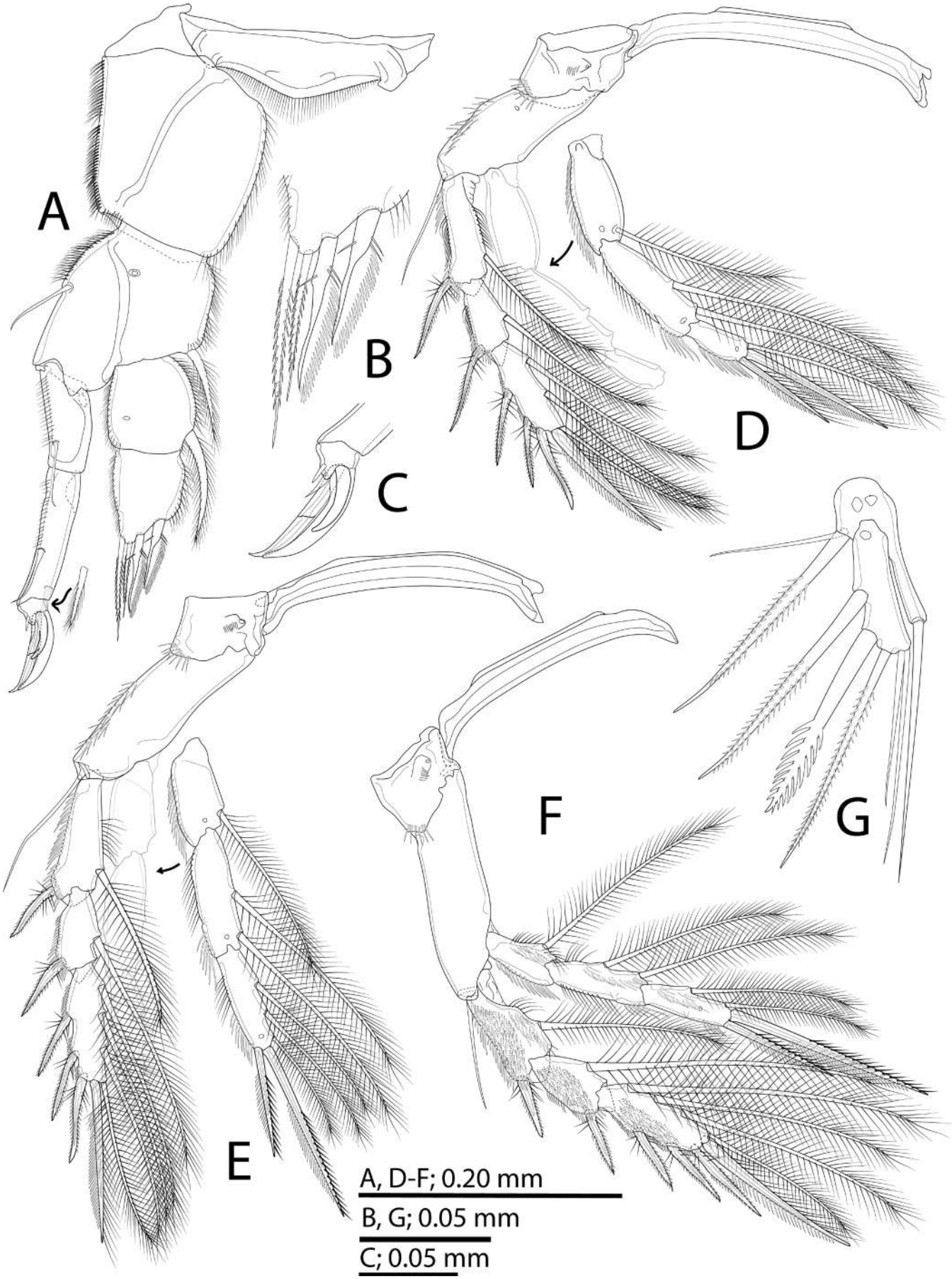

Fig. 7. *Peltidium penyu,* new species, female holotype (UKMMZ-1638). A–C, right P1, anterior view; D, right P2, anterior view; E, right P3, anterior view; F, right P4, anterior view; G, left P5, anterior view.

inserted apically and on outer margin of P5Exp, and *P. ovale* belong to Geddes' (1968) third group in which representatives are characterised by the stilettiform and heavily chitinised P5Exp bearing four spiniform setae and one slim seta.

Amongst members of species group B, *P. penyu,* new species, is distinguished from all its congeners by a combination of the following characteristics: 1) the cephalothorax bears small fenestra situated in the area between the anterior-most median fenestra and rostrum, combined with a large area of cephalic fenestra in which the chitin strut is not or less developed on dorsal surface (Fig. 3A); 2) seven-segmented antennule (Fig. 3A); 3) the maxilliped bears inner minute seta on inner margin of basis (Fig. 6C); and 4) maxilla bears three endites (Fig. 6A). The new species is differentiated from the Neotropical species by having four elements on the armament of P1Enp-2 (Fig. 7A, B) instead of three elements in the latter and from *P quinquesetosum,* which has five elements (see Geddes, 1968: figs. 6B, 8C; Suárez-Morales & Jarquín-González, 2013: fig. 3D; Varela & Gómez, 2018: fig. 4A). All the elements on segment 7 of antennule are setae, with a total number of 12 in the new species, but the elements are comprised of nine setae and one aesthetasc in *P. byungwooi*, *P. camilae*, and *P. nayarit*.

The new species can be distinguished from *P. proximum* by having five elements on P3Enp-3 rather than four, and can be differentiated from the three following species, which include *P. hawaiiense*, *P. monarda*, and *P. maldivianum*, by having a seven-segmented antennule rather than an eight-segmented antennule in the latter three (see Pesta, 1935: fig. 2, 3; Sewell, 1940: fig. 6B). Furthermore, the new species is distinguished from *P. intermedium* and *P. laudatum*, according to the difference of the shape of the P4Enp and P5Exp, respectively. The P4Enp is subequal in length to the Exp in the new species, but it is considerably shorter in *P. intermedium*, and relative length of P5Exp is about 2.5 times as long as wide in the female of the new species, but it is as long as wide in *P. laudatum* (Tanaka & Hue, 1968: fig. 2o).

The new species most resembles *P. exiguum*, which was originally described from the Aru Islands (Indonesia) by Scott (1909) and redescribed from Ifaluk Atoll (Micronesia) by Vervoort (1964). Both species share the characteristics of skeletal pattern of chitin struts (see Scott, 1909: pl. LXV fig. 11; Vervoort, 1964: fig. 46c) and the same armature formula of P1–P5. However, the Malaysian *Peltidium* is differentiated from its closest congener, *P. exiguum*, by the following characteristics: 1) the antennule is seven-segmented (Fig. 4A) [six-segmented as in *P. exiguum* (see Scott, 1909: pl. LXV, fig. 12; Vervoort, 1964: fig. 49b)]; 2) the maxilla has three endites (Fig. 6A) [two in *P. exiguum* (see Vervoort, 1964: fig. 49d)]; and 3) the maxilliped bears a minute seta on the inner margin of the basis (Fig. 6C) [absent in *P. exiguum* (see Vervoort, 1964: fig. 49e)].

Another closely related species is *P. angulatum*, described from Ceylon (now known as Sri Lanka) by Thompson & Scott (1903) and redescribed from the Andaman Islands by Wells & Rao (1987). Based on both contributions, the species bears the following characteristics: 1) the cephalothorax bears two fenestrae in front of the anteriormost median fenestra (see Thompson & Scott, 1903: pl. XIII fig. 7; Wells & Rao, 1987: fig. 37e); 2) the P5Exp bears a relatively long inner apical seta, which is slightly shorter than the outer one; and 3) the maxilliped is without a seta on the inner margin of the basis. Both the new species and *P. angulatum* share the characteristic of having small fenestrae in the area between the anteriormost median fenestra and rostrum, but the new species can be distinguished from *P. angulatum* by having an inner seta on the inner margin of the basis of maxilliped. The ornamentation of the circular craters with a small setule has been recorded in *P. angulatum* (Wells & Rao, 1987); however, the specimens have only two endites on the maxilla, which differs from the new species, in which three endites are present (Fig. 6A).

Two other species with close affinity to the new species are *P. speciosum* and *P. minutum*, because they have small fenestra in the area between the anterior-most median fenestra and rostrum (see Thompson & Scott, 1903: pl. XIII figs. 12, 17; Nicholls, 1941: fig. 5C). The former species was originally described from Ceylon by Thompson & Scott (1903) and redescribed based on specimens from South Australia by Nicholls (1941), and the latter species was described from the Aru Islands, Indonesia by Scott (1909) and was subsequently synonymised with *P. speciosum* by Nicholls (1941). Illustrations of the habitus in Thompson & Scott (1903) and Nicholls (1941) show one single fenestra in the mid-line of the genital double-somite, differing from that of the new species in which the fenestra is longitudinally separated by a strut into two median fenestrae (Fig. 3A).

The last two species belonging to Geddes' (1968) species group B are *P. perplexum* and *P. falcatum*, which were described from Ceylon and the Aru Islands, respectively (Thompson & Scott, 1903; Scott, 1909). The new species can be differentiated from these two species by the characteristics of the skeletal pattern and the difference of the relative length of the inner apical seta on P5Exp. In *P. falcatum* and *P. perplexum*, the small fenestra of the skeletal pattern is absent in the area between the anteriormost median fenestra rostrum (see Thompsom & Scott, 1903: pl. XIII fig. 23; Scott, 1909: pl. LXIV fig. 7), and the P5Exp bears a small inner apical seta, being considerably shorter than the outer one. In the new species, the small fenestrae are present in the mentioned area, and the inner apical seta is relatively longer, reaching about distal third of the outer one (Fig. 6G). Furthermore, the distal margin of the free thoracic somite is produced dorsally in the mid-line in *P. falcatum* (see Scott, 1909: pl. LXIV, fig. 7203), differing from the new species in which the distal margin of the free thoracic somite is plain, without the expansion in the mid-line (Fig. 3A).

Dispersal. This is the first discovery of *Peltidium* species inhabiting a marine cave environment. Members of the genus are otherwise typically associated with phytal habitats, particularly macroalgae and seagrass meadows, where they are often common. The occurrence of *Peltidium penyu* within

Turtle Cave therefore raises questions regarding its mode of dispersal into this atypical habitat.

Rather than indicating permanent cave adaptation, the presence of only two individuals may reflect recent or episodic introduction. Marine turtles, which regularly forage in seagrass habitats and frequently enter coastal caves and overhangs, may act as incidental transport vectors. Considering known ecological pathways linking phytal and cryptic habitats, passive dispersal mechanisms offer the most parsimonious explanation. Dispersal could occur via epibiotic attachment to skin, carapace surfaces, or algal material adhered to the turtle, without requiring ingestion. Such ectozoochorous transport has been increasingly recognised as a mechanism facilitating the redistribution of meiofauna across habitat boundaries, including into cryptic or low-energy environments. While endozoochory via gut passage cannot be entirely excluded, this mechanism remains speculative and is not required to explain the observed distribution. Alternative pathways, including hydrodynamic transport of detached phytal substrates or secondary introduction via mobile fauna, are equally plausible. Comparable studies (e.g., Ptatscheck & Traunspurger, 2020; Martín-Vélez et al., 2022; Bisquert-Ribes et al., 2025) have demonstrated the role of large marine organisms as vectors for meiofaunal dispersal, highlighting a potentially underappreciated influence of megafauna on microfaunal biogeography in marine and aquatic systems. Further sampling is necessary to determine whether *P. penyu* represents a transient occurrence or an overlooked component of cave-associated meiofauna.

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