Bull. Natl. Mus. Nat. Sci., Ser. A, 43(3), pp. 119–128, August 22, 2017

A new species of the subgenus *Javanisomysis* in the genus *Anisomysis* Hansen, 1910 (Mysida, Mysidae) from a sandy beach in Bali, Indonesia

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(Received 12 June 2017; accepted 28 June 2017)

Abstract Mysid specimens reported under *Anisomysis thurneysseni* Nouvel, 1973 by Fukuoka *et al.* (2002) were re-examined and re-assessed taxonomically. These specimens consistently differ from the original description of *A. thurneysseni* by Nouvel (1973) on (1) the length of the fourth male pleopod, (2) the arrangement of apical spines on the telson, (3) the articulation in some thoracopodal endopods in both sexes, and (4) the form of the frontal carapace plate. The species is also clearly separable from *A*. (*J.*) *gutzui* Băcescu, 1992 and *A*. (*J.*) *similis* Sawamoto *et al.*, 2015 on the fourth male pleopod and the articulation in several thoracopodal endopods in both sexes. The species thus is considered a new species of the subgenus *Javanisomysis*.
Key words: Mysida, Crustacea, Mysidae, *Anisomysis* (*Javanisomysis*), new species, *A.* (*J.*) *baliensis.*

Introduction

The genus *Anisomysis* was established by Hansen (1910) to describe *Anisomysis laticauda* collected during the Siboga Expedition. The genus was later divided by Băcescu (1973) into two subgenera, *Paranisomysis* and *Anisomysis*, based mainly on the structure of mandibular palp. Furthermore, Băcescu (1992b) provisionally created the subgenus *Javanisomysis.* This subgenus was recently redefined and reinstated under the genus *Anisomysis* by Sawamoto, Srinui and Moriya (2015) so as to provide a combination of following morphological characteristics: (1) the carapace armed with spinules on the anterolateral margin, (2) the first segment in the fourth male pleopodal exopod as long as or slightly shorter than the third segment, excluding the terminal setae, and (3) the telson with basally un-articulated denticles on the lateral margin.

Murano and Fukuoka (2003) studied the taxonomy of the genus *Anisomysis*, in which they created a fourth subgenus, *Pseudanisomysis*, to accommodate *Carnegieomysis xenops* (Tattersall, 1943) and other few species that have the eye divided into two parts by a groove. However, *Pseudoanisomysis* is considered a junior synonym of the subgenus *Carnegieomysis* W. Tattersall, 1943 (see the Board of Editors of Crustaceana, 2015 DOI 10.1163/15685403-00003486). Thus the genus *Anisomysis* is currently regarded to contain the four subgenera, *Anisomysis*, *Paranisomysis*, *Javanisomysis* and *Carnegieomysis*.

Fukuoka, Hanamura and Murano (2002) reported an interesting species similar to *Anisomysis* (*Anisomysis*) *thurneysseni* Nouvel, 1973 from Bali Island, Indonesia. *A. thurneysseni* shows typical morphological characteristics of

the subgenus *Javanisomysis*, and is accommodated in this subgenus (see Sawamoto *et al.*, 2015). The specimens of Fukuoka *et al.* (2002) appeared to be different from the original description of Nouvel (1973) in certain features, i.e. (1) the fourth male pleopod fully reaching the base of the telson, and (2) an indistinctly articulated and regularly arranged apical spines on the telson. The Balinese specimens studied by Fukuoka *et al.* (2002) were examined and compared with other known congeners of the subgenus *Javanisomysis*, *A*. (*J.*) *gutzui*, *A*. (*J.*) *similis* and *A*. (*J.*) *thurneysseni.* Our analysis reached is the recognition of a fourth species in the subgenus from a sandy coast of Bali, Indonesia.

Methods

Body length was measured from the tip of the rostrum to the distal end of the telson excluding apical denticles with a micrometer installed on the eyepiece. Illustrations were made with the aid of a camera lucida, in which marginal setae of some appendages, especially the antennal scale, thoracopodal exopods and uropod, were omitted. Terminology was based mainly on Wittmann, Ariani and Lagardère (2014).

Specimens examined in this study are lodged at the National Museum of Nature and Science, Tsukuba, Japan (NSMT).

Taxonomy

Family Mysidae
Subfamily Mysinae
Tribe Anisomysini
Genus *Anisomysis*
Subgenus *Javanisomysis* Băcescu, 1992

Genus *Javanisomysis* Băcescu, 1992a: 20, Fig. 1A–G; Murano and Fukuoka, 2003: 66; Sawamoto and Fukuoka, 2005: 86 (in list); Sawamoto, 2014: 6 (in list).

Subgenus *Javanisomysis* Băcescu, 1992b: 79–86, Figs. 1A–N, 2A–H; Sawamoto, Srinui and Moriya, 2015: 814–816.

Type species: Javanisomysis gutzui Băcescu, 1992a.

Diagnoses. Eyes globular, not divided into 2 portions. Carapace with spinules along antero-lateral margin. Antennular peduncle having neither expanded lobe nor finger-like process on second segment. Second segment of mandibular palp foliate, without prominent triangular processes armed with subterminal seta. First segment of fourth male pleopodal exopod as long as or slightly shorter than third segment, excluding terminal barbed setae. Telson short, linguiform, denticles on lateral margin un-articulated. Other features typical for species of genus *Anisomysis*.

Anisomysis (*Javanisomysis*) *baliensis* sp. nov.

(Figs. 1–4)

Anisomysis thurneysseni: Fukuoka, Hanamura and Murano, 2002: 43, Fig. 1O, P (not Nouvel, 1973).

Material examined. Holotype (NSMT-Cr 25563), adult male (BL 2.8 mm); allotype (NSMT-Cr 25564), adult female (BL 2.6 mm); paratypes (NSMT-Cr 25565), 3 males (BL 2.5–2.6 mm; dissected male, BL 2.6 mm), 8 females (BL 2.3–2.7 mm; dissected female, BL 2.6 mm), 1 juvenile (BL 2.1 mm), Tasman Sar, Pejamantan Bay, Bali Island, Indonesia, sandy beach, 4 Dec. 1996, coll. Y. Ogawa and Y. Hanamura.

Description. Tegmen of body smooth. Anterior margin of carapace broadly triangulate or rounded, partly covering basal part of eye-stalk (Fig. 1C, D). Carapace with spinules on antero-lateral margin (Fig. 1A–D), rounded at antero-ventral corner, hardly covering basal parts of maxillule and maxilla anteriorly, and leaving uncovered last thoracic somite postero-dorsally (Fig. 1A, B). Eye large, cornea globular, not concealed by anterior part of carapace except for proximal part of eye-stalk (Fig. 1C, D). Antennular peduncle more robust in male than in female (Fig. 1C, D), second segment shortest in both sexes; first and second segments with minute dorsal projection with setae; first and third segments with setae at antero-lateral corner (Fig.

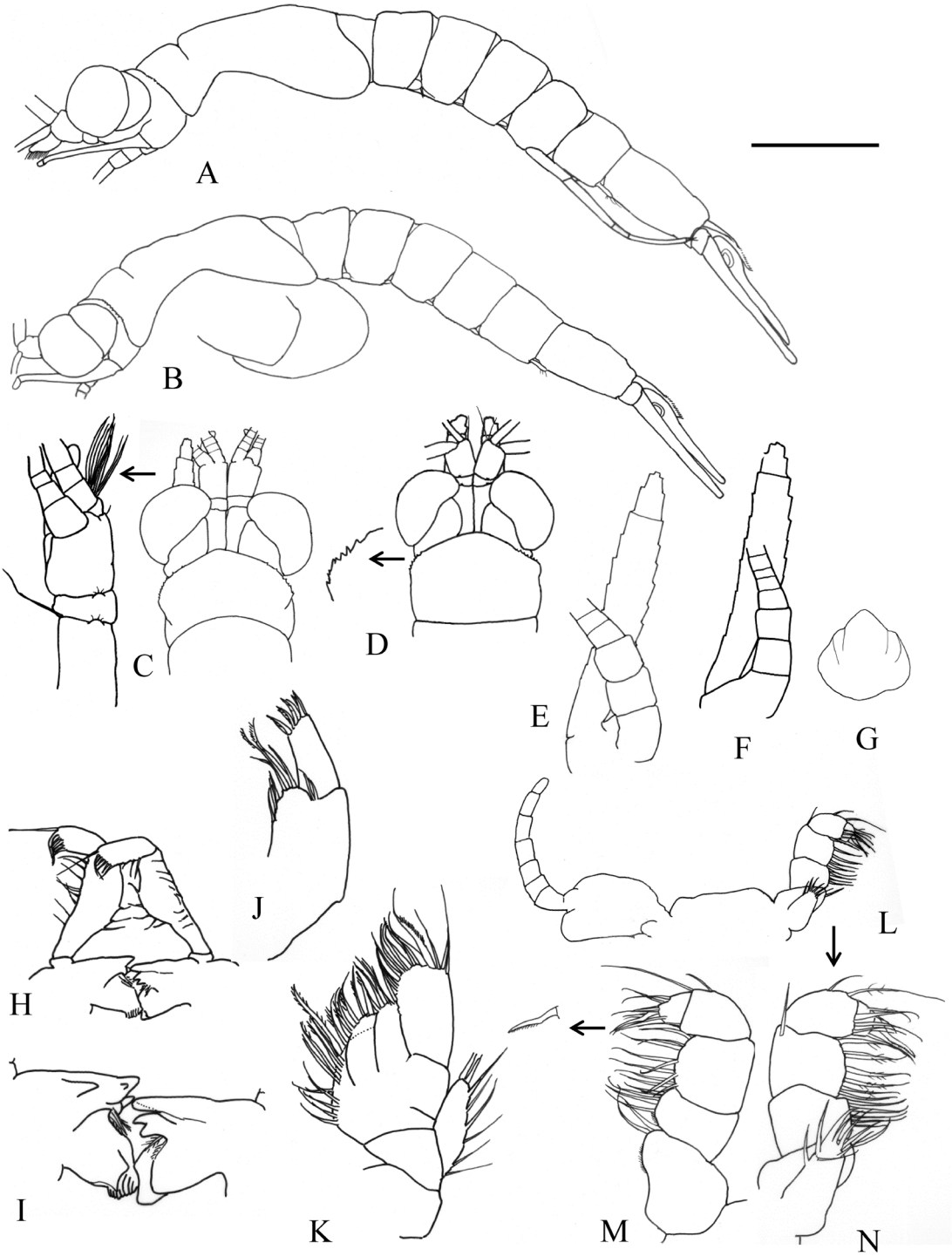

Fig. 1. *Anisomysis* (*Javanisomysis*) *baliensis*, sp. nov. Holotype, male (BL 2.8 mm: A, C, E), allotype, female (BL 2.6 mm: B, D, F), paratype, male (BL 2.6 mm: H–N) and female (BL 2.6 mm: G). A, B, lateral view of whole body; C, dorsal view of anterior body, left antennular peduncle enlarged; D, dorsal view of anterior body, left antero-lateral margin of carapace enlarged; E, F, ventral view of antenna; G, external view of labrum; H, external view of mandibles with palps; I, external view of mandibles enlarged; J, right maxillule; K, right maxilla; L, right first thoracopod; M, right first thoracopodal endopod, terminal claw enlarged; N, right first thoracopodal endopod. Scale bar 0.5 mm for A, B; 0.4 mm for C, D; 0.2 mm for E–H, L; 0.1 mm for I–K, M, N.

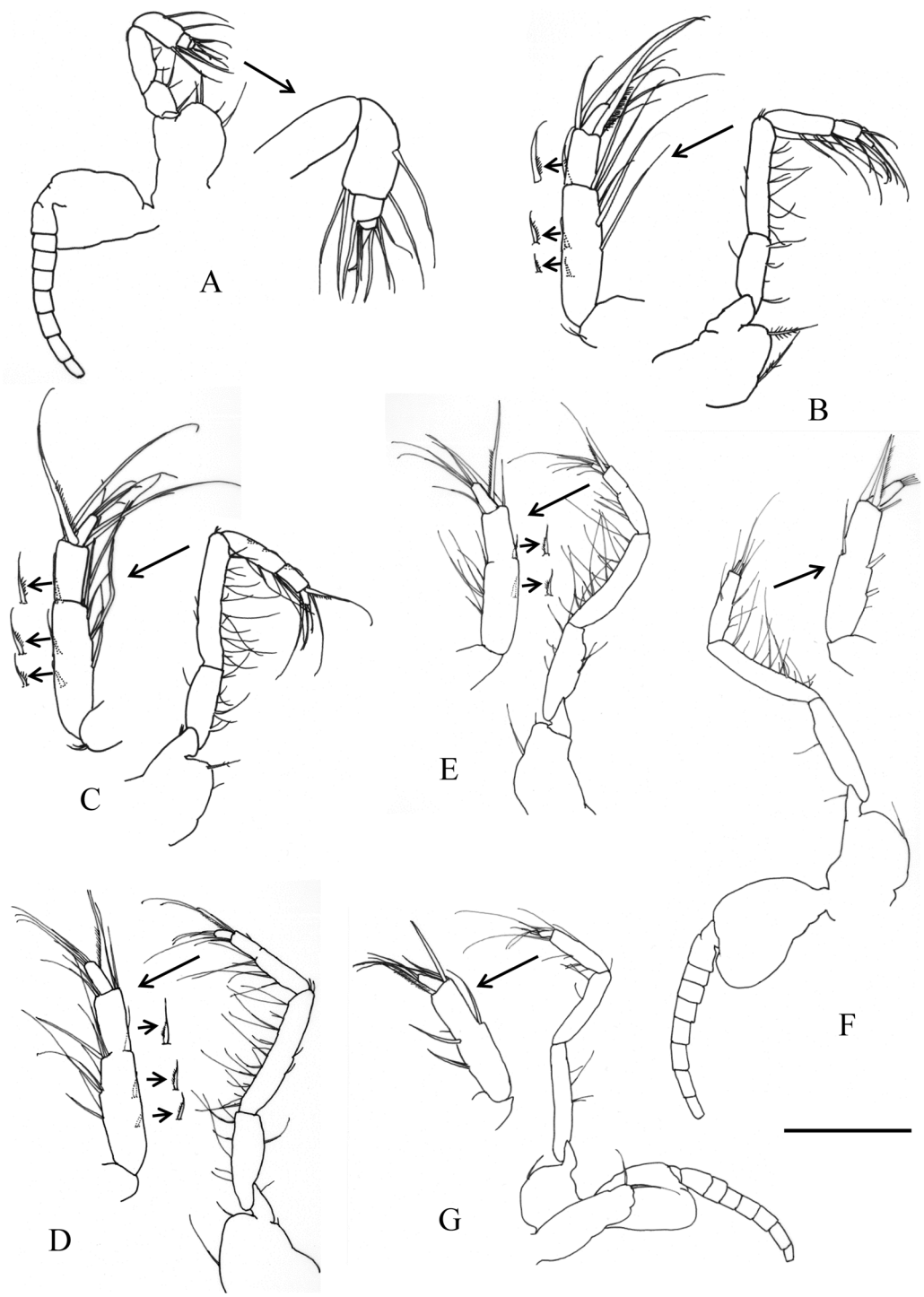

Fig. 2. *Anisomysis* (*Javanisomysis*) *baliensis*, sp. nov. Paratype, male (BL 2.6 mm: same specimen as for fig. 1: A–G). A, right second thoracopod; B, right third thoracopodal endopod; C, right fourth thoracopodal endopod; D, right fifth thoracopodal endopod; E, right sixth thoracopodal endopod; F, right seventh thoracopod; G, right eighth thoracopod with penis (Distal segments of the second to the eighth endopods are enlarged). Scale bar; 0.2 mm for A–G.

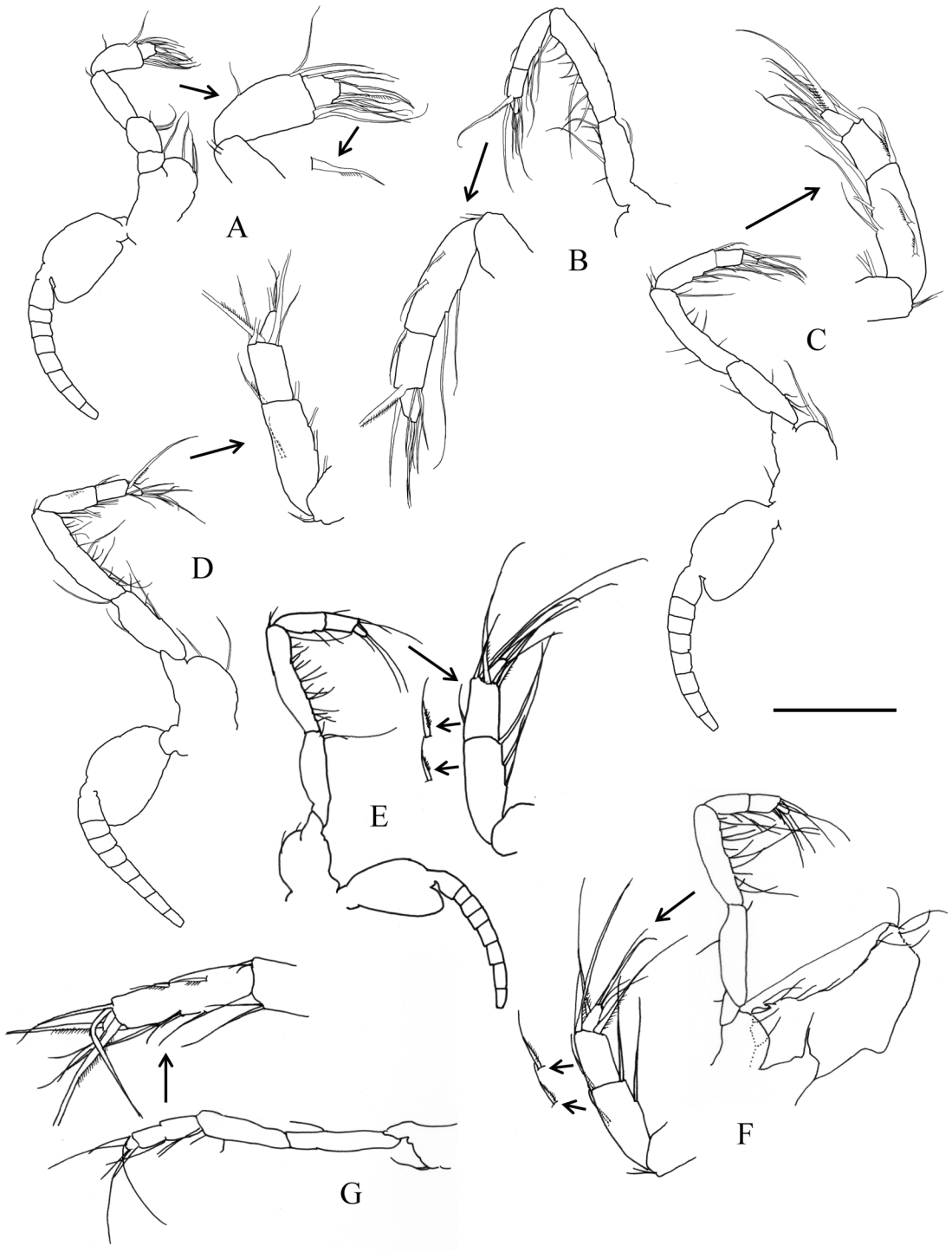

Fig. 3. *Anisomysis* (*Javanisomysis*) *baliensis*, sp. nov. Paratype, female (BL 2.6 mm: same specimen as for fig. 1: A–G). A, right second thoracopod; B, right third thoracopodal endopod; C, right fourth thoracopod; D, right fifth thoracopod; E, right sixth thoracopod; F, right seventh thoracopodal endopod with oostegite; G, right eighth thoracopodal endopod (Distal segments of the second to the eighth endopods are enlarged). Scale bar; 0.2 mm for A–G.

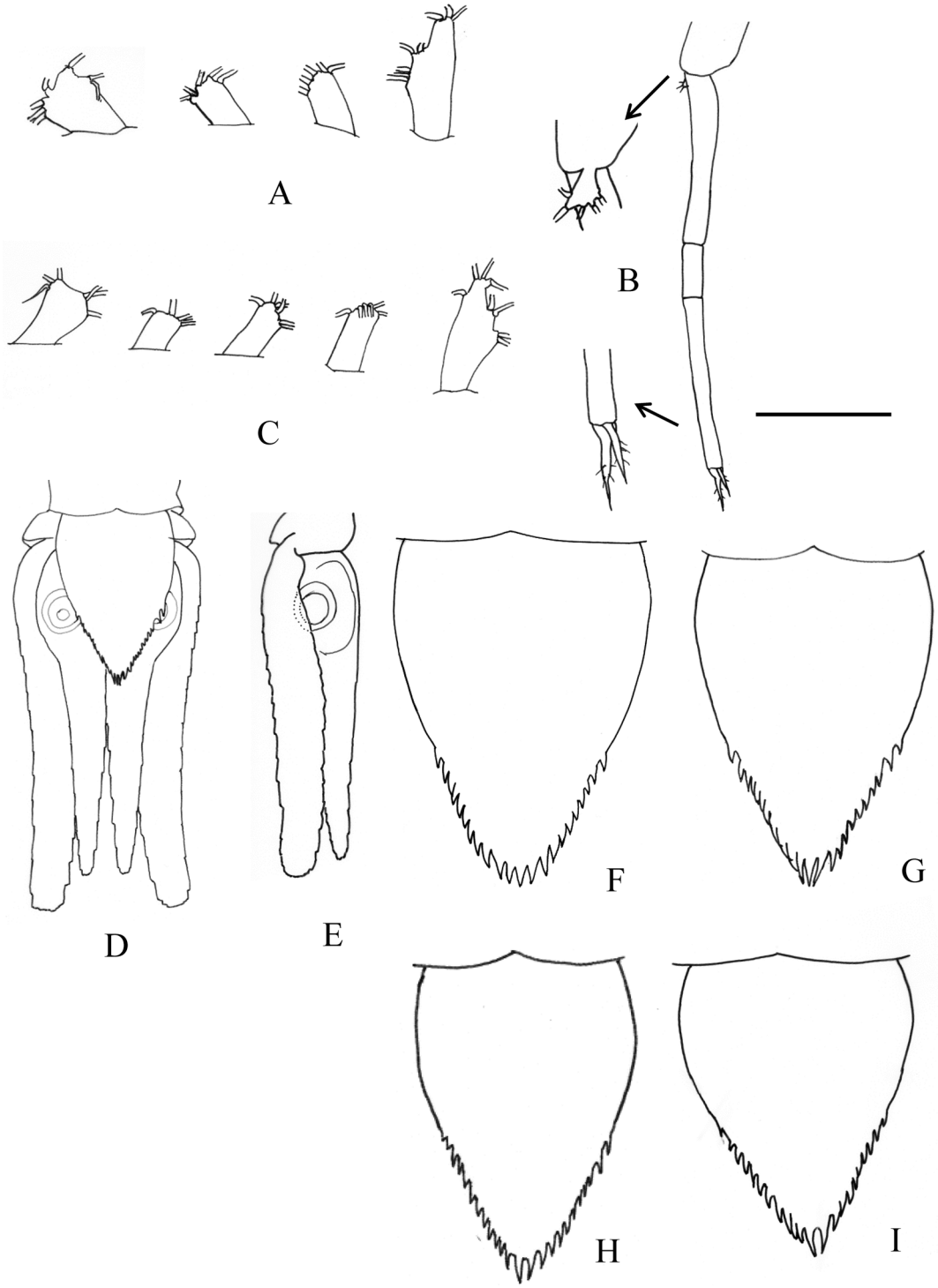

Fig. 4. *Anisomysis* (*Javanisomysis*) *baliensis*, sp. nov. Holotype, male (BL 2.8 mm: A, B, F), allotype, female (BL 2.6 mm: C, E, H), paratype, male (BL 2.6 mm: same specimen as for fig. 1: D, G) and female (BL 2.6 mm: same specimen as for fig. 1: I). A, ventral view of right first to third and fifth male pleopods from left to right; B, ventral view of right fourth male pleopod, endopod and apical barbed setae enlarged; C, ventral view of first to fifth left female pleopods from left to right; D, dorsal view of uropod and telson; E, ventral view of right uropod; F, dorsal view of telson; G, dorsal view of telson; H, dorsal view of telson; I, dorsal view of telson. Scale bar 0.2 mm for B, D, E; 0.1 mm for A, C, F–I.

1C). Antennal scale over-reaching anterior end of antennular peduncle excluding male lobe in male (Fig. 1A, C), over-reaching in female (Fig. 1B, D), nearly 6 times longer than wide, and nearly 2.3 times longer than antennal peduncle in male (Fig. 1E) and nearly 2.4 times longer in female (Fig. 1F), narrowly lanceolate, setose all around, nearly straight in male and slightly curved outward in female, with rounded apex, near-apical suture present. Abdominal somites smooth, first 5 ones sub-equal in length, sixth longest, nearly 2 times longer than fifth in male (Fig. 1A) and 1.5 times longer in female (Fig. 1B).

Labrum anteriorly obtuse, without process, with expanded antero-lateral parts (Fig. 1G). Mandibular palp 3-segmented; second segment longest and widened at mid-length, with barbed setae on both margins, 3 to 5 on inner margin and 7 to 10 on outer margin in males (Fig. 1H, Table 1), and 3 to 5 and 6 to 9, respectively in females (Table 1). Maxillule (Fig. 1J), maxilla (Fig. 1K) and first thoracopodal endopod (Fig. 1L–N) similar in form between male and female. Claw of dactylus of first thoracopodal endopod remarkable in shape with long spine constricted at middle part and then curved distally, fringed with minute denticles from middle to distal part (Fig. 1M). Similar spine also present on dactylus of second thoracopodal endopod (Figs. 2A, 3A). Third to fifth thoracopodal endopods comparatively long and then becoming gradually shorter towards eighth. Carpopropodus of thoracopodal endopod divided distally into 2 segments in third and fourth legs in male (Fig. 2B, C) and third to seventh in female (Fig. 3B–F); fifth to eighth endopods of male (Fig. 2D–G) and eighth of female (Fig. 3G) undivided; third to sixth endopods with 2 or 3 outer marginal setae fringed with minute denticles in male (Fig. 2B–E) and in third to eighth in female (Fig. 3B–G); flagelliform parts of first and eighth thoracopodal exopods with 7 segments (Figs. 1L, 2G) and those of second to seventh exopods with 8 segments in both sexes (Figs. 2A, F, 3A, C–E). Oostegite on seventh thoracopod (Fig. 3F) smaller than that of eighth. Penis cylindrical, with 2 setae at rounded apex (Fig. 2G).

Pleopods uniramous, un-segmented in first to third and fifth of male (Fig. 4A); first pleopod slightly bilobate, widened distally and broader

Table 1. Intraspecific variation in the number of setae on the second segment of the mandibular palp and denticles on the telson of paratype specimens of *Anisomysis* (*Javanisomysis*) *baliensis* sp. nov.

Sex	Body length (mm)	Number of setae on				No. of denticles on telson
		Left mandibular palp		Right mandibular palp		
		Outer margin	Inner margin	Outer margin	Inner margin	
Male (n = 4)	2.8	7	3	7	3	22
	2.5	10	4	8	4	24
	2.5	8	4	8	4	22
	2.6	7	5	8	5	24
Average	2.6	8.0	4.0	7.8	4.0	23.0
Female (n = 9)	2.5	8	4	7	5	23
	2.6	7	4	7	4	20
	2.4	7	4	9	4	23
	2.6	9	4	8	4	22
	2.3	6	3	6	3	19
	2.7	6	4	6	4	19
	2.5	9	No data	No data	No data	23
	2.5	7	3	7	3	22
	2.6	No data	No data	6	3	26
Average	2.5	7.4	3.7	7.0	3.8	21.9
Juvenile (n = 1)	2.1	6	3	No data	No data	21

Table 2. Comparison of morphological characters among four species of the subgenus *Javanisomysis* in the genus *Anisomysis*

Species/Morphological characters	*Anisomysis* (*J.*) *gutzui* Băsescu (1992a)	*Anisomysis* (*J.*) *similis* Sawamoto *et al.* (2015)	*Anisomysis* (*J.*) *thurneysseni* Nouvel (1973)	*Anisomysis* (*J.*) *baliensis* sp. nov.
Carapace	Produced anteriorly into broadly rounded or rounded triangular plate	Same as *A. gutzui*	Produced anteriorly into obtuse triangular plate	Same as *A. gutzui*
Antennal scale length to width ratio length ratio to peduncle	Narrowly lanceolate, setose all around, slightly curved outward; nearly 6.5 times longer than wide; nearly 2.0 times (male), nearly 2.5 times (female) longer than antennal peduncle	Same as *A. gutzui*; 5.0–5.5 times longer than wide; nearly 2.0 times (male) and nearly 2.3 times (female) longer than antennal peduncle; (length of flagellum ca. 80% of BL in male, ca. 65% in female)	Same as *A. gutzui*; ratio not described	Nearly straight in male, slightly curved outwards in female; nearly 6 times longer than wide; nearly 2.3 times (male) and nearly 2.4 times (female) longer than antennal peduncle; (length of flagellum ca. 100% of BL in male, ca. 70% in female)
Mandibular palp 2nd segment	With 3–5 barbed setae along inner margin and 8–10 along outer margin in male, 3–5 along inner margin and 7 or 8 along outer margin in female	With 3–5 barbed setae along inner margin and 5–9 along outer margin in male, 3 or 4 along inner margin and 5–9 along outer margin in female	Not described	With 3–5 barbed setae along inner margin and 7–10 along outer margin in male, 3–5 along inner margin and 6–9 along outer margin in female
Thoracic endopods	3rd to 8th thoracopod carpopropodi in male and 3rd to 6th in female indistinctly divided distally into 2 segments	3rd to 8th thoracopod carpopropodi in male and 3rd to 5th in female divided distally into 2 segments	3rd to 8th thoracopod carpopropodi un-divided	3rd and 4th thoracopod carpopropodi in male, 3rd to 7th carpopropodi in female divided distally into 2 segments
Length of 4th male pleopod	Reaching posterior 3/4 of 6th abdominal somite excluding apical barbed setae	Same as *A. gutzui*	Reaching midlength of 6th abdominal somite	Reaching or slightly over- reaching posterior margin of 6th abdominal somite excluding apical barbed setae
4th male pleopod Endopod and exopod	Endopod minute, with 6 setae; 1st segment of exopod becoming gradually broadened towards distal 1/3, then narrowing distally, with small, blunt projection at widest corner	Endopod minute, with 7 setae; exopod same as *A. gutzui*, 1st segment of exopod same as *A. gutzui* but without projection at widest corner	Endopod minute, with several setae; 1st segment of exopod cylindrical, sub-equal to 3rd segment in length	Endopod minute, with 5 setae; 1st segment of exopod cylindrical, slightly longer than 3rd segment
Telson	Nearly half length of 6th abdominal somite, linguiform, as long as wide, fringed with 21 to 26 denticles in distal 1/3 to 1/2, apical 2 denticles slightly longer than others	Nearly half length of 6th abdominal somite, linguiform, narrow at base, widened towards proximal 1/3, as long as wide or slightly longer than width, fringed with 16 to 26 (mostly 20–24) denticles in distal 1/3 to 1/2, apical 2 denticles same as *A. gutzui*	Length ratio not described, linguiform, narrow at base, widened towards proximal third, ca. 1.5 times longer than width, fringed with 18 to 23 denticles in distal 1/3, denticles nearly same in length, apical denticles irregularly arranged	Nearly 2/3 of 6th abdominal somite in length, linguiform, narrow at base, widened towards proximal 1/3, 1.2–1.3 times longer than width, fringed with 19 to 26 (mostly 20–24) denticles in distal 1/2, apical 2 denticles same as *A. gutzui*
Body length (mm)	Male 3.0–3.2; female 2.5–3.0	Male 2.3–3.4; female 2.6–3.6	Male 3.3–3.7; female 3.5–3.7	Male 2.4–3.2; female 2.5–3.2
Source of data	Sawamoto *et al.* (2015)	Sawamoto *et al.* (2015)	Nouvel (1973)	Present study

than remaining ones, third pleopod narrow; fourth pleopod biramous (Fig. 4B); endopod minute, with 5 setae (Fig. 4B); exopod long, reaching posterior margin of sixth abdominal somite, excluding barbed setae, cylindrical and 3-segmented, first segment slightly longer than third, second segment shortest, third segment with 2 terminal barbed setae of different form, inner seta robust in proximal part, slightly longer than outer slender seta (Figs. 1A, 4B). Female pleopods all un-segmented, uniramous; first pleopod slightly widened distally, second shortest, fifth longest and similar in form to male (Fig. 4C). Uropodal endopod shorter than exopod (Fig. 4D, E), without spine on ventral side in statocyst region (Fig. 4E). Telson nearly half length of sixth abdominal somite, slightly longer than wide (1.1 to 1.3 times longer excluding apical 2 denticles), linguiform, narrow at base, widened towards proximal third, distal third triangular in shape, with 22 to 24 basally un-articulated denticles in males (Fig. 4F, G, Table 1) and with 19 to 26 (commonly 19–23) in females (Fig. 4H, I, Table 1), unarmed with apical plumose setae (Fig. 4F–I).

Etymology. This species is named after the locality of the specimens, Bali Island.

Distribution. This species was captured on a sandy beach at Tasman Sar, Pejamantan Bay, Bali Island, Indonesia. Recently, a research team led by Hanamura found a considerable number of mysids referable to this species from shallow-coastal waters in Lombok Island, Indonesia. Further information on these materials will be reported elsewhere.

Remarks. The specimens collected from Bali were once reported by Fukuoka *et al.* (2002) under *A. thurneysseni* Nouvel 1973, that was originally recorded from New Caledonia, although they noted differences between the two populations in the length of the male fourth pleopod; i.e., the exopod of the fourth male pleopod extends posteriorly beyond the base of the telson in Balinese specimens, whereas it barely reaches the middle of the last abdominal somite in the type specimens. This initiated further studies and the present observation confirmed the finding by Fukuoka *et al.* (2002). However, in the present observation, marginal denticles on the telson were found to be completely un-articulated at base as opposed to indistinct but articulated ones in the previous description (see Fukuoka *et al.*, 2002). In their short report, no information on thoracopodal endopods was provided.

Morphological characteristics of the Balinese specimens, now considered the new species *A.* (*J*) *baliensis*, were compared with those of the three known species of the subgenus *Javanisomysis* (Table 2). The present new species exhibits a closer affinity to *A.* (*J.*) *thurneysseni* but it can be separable based on (1) the length of the fourth male pleopod, (2) the articulation in some thoracopodal endopods in both sexes, (3) the form of the frontal carapace plate, and (4) the arrangement of the denticles of the telson. In addition, the third and fourth thoracopodal endopods also differ in having with two-segmented carpopropodi in male (Fig. 2B, C), and similarly in the third to seventh in female (Fig. 3B–F) in *A.* (*J.*) *baliensis* instead of undivided ones in *A.* (*J.*) *thurneysseni*. The frontal carapace plate is broadly rounded or rounded triangular in *A.* (*J.*) *baliensis* in contrast to bluntly pointed triangular in *A.* (*J.*) *thurneysseni*. The apical denticles of the telson are slightly longer than the others in *A.* (*J.*) *baliensis*, while irregularly arranged in *A.* (*J.*) *thurneysseni*. The form of the first segment of the exopod of the fourth male pleopod is remarkable in having no expansion as in *A.* (*J.*) *thurneysseni*, and this is a clear contrast to *A.* (*J.*) *similis* and *A.* (*J.*) *gutzui*, both of which have a marked expansion near the distal part. The telson of *A.* (*J.*) *baliensis* is approximately one and half times longer than broad at base as in *A.* (*J.*) *thurneysseni*, while it is approximately the same length in *A.* (*J.*) *gutzui* and *A.* (*J.*) *similis*, and denticles on the telson are irregular both in size and arrangement in *A.* (*J.*) *thurneysseni*, while they are regularly arranged and become longer distally in *A.* (*J.*) *gutzui* and *A.* (*J.*) *similis* and *A.* (*J.*) *baliensis*.

Acknowledgements

We express our hearty thanks to Dr. Kouki Fukuoka, Seikai National Fisheries Research Institute, Japan Fisheries Research and Education Agency, for reading and useful comments to our manuscript. We acknowledge Prof. Dr. Ephrime B. Metillo, Mindanao State University, Iligan Instituite of Technology, for his useful suggestions and improvement of the English to our manuscript. We acknowledge our sincere thanks to Dr. Yasuhiro Senga, School of Marine Science and Technology, Tokai University, for his kind support during the laboratory work. Our thanks also go to Dr. Yasuki Ogawa for his help in the field sampling.

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