

A NEW CALANOID COPEPOD OF THE GENUS *ACARTIA* FROM THE  
COCHIN BACKWATERS, INDIA, AND A REDESCRIPTION OF  
*ACARTIA CENTRURA* GIESBRECHT

BY

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While studying the systematics and ecology of copepods of the family Acartiidae from plankton samples collected in 1968-'69, from the Cochin Backwaters, a species of *Acartia* closely related to and co-existing with the females of *Acartia centrura* Giesbrecht, 1889, but different specifically from all other known species of the genus, was encountered.

Previously members of the family Acartiidae from the Cochin Backwaters were recorded by George (1958), Wellershaus (1969), Abraham (1970) and Tranter & Abraham (1971). New species of this family have been recorded from this area (Wellershaus, 1969; Abraham, 1970). The discovery of another new species from these waters is not surprising as this estuary is characterised by the greatest species diversity of Acartiidae on record (Abraham, 1969).

Since a detailed description of *Acartia centrura* is lacking, a redescription was found necessary for a comparative study with the new species. As the males of *A. centrura* were absent in the plankton samples examined, specimens collected from Eastern Mediterranean were borrowed from Prof. Kimor of Israel.

***Acartia centrura* Giesbrecht, 1889 (figs. 4-6, 13-16)**

*Acartia centrura* Giesbrecht, 1889: 25; Giesbrecht, 1892: 508, pl. 30 figs. 26, 31, pl. 43 figs. 9, 16; Sewell, 1932: 396 (synonymy); Wellershaus, 1969: 273-274, ♀, figs. 86, 87; Tranter & Abraham, 1971: 224, ♀, fig. 2B g.

Locality and material. — 10 females and 10 males from Natanya, Israel, eastern Mediterranean, collected at a depth of 25 fath. on 18 December 1968.

The first record of *Acartia centrura* was from the Red Sea (Giesbrecht, 1889). Later this species was recorded from the Ceylon Pearl Banks (Thompson & Scott, 1903; Sewell, 1914); from Chilka Lake (Sewell, 1924); at Investigator Stations 540, 541, 542, 543, 544, 552 and 562; from the coast of Southern Burma (Sewell, 1932) and from Indian coastal waters (Kasturirangan, 1963). It therefore appears to be widely distributed throughout Indian Seas.

Description. — Female: Total length 1.35 to 1.4 mm. Head broadly triangular anteriorly, rostral horn well developed. Relative lengths of prosome and urosome 78:22%. Posterior corners of fifth pedigerous segment rounded with 1 pair of spines on each side, lateral spine longer than dorsal spine (fig. 4). Relative lengths

of urosome segments and caudal rami 40:20:16:24%; genital segment longer than wide; posterodorsal surface of genital and second urosome segments armed with 1 pair of spines, former pair smaller; anal segment shortest, without spines, distolateral half fringed with hairs. Caudal rami twice as long as wide with hair on lateral margins.

A1 of 17 to 18 rather well-defined segments, extending to distal end of 2nd urosome segment. Spines on distal margins of 5th, 10th, 11th and 13th segments on posterior side; 1 spine each on 5th, 10th and 11th and 3 on 13th (fig. 6a-c). In the original description and illustration the presence of these spines is not mentioned. Steuer (1923) refers to an unclear small spine on hinder side of segment 1.

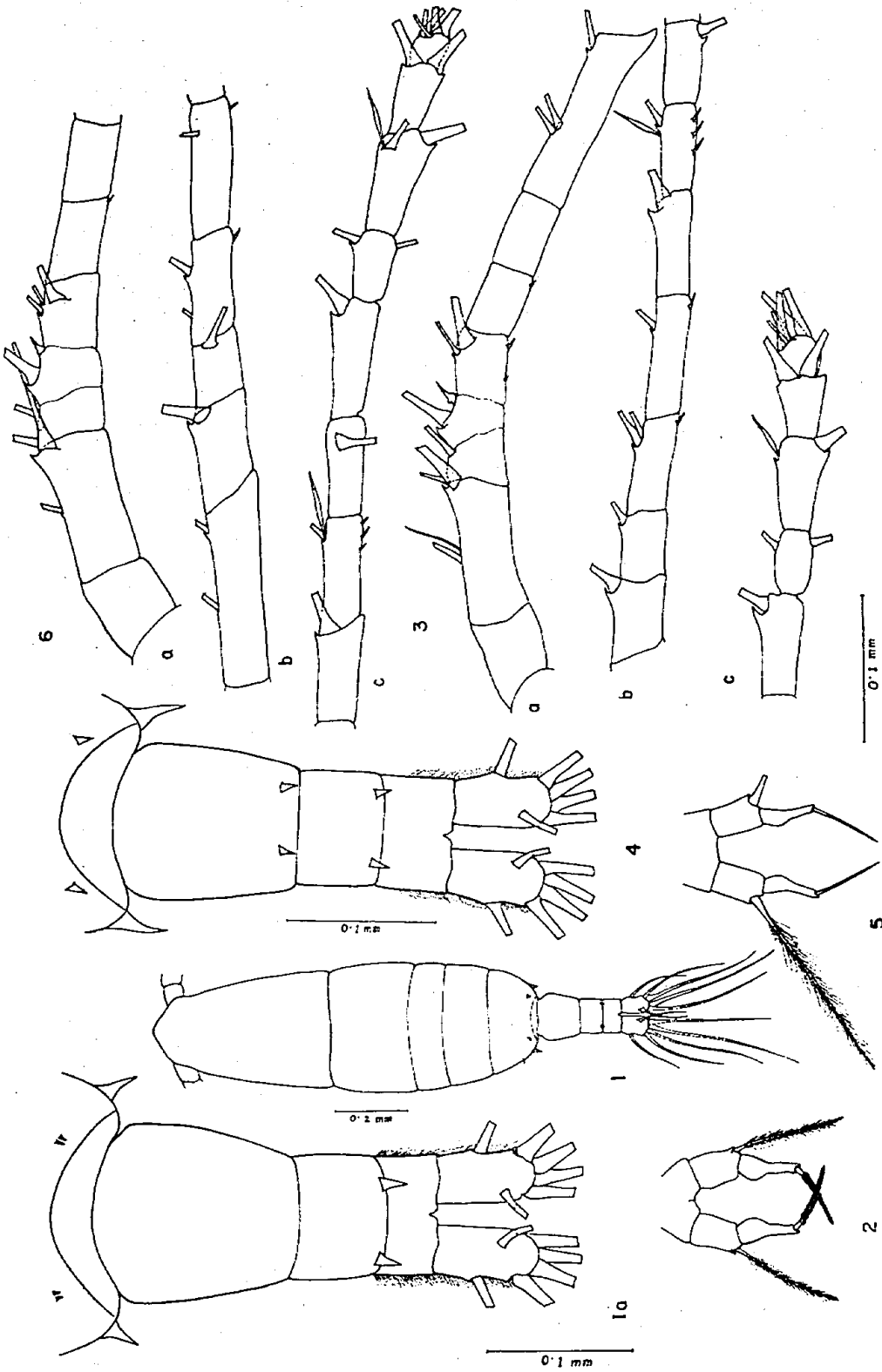
Mouth parts quite similar to those of *Acartia bilobata* (cf. Abraham, 1970) except for cutting edge of mandible (fig. 16) and intersettle spacing of maxillae (Tranter & Abraham, 1971, fig. 18 c, d). Legs 1 to 4 typical for genus *Acartia* with 2-segmented endopods and 3-segmented exopods. In leg 5, first segments fused medially, second segment about twice as long as wide with plumose seta nearly twice as long as third segment and terminal spine; third segment expanded basally and narrowed distally terminating in a pointed and non-dentate spine (fig. 5).

Male: Total length 1.25 to 1.28 mm. Shape and spination of prosome as in female but lateral spines smaller. Proportions of prosome and urosome 76:24%. Relative lengths of urosome segments and caudal rami 12.4:33.4:25.4:12.8:12.4%. Lateral margins of first urosome segment bilobed with a pair of setae emerging one on either side of lower lobe. Posterior margins of 2nd, 3rd and 4th urosome segments armed with 2 to 6 spines. Small spines seen in between larger ones on segments 3 and 4 (not found in original figures and description). Posterior margin of anal segment with 1 pair of spinules. Caudal rami short (fig. 13).

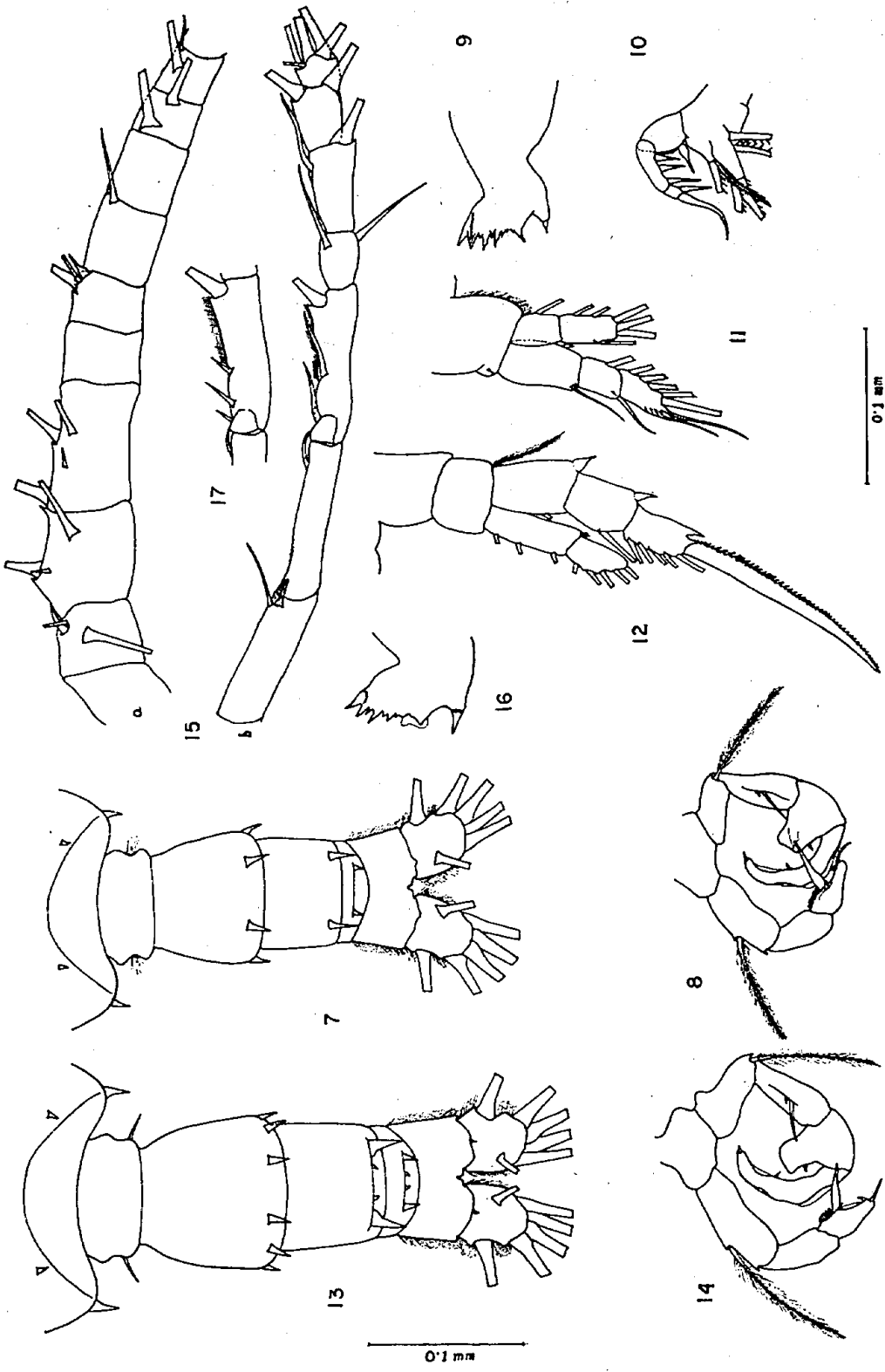
A1 reaching to distal end of urosome; geniculation between 12th and 13th segments, these segments having serrated anterior margins; one slender long spine and 1 spatula-shaped structure on distal region of 11th segment towards anterior margin; 14th and 15th segments with single spine anteriorly (fig. 15 a, b). These features not found in original description and figures.

Mouth parts and legs 1 to 4 as in female. Right leg of P5 with broad 1st segment, narrow second segment with a strong spine on inner posterior part; 3rd segment with inner lobe of roughly quadrangular shape carrying 1 spinule on distal inner margin; 4th segment long with 1 small spine on inner mid region and terminating in similar spine. Left 5th leg with rather broad first segment; narrow second segment; 3rd segment fringed with hairs on inner proximal region, having leaf-like process and a small basal spine at about mid-length and apex with spine and short curved process (fig. 14).

**Discussion.** — Females of 1.22 to 1.45 mm (specimens falling into two distinct size groups: 1.22-1.30 mm and 1.35-1.45 mm), quite similar to *Acartia centrura* females, were found in the plankton samples examined from Cochin Backwaters,



Figs. 1-3. *Acartia boumani* n. sp., female. 1, female, dorsal view; 1a, urosome, dorsal view; 2, fifth foot; 3, first antenna, right side. (1 and 3, holotype; 2, paratype).  
 Figs. 4-6. *Acartia centrura* Giesbrecht, 1889, female. 4, urosome, dorsal view; 5, fifth foot; 6, first antenna, right side.



Figs. 7-12. *Acartia bowmani* n. sp. 7, urosome, ♂, dorsal view; 8, fifth foot, posterior view, ♀; 9, gnathal lobe of mandible; 10, maxilliped; 11, first foot; 12, fourth foot. (7, allotype; 8-12, paratype).

Figs. 13-16. *Acartia centrura* Giesbrecht, 1889. 13, urosome, ♂, dorsal view; 14, fifth foot, ♂, posterior view; 15, first antenna, ♀, right side; 16, gnathal lobe of mandible.

but males were totally absent. This species penetrated and spread throughout the estuary between January and June along with high salinity water from the shelf (Tranter & Abraham, 1971, figs. 7 b, c). The absence of males, however, is quite intriguing. It is possible that the males are not as tolerant to the lower salinity conditions of the estuary as their females, which may lead to an ecological segregation of sex. Or it may be that the females are what Hutchinson (1951) has termed "fugitive species". Tranter & Abraham (1971: 239) discussed the possibility that the Acartiidae of Cochin Backwater are a typical example of a "non-equilibrium population". An answer to this problem will be forthcoming only from an intensive study of the plankton of the adjacent marine area which is in progress.

***Acartia bowmani* n. sp. (figs. 1-3, 7-12)**

*Acartia spinicauda* Wellershaus, 1969: 275, figs. 76-78, ♂.

*Acartia centrura* Tranter & Abraham, 1971: 223, fig. 2A g, ♂ only.

Types. — The 10 types, all from the Cochin Backwaters, South India, are deposited in the Reference Collection at the Indian Ocean Biological Centre of the National Institute of Oceanography, Cochin-18, India, with the following catalogue numbers: Holotype ♀, 0165-08-46; allotype ♂, 0166-08-46; and 4 paratypes of each sex. The holotype female was collected at Station Aroor on 14 March 1968 in surface water.

Description. — Female: Total length 1.2-1.3 mm. Head moderately produced and triangular anteriorly; shape of metasome as that of *A. centrura*. Relative lengths of prosome and urosome 79.5:20.5%. Posterior corners of fifth pedigerous segment rounded, each side with 1 medium sized lateral spine and 1 or 2 very small dorsal spines (fig. 1). Relative lengths of urosome segments and caudal rami 41.7:20.8:12.5:25%. First segment of urosome without spines, second segment with 2 large dorsal spines (fig. 1 a).

A1 reaches to about distal end of genital segment; small straight spines on posterior margins 4th, 5th, 10th, 11th and 13th segments; 2 spines on 4th, 1 each on next 3 of the series and 3 on 13th segment (fig. 3 a, b, c). A2 and maxillae as in *A. bilobata*, intersettle spacing of maxillae almost similar to that of *A. centrura*. Gnathal lobe of mandible and maxilliped as in figs. 9 and 10.

Legs 1 to 4 as in other species of *Acartia* with 2-segmented endopods and 3-segmented exopods (figs. 11 and 12). In leg 5, lateral seta subequal to 3rd segment including terminal spine; 3rd segment with bulbous base and a pectinate terminal spine, terminal spine comparatively short and stout (fig. 2).

Male: Total length 1.1 mm. Metasome shape as in female, but lateral and dorsal spines smaller than those in female. Prosome of urosome segments and caudal rami 12.5:30:22.5:5:15:15%. Ur. I small, bilobed, lateral margins having few hairs laterally in concavity of surface (fig. 7). Ur. II with 1 pair of lateral and 1 pair of dorsal spines distally, latter pair larger. Ur. III with 1 pair of still larger spines. Ur. IV bears a pair of small spinules. Anal segment without prominent knobs. Caudal rami nearly twice as long as wide and setae slightly more divergent than in *A. centrura*.

A1 reaching to nearly distal end of prosome, spination similar to that of *A. centrura*. Appendages from A2 to P4 as in female.

Right leg 5 with strong spine on inner posterior side of 2nd segment; 3rd segment broad with inner lobe of quadrilateral shape with shelf-like projection on it and carrying a spinule on distal margin; 4th segment long with irregular margins and 2 small spines, 1 on inner middle region and the other terminally. Left leg with 3 segments; 1st segment broad, 2nd segment rather small, 3rd segment with fringed inner proximal margin, long leaf-like process with small basal spine at about midlength and apex with long spine and curved process (fig. 8).

Discussion. — *Acartia centrura* and *Acartia bowmani* coexist and their trophic adaptations are similar. However, the absence of specimens with the specific features of the two species overlapping is evidence that the two species are reproductively isolated. A comparison of the various features of the two species as shown in tables I and II would establish the identity of the species.

Wellershaus' (1969, figs. 76, 77, and 78) *A. spinicauda* male seems to be identical with *A. bowmani*. While identifying his specimens as *A. spinicauda*, he mentioned two differences from the illustrations of the species by Giesbrecht (1892). These two differences, viz. the absence of additional spinules between the two spines of Ur. IV and the presence of a flattened hair on the inner side of left Re 3 of P5, cannot be ignored as variations. The present species is found to possess these characters. Additional differences given in table III make it possible to consider Wellershaus' record of *A. spinicauda* ♂ pertaining to *A. bowmani* ♂.

Name. — The new species is named after Dr. Thomas E. Bowman of the Smithsonian Institution, Washington, D.C., U.S.A.

Relationship. — *A. bowmani* n. sp. is referable to Steuer's (1923) *Odontacartia*. It differs from coexisting species belonging to the same group, *A. centrura* and *A. spinicauda* in the characters cited earlier.

In the structure of ♀ P5 and the spination of ♀ A1, *A. bowmani* resembles *A. chilkaensis* Sewell and *A. chilkaensis* var. *sittangi* Steuer. But detailed comparison, as shown in table IV would clearly indicate that these are quite distinct from the present species.

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#### RÉSUMÉ

*Acartia bowmani* n. sp. a été recueilli dans les „Backwaters” de Cochín, un estuaire caractérisé par la grande diversité spécifique des Acartiidae signalés. Cette espèce est particulière par la structure des P5 ♂ et ♀, les épines des A1 ♀ et des Ur. II-IV ♂. L'espèce étroitement apparentée et qui cohabite avec elle, *Acartia centrura* Giesbrecht, est redécrite de manière comparative afin de mettre en évidence les différences morphologiques des deux espèces.

TABLE I

Comparative list of characters of *Acartia bowmani* n. sp. and *A. centrura* (♀)

	<i>A. bowmani</i>	<i>A. centrura</i>
Length (mm)	1.2 - 1.3	1.35 - 1.4
Proportions:		
Prosome: urosome	79.5:20.5	78:22
Urosome: caudal rami	41.7:20.8:12.5:25	40:20:16:24
Spinination:		
Al	Small spines on posterior side of basal segment 4 and 5	A small spine on basal segment 5 on posterior side
Prosome	Moderately big spines	Big and strong spines
Ur. I	No spines	A pair of moderately big spines
Shape of genital segment	Proximal region very wide	Longer than wide
P5	Lateral seta, short, subequal to 3rd segment + terminal spine Terminal spine short and pectinate.	Lateral seta, longer, about twice as long as 3rd segment + terminal spine Terminal spine long and non-pectinate

TABLE II

Comparative list of characters of *Acartia bowmani* n. sp. and *A. centrura* (♂)

	<i>A. bowmani</i>	<i>A. centrura</i>
Length (mm)	1.1	1.25 - 1.28
Proportion of urosome: caudal rami		
Spinination:	12.5:30:22.5:5:15:15	12.4:33.4:25:4:12.8:12.4
Ur. I	A tuft of setules at lateral concavity	A small bristle at the lateral margin of the lower lobe
Ur. II	2 pairs of spines; 1 pair dorsal and another pair lateral	3 pairs of spines; 2 pairs dorsal and 1 pair lateral
Ur. III and IV	No additional spinules in between the spines	Additional spinules in between the spines
Anal segment	No spines	A pair of spinules
P5; right leg	Inner lobe of 3rd segment quadrilateral	Inner lobe of 3rd segment quadrangular

TABLE III

Comparison between *Acartia bowmani* (♂) and *A. spinicauda* (♂)

	<i>A. bowmani</i>	<i>A. spinicauda</i>
Length (mm)	1.1	1.2
Shape of Ur. I	Smoothly rounded laterally	Like an inverted bell (Tranter & Abraham, 1971, fig. 2A h)
Metasome: laterodistal spines	Small	Very big and strong
Ur. III: Spines on the distal margin	Moderately big	Very big and quite prominent
Al: Spines on segment distal to geniculation	2 spines	3 spines (fig. 17)
Shape of inner lobe of right Re 3 of P5	Quadrilateral	Rounded

TABLE IV

	<i>A. bowmani</i>	<i>A. chilkaensis</i>	<i>A. chilkaensis</i> var. <i>sittangi</i>
Length (mm)	♀ 1.2 - 1.3 ♂ 1.1	0.75 0.70	1.05 - 1.15 1.00 - 1.06
Urosome segment + caudal rami	♀ 41.7:20.8:12.5:25% ♂ 12.5:30:22.5:5:15: 15%	39:19:17:25% 10:31:20:6:14:19%	34:23:10:33% 13:23:20:7:11:26%
AI ♀	Small straight spines on posterior margins of 4th, 5th, 10th, 11th and 13th segments (total number of segments taken as 17-18 following Bowman (1965)	Transverse rows of minute spines on 16th, 17th and 19th segments	Transverse rows of spines on segments
P5 ♀:			
Terminal spine	nearly as long as 3rd segment, pectinate	subequal, not pectinate	subequal, pectinate
Seta	nearly as long as the third segment + terminal spine	nearly half	very small
Armature of the dorsal posterior margin of			
Last segment of prosome ♀	2-3 pairs of spines 1-2 pairs of small spines dorsally and 1 pair of big spines laterally	series of small spines	1 row of small spines dorsally, 5 bigger spines ventrally
Id. ♂	2 pairs of moderately big spines	series of small spines	similar to ♀
Ur. I ♀	no spines	row of minute spines	similar to ♂
Ur. I ♂	no spines	no spines	rows of minute spines
Ur. II ♂	2 pairs of big spines	no spines	rows of minute spines
Ur. III ♂	1 pair of very big spines	no spines	rows of minute spines

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