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A new species of *Bradyidius* (Copepoda, Calanoida) from the Gulf of Carpentaria, Australia

B.H.R.Othman¹ and J.G.Greenwood

Dept. Zoology, University of Queensland, St Lucia 4067, Australia

¹Present address: 121 Jalan Athinahan Dua, Taman Tun Dr Ismail, 60000 Kuala Lumpur, Malaysia

Abstract. A new species of copepod belonging to the family Aetideidae, *Bradyidius styliiformis* sp. nov. is described and figured. The relationship of this species to the other 12 members of the genus is discussed.

Introduction

There have been few studies of copepods from the Gulf of Carpentaria, these being limited to the works of Greenwood and Othman (1979) and Fleming *et al.* (1982). The need to fill this gap in knowledge of the copepod fauna of this biogeographically important area prompted our study of zooplankton from the region. A new species belonging to the genus *Bradyidius* was widely encountered in our samples, and is described below.

Specimens were taken in stepped-oblique plankton hauls from near-bottom to the sea surface, using plankton nets of 0.25 m² mouth area and 140 µm mesh aperture. Additional details relating to sample numbers are given in Rothlisberg and Jackson (1982). Dissections and measurements were made in glycerine/water and drawings were made using a Leitz HM-LUX microscope with a camera lucida.

Bradyidius styliiformis sp. nov. (Figures 1–3)

Types: Type materials are deposited in the Queensland Museum as follows: holotype female total length (TL) 1.55 mm, allotype male TL 1.20 mm, two female paratypes. Reference nos. QM W12077, W12078 and W12079 respectively.

Type locality: Gulf of Carpentaria, latitude 14°1.5'S, longitude 138°0.0'E.

Material examined: one male, five females, sample no. 28A2, lat. 14°1.5'S, long. 138°0.0'E, 19.VIII.75; three females, sample no. 201A4, lat. 15°6.0'S, long. 137°53.0'E, 28.IV.76; two females, sample no. 332A4, lat. 13°57.0'S, long. 137°53.0'E, 5.IX.76; one male, sample no. 449A4, lat. 11°57.5'S, long. 137°57.0'E, 8.XI.77; two females, sample no. 454A4, lat. 13°2.0'S, long. 137°58.5'E, 8.II.76; one male, sample no. 465A8, lat. 13°57.3'S, long. 138°58.0'E, 11.XI.76.

Description of female (Figures 1A–G and 2A–F)

Size (based on 13 individuals measured): TL from anterior tip of prosome to end of caudal rami 1.45 mm (SD 0.03, range 1.33–1.56 mm). Prosome length to width ratio 2.37:1, prosome to urosome length ratio 3.86:1.

Body robust (Figure 1A, B); head uniformly rounded in dorsal view. Rostrum hav-

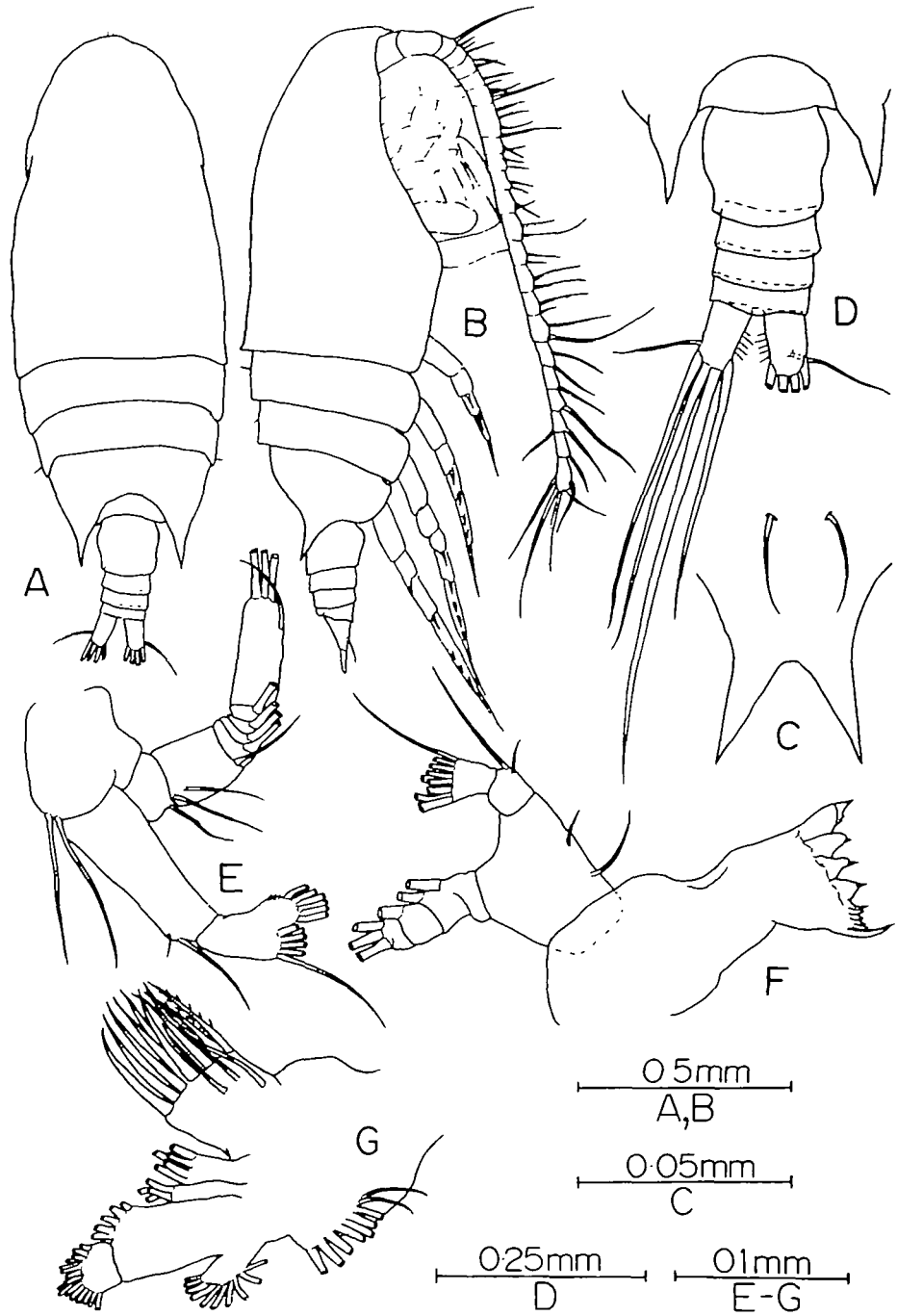


Fig. 1. *Bradyidius styliformis* sp.nov., female, A, dorsal view; B, lateral view; C, rostrum; D, urosome, dorsal view; E, 2nd antenna; F, mandible; G, 1st maxilla.

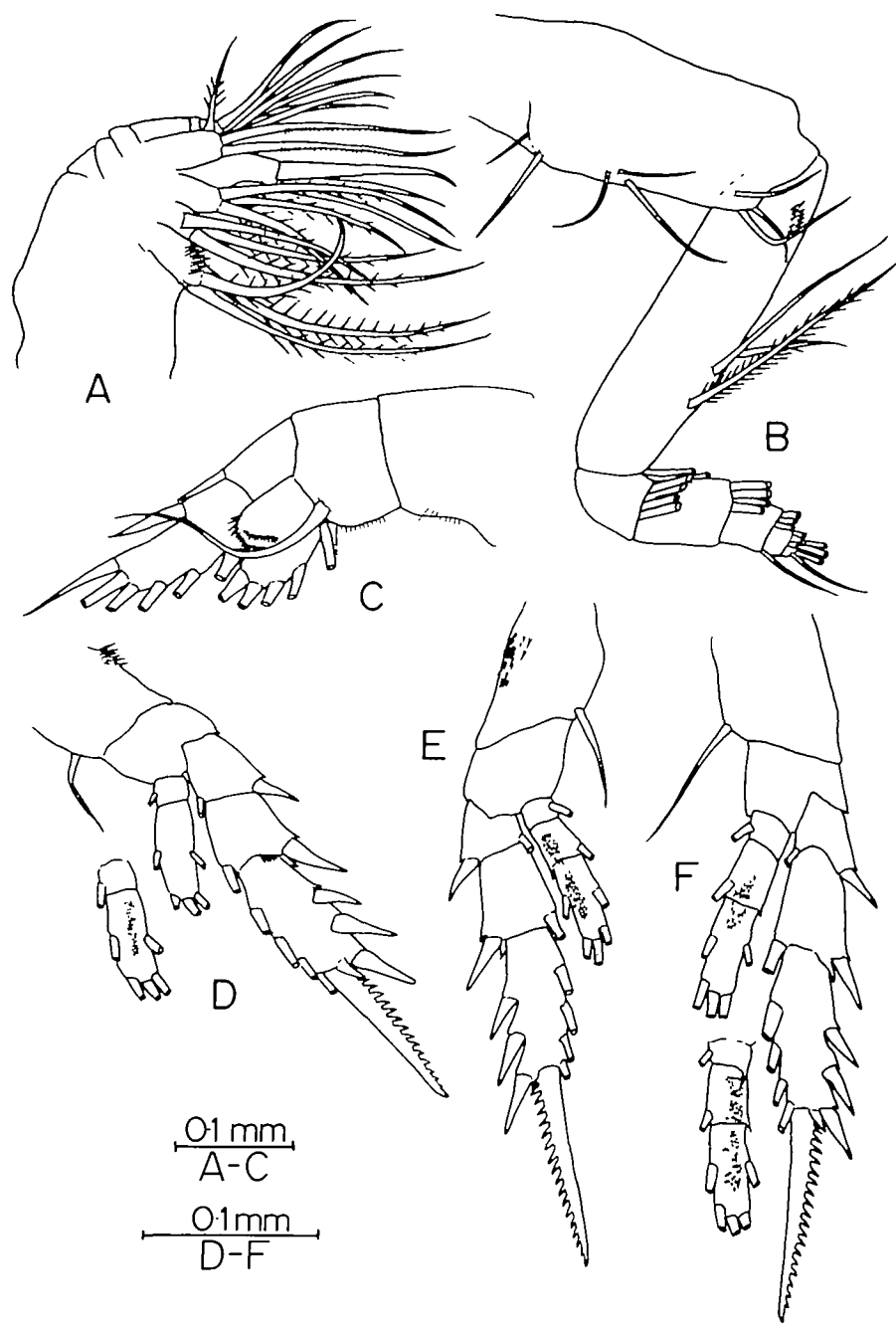


Fig. 2. *Bradyidius styliformis* sp. nov., female, A, 2nd maxilla; B, maxilliped; C, 1st leg; D, 2nd leg, anterior view of left leg and posterior view of right endopod; E, 3rd leg, posterior view; F, 4th leg, anterior view of left leg and posterior view of right endopod.

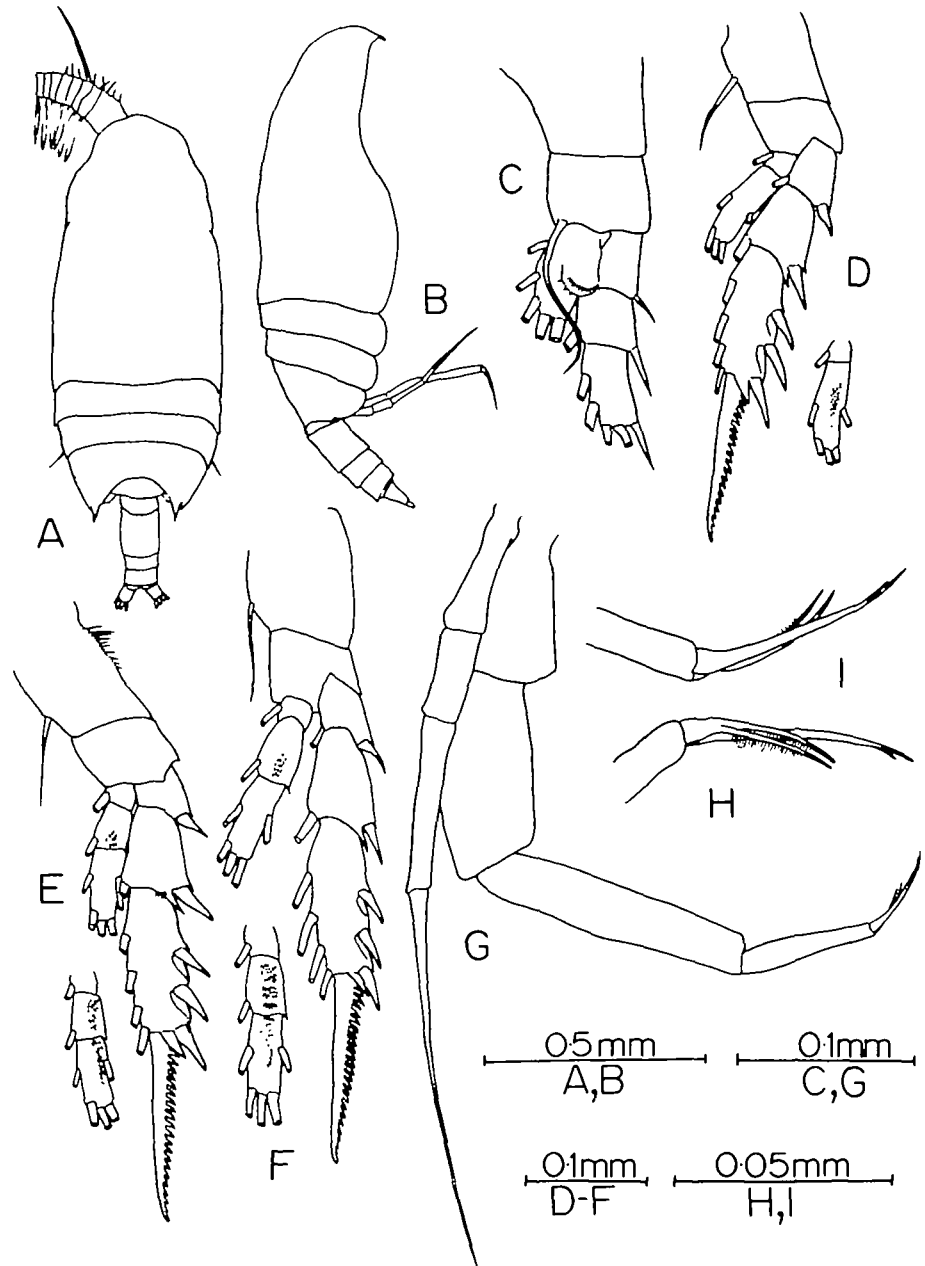


Fig. 3. *Bradyidius styliformis* sp. nov., male, A, dorsal view; B, lateral view; C, 1st leg; D, 2nd leg, anterior view of left leg and posterior view of right endopod; E, 3rd leg, anterior view of left leg and posterior view of right endopod; F, 4th leg, anterior view of left leg and posterior view of right endopod; G, 5th leg; H, terminal segment of right 5th leg; I, same, another view.

Table 1. Comparison of some characteristics of 13 species of *Bradyidius*. The species are: A, *B. angustus*; B, *B. armoldi*; C, *B. bradyi*; D, *B. hirsutus*; E, *B. luluac*; F, *B. pacificus*; G, *B. plinoti*; H, *B. rakuna*; I, *B. saanichi*; J, *B. similis*; K, *B. spinifer*; *L, *B. tropicus*; M, *B. styiformis*. (Abbreviations used: P = leg, post. = posterior, Re = exopod, Ri = endopod).

Feature	A	B	C	D	E	F	G	H	I	J	K	M
Female												
Size (mm)	Unknown	1.64	2.65	1.59-1.68	3.12	4.4	2.45-2.52	3.1-3.3	2.33-2.56	3.0	2.74	1.33-1.56
P ₁ -outer distal spine of Re ₁ reach base of next spine	-	Short	Yes	Short	Well beyond	Yes	Short	Short	Yes	Yes	Well beyond	Yes
Thoracic margin reach post. border of genital segment	-	Almost	Yes	Almost	Beyond	Short	Beyond	Almost	Almost	Short	Almost	Almost
Male												
Size (mm)	1.37	1.19-1.23	2.20	1.36-1.53	3.0-3.25	3.3	Unknown	Unknown	2.01-2.24	2.4	1.96	1.20-1.25
Status of P ₃	Uniramous	Biramous	Uniramous	Uniramous	Uniramous	Biramous	Biramous? (juverniles)	-	Biramous	Biramous	Uniramous	Uniramous
Male and female												
Rostrum, divergent	Hardly	Not	Slightly	Slightly	Strongly	Not	Divergent	Divergent	Strongly	?	?	Divergent
Surface spinules on Ri, P ₂₋₄	Post.	Post.	Post.	Post. & anterior	Post. (males)	None	Post. & anterior	None	None	None	Post.	Post. & anterior

*L—except for the body size of female (1.2 mm), no information is available on this species.

ing two divergent broadly acute rami, base of rostrum with pair of distinct sensory filaments (Figure 1C), which are visible, even from dorsal view, at anterior tip of head. Pair of sensory filaments visible on dorsal surface of 2nd thoracic somite, another on lateral surface of 3rd thoracic somite. Posterior thoracic margins symmetrical, each ending in acute posteriorly directed process which almost reaches posterior end of genital somite; in lateral view these processes directed slightly dorsally.

Urosome 4-segmented (Figure 1D), relative lengths of visible somites as follows:

Somites:	1	2	3	4	Caudal rami
Proportions:	42	13	12	8	25 = 100

Caudal rami symmetrical, each ramus with one slender lateral seta and three *subequal* plus one longer strong apical setae. Length to breadth ratio of each furcal ramus 1.70:1.

First antenna 24-segmented, almost reaching end of last thoracic segment when parallel to body (Figure 1B).

Second antenna exopod and endopod almost equal in length (Figure 1E). Basipod 1-segmented, with two setae on distomedial margin. Exopod with seven segments of varying lengths: segment 7 longest, about equal to the combined lengths of segments 1 and 2; combined lengths of segments 3–6 equals that of 1st segment. Segment 1 with one distal medial seta; 2nd segment with two proximal and one distal medial setae; 3rd to 6th segments each with an inner distal seta; apical segment with one small subapical and three terminal setae. Endopod 2-segmented; first segment carries two distal medial setae (one minute); 2nd segment bears six apical setae on both lateral and medial lobes; outer margin furnished with short row of subapical spinules.

Mandibular palp with stout basipod bearing two inner setae (Figure 1F). Exopod 4-segmented, first three segments each carry a medial distal seta, 4th segment with one inner and two apical setae. Endopod 2-segmented, first segment with one minute and one long distal setae, 2nd segment with nine apical setae. Mandibular blade (gnathobase) expanded at apex, with a basal seta and row of nine sharp denticles, four being very strongly developed and occupying 2/3rds of apical space.

Basipod of 1st maxilla possesses seven strong and two small outer marginal setae (Figure 1G). Inner margin of basipod 3-lobed; large proximal lobe bears nine stout spines with four submarginal setae; middle lobe with five apical setae; distal lobe with four apical setae. Exopod has 10 setae around outer and apical margin. Endopod 2-segmented, 1st segment bears five distal setae, apical segment has 16 setae.

Second maxilla very weakly segmented (Figure 2A); five lobes readily distinguished on inner margin, in addition to apical lobe. First four lobes each bears three strong spinulose setae, the 5th lobe bears a strong dagger-shaped spine plus two spinulose setae, apical lobe with six setae.

Maxilliped 7-segmented (Figure 2B): first two segments of equal length, combined lengths of remainder only 2/3rds that of either of 1st two segments. First segment with two plus three plus three setae on medial margin; 2nd segment with three setae at midlength on lateral margin, two setae at distal end, proximal end of segment with two rows of spinules. Each of segments three to four carries four distal setae, segment 5 has three plus one distal setae, segment 6 has three distal setae, apical segment has four terminal setae.

First pair of legs with 3-segmented exopod, 1-segmented endopod; coxa without setae,

2nd with medial distal seta extending nearly to tip of exopod (Figure 2C). Exopod with distolateral spine on each segment; 1st segment without setae, 2nd with a medial seta, 3rd with two marginal and two apical setae. Endopod reaching to distal end of 2nd exopod segment; lateral margin with bulbous lobe bearing two tiers of spinules; distomedial margin with five setae.

Coxa of 2nd leg (Figure 2D) with patch of spinules on lateral margin proximally, medial margin with plumose seta. Basis unarmed. Exopod with distolateral spine and distomedial seta on 1st and 2nd segments; 2nd segment also with row of spinules at distal margin of anterior surface; lateral margin 3rd exopod segment with two marginal, one apical, one terminal serrate spine bearing 16 teeth; medial margin of 3rd segment with four setae. Both endopod segments smooth on anterior surface, minute spinules present on posterior surface of the 2nd segment.

Third (Figure 2E) and 4th legs (Figure 2F) similar in structure to 2nd leg, differing in that both endopods are 3-segmented. First protopod segment with numerous spinules on lateral margin on 3rd leg, smooth on 4th. Second and 3rd endopod segments of both these legs bear numerous minute spinules on both anterior and posterior surfaces, those on the posterior surface being more numerous. Terminal spine of 3rd leg with 17 marginal denticles, that of 4th with 19.

5th leg absent.

Description of male (Figure 3A–I)

Size: TL (tip of prosome to end of furcal rami) for two individuals was 1.20 and 1.25 mm. Prosome length to width ratio 2.34:1, prosome to urosome length ratio 3.75:1.

Male differs slightly from female in being smaller, and having posterior thoracic margins shorter and directed posteriorly rather than posterodorsally (Figure 3A, B). Segmentation of prosome similar to that of female.

Urosome 5-segmented, proportional lengths of somites as follows:

Somites	1	2	3	4	5	Caudal rami
Proportions	15	40	12	15	4	14 = 100

Caudal rami symmetrical, each ramus with breadth to length ratio 1.20:1.

First right antenna with 23 free segments, and many aesthetascs near proximal end. Remaining cephalic appendages similar to those of female.

Segmentation of 1st to 4th legs similar to that of females; first leg (Figure 3C) differs slightly in having generally shorter distolateral spines on exopod, slightly shorter endopod. Second to 4th legs (Figure 3D–F) identical to those of females.

Fifth leg uniramous and asymmetrical (Figure 3G). Left leg 4-segmented: first segment of equal length to 2nd; 3rd segment almost twice length of 2nd, tapering toward distal end; 4th segment long, length about equal to first three segments combined, tapers to very fine termination. Right leg 5-segmented: proximal segment broad and short; 2nd segment also broad, but 1.5× length of 1st; 3rd segment twice length and half breadth of 1st; 4th segment even more slender, tapering distally; 5th segment with four filaments each tapering to a fine point, two short ones with very fine hairs on their margins and two longer ones which are smooth (Figure 3H, I).

Etymology: the specific name alludes to the styliform nature of the male 5th leg.

Remarks

This description brings the known species of *Bradyidius* to 13. Species previously included in this genus are *Bradyidius bradyi* (Sars, 1903), as *Undinopsis*; *B. similis* (Sars, 1903), as *Undinopsis*; *B. tropicus* Wolfenden, 1905; *B. pacificus* (Brodsky, 1950), as *Undinopsis*; *B. arnoldi* Fleminger, 1957; *B. angustus* (Tanaka, 1957), as *Undinopsis*; *B. saanichi* Park, 1966; *B. spinifer* Bradford, 1969; *B. luluae* Grice, 1973; *B. hirsutus* Bradford, 1976; *B. rakuma* (Zvereva, 1976), as *Aetideopsis*; *B. plinoi* Campaner, 1978 (two subspecies).

Females of *Bradyidius* species are quite similar to each other. Thus the species, *arnoldi*, *hirsutus*, *luluae*, *plinoi*, *saanichi* and *spinifer* are generally similar to the present species in that the posterior thoracic processes is directed dorsad in lateral view. However, *B. styliiformis* can be distinguished from these species by being much smaller in size, having divergent rostral processes, and having minute spinules on both the posterior and anterior surfaces of the endopods of the 2nd to 4th legs. These, and other combinations of characters that distinguish *B. styliiformis* females from other species of the genus, are summarized in Table I.

Males of *B. styliiformis* are most similar to *B. angustus*, *B. bradyi*, *B. hirsutus*, *B. luluae* and *B. spinifer* in having uniramous 5th legs. The present species can easily be distinguished from these species in having the distal segment of the right 5th legs ending in four filaments. Detailed differences in body size, shape and relative lengths of the appendages between *B. styliiformis* males and the rest of the members of the genus are given in Table I.

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