

A New Species of *Branchinella* (Crustacea: Anostraca: Thamnocephalidae) from Alice Springs, Australia.

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A new fairy shrimp, *Branchinella rosaliaeae* n.sp., is described from a claypan within Alice Springs, Northern Territory. Its frontal appendage is like other members of the *B. affinis* group, consisting of a central trunk divided terminally into two substantial branches but distinctively with sensory papillae only along its medial margin. Other male characteristics are unremarkable and the female is like many others in *Branchinella*. The egg is spherical with close set polygons, like that in many species of *Branchinella*.

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KEYWORDS: *Branchinella affinis* species group, frontal appendage, narrow endemic.

INTRODUCTION

Branchinella is one of the most speciose genera of fairy shrimps, with forty known species found most commonly in inland Australia (Pinceel et al. 2013, Rogers 2013, Rogers and Timms 2014, Timms 2015a). Many species have been encountered only recently when more remote parts were explored, but narrow range endemics still elude investigators (Rogers et al. 2015). Australia is particularly disadvantaged by limited access in the inland, sparse human habitation, stochastic filling of aquatic habitats, and the turbidity of most inland sites, so that shrimp may remain to be discovered. The last two above factors apply at Alice Springs in the Northern Territory where a small turbid claypan besides a suburban street filling about once a decade has escaped investigation. This claypan is the site of the discovery of a new fairy shrimp. To date nine species are known from the Northern Territory, fewer than adjacent jurisdictions (Timms 2015b), the first two factors above no doubt contributing to this disparity. Herein, the new species is described and possible relationships to congeners are explored.

METHODS

Specimens (Fig. 1) were examined and drawn under a Wild M3C stereomicroscope with a drawing tube and the male thoracopod V was studied under an

Olympus BH monocular microscope at mainly 100x. Eggs were photographed on a Zeiss Evo LS15 SEM using a Robinson Backscatter Detector. Specimens were prepared as detailed in Timms and Lindsay (2011).

SYSTEMATICS

Class Crustacea Brünnich 1772
Order Anostraca Sars 1867
Family Thamnocephalidae Packard 1883
***Branchinella* Sayce 1903**

Branchinella Sayce 1903: 233; Henry 1924: 129; Linder 1941: 244; Geddes 1981: 255-256; Rogers 2006: 15-16.

Type species

Branchipus australiensis Richters 1876 by subsequent designation.

Branchinella rosaliaeae n.sp.

Etymology . This species is named for its collector, Mrs Rosalie Breen of Alice Springs.

Type Locality Northern Territory, Alice Springs, Sadadeen Road, a small claypan almost opposite the YMCA building, 23° 42' 18.9"S, 133° 53' 32.3"E.

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Fig. 1. Images of male (top) and female (bottom) *Branchinella rosalieae* n. sp.

Type Specimens. *Holotype.* Male, body length (anterior margin of head to posterior margin of telson) 11.2mm, collected by Rosalie Breen from the type locality, 25 January 2015, AM P105232; *Allotype.* Female, body length 10.3 mm, same data as holotype, AM P105233.

Other Material. Four males, body length ranging from 9.5 to 11.3 mm; five females, body length 10.0 to 11.9 mm from the type locality, same data as above, AM P105234.

Diagnosis. Male gonopod of typical *Branchinella* form with lateral coarse spines and many small spines on its trunk. Frontal appendage length 0.6x thorax length but simple, consisting of a trunk and a bifurcated terminal fourth, each branch broadly

triangular, with an elongated, filiform apex. Sensory papillae only along the medial margins of the branches. Second antenna basal antennomere unadorned, arcing medially. Female unremarkable and typical of the genus. Egg spherical adorned with large, close set polygons.

Description.

Male.

Head typical for *Branchinella* (Fig. 2A). Compound eye suboval, peduncle short, naupliar eye small and insignificant, located dorsally between the compound eyes. First antennae filiform, length roughly 0.7x second antenna length. Second antenna with proximal antennomeres fused basally, lacking medial spines or structures. Second antenna distal antennomere basally subequal in width to proximal

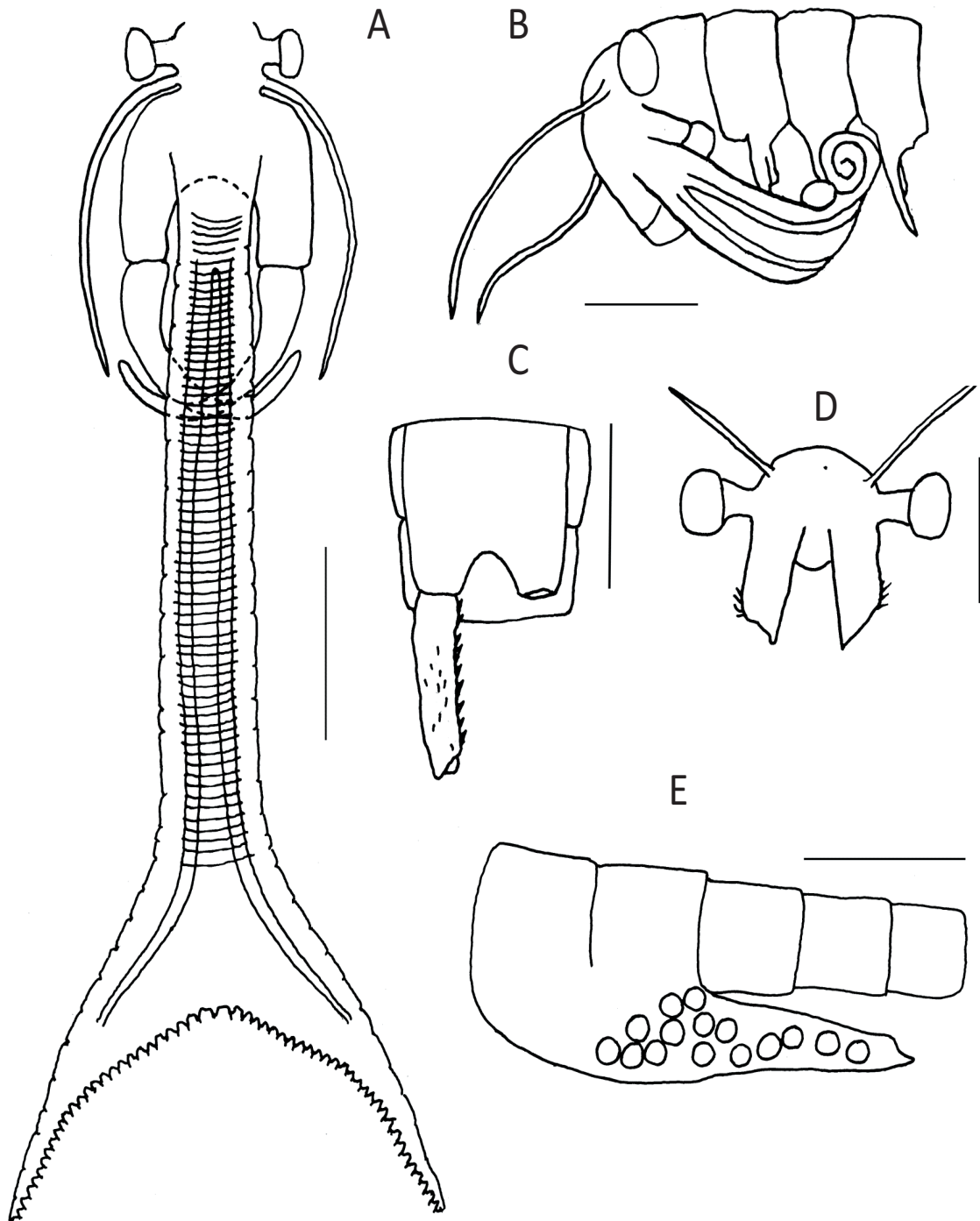


Fig. 2. *Branchinella rosaliae* n. sp. A, male head and frontal appendage extended, frontal view; B, male head and anterior thorax to show curled frontal appendage, lateral view; C, male genital segments with gonopod base and one everted gonopod, ventral view; D, female head, frontal view; E, female genital segments plus three adjacent abdominal segments with ovisac, lateral view. Scale bars 1 mm.

antennomere, arcing evenly, medially greater than 90°, narrowing to a blunt apex, length approximately 1.3x the proximal antennomere.

Fully extended frontal appendage (Fig. 2A) length approximately 0.6x thorax length. Frontal appendage

consisting of a long trunk, with lateral margins very gradually divergent, and apically bifurcated into two branches. Trunk lateral margins smooth except for occasional irregular shallow folds; dorsal surface with numerous regular folds at right angles to axis. Branch

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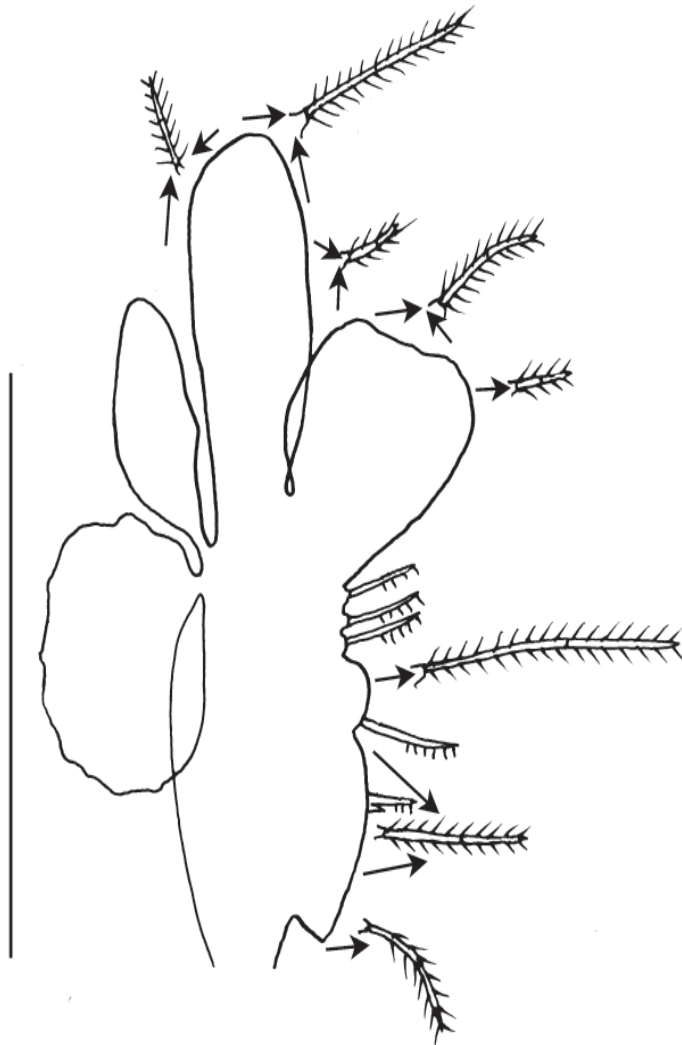


Fig. 3. Male thoracopod 5. Anterior setae shown in position and for clarity with only about a third of their setules shown; posterior setae shown detached from the thoracopod but near their insertion and, for clarity, with only about a third of their setules shown. Scale bar 1 mm.

length $\sim 0.4x$ trunk length. Apical branch broadly triangular, with apex narrowing, elongate, becoming a filiform flagellum. Flagellum length nearly as long as branch basal width. Branch medial margin lined with numerous papillae, each tipped with a small spine. Internally with two parallel, longitudinal tubes the length of the trunk, one each extending into the branch bases. In life, the frontal appendage carried tightly coiled beneath the head (as seen in two males among the other material, one of these with a partly uncoiled frontal appendage illustrated in Fig. 2B).

Thoracopod V (Fig. 3) with endite I+II breadth approximately $4x$ endite III, broadly curved, with

proximomedial margin angulate, anterior seta pectinate on one side in distal half, short with a much shorter adjacent subsidiary spine, and with about 45 posterior geniculate, plumose setae of various lengths and curvature.

Endite III evenly curved, anterior seta pectinate on one side in distal half, length about $3x$ longer than endite I+II anterior and with about 12 posterior geniculate, plumose setae, length $2x$ the length of longest posterior setae of endite I+II.

Endites IV, V and VI papilliform, each with an anterior seta pectinate on one side in distal half, approximately twice as long as on endite III. Endites IV and V with two posterior geniculate, plumose setae, endite VI with one.

Endopod lamellar, subquadrate, truncated distally, with approximately 30 setae on distal two thirds margin, varying from short to moderate lengths, as in endite I+II. Exopod elongate oval, with a bluntly rounded apex, with about 40 setae on distal half and again varying in length from short at lateral margins to longest setae at apex. Epipod lobiform and inerm. Praeepipodite subcircular, margin slightly crenulate, and inerm.

Other thoracopods of similar structure, particularly III to VIII, with some reduction in size and complexity anterior and posterior from these.

Genital segments (Fig. 2C), subequal in size, with gonopod rigid bases fused medially. Gonopods rigid bases separate distally, one fourth from apex, and reach almost to posterior margin of second genital segment. One gonopod

everted in type specimen; gonopod eversible portion length subequal to rigid portion, bearing a medial longitudinal row of strong spines and generally scattered with small spines.

Abdominal segments and telson smooth, inerm. Cercopod length about $2x$ the length of last abdominal segment. Telson plus cercopods about 30% of total thorax length.

Female.

Head (Fig. 2D) as in male. First antennae filiform, slightly longer than second antennae. Second antennae broad and flat, approximately rectangular in

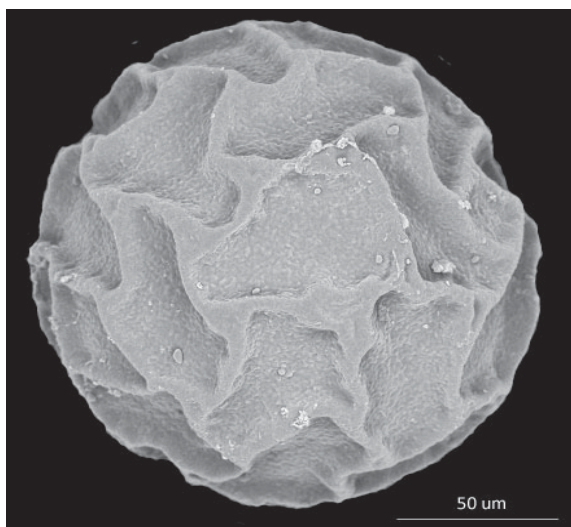


Fig. 4. A typical egg of *Branchinella rosaliae* n. sp.

shape with apex oblique, longer and apically acute mediodistally, with a few short setae on the rounded laterodistal corner.

Thorax and thoracopods of similar structure to those of the male. Genital segments (Fig. 2E) subequal, brood pouch conical, extending to between the second and third abdominal segment.

Egg (Fig. 4) spherical, $164.0 \pm 12.0 \mu\text{m}$ in diameter ($n=10$), with surface divided into 36.7 ± 1.6 ($n=10$) polygons of variable size, shape and depth. Typical polygons about $60 \mu\text{m}$ long and $30 \mu\text{m}$ wide and $10 \mu\text{m}$ deep, with a scabrous flat floor. Polygon ridges flat, steep sided, and perhaps expanded where three polygons meet. Number of eggs per mature brood pouch about 35 – 40 ($n=5$).

DISCUSSION

This species belongs to the genus *Branchinella* because it has gonopods with a row of larger spines and at least a few smaller spines on the distal half of the everted portion (Brendonck 1997; Rogers 2006). Having a frontal organ is also typical, but not absolutely diagnostic (Geddes 1981; Rogers 2006).

The thoracopods are like those of other *Branchinella* species for which data are available (Geddes 1981; Timms 2001, 2002, 2005, 2008, 2012; Timms and Geddes 2003), with just minor variations in proportions of the endopod, exopod, epipod and praepipod, in relative size and spination of the anterior setae, and in size and numbers of posterior setae (cf. Fig 3 with Figs 1 & 2 in Timms 2001, Figs 6, 7, 8, & 10 in Timms 2002, Figs. 7, 8 & 9 in Timms and Geddes 2003, Fig 5 in Timms 2008, Figs. 3 & 9 in Timms 2012 and Fig. 3 in Timms 2015b).

It is the frontal appendage that is the most distinctive feature in most *Branchinella* species. *Branchinella rosaliae* n. sp. clearly belongs to the *B. affinis* Linder 1941 species group in that its frontal appendage is long, simple and bifurcates terminally. Most species in this group (*B. affinis*, *B. denticulata*, *B. latzi*, *B. macraeae*, *B. minmina*, *B. proboscida* and *B. rosaliae* n.sp.) (Figs. 2, 5) also have simply constructed second antennae (claspers) and are relatively small, about 10 to 15 mm. Eggs are spherical and usually adorned with polygons.

The frontal appendage (Figs. 2, 5) in *B. affinis*, and *B. proboscida* is thin and uniformly narrow, slightly relatively thicker in *B. macraeae*, slightly thickening distally in *B. rosaliae* n. sp., more so in *B. minmina*, and bulbous in *B. latzi* and *B. denticulata*. It is without lateral papillae in *B. affinis*, *B. proboscida* and *B. rosaliae* n.sp., with a few terminally in *B. macraeae* and *B. minmina*, and with numerous papillae all over in rows in *B. latzi* and *B. denticulata*. Two internal longitudinal tubes are present in all species of the group, but most obvious in *B. rosaliae*.

The frontal appendage bifurcates terminally usually at about 3/4 to 3/5ths of its length (Figs. 2, 5). The branches are narrow and nearly straight in *B. affinis*, curved medially in *B. proboscida*, curved laterally in *B. macraeae* and *B. minmina*, and bulbous in *B. latzi* and *B. denticulata*. In *B. rosaliae* n. sp. this apical branch is broadly triangular, with a filiform flagellum. A tubular flagellum also occurs in *B. minmina* and *B. latzi*, and is markedly separate from the bulk of the apical branch in *B. latzi*. Lateral papillae completely adorn the branch medial margin in *B. rosaliae* n. sp., *B. latzi* and *B. denticulata*, almost so in *B. minmina*, and only partly in *B. affinis*, and *B. proboscida*, while the medial margin is inerm in *B. macraeae*.

The second antennae (Figs. 2, 5) are unremarkable in *B. rosaliae* n. sp., and also *B. macraeae*, *B. minmina* and *B. latzi*, a little different to that in *B. affinis* with its medial swelling on the proximal antennomere. *Branchinella proboscida* also has a similar swelling, but has distinctive distal antennomeres, bent medially almost at right angles. The second antennae are most distinctive in *B. denticulata* with large triangular outgrowth distolaterally on the proximal antennomere.

The addition of *B. rosaliae* to the Australian Anostracan fauna requires a modification to the key to species commencing with replacement of couplet 25 (Timms 2015b):

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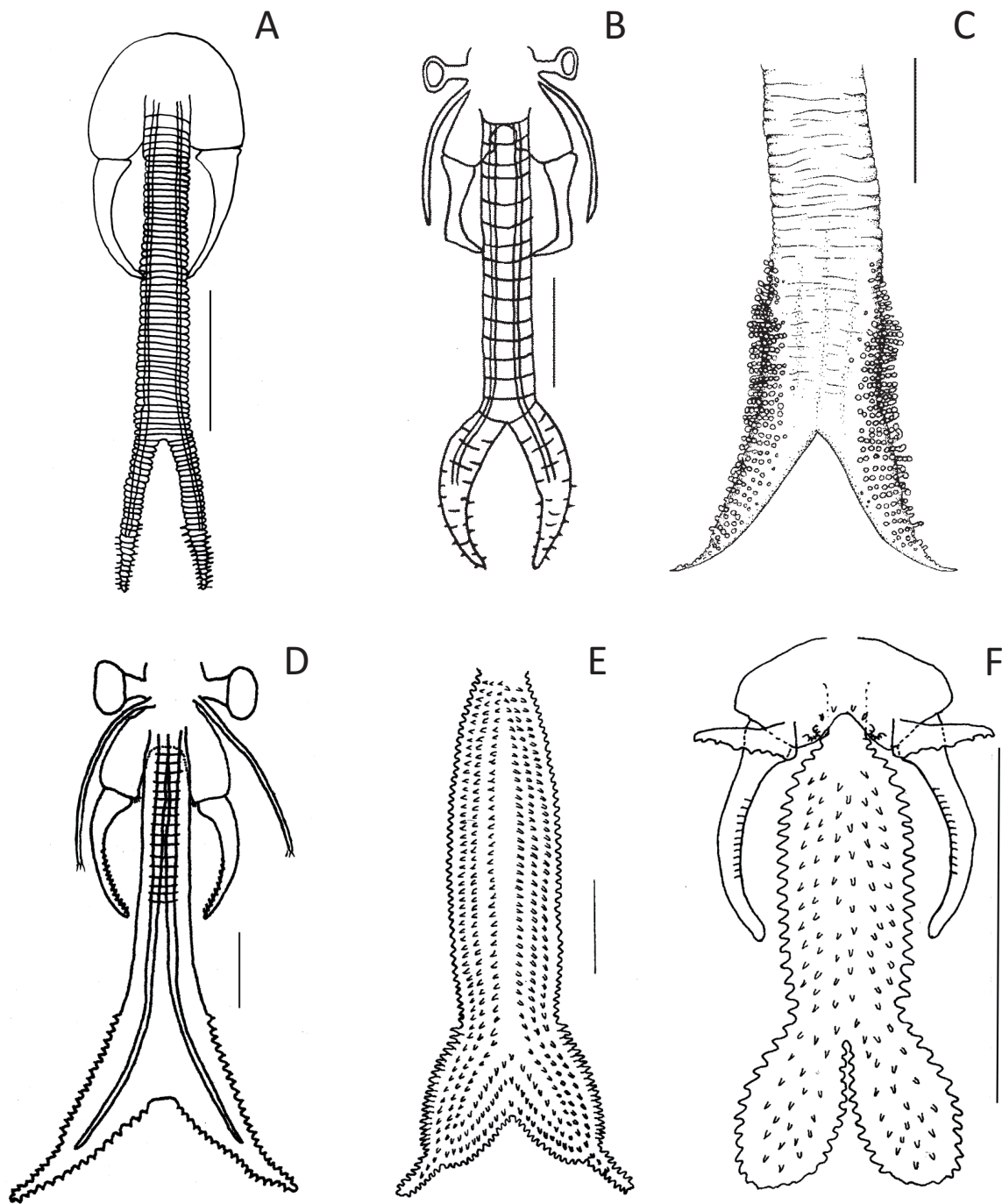


Fig. 5. Frontal appendages of various males of *Branchinella* spp. similar to *B. rosaliaeae* n. sp.: A, second antennae and FA of *B. affinis*, original illustration from AM P105230 from Currawinya National Park, Queensland; B, head, second antennae and FA of *B. proboscida*, original illustration of AM P105231 from near Oodnadatta, South Australia; C, frontal appendage of *B. macraeae* (from Timms, 2005); D, head, second antennae and FA of *B. minmina* (from Timms, 2012); E, frontal appendage of *B. latzi* (from Timms, 2015b); and head, second antenna and FA of *B. denticulata* (from Timms, 2015b). Scale bars 1 mm.

- 25 (a) No basolateral projections on gonopod base; fringe of denticles on medial surfaces of frontal stem branches; medial surface of proximal antennomere smooth, without a lobe.....26Aa
 (b) Basolateral projection on gonopod base; no fringe of denticles on medial surface of frontal stem branches; medial surface of proximal antennomere with a lobe.....*B. erosa*
 26A(a) Fringe of denticles on lateral and medial surfaces of frontal stem branches; frontal appendage about 2-2.5x longer than second antennomere (ie claspers).....*B. minmina*
 (b) Fringe of denticles on medial surface only of frontal stem branches; frontal appendage about 4x longer than second antennomere (ie claspers).....*B. rosaliae* n.sp.

Eggs of *B. rosaliae* n. sp. are almost identical to those of *B. affinis*, but larger (diameter of *B. affinis* eggs ca 113 µm, and the polygons fewer in number and more pinched in *B. affinis* (Timms et al. 2004). The later character could be due to differing extent of dehydration.

Branchinella rosaliae n. sp. is sympatric with *B. latzi* and possibly the widespread *B. affinis* and *B. proboscida*, and is allopatric to the narrow range endemics *B. macraeae*, *B. minmina* and *B. denticulata*.

Branchinella rosaliae n. sp. was collected from a turbid claypan along with *Branchinella australiensis* Richters 1876, and the spinicaudatans *Ozestheria lutraria* (Brady 1886) and *O. packardi* (Brady 1886). All three species are widespread in inland Australia, though *O. packardi* is an unresolved species complex (Schwentner et al. (2015), so its southern Northern Territory form could be a more restricted species.

The slightly longer first antennae in *B. rosaliae* n. sp. males may allow for more sensory perception perhaps of females, of its turbid environment. Curiously the situation is reversed in *B. pinderi* Timms 2008, another inhabitant of turbid waters. The only other unusual feature of *B. rosaliae* n. sp. is its prominent tubes in the frontal appendage which would serve for rapid extension of the frontal appendage and to maintain its turgor when extended. These tubes have been reported in many other species with long frontal appendages (e.g. Fig 5) but they are largest in *B. rosaliae* n. sp..

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