

A New Species of Caenidae from Australia: *Tasmanocoenis arcuata* sp.n. (Insecta, Ephemeroptera)

by

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The nymphs, adults and eggs of a new species of the genus *Tasmanocoenis* Lestage (1930) from South Australia are described and illustrated, and a key to the adults and nymphs of known *Tasmanocoenis* species is provided.

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In recent collections from the lower River Murray, South Australia, nymphs and adults of a new species similar to *Tasmanocoenis tonnoiri* Lestage, 1930 were caught. Laboratory rearing confirmed the nymphs and adults differed from *T. tonnoiri* and belong to a new species that we name *Tasmanocoenis arcuata* sp.n.

The material examined by SEM was critical-point dried using the liquid CO₂/Ethanol procedure in a Polaron E 3000 C.P. drier. Specimens were coated with 15 nm gold/palladium (80:20), and viewed in an ETEC scanning electron microscope at 20 Kv.

Terminology and most of the characters used in the description are after Malzacher (1982, 1984, 1986).

Tasmanocoenis arcuata sp.n.

Material: Holotype ♂ imago (genitalia and body on one slide). Paratypes: ♂ subimago (genitalia and body on one slide) and nymphal cast skin (dissected on two slides), 8 ♂♂ imagines in alcohol, 4 ♀♀ subimagines and 1 ♂ subimago (bodies and nymphal skins in alcohol), collected 11.03.1987 by J. Alba-Tercedor, 2 ♂♂ imagines (dissected on two slides) collected 12.03.1987 by J. Alba-Tercedor and 5 nymphs (in alcohol) collected 11.02.1986 by K. F. Walker and L. N. Lloyd from the type locality and 26 ♂♂ imagines collected 14.04.1987 by J. Alba-Tercedor from the River Murray at Renmark, South Australia.

Type Locality: River Murray near Overland Corner, South Australia, 140° 19' Long. E., 34° 10' Lat. S.

The holotype and most paratypes are held in the South Australian Museum, Adelaide (register number for holotype: I 21,205). Some paratypes (12 ♂♂ in alcohol and 2 ♂♂ on slides) are held by the senior author.

Additional material examined: Nymphs and adults from Surveyor Pool, Mitchell Plateau, the Kimberleys, N.W. Western Australia collected 19.07.1978 by P. J. Suter and M. J. Tyler; Fitzroy River at Capricornia Institute of Advanced Education collected April 1984 by P. Mackey, and from the River Murray at Euston, Swan Hill and Torumbarry, collected by the Rural Water Commission officers as part of the Murray Darling Basin Commission's biological monitoring programme.

Etymology: From *arcuatus*, L., meaning curved like a bow (referring to the very curved forceps of the male genitalia).

Male Imago. Body length: 2.7-3.1 mm; wing length: 2.4-2.7 mm. Head and thorax yellow-brown, mesonotum darker. Antennae whitish, base of flagellum brown. Fore leg: coxa, trochanter, femur and base of tibia light brown, tibia and tarsi whitish with dark joints; femur with two brown stripes dorsally; tarsal segment formula 2,4,3,5,1. Mid and hind femora with short, dark, distal stripe, tarsal formula 5,1,2,4,3. Wings with costal, subcostal and radial sectors translucently shaded grey-brown, remainder hyaline, veins brownish, veins Sc and R occasionally purple.

Abdomen: dorsally light brown, with a light medial line, wider on posterior half of segments 7 and 8, a small central U-shaped brown marking (open posteriorly) on segment 8, occasionally 7; ventrally light yellow with small faint oblique stripe laterally on each segment, but may be absent. Cerci white with darker brown segment joints in basal $\frac{2}{3}$.

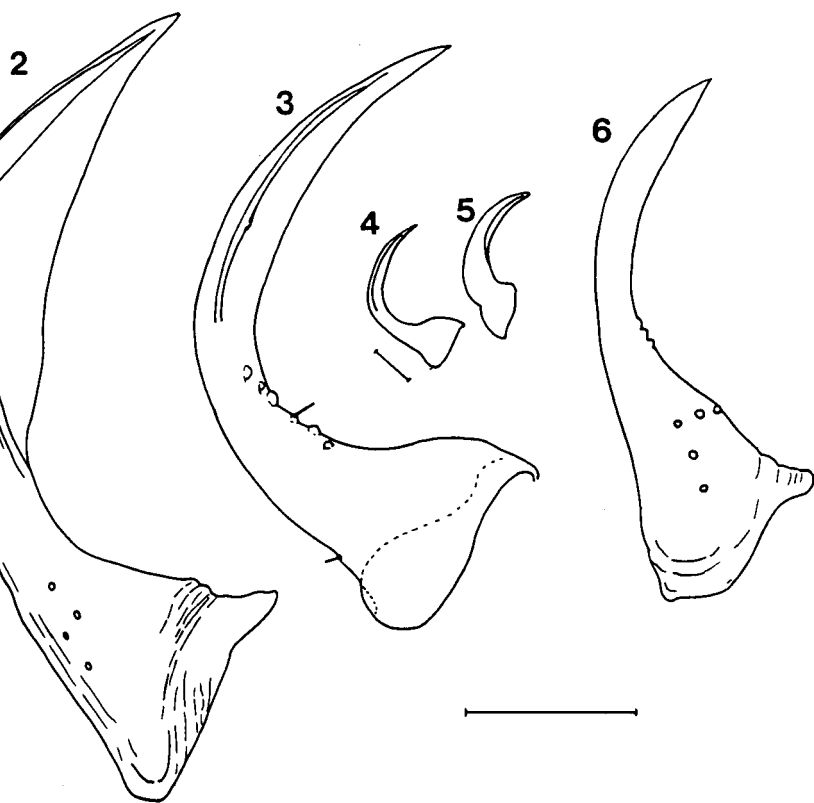
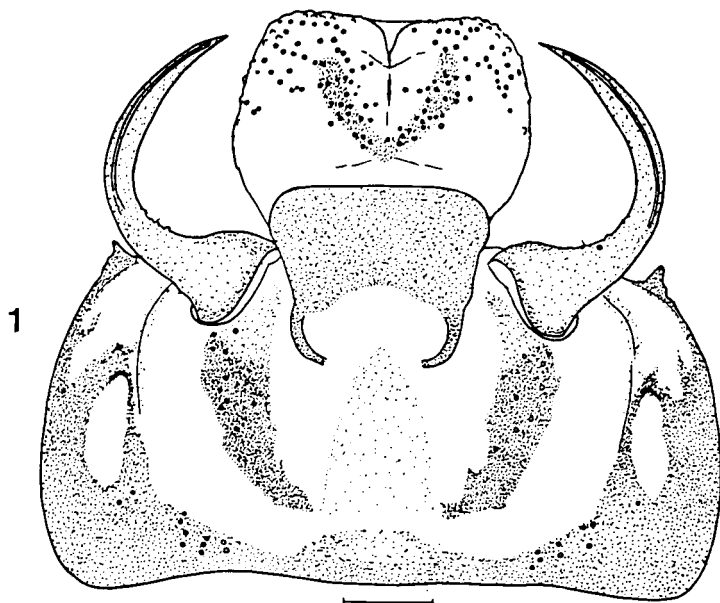
Genitalia: penes slightly shorter than forceps (in Fig. 1, they appear longer due to distortion after slide preparation), almost square: small papillae, and V-shaped marking present. Forceps strongly bowed and pointed (Figs. 1, 3 and 4), with small tubercles on inner, basal edge, some carry a small sharp bristle, longitudinal fold present on distal half. Sclerite of styliger very wide, apophysis long, curved inwards; lateral and baso-lateral sclerites of styliger as shown in Fig. 1; central sclerite may be more pointed than illustrated and can unite with baso-lateral sclerite.

Female. Body length: 4.6-5.3 mm; wing length: 3.3-3.6 mm. Colour similar to male, abdomen with lateral apophysis $\frac{1}{4}$ - $\frac{1}{5}$ as long as segment.

Eggs. Length 150-170 μm , width 100-105 μm . Two epithema (polar caps) present (Figs. 29 and 30) one micropyle (two noted for this genus by Koss and Edmunds, 1978). Micropyle long, opening as shown in Fig. 31, with oval zone on chorionic surface before the opening. Fig. 32 shows an anomalous micropyle with a secondary lateral opening.

Nymphs. Body length: ♂ ca. 3 mm, ♀ 4.5-5.4 mm; cerci: ♂ ca. 2.5 mm, ♀ 3.8-4.2 mm. Head and thorax yellow-brown, abdomen lighter, cerci yellowish. Head with large transversely oval spot three times wider than middle ocellus in fronto-clypeal region, between antennae and another similar but longitudinal one on vertex; lateral ocelli united by a transverse brown band. Ocelli white with black base. Antennae yellowish, ventral surface of pedicel with some bristles longer than ca. $\frac{1}{2}$ pedicel length (fig. 27).

Figs. 1-6. Male genitalia and forceps of different species of the genus *Tasmanocoenis*: *T. arcuata* sp.n. (1, 3, 4), *T. tillyardi* (2), *T. jillongi* (5, after Harker's original drawing, and directly compared with *T. arcuata* at the same scale) and *T. tonnoiri* (6). Scale lines 0.05 mm.



Mouthparts: (Figs. 8-14). Labrum with long setae, broadly emarginate, with a denticle on each side (Fig. 10). Maxillae (Fig. 8) length of 1st palp segment approximately equal to 3rd segment, and 1.3 times longer than 2nd, outer margin with row of strong pointed bristles with 1-2 short setae on distal zone of internal edge; second segment with fine setae on outer margin, a bristle apically; third segment with long pointed bristles along inner edge and some setae on external margin of apex (Fig. 9). Mandibles with long bristles on margins (at 400x magnification bristles bifid and pinnate), outer incisors with 3-4 teeth and additional fold slightly displaced posteriorly; mesal incisors with 2-3 teeth (Figs. 13 and 14). Labium (Fig. 11), paraglossae as long as glossae, pointed; 1st segment of labial palp slightly longer than 2nd segment, and ca. 2.3 times longer than 3rd (Fig. 12).

Thorax: surface almost glabrous, pronotum yellowish with brown indistinct markings, lateral margins lighter, with a spine and bristles on fore angles (Fig. 21) (material from locations other than River Murray may have more than one spine on fore angles). Mesonotum with light spots symmetrically arranged on each side of median suture, and two light spots on median suture, one elongate anteriorly, and one V-shaped posteriorly, between wing pads.

Legs whitish, fore leg with dark band on external side of femur, tibia and tarsus (Fig. 20); femur with transverse row of 6-8 bifid bristles (Figs. 20 and 22), claws long, slender, slightly curved, with three teeth near base. Femora of mid leg with 3-6 teeth, and hind claw with two types of teeth, 3-4 near base, similar to those on fore and mid claws, but sharper, and other long narrow, sharp teeth apically.

Abdomen: dorsal surface of 1st abdominal tergite without bristles; 2nd tergite with short smooth triangular backwards pointing spine between plates of 2nd gills (Fig. 25); hind margins of tergites 7 and 8 with long setae, some as long as each segment.

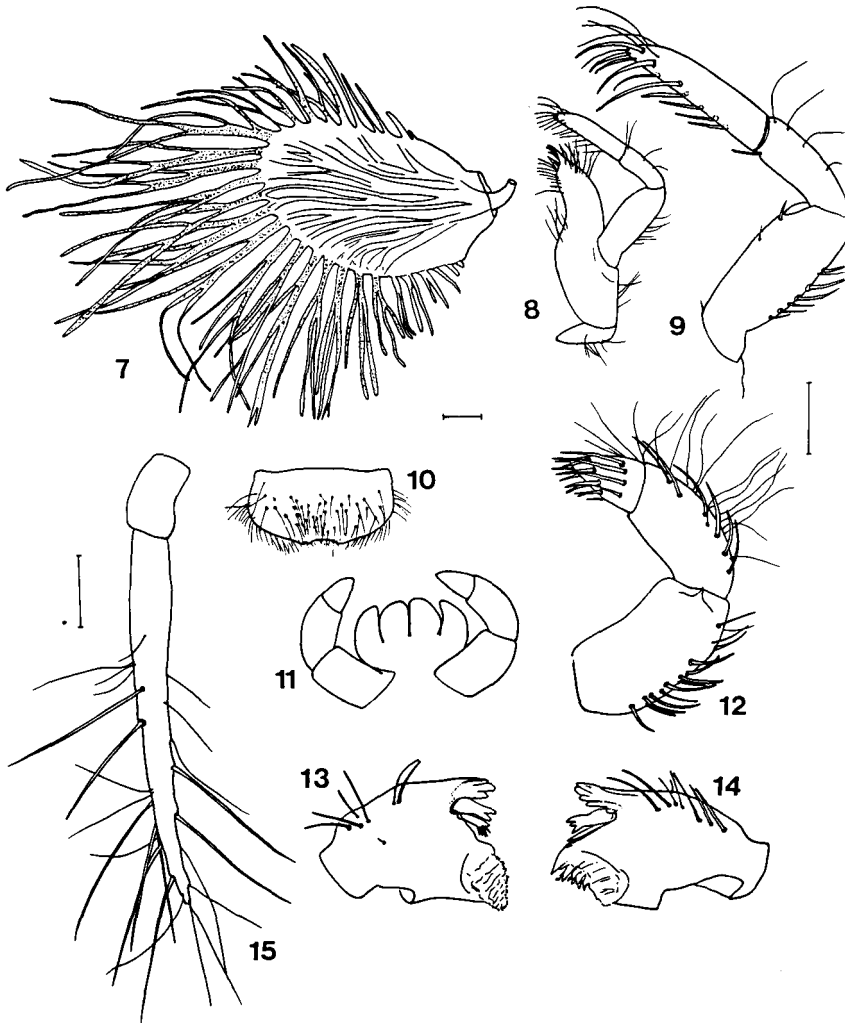
Gills: 1st gill 2 segmented (Fig. 15); 2nd gills with long bristles on outer and posterior margins, inner margin with few short bristles (Fig. 19); mesal fork of triangular ridge with ca. 8 bristles (Fig. 16); submarginal row of scales (microtrichia) simple (Figs. 26 and 28); 3rd to 6th gills oval shaped in River Murray material (Fig. 7), but more triangular in material from N.W. Western Australia, with two rows of branched bristles on their surface (not illustrated in Fig. 7).

Affinities

The adults of *Tasmanocoenis arcuata* sp.n. are similar to the three species with described adults: *T. tonnoiri* Lestage, 1930; *T. tillyardi* Lestage, 1938 and *T. jillongi* Harker, 1957, but can be distinguished by the shape of the forceps (Figs. 3 to 6), structure of the penis, and the tarsal formulae of the mid and hind legs.

The nymphs of *T. arcuata* can be distinguished from other described species in

possessing markings on the legs, 2nd gills with short and stout bristles, but no long setae dorsally, and no long setae on the dorsal surface of the 1st abdominal segment.



Figs. 7-15. *T. arcuata* sp.n. nymph: 3rd gill (7), maxilla (8), maxillary palp (9), labrum (10), labium (11), labial palp (12), right mandible (13), left mandible (14) and 1st gill (15). Scale lines 0.05 mm.

KEY TO THE DESCRIBED SPECIES OF THE GENUS *TASMANOCOENIS*

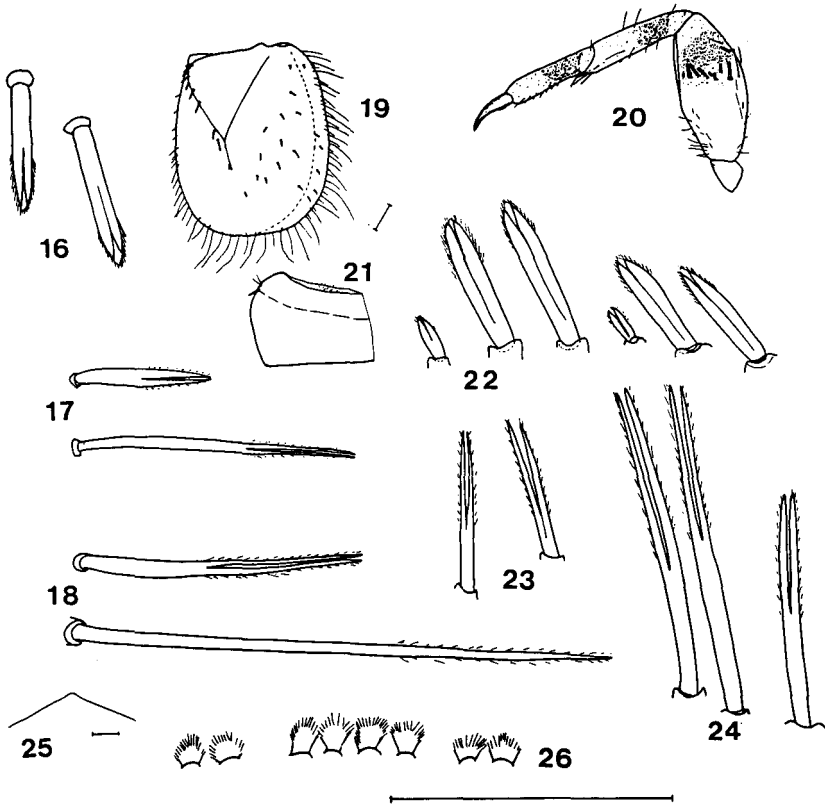
Original descriptions and additional literature (Lestage, 1930; Tillyard, 1936; Demoulin, 1955; Harker, 1957; Soldán, 1984; 1986; Malzacher, 1987) were reviewed. However, this key is based on characters determined for direct observations on adults of all species with the exception of *T. jillongi* for which the original description was used (Harker, 1957).

For the nymphs direct observations were made on all described species except *T. jillongi*, for which original description was used (Harker, 1957). On examination of this material it was clear that the two species *T. queenslandica* (Soldán) and *T. rieki* could not be distinguished from nymphs of *T. tilyardi*. Soldán (1978) recorded a number of characters which should separate these species, but on examination of paratype material they do not agree with the original descriptions. Soldán recorded "Claws long and slender, slightly bent, bearing two kinds of teeth: bigger and blunt teeth near the base, and a smaller pointed tooth situated distally"; this is only true on the hind legs. Soldán also recorded setae on the dorsal posterior margin of abdominal segments VII-IX, but they are only present on segment VII-VIII. The setae on the gills and fore legs of *T. queenslandica* are similar to those of *T. tilyardi*. The only character which may differ is the length of the apical segment of the antennae. In *T. queenslandica* the apical segment is longer than the three basal segments (Soldán, 1978); whereas, in all other species this segment is shorter than the three basal segments. In the paratypes the antennae were broken, and this character was not compared.

ADULTS

Adults of *T. queenslandica* (Soldán, 1978) and *T. rieki* (Soldán, 1978) remain unknown.

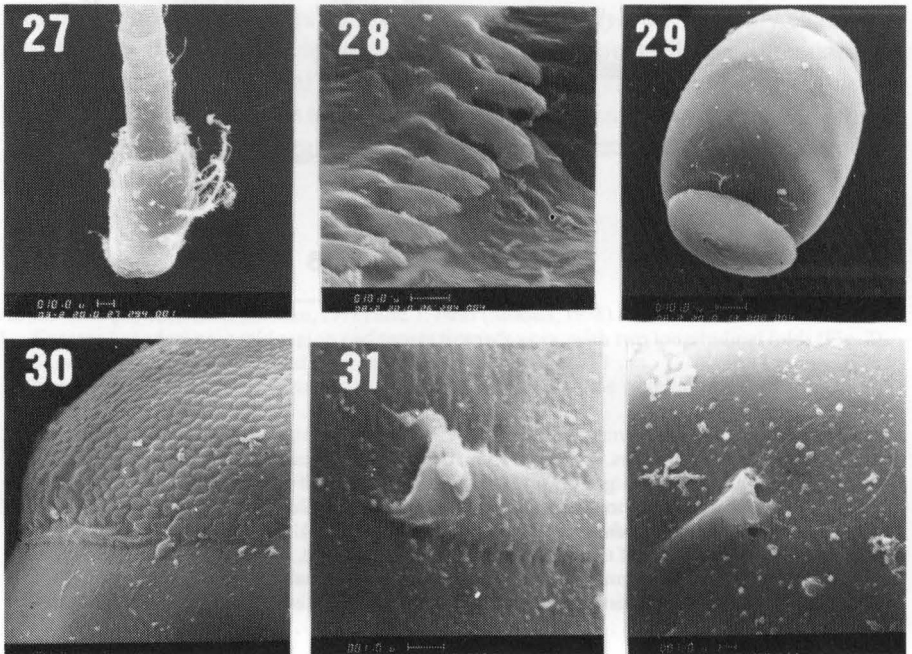
- 1.- Forceps broadest near mid region and tapers towards apex, with two longitudinal folds (Fig. 2). Tarsal formulae of middle and hind legs 1,5,2,3=4 or 1=5,4,2=3 *T. tilyardi* Lestage, 1938.
 - Forceps uniformly wide, tapering at apex, not more than one longitudinal fold (Figs. 3-6). Tarsal formulae not as above 2
- 2.- Forceps bowed at right angles (Figs.: 1, 3 and 4). Tarsal formulae of middle and hind legs 5,1,2,4,3 *T. arcuata* sp.n.
 - Forceps not as strongly bowed (Figs.: 5 and 6). Tarsal formulae not as above 3
- 3.- Penes shorter than forceps, with anterior margin rounded, and with a small emargination. Forceps without longitudinal fold (Fig. 6). Tarsal formula of middle and hind legs 5,1,2,3,4 *T. tonnoiri* Lestage, 1930.
 - Penes longer than forceps, anterior margin straight, and with a deep V-shaped emargination. Forceps with one longitudinal fold (Fig. 5). Tarsal formula of middle and hind legs 5,4,3=2,1 *T. jillongi* Harker, 1957.



Figs. 16-26. Nymphal characters. *T. arcuata* sp.n.: bristles of the mesal fork of the triangular ridge of 2nd gills (16), 2nd gill (19), fore leg (20), left half of pronotum (21), bristles of the transverse row of fore femur (22), posterior margin of 2nd abdominal tergite (25), scales (microtrichia) of submarginal row of the 2nd gills (26). *T. tonnoiri*: 3rd and 6th bristles of the mesal fork of the triangular ridge of 2nd gill (17), bristles of the transverse row of femur (23). *T. tylliardi*: 1st and 3rd bristles of the mesal fork of the triangular ridge of 2nd gill (18) and bristles of the transverse row of fore femur (24). Scale lines 0.1 mm.

NYPHHS

- 1.- Second pair of gills rectangular, lateral margins straight and parallel. Third segment of maxillary palp twice length of second segment. Third segment of labial palp long, length twice width. The whole nymph covered with hairs *T. jillongi* Harker, 1957.
 - Second pair of gills with convex lateral margins (Fig. 19). Third segment of maxillary palp equal to or slightly longer than second segment. Third segment of labial palp short, length approximately equal to width 2
- 2.- A transverse row of long setae on 1st abdominal tergite. Surface of second gill (gill covers) with long and slender bristles (Figs.: 17 and 18), viewed laterally the nymph appears very hairy. Transverse row of bristles on fore femora slender (Figs. 23 and 24) 3
 - Without long setae on 1st abdominal tergite. Surface of gill covers with scarce stout bristles (Figs. 16 and 19) and similar bristles on the transverse row of femora (Fig. 22) . . *T. arcuata* sp.n.
- 3.- Femora without dark markings. All bristles on mesal fork of triangular ridge on gill covers bifid, but short (Fig. 17) *T. tonnoiri* Lestage, 1930.
 - Distal region of femora with dark V-shaped pigmented spot. Bristles on mesal fork of triangular ridge of gill covers very long and slender, with one, two or all three bristles bifid (Fig. 18) 4
- 4.- Apical antennal segment longer than three basal segments, and with 3 or 4 setae about half way along length *T. queenslandica* (Soldán, 1978) and *T. rieki* (Soldán, 1978).
 - Apical antennal segment shorter than three basal segments, and with setae restricted to intersegmental joints. *T. tillyardi* Lestage, 1938.



Figs. 27-32. *T. arcuata* sp.n.: basal part of the nymphs antenna (27), submarginal row of scales (microtrichia) on the 2nd gills (28), whole egg (29), polar cap (epitheca) edge (30), micropyle and chorionic surface (30 and 31).

DISTRIBUTION OF THE KNOWN *TASMANOCOENIS* SPECIES

The most widely distributed species are *T. tilliardy* and *T. arcuata*. Suter (1986) recorded *T. tilliardy* in Tasmania, Victoria, South Australia, and Western Australia. In South Australia *T. tilliardy* was recorded throughout the streams of the Mt. Lofty and Flinders Ranges but little material from the river Murray was collected (Suter, 1986). The present study recorded both *T. tilliardy* and *T. arcuata* in the River Murray, but the latter species was not recorded in the smaller streams draining the Mt. Lofty Ranges. *T. arcuata* was examined from the River Murray in New South Wales; Koongie Lakes in central South Australia; Fitzroy River, Rockhamptom Queensland and the Kimberleys in north west Western Australia.

T. tonnoiri has been recorded in Tasmania and Victoria (Suter, 1984), while *T. jillongi*, *T. queenslandica* and *T. rieki* have only been found at the type localities: Kuringae Chase (New South Wales), Fitzroy River near Rockhamptom (Queensland) and Nerolyn Reservoir (New South Wales), respectively.

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