

# New species and new records of *Tonnoira* (Diptera: Psychodidae) from Brazil

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**Abstract.** A new species of moth-fly, *Tonnoira igrapuensis* sp. nov. (Psychodidae, Psychodinae), from the Brazilian Atlantic Rain Forest is described. The new species can be distinguished from other species of the genus by its eye bridge separated by 0.5 facet diameter,  $R_5$  ending slightly posterior to apex of the wing, gonostyli bifurcated with long arm shorter than length of gonocoxites, aedeagus bipartite and asymmetrical, and two asymmetrical parameres. The gonostylus is similar to that of *Tonnoira andradei* Santos, 2014, but in the latter species the aedeagus has only one shaft and not two as in the new species. *Tonnoira bifida* Bravo & Chagas, 2004, *Tonnoira brisoliai* Santos, 2014, and *Tonnoira galatae* Santos, 2014 have their distribution expanded.

**Key-Words.** Psychodinae; Maruinini; Moth fly; Atlantic Rain Forest; Neotropical Region.

## INTRODUCTION

The American genus *Tonnoira* Enderlein, 1937 (Psychodinae) has been recorded from Nicaragua to Brazil (Espírito Santo State), with no records for the Caribbean islands. Twenty-five species are currently known for the genus (Bravo *et al.*, 2008; Chagas-Vieira, 2012; Santos & Curler, 2014). There are records of seventeen *Tonnoira* species in Brazil, which represents 70% of all known species in that genus (Bravo & Chagas, 2004; Bravo *et al.*, 2008; Quate & Brown, 2004; Chagas-Vieira, 2012; Santos & Curler, 2014). We describe here a new species of *Tonnoira* from the Atlantic Rain Forest of Bahia State, Brazil, and expand the distributions of three previously described species.

The specimens examined in this study were cleared with 10% potassium hydroxide (KOH), neutralized with acetic acid 20%, dehydrated in ethanol, diaphanized in clove oil and mounted in Canada balsam on slides. General morphological terminology follows Cumming & Wood (2017). Cercus is preferred to the apical appendages of male terminalia following Araújo & Bravo (2019). Additional information not included in the collection label was added in brackets in material examined. The type specimens and other material studied are deposited in the Entomological Collection Prof. Johann Becker of the Museu de Zoologia da Universidade Estadual de Feira de Santana, Bahia, Brazil (MZFS).

## MATERIAL AND METHODS

The specimens described here were collected by Dr. Sergio Andena and collaborators using Malaise and Pennsylvania light traps during an insect inventory in the Reserva Ecológica da Michelin (Michelin Ecological Reserve, 13°46'53"S; 38°49'44"W), which is located in the Central Corridor of the Atlantic Rain Forest, Bahia State. The Psychodidae specimens were collected in one of the most intact forest fragments in that reserve, called Vila 5, which covers 180 ha at elevations between 160 and 288 m a.s.l. (Fig. 1) (Nascimento *et al.*, 2017).

## TAXONOMY

### Genus *Tonnoira* Enderlein, 1937

**Type species:** *Tonnoira pelliticornis* Enderlein (orig. des.), known only by female.

**Comments:** Santos & Curler (2014) provide an accurate diagnosis of *Tonnoira*. In some species of *Tonnoira* the  $R_5$  ends at pointed apex but other species this vein ends slightly beyond the apex, thus, these character states should be included in the diagnosis.

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### *Tonnoira igrapiunensis* sp. nov.

#### Figs. 2-12

**Type material:** **Holotype:** male, BRAZIL, Bahia, Igrapiúna, Reserva Ecológica Michelin, Vila 5, 28.v-12.vii.2012, Malaise [trap]. Aragão, M.; Menezes, E.; Mota, E.; Andena, S, leg. (MZFS #56225). **Paratypes:** 6 males, same data as holotype (MZFS #56227, #56229, #56230, #56231, #56232, #56233); 2 males, same locality as holotype, 27-28.x. 2012, light [trap], Aragão, M., Menezes, E., Mota, E. leg. (MZFS #56226, #56234); 1 male, same locality as holotype, 28.x-18.xi.2012, Malaise [trap], Aragão, M., Menezes, E. leg. (MZFS #56228).

**Description: Male: Head:** slightly wider than long; short vertex; eye bridge with four facet rows; eyes separated by almost one facet diameter; interocular suture inverted Y-shaped (Fig. 2). **Antenna:** scape wider apically than at base, 2.0 times the length of the pedicel (Fig. 3); pedicel spherical, with two groups of three small sensorial setae both in front of and behind the proximal margin (Fig. 6); flagellum with 14 flagellomeres, all cylindrical (Figs. 3-5); ascoids not observed, probably lost; 14<sup>th</sup> flagellomere with long apiculus, 0.3 times the length of the flagellomere (Fig. 5). **Wing (Fig. 8):** Sc short not reaching C; R<sub>2+3</sub> not connected to R<sub>4</sub>; R<sub>5</sub> ending slightly beyond the wing apex; radial fork basal to medial fork. **Terminalia:** hypandrium bent backwards, narrower laterally (Fig. 9); gonocoxites 1.2 times the length of gonostyli, with setae only dorsally (Figs. 9, 11); gonostyli bifurcate; lateral branch of gonostylus longer than mesal branch (Figs. 9, 10), divergent in lateral view (Fig. 10); aedeagus bipartite, asymmetrical, short shaft 0.8 times the length of the long shaft; short shaft with two sclerites fused basally, dorsal sclerite plate-like, shorter than the narrow ventral sclerite, both covered by an apical membrane (Fig. 9); parameres asymmetrical, long shaft with curved apex and short shaft plate-like with rounded apex (Figs. 9, 11); gonocoxal apodemes fused medially and articulated with parameres (Fig. 11); epandrium wider than long, bare ventrally, with one basal aperture (Fig. 12); hypoproct longer than epandrium, with apex tapered; epiproct shorter than hypoproct, with rounded apex; hypoproct and epiproct both with apical micropilosity (Fig. 12); cerci with two tenacula (Fig. 12).

**Female:** Unknown.

**Remarks:** The new species can be distinguished from other species of *Tonnoira* by the eye bridge with four facet rows, separated by 0.5 facet diameter; R<sub>5</sub> ending slightly posterior to apex of wing; gonostyli bifurcated, dorsal arm shorter than ventral arm; long arm of gonostyli shorter than length of gonocoxites; cerci with two tenacula; aedeagus bipartite, asymmetrical, short shaft 0.8 times the length of the long shaft; parameres asymmetrical, longer shaft with apex curved. The gonostylus is similar to that of *T. andradei* Santos, 2014, but differs, mainly, by the bifid aedeagus in the new species and with only one shaft in *T. andradei*. The ejaculatory apodeme and hypoproct in the new species is longer than the same structures in *T. andradei*.

**Etymology:** The species name is a reference to the municipality of Igrapiúna where the specimens of the new species were collected.

**Distribution:** Known only from the type locality.

### *Tonnoira bifida* Bravo & Chagas, 2004

*Tonnoira bifida* Bravo & Chagas, 2004: 601, figs. 1-9.

**Material examined:** 1 male, BRAZIL, Bahia, Varzedo, Sr. Getúlio, x.2016, Dias & Campos, leg. (MZFS).

**Distribution:** Brazil: Bahia, Serra da Jibóia (type locality: 12°52'S, 39°28'W, 720 m.a.s.l.); Bahia, Varzedo (new record, 12°57'45.1"S, 39°27'12.1"W, 280 m.a.s.l.).

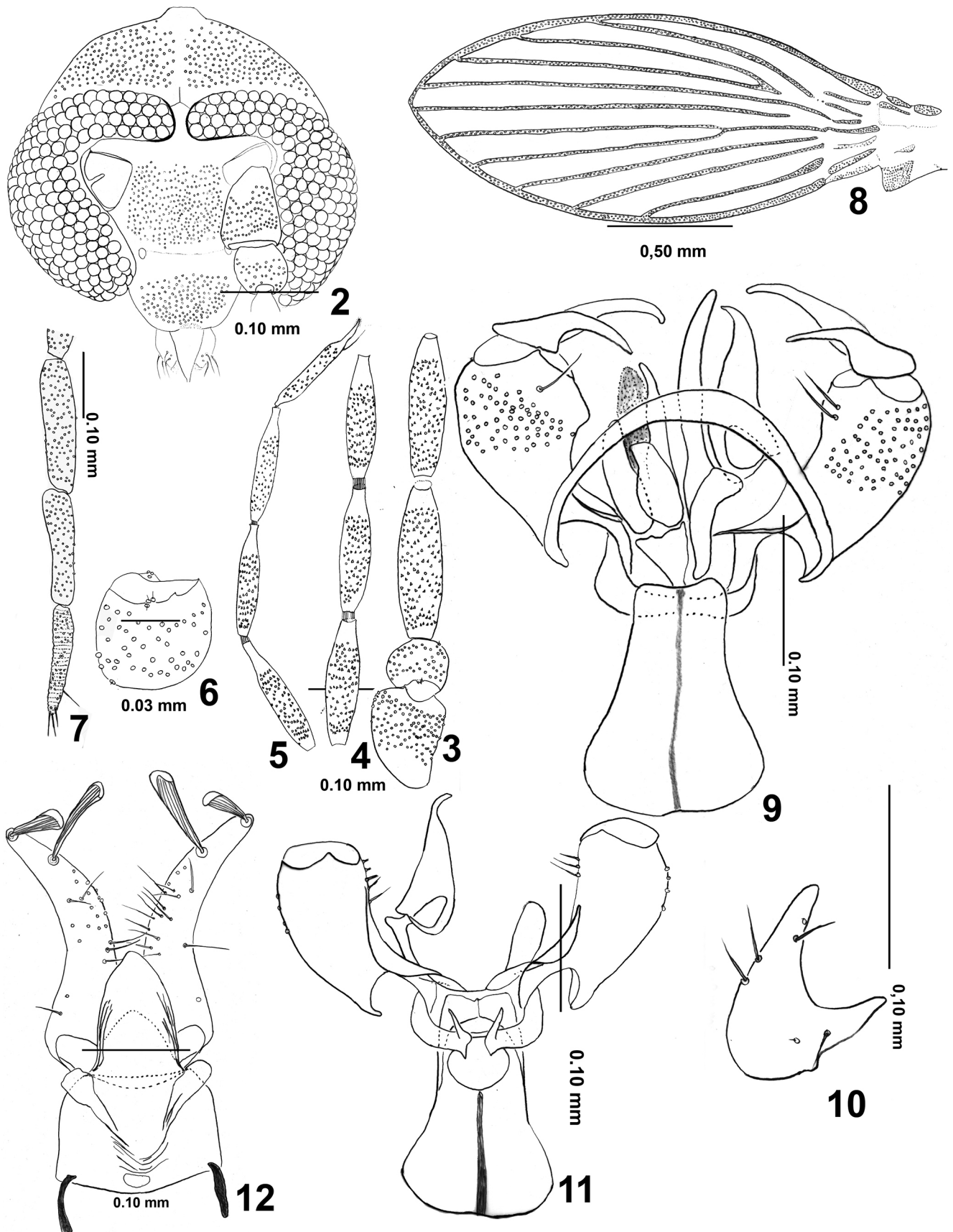
### *Tonnoira brisolaii* Santos, 2014

*Tonnoira brisolaii* Santos, 2014 (in Santos & Curler, 2014): 464, figs. 1-5.

**Material examined:** 1 male, BRAZIL, Bahia, Serra da Jibóia, Sede Gambá, 10.v.2017, Ligth [trap], Silva-Neto, Mendes & Moura, leg. (MZFS).



**Figure 1.** Atlantic Rain Forest in Reserva Ecológica Michelin, Vila 5. Photo by M. Aragão.



**Figures 2-12.** *Tonnoira igrapiunensis* sp. nov., adult male. (2) Head in frontal view (paratype 56227). (3) scape, pedicel and first flagellomeres (paratype 56227). (4) Flagellomeres 4, 5 and 6 (paratype 56227). (5) Apical flagellomeres and apiculus (paratype 56226). (6) pedicel with the marginal sensory setae (paratype 56227). (7) Palpus (paratype 56227). (8) wing. (9) Hypandrium, gonocoxites, gonostylus, ejaculatory apodeme, aedeagus and parameres (holotype). (10) gonostylus, lateral view (paratype 56227). (11) gonocoxites, gonocoxal apodemes fused, parameres and ejaculatory apodeme (holotype 56225). (12) Epandrium, cerci and hypoproct (paratype 56227). Abbreviations: am = apical membrane; lsae = long shaft of aedeagus; pr = paramere; ssae = small shaft of aedeagus.

**Distribuição:** Brazil: Espírito Santo, Santa Teresa, (type locality); Bahia, Serra da Jibóia (new record, 12°52'S, 39°28'W, 720 m.a.s.l.).

### *Tonnoira galatiae* Santos, 2014

*Tonnoira galatiae* Santos, 2014 (in Santos & Curler, 2014): 468, figs. 14-17.

**Material examined:** 3 males, BRAZIL, Bahia, Igrapiuna, Reserva Ecológica Michelin, Vila 5, 22.ix-28.x.2012, Malaise [trap]. Aragão, M.; Menezes, E. leg. (MZFS); 1 male same data as the previous one, except 16.xii.2012-20.i.2013 (MZFS); 2 males, same data as the previous one, except 20.i-24.ii.2013 (MZFS); 2 males, same data as the previous one, except 24.ii-31.iii.2013 (MZFS); 1 male, same data as the previous one, except 31.iii-28.iv.2013 (MZFS).

**Distribution:** Brazil: Espírito Santo, Santa Teresa (type locality: 19°54'S, 40°33'W, 820 m.a.s.l.); Bahia, Igrapiúna (new record: 13°50'S; 39°10'W, 160 m.a.s.l.).

### Species included in *Tonnoira*

Twenty-six species are recognized in *Tonnoira*: *T. andradei* Santos, 2014 (Brazil: Espírito Santo); *T. bifida* Bravo & Chagas, 2004 (Brazil: Bahia); *T. bifurcata* Quate & Brown,

2004 (Brazil: Rondônia); *T. bitalea* Quate, 1999 (Panama, Brazil: Amazonas); *T. bitenacula* Quate, 1996 (Costa Rica); *T. bristolaii* Santos, 2014 (Brazil: Espírito Santo); *T. castanea* Quate & Brown, 2004 (Brazil: Amazonas, Suriname); *T. cavernicola* Quate & Brown, 2004 (Bolivia, Guiana Francesa); *T. didyma* Quate & Brown, 2004 (French Guiana, Suriname); *T. distincta* Bravo, Alves & Chagas, 2008 (Brazil: Amazonas); *T. ferreirai* Santos, 2014 (Brazil: Espírito Santo); *T. fusiformis* Quate & Brown, 2004 (Costa Rica, Ecuador); *T. galatiae* Santos, 2014 (Brazil: Espírito Santo); *T. igrapiunensis* sp. nov. (Brazil: Bahia); *T. longipennis* Bravo & Chagas, 2004 (Brazil: Bahia); *T. magna* Bravo & Chagas, 2004 (Brazil: Bahia); *T. mirabilis* Wagner, 1981 (Brazil: Amazonas, Suriname); *T. pelliticornis* (Peru); *T. protuberata* Quate & Brown, 2004 (Venezuela); *T. psacadoptera* Quate & Brown, 2004 (Venezuela); *T. rapiformis* Quate & Brown, 2004 (Brazil, Suriname); *T. rectilata* Quate, 1999 (Nicaragua, Panama, Suriname, Brazil: Amazonas, Rondônia); *T. robusta* Bravo, Alves & Chagas, 2008 (Brazil: Amazonas); *T. sicilis* Quate & Brown, 2004 (French Guiana); *T. spina* Chagas-Vieira, 2012 (Brazil: Amazonas); *T. tripenis* Chagas-Vieira, 2012 (Brazil: Amazonas).

In Brazil, eighteen species of *Tonnoira* are recorded only from the Amazon and Atlantic Rain forests, two regions with high annual rainfall levels. Ten species occur in the Brazilian Amazon (states of Amazonas, Para, and Rondônia), and eight in the Atlantic Rain Forest (states of Espírito Santo and Bahia).

### Key to males of *Tonnoira*

The male of the type species of the genus, *T. pelliticornis*, is unknown.

1. Gonostylus bifurcate ..... 2  
— Gonostylus simple, not bifurcate ..... 9
2. Gonostylus with lateral and mesal branches of different length; branches subparallel or divergent ..... 3  
— Gonostylus with lateral and mesal branches of same length, crossed (Santos & Curler, 2014: Fig. 4) ..... *T. bristolai*
3. Lateral branch of gonostylus longer than mesal branch; mesal branch of gonostylus shorter than the length of gonocoxite (e.g., Santos & Curler, 2014: fig. 12) ... 4  
— Lateral branch of gonostylus shorter than mesal branch; mesal branch of gonostylus longer than the length of gonocoxite (e.g., Bravo & Chagas, 2004: fig. 6) ... 6
4. Eye bridge with 5 facet rows; cercus with one tenaculum ..... *T. protuberata*  
— Eye bridge with 4 facet rows; cercus with two tenacula ..... 5
5. Eyes separated by 0.5 facet diameter; parameres symmetrical (Santos & Curler, 2014: fig. 12) ..... *T. andradei*  
— Eyes separated by almost 1 facet diameter; parameres asymmetrical (fig. 9) ..... *T. igrapiunensis* sp. nov.
6. Lateral branch of gonostylus very short, 0.2 times the length of mesal branch (Santos & Curler, 2014: fig. 8) ..... *T. ferreirai*  
— Lateral branch of gonostylus 0.4-0.6 times the length of mesal branch (e.g., Bravo & Chagas, 2004: fig. 6) ..... 7
7. Aedeagus with one branch apically U-shaped with one of the branches longer than other (Quate & Brown, 2004: fig. 69a) ..... *T. bifurcata*  
— Aedeagus with two branches, none of them apically U-shaped ..... 8
8. Lateral branch of gonostylus with the same sclerotization of mesal branch; hypandrium narrower than width of gonocoxite, strip-like (Quate & Brown, 2004: fig. 70) ..... *T. didyma*  
— Lateral branch strongly sclerotized; hypandrium wider than width of gonostylus (Bravo & Chagas, 2004: fig. 6) ..... *T. bifida*
9. Cercus with 1 tenaculum ..... 10  
— Cercus with 2 or 3 tenacula ..... 13
10. Base of R<sub>3</sub> with cluster of black "granules" (Quate & Brown, 2004: fig. 63) ..... *T. psacadoptera*  
— Base of R<sub>3</sub> normal, without cluster of black "granules" ..... 11
11. Hypandrium wide, of the same length of width of gonostylus; gonocoxite 0.8 times the length of gonostylus (Chagas-Vieira, 2012: fig. 16) ..... *T. tripenis*  
— Hypandrium stripe-like; gonocoxite about as long as gonostylus ..... 12
12. Aedeagus "tripartite with short spur, a sickle shaped lateral shaft, and broad, paddle shaped central part twisted" (Quate & Brown, 2004: p. 29, fig. 68) .....  
..... *T. sicilis*

- Aedeagus “bipartite, larger shaft with basal three-quarters broad, asymmetrically narrowing at distal one-quarter, smaller shaft small, blunt, about one-half as long as other shaft” (Quate & Brown, 2004: p. 27, fig. 67a) ..... *T. castanea*
13. Cercus with 3 tenacula ..... 14
- Cercus with 2 tenacula ..... 15
14. Aedeagus ending at the same level of apex of gonostylus; ejaculatory apodeme shorter than gonostylus (Wagner, 1981: fig. 3) ..... *T. mirabilis*
- Aedeagus ending above of apex of gonostylus; ejaculatory apodeme longer than gonostylus (Chagas-Vieira, 2012: fig. 12) ..... *T. spina*
15. Aedeagus symmetrical, base broad, apex sagittate; parameres absent (Quate, 1996: fig. 13b; Quate & Brown, 2004: fig. 71) ..... 16
- Aedeagus symmetrical or asymmetrical, long, subcylindrical, pointed or rounded at apex; parameres present ..... 17
16. Hypandrium present, strip-like; gonocoxite as wide as long (Quate, 1996: fig. 13b) ..... *T. bitenacula*
- Hypandrium vestigial, broken in the middle; gonocoxite longer than wide (Quate & Brown, 2004: fig. 71) ..... *T. rapiformis*
17. Aedeagus ending far beyond the apex of gonostylus (Bravo & Chagas, 2004: fig. 1) ..... *T. longipennis*
- Aedeagus ending near or just beyond the apex of gonocoxites, never beyond the apex of gonostylus ..... 18
18. Aedeagus sickle shaped; ejaculatory apodeme triangular, short (Quate & Brown, 2004: fig. 77) ..... *T. rectilata*
- Aedeagus straight or little curved; ejaculatory apodeme sub-oval, longer than wide ..... 19
19. First flagellomere fusiform ..... 20
- First flagellomere cylindrical ..... 23
20. “Gonocoxal apodeme with pair of slender, acute processes flanking aedeagus and extending nearly to the tip of aedeagus” (Quate, 1999: p. 429, fig. 5K) ..... *T. bitalea*
- Gonocoxal apodeme not expanded posteriorly ..... 21
21. Hypandrium, wide, posteriorly bilobed (Bravo & Chagas, 2004: fig. 23) ..... *T. magna*
- Hypandrium, narrow, without lobes ..... 22
22. Eyes separated by 0.5 facet diameters; gonostylus shorter than gonocoxites; ejaculatory apodeme shorter than gonocoxite (Bravo et al., 2008: figs. 11, 16) ..... *T. robusta*
- Eyes separated by 0.2 facet diameters; gonostylus longer than gonocoxites; ejaculatory apodeme longer than gonocoxite (Santos & Curler, 2014: fig. 16) ..... *T. galatiae*
23. Aedeagus with one shaft, “abruptly narrowing to acute apex” (Quate & Brown, 2004: p. 32, fig. 74) ..... *T. fusiformis*
- Aedeagus with one shaft evenly narrowing in acute apex ..... 24
24. Eyes separated by less than 1 facet diameter; “aedeagus extending little beyond tip of gonocoxite” (Quate & Brown, 2004: p. 31, fig. 72) ..... *T. cavernicola*
- Eyes separated by 1 facet diameter; aedeagus extending to half of gonostylus (Bravo et al., 2008: fig. 6) ..... *T. distincta*

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