



Redescription of *Argia concinna* (Rambur), with a description of *Argia telesfordi* spec. nov. from Grenada, West Indies (Zygoptera: Coenagrionidae)

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Abstract

Argia telesfordi sp. nov. a new species close to *Argia concinna*, is described from Grenada. Both species are illustrated and diagnosed. They can be distinguished by morphology of male tori, cerci and paraproct and female mesostigmal laminae. Their distribution is allopatric, with *Argia telesfordi* distributed on Grenada and *Argia concinna* known only from Guadeloupe and Dominica.

Key words: Lesser Antilles, Guadeloupe, Dominica, endemics, new species

Introduction

With more than 110 species, the genus *Argia* is the most speciose genus of the *Coenagrionidae* in the New World of which only one, *Argia concinna* (Rambur), is known from the West Indies. *Agrion concinnum* was first described by Rambur (1842) without illustrations. Hagen *in* Calvert (1902) and Ris (1921) provided illustrations of the male caudal appendages based on Rambur's type specimens. Unfortunately, the syntype male now lacks the caudal appendages, as stated by Gloyd (1941).

Ever since its original description, the type locality has remained a mystery. Rambur noted “du Cap” as the type locality, and the species was thus thought to be from Africa. Selys (1876) doubted the African origin for *Argia concinna* and Gloyd (1941) after examining like material, restricted the type locality to the Lesser Antilles. Donnelly (1970) proposed Cape Estate (northern part of St Lucia) and Meurgey (2007) proposed Capesterre (Guadeloupe, FWI) as probable type localities. The species was first recorded from Guadeloupe by Goyaud (1994), from Dominica by Donnelly (1970) and from Grenada by Clarke (1904), followed by Woodruff *et al.* (1998). The species was erroneously mentioned from Martinique based on a single male specimen collected by Starmühlner (1982), now housed at the Florida State Collection of Arthropods (FSCA). Examination of this specimen (J. Daigle *pers. comm.*) revealed that the specimen was *Enallagma coecum* (Hagen); *A. concinna* is thus not known from this island. Recently, M. Ivie (Donnelly, 2007) and F. Sibley (*pers. comm.*) both failed to find *Argia concinna* on Montserrat and Ste. Lucia during a two-week collecting trip in 2007 and 2009 respectively.

I compared specimens from Guadeloupe, Dominica and Grenada during a survey carried out in 2009. My examination of an extensive series revealed that two species are involved. As a part of an on-going study of Caribbean odonata, I redescribe *Argia concinna* based on a number of specimens and describe another species which has been incorrectly associated with the former species until now.

***Argia concinna* (Rambur, 1842)**

(Figures 1, 3, 5–6, 9, 11, 13, 15, 17, 19, 21, 23)

Material examined: 101 ♂♂, 66 ♀♀: **GUADELOUPE:** 4 ♂♂, 2 ♀♀, Grand Etang, Capesterre-Belle-Eau 1312 ft, N 17° 72' 49,2" W 64° 67' 57", 23.IV.2003, F. Meurgey leg. 10 ♂♂ 7 ♀♀, Stream near Route des Mamelles, Petit-Bourg 590 ft, N 17° 89' 29,4" W 64° 10' 64,9", 27.IV.2003, F. Meurgey leg. 3 ♂♂, 1 ♀, Stream at Sofaïa, Sainte Rose 1082 ft, N 17° 89' 36" W 32' 00", 02.V.2003, F. MEURGEY leg. 6 ♂♂, 4 ♀♀, Grand Carbet river, Capesterre-Belle-Eau 1961 ft, N 17° 74' 25,7" W 64° 50' 08", 05.V.2003, F. Meurgey leg. 1 ♂, 2 ♀♀, Galion river, Saint Claude 1049 ft, N 17° 70' 10,6" W 63° 98' 42", 08.V.2003, F. Meurgey leg. 12 ♂♂, 9 ♀♀, Corrosol river, Petit-Bourg 836 ft, N 17° 88' 38,0" W 64° 02' 12", 29.III.2004, F. Meurgey leg. 1 ♂, 1 ♀, Canal Dongo, Vauchelet, Capesterre-Belle-Eau 1115 ft, N 17° 72' 32,4" W 64° 77' 47", 27.I.2006, F. Meurgey leg. 1 ♂, 1 ♀, Stream at Sofaïa, Sainte-Rose 1082 ft, N 17° 89' 36" W 32' 00", 01.II.2006, F. Meurgey leg. 4 ♂♂, 6 ♀♀, Grand Rivière de Vieux-Habitants, Vieux-Habitants 127 ft, N 17° 75' 65,9" W 63° 33' 40", 03.II.2006, F. Meurgey leg. 3 ♂♂, 4 ♀♀, Ravine Boudoute, Trois-Rivières 2250 ft, N 17° 71' 74,7" W 64° 44' 92", 06.VI.2007, F. Meurgey leg. 1 ♂, 2 ♀♀, ravine à Vache, Saint-Claude 3182 ft, N 17° 73' 23,2" W 64° 23' 47", 08.VI.2007, F. Meurgey leg. 4 ♂♂, 5 ♀♀, Rivière Madelonnette, Sainte-Rose 967 ft, N 17° 95' 72,4" W 63° 82' 16", 18.VI.2007, F. Meurgey leg. 6 ♂♂, 2 ♀♀, Rivière Janikeete, Sainte-Rose 770 ft, N 17° 94' 91" W 63° 23' 47", 18.VI.2007, F. Meurgey leg.

DOMINICA: 5 ♂♂, 1 ♀ River Blanc at Chamberlain Estate, 750 ft, 2.XI.2006 G. Weber leg.; 2 ♂♂ same data, 22.XI.2006 G. Weber leg.; 5 ♂♂, 1 ♀ Wotten Waven, 1100 ft, 21.XI.2006 G. Weber leg.; 6 ♂♂ same data, 22.XI.2006 G. Weber leg.; 5 ♂♂, 2 ♀♀ stream at Casso 650 ft, 21.XI.2006 G. Weber leg.; 3 ♂♂, 4 ♀♀ Roseau River at Goodwill reservoir 150 ft, 21.XI.2006 G. Weber leg.; 6 ♂♂, 4 ♀♀ unnamed stream at Springfield Estate 1200 ft, 23.XI.2006 G. Weber leg.; 4 ♂♂, 6 ♀♀ Check Hall River, Springfield Estate 1100 ft, 23.XI.2006 G. Weber leg.; 2 ♂♂, 1 ♀ Layou river, Camp Soleil 150ft, 26.XI.2006 G. Weber leg.; 2 ♂♂, 1 ♀ Pagua river, Stonefield 600 ft, 29.XI.2006 G. Weber leg.; 1 ♂ Pagua river, Concord 150 ft, 29.XI.2006 G. Weber leg.; 4 ♂♂ unnamed stream at Pont Cassé 1550 ft, 04.12.2006 G. Weber leg.

Diagnosis: Medium sized dark and blue species.

Morphology: Male: Medium sized dark and blue species. **Head:** Labium light blue or black; palps and apical portion of teeth black. Labrum light blue with a black posteroventral distal margin and a black stripe basally. Anteclypeus black; postclypeus blue bordered with black. Mandibles light blue. Genae light blue each with a black, rounded spot (Figs. 1, 3). First antennal segment blue basally and black distally, second segment and flagellum black; Frons entirely black except for a large transverse anterior blue stripe. Vertex black with two blue spots at anterior margin of lateral ocelli. Rear of head black with a discontinuous lateral blue stripe along posterior margin of eyes. Eyes in life bright blue with a shade of black above. **Thorax:** Prothorax mostly black, middle lobe with two large dorsolateral blue spots and two small blue spots at angles of the rear margin these spots always aligned with the blue antehumeral stripe on pterothorax; a deep depression of each side of median lobe; anterior margin with a sinuate blue stripe along carina, lateral margin each with a blue spot (Fig. 9). Mesepisternum and metepimeron black with complete blue antehumeral stripe. Metepisternum, metepimeron and venter of pterothorax blue. Large black stripe between the metepisternal-metepimeral carina, dark stripe along carina between metepimeron and venter of thorax (Fig. 1). **Wings:** Hyaline or smoky; venation black. Pterostigma dark brown. **Legs:** Coxae light blue with each a black spot on the external side; third of internal face of profemora blue, the remainder black; sixth of internal face of meso- and metafemora blue, the remainder black. External face of tibiae blue; tarsi black. **Abdomen:** Black with blue areas as follows (Figs. 5, 6): Dorsally and dorsoventrally on S1; two spots dorsally and a spot laterally on S2, dorsolaterally basal two thirds dorsally and lateral fifth of S3–6; small dorsal spot basally on S7; S8–10 dorsally. Torifer region distinctly raised; tori elongated, light blue, almost rectangular and divergent dorsally, directed ventrally into two long blunt processes each ending with a small torus these situated between cerci (Fig. 15). Epiproct long and slightly surpassing tori. Cercus and paraproct black. Cercus short, in lateral view about as long as or slightly shorter than paraproct (Fig. 11). In mediodorsal view, cercus bifid at tip with

decumbent tooth as long as or shorter than outer branch; concavity between them slightly marked (Fig. 15). Decumbent tooth situated medially (more rarely subapically). In dorsal view, cercus oval, broader than space between them and broader than long with a distinct notch on apical margin (Fig. 13). Paraproct almost square or roundly triangular directed dorsally and reaching cercus, ventral branch lacking or represented by a small lobe; in lateral view with only a small tooth on external margin, reaching or slightly surpassing level of cercus (Fig. 11).

FEMALE: Similar to male but with less extensive pale areas, cream-colored or light brown instead of blue. **Head:** As in male but dark stripe on the labrum larger, often covering the entire basal half. Eyes in life dark gray or black when mature, black above and blue below as immature. **Thorax:** As in male but prothorax black with a small isolated yellowish spot above notopleural suture and often with a small yellowish spot on each side of the posterior margin. These spots always aligned with pale antehumeral stripe. Mesostigmal plates triangular, posterodistal margin unmodified, posteromedial margin not expanded and forming an entirely black slightly raised lobe (Figs. 17, 19). Pterothorax as in male but with metepimeral stripe narrower and yellow or light brown. Other pale areas on the thorax as in male but cream, or yellow colored. **Wings:** As in male. **Legs:** Coxae pale with each a black spot on the external side; third of internal face of profemora pale, the remainder black; sixth of internal face of meso- and meta femora pale, the remainder black. External face of tibiae pale; tarsi black. **Abdomen:** S1 with a small blue spot dorsally, sometimes absent, and with yellowish spots ventrolaterally. S2–4 (or S2–3) black dorsolaterally with a blue longitudinal stripe dorsally, yellowish ventrally. S5–7 black with a small blue spot basally. S8–9 with a large blue or yellow spot on the distal half. S10 black. S2–7 sometimes entirely black, but spots on S8–9 always present (Fig. 21). Ovipositor and caudal appendages black; ventral margin of ovipositor straight and not surpassing level of S10 (Fig. 23).

Variations among specimens: Total length (mm) ♂♂: 35.0–37.0, total length ♀♀: 34.5–38.0, abdomen ♂♂: 26.0–28.5, ♀♀ abdomen: 37.0–30.0, forewings ♂♂: 20.0–22.0, ♀♀ forewings: 21.0–23.0, ♂♂ hindwings: 19.5–21.0, ♀♀ hindwings: 20.0–22.0.

Argia concinna is highly variable as to extent of pale markings but these differences do not correlate with locality. Palest individuals have S1 dark lateral stripe reduced to a dot and sometimes with only a perpendicular black stripe on the apical half; a broad blue ring at base of S7 and a large blue spot dorsally on S10. Darkest specimens have an almost completely black S1–2, sometimes no basal pale ring on S7 and only 1–3 small spots on S10. Females are more variable than males and some are completely dark, except for a small blue or yellowish spot dorsally on S8–9. Palest specimens have a middorsal blue or yellowish stripe dorsally on S3–5, a basal pale ring on S3–8 and larger blue or yellowish spots on S8–9 and sometimes S10; Most of specimens from Guadeloupe are longer than those from Dominica. Morphological attributes are less variable; the lower branch of the cerci is sometimes longer with more or less longer tooth on the external margin.

***Argia telesfordi* Meurgey, new species**

(Figures 2, 4, 7–8, 10, 12, 14, 16, 18, 20, 22)

Material examined: 22 ♂♂, 14 ♀♀. Holotype ♂: **GRENADA:** St Andrew Parish, Ste Margarets Falls 1350 ft, river and trail, N 12° 05' 40" W 61° 40' 49.5", 9.V.2009 F. Meurgey leg. Allotype ♀: same data as holotype; Paratypes: (21 ♂♂, 13 ♀♀). 4 ♂♂, St George Parish, Annandale Falls, Annandale Estate, Willis 600 ft, waterfall and ditch along the trail 600 ft, 3.V.2009 F. Meurgey leg.; 1 ♂, St Andrew Parish Mont Carmel's Falls, Marquis river, 600 ft, waterfall and trail, N 12° 05' 36" W 61° 38' 07" F. Meurgey leg. 3 ♂♂, 2 ♀♀, St Andrew Parish, Ste Margarets Falls 1350 ft, river and trail, N 12° 05' 40" W 61° 40' 49.5", 9.V.2009 F. Meurgey leg.; 4 ♂♂, 3 ♀♀, St John Parish, Concord Falls, Concord Valley, Davidall Estate, Black Bay River 1480 ft, waterfalls and river, 7.V.2009 F. Meurgey leg.; 1 ♂, 1 ♀, Gouyave, Charlotte River 400 ft, N 12° 10' 3.7" W 61° 43' 37.8", 5.V.2009 F. Meurgey leg.; 5 ♂♂, 5 ♀♀, Tufton Hall falls, Saumache River 920 ft, river and trail, N 12° 10' 52.2" W 61° 41' 38.1", 7.V.2009 F. Meurgey leg.; 3 ♂♂, 1 ♀, St Patrick

Parish, Pond near Tricolor, 1200 ft, N 12° 10' 52.2" W 61° 39' 48.5", 7.V.2009 F. Meurgey leg.. Holotype, allotype and paratypes deposited in the Nantes Museum of Natural History (France), 1 paratype ♂, 1 paratype ♀ deposited in the Rosser Garrison collection.

Etymology: This species is dedicated to John Telesford, entomologist at the Grenada Ministry of Agriculture who led us to aquatic habitats of Grenada and for his help on the field.

Diagnosis: Medium sized equally dark and blue species.

Morphology: MALE (**Holotype**): **Head:** Labium pale, palps light blue with inner margin bordered with black; apical portion of teeth black. Labrum light blue, posteroventral margin whitish. Anteclypeus light blue; postclypeus blue bordered with black. Genae light blue each with a black, rounded spot. Frons entirely black except a large transverse anterior blue stripe. Vertex black with two blue spots at anterior margin of lateral ocelli (Figs. 2, 4). Rear of head black, with a lateral blue stripe along posterior margin of eyes. Eyes in life bright blue with a shade of black above. **Thorax:** Prothorax mostly black, middle lobe with two large dorsolateral blue spots and two small blue spots on the angles or the rear margin these spots always aligned with the blue antehumeral stripe on pterothorax; middle lobe with small depression on each side or with no depression; anterior margin with a sinuated blue stripe along the carina, lateral margin each with a blue spot (Fig. 10). Mesepisternum and metepimeron black with complete blue antehumeral stripe. Metepisternum, metepimeron and venter of pterothorax blue. Large black stripe between the metepisternal-metepimeral carina, dark stripe along carina between metepimeron and venter of thorax (Fig. 2). **Wings:** Hyaline (rarely smoked), venation black; pterostigma dark brown. Ax 16 in left forewing, 16 in right forewing; Px 14 in left hindwing, 14 in right hindwing. **Legs:** Coxae pale with each a black spot on the external side; third of internal face and basal third of external face of profemora light blue, the remainder black; sixth of internal face of meso and meta femora pale, the remainder black. External face of tibiae pale; tarsi black. **Abdomen:** Similar in color to that of *Argia concinna* (Figs. 7, 8). Caudal appendages similar in color to that for *Argia concinna* but torifer not raised above the level of tenth abdominal segment; tori small, light blue, rounded as large as space between them. Cercus black; paraproct externally black, interiorly black distally and pale basally. Cercus long, distinctly shorter than paraproct in lateral view (Fig. 12), in mediadorsal view cercus bifid at tip with inner branch longer than outer branch and concavity between them distinctly marked; inner branch situated subapically (Fig. 16). In dorsal view, cercus truncate, broader than space between them and as long as broad, slightly notched on apical margin (Fig. 14). Paraproct bifid, narrowed at midlength upper branch roundly triangular directed upwardly; with base wider than that of digit-like ventral branch. Posterior branch long extending distinctly beyond level of cerci, slightly curved dorsoposteriorly (Figs. 20, 22)

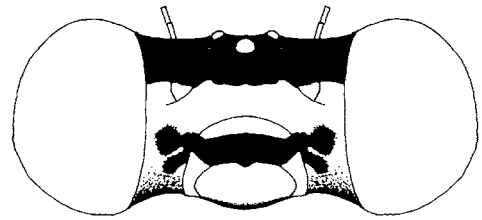
FEMALE (Allotype): Similar to male but with less extensive pale areas, yellowish or light brown in color. **Head:** As in male but pale areas yellow or light brown. Anteclypeus blue with two lateral dark spots or entirely yellow or light brown; postclypeus yellow bordered with black. Eyes in life dark above and blue below. **Thorax:** Prothorax black with two yellow spots above the notopleural suture, aligned with pale antehumeral stripe of pterothorax. Mesostigmal plates black, triangular, posterodistal margin unmodified, posteromedial margin expanded, forming a raised foliate lobe, its tip pale (Figs. 23, 24). **Wings:** Hyaline (rarely smoky), venation black; pterostigma black. Ax 15 in left forewing, 15 in right forewing; Px 13 in left hindwing, 14 in right hindwing. **Legs:** Coxae pale with each a black spot on the external side; basally third of internal face and externally third of profemora pale, the remainder black; third of external face of pro femora pale; sixth of internal face of meso and meta femora pale, the remainder black. External face of tibiae pale; tarsi black. **Abdomen:** Black with pale areas as follows: S1 with a small pale spot dorsally, and with yellowish spots ventrolaterally. S2–6 black dorsolaterally with a blue longitudinal stripe dorsally, yellowish ventrally. S7 black with a small blue half ring basally. S8–10 with a large blue or yellowish spot on the distal half. S2–7 sometimes entirely black, but spots on S8–10 always present. Ovipositor and caudal appendages black, ventral margin of ovipositor distinctly sinuate (Fig. 21).

Measurements (in mm): Holotype ♂: Total length: 34.0, Abdomen: 27.0, FW: 20.0, HW: 19.7–Allotype ♀: Total length: 32.0, abdomen: 25.5, FW: 21, HW: 19.5.

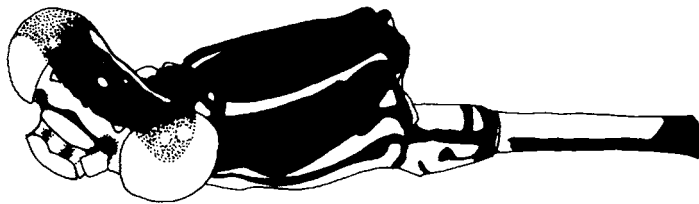
Variations among paratypes: Total length ♂♂: 34.0–36.0, total length ♀♀: 32.0–34.0, abdomen ♂♂: 27.0–28.8, ♀♀ abdomen: 25.5–27.0, forewings ♂♂: 19.7.0–21.0, ♀♀ forewings 20.0–21.0, ♂♂ hindwings: 19.0–20.0, ♀♀ hindwings: 19.0–20.0.



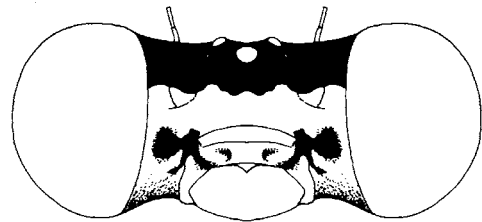
1. *concinna* ♂ head, thorax, S1-2



3. *concinna* ♂ head, frontal view



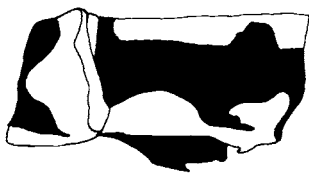
2. *telesfordi* ♂ Holotype: head, thorax, S1-2



4. *telesfordi* ♂ Holotype: head frontal view



5. *concinna* ♂ S4-10



6. *concinna* ♂ S1-2 lateral view



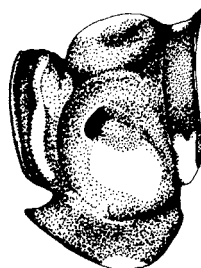
7. *telesfordi* ♂ Holotype: S4-10



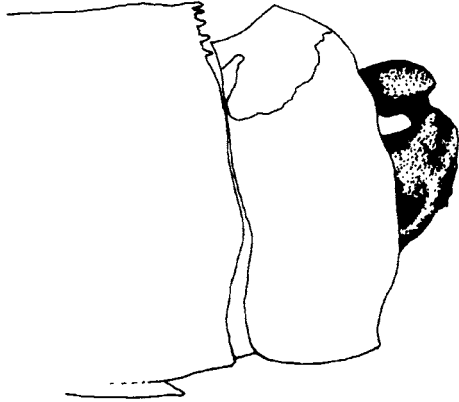
8. *telesfordi* ♂ Holotype: S1-2 lateral view



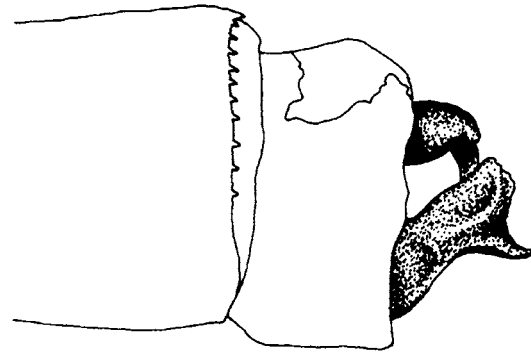
9. *concinna* ♂ pronotum dorso-lateral view



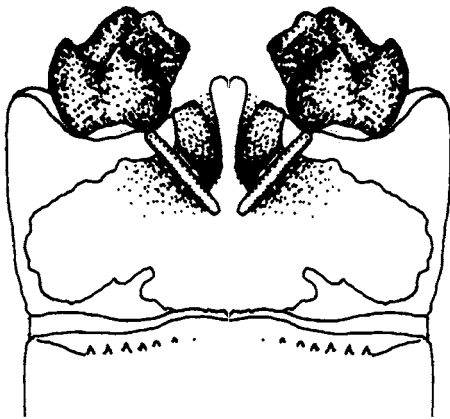
10. *telesfordi* ♂ Holotype: pronotum dorso-lateral view



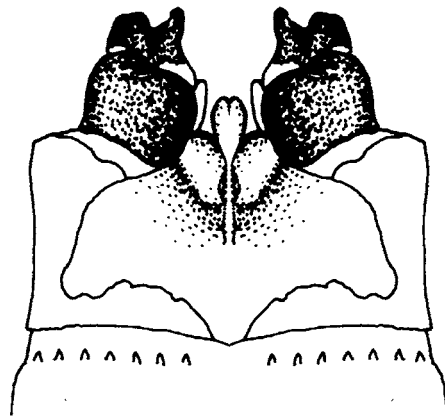
11. *concinna* ♂ caudal appendages, lateral view



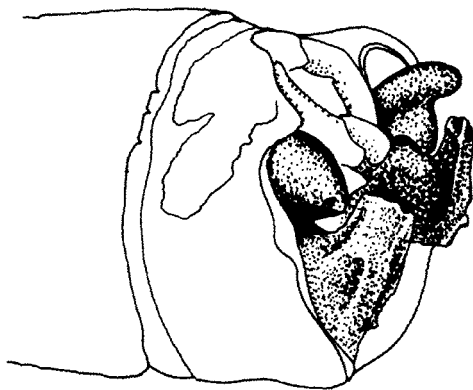
12. *telesfordi* ♂ Holotype: caudal appendages, lateral view



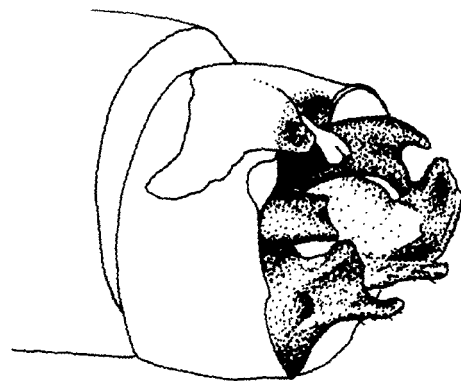
13. *concinna* ♂ caudal appendages, dorsal view



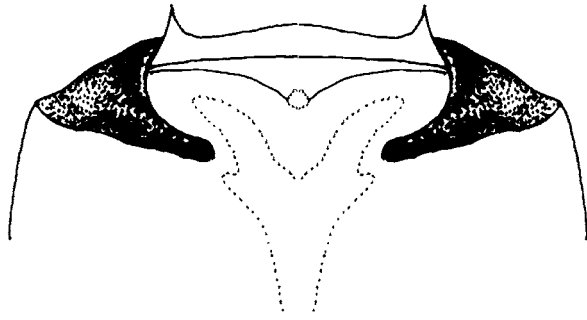
14. *telesfordi* ♂ Holotype: caudal appendages, dorsal view



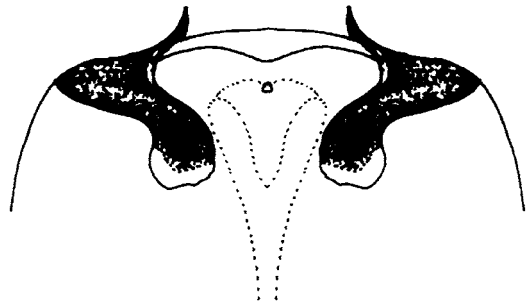
15. *concinna* ♂ caudal appendages, oblique medial view



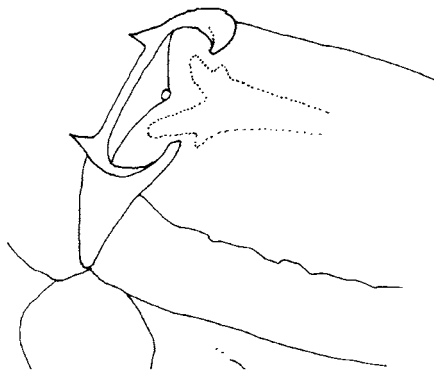
16. *telesfordi* ♂ Holotype: caudal appendages, oblique medial view



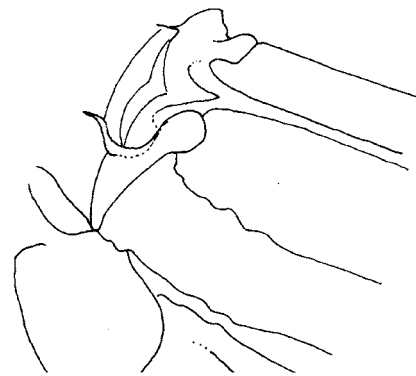
17. *concinna* ♀ mesostigmal plates, dorsal view



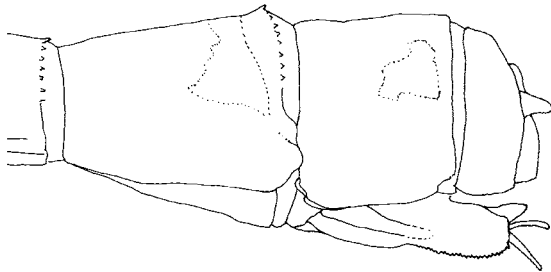
18. *telesfordi* ♀ Allotype: mesostigmal plates, dorsal view



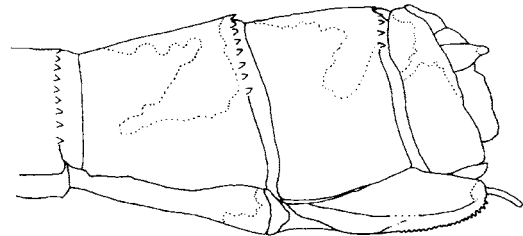
19. *concinna* ♀ mesostigmal plates, latero-dorsal view



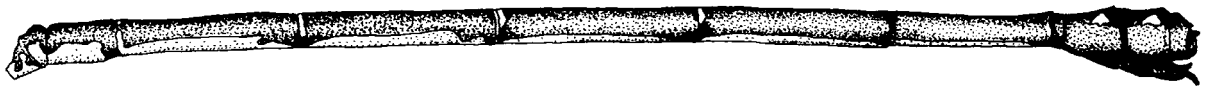
20. *telesfordi* ♀ Allotype: mesostigmal plates, latero-dorsal view



21. *concinna* ♀ S8-10, lateral view



22. *telesfordi* ♀ Allotype: S8-10, lateral view



23. *concinna* ♀ abdomen, lateral view

Discussion

Argia telesfordi differs from *Argia concinna* by the following set of characters (those of *Argia concinna* in brackets): anteclypeus uniformly light blue or with at least two lateral dark spots, Fig. 4 (anteclypeus entirely dark, Fig. 3); torifer region not raised (distinctly raised); tori rounded as broad as space between them, Fig. 14 (tori elongated and divergent, Fig. 13); cercus with inner tooth slightly longer than outer tooth and concavity between them distinctly marked, Fig. 16 (cercus with inner tooth as long as outer tooth and concavity between them slightly marked, Fig. 15); paraproct bifid, Fig. 12 (paraproct almost square, Fig. 11); ventral margin of ovipositor distinctly sinuate, Fig. 21 (ventral margin of ovipositor straight, Fig. 21).

The color pattern of both species is variable, so close that this might account for past misapplication of *Argia concinna* for specimens from Grenada. Lack of a detailed original description precluded comparison specimens from different islands, and the confusion over the identity of *Argia telesfordi* was prolonged by the application of the name *Argia concinna* to all material from the Lesser Antilles.

With two species from the Lesser Antilles—and the absence of a precise type locality—the question remained about application of the name to Rambur's types. The original description fits with the specimens we have from Guadeloupe and Dominica: (translated from French): “Tenth abdominal segment notched posteriorly, with angles projected in two contiguous spine-like bumps, between the cerci; caudal appendages black, very short; cerci shorter than paraprocts, thick, truncate, with external angle very blunt and not projecting, prolonged in the lower part by a tooth. Paraprocts directed towards the cerci which they touch, very blunt, compressed with a slight projection inferiorly before their end”. This tallies with the known distribution of *Argia concinna* and favors a Guadeloupian or Dominican origin of the types. Additional confirmation of our assignment of the name *A. concinna* to material as here described is further verified by the illustrations of the appendages of the male syntype by Hagen *in* Calvert (1902), and especially by Ris (1921); both sets of illustrations show equally branched cercus and unbranched paraproct.

Argia telesfordi is uncommon in Grenada, occurring at an altitude between 400 and 1480 feet. The species occurs on slower flowing parts of fast flowing mountain streams and small rivers in open areas. It also occurs near stagnant water such as lakes, meadows and seepages. We have found *Argia concinna* predominantly on fast flowing montane rivers belted with canopy. Biology of both species is similar. Adults are found on exposed rocks, fully mature males and females are also found in forested areas. Mating takes place on rocks or on the banks of streams and rivers. Tandem pairs fly to suitable oviposition sites; females oviposit in tandem or alone (depending on the population density) on leaf debris, mosses in low or fast flowing parts of the habitats.

Larvae and exuviae were found in two stations on different rivers, between 5 and 50 meters altitude. Exuviae were typically found clinging on sides of rocks, in a vertical position in sunny areas, and near the water's surface. Companion species of *A. telesfordi* are *Dythemis sterilis* Hagen, *Brechmorhoga praecox grenadensis* Kirby and sometimes *Erythrodiplax fusca* (Rambur).

Acknowledgements

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